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Pisoni, Galena, Zhu, Hongrui and Gurnell, Ann (2025) The Role of Artificial Intelligence (AI) in Enhancing Accessible Experiences: Insights from Case Studies in Yorkshire. In: Halpern, Nigel, Rickly, Jillian, Garrod, Brian and Hansen, Marcus, (eds.) Handbook of Accessible Tourism. De Gruyter studies in tourism . De Gruyter, pp. 285-301

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# **The Role of Artificial Intelligence (AI) in Enhancing Accessible Experiences: Insights from Case Studies in Yorkshire**

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Chapter highlights:

- Identifies how AI can enhance accessible experiences in the domain of tourism and hospitality.
- Develops a new framework for AI-enabled accessible tourism.
- Features examples from industry practitioners of implementing AI-powered technologies to enhance accessible experiences.
- Provides a future research agenda for AI-enhanced accessible tourist experiences.

## **1. Introduction**

Accessible tourism aims to ensure that everyone, including people with disabilities, can easily access and fully enjoy different places and activities (United Nations Department of Economic and Social Affairs [UN DESA], n.d.). This includes having places and facilities that are easy to use, transportation that is suitable for everyone, high-quality services, and events and attractions that are open to everyone (Lisi & Esposito, 2015; Ryndach et al., 2021). The term “accessible tourism” highlights the importance and necessity of providing inclusive and barrier-free tourism products, services and experiences for everyone (Buhalis & Darcy, 2011). The term “people with disabilities” highlights the inclusive nature of individuals who have diverse access needs related to their physical, sensory, or cognitive abilities (World Health Organisation, 2011).

Technologies powered by artificial intelligence (AI) encapsulate a range of sub-areas including algorithms, machine learning, computer vision, robotics and natural language processing to simulate human intelligence and optimise the process (Murdick et al., 2020; Russell & Norvig, 2016). These AI-powered technologies are of

great importance to enhance inclusivity and remove barriers for people with disabilities, for instance, offering personalised experiences based on individual needs (Kinnula et al., 2021); implementing navigation systems in hotels for vision-impaired tourists (Liu et al., 2024); optimising operational processes for tourism providers to better embrace inclusivity (Vujičić et al., 2024). Leading specialist interpretive design organisations, such as Bright White Ltd, Ay-Pe, Mather & Co, Ralph Appelbaum Associates and Chargeurs Museum Studio Group, are developing new approaches in answer to national and international cultural institutions' need to provide a more accessible experience for people with disabilities. Against this backdrop, this chapter sets out to investigate the revolutionising role of AI-powered technologies in enhancing accessible experiences by proposing a theoretical framework for designing accessible solutions based on critically examining the current academic discourse of how AI-driven solutions have enhanced tourist experiences and made tourism more accessible and inclusive.

The chapter aims to develop a theoretical framework for the role played by AI-driven solutions and applications in the current academic discourse. This model will allow the identification of where the gaps will be for future research directions regarding how AI-powered technology will enhance accessible experiences. Practitioners in the tourism and hospitality industry can design their experiences with the help of this framework and can consider what types of AI-driven solutions are available to adopt based on their specific circumstances to reduce the barriers for people with disabilities and make the tourist experience more accessible and inclusive.

This chapter is comprised of the following sections: Firstly, this chapter reviews and synthesises the current state of academic discussion on AI-driven applications adopted in the field of accessible tourism. The critical discussion not only reflects the significant benefits and potentials of integrating AI-driven solutions in enhancing accessible experience but also evaluates the challenges and risks of adopting such solutions. Secondly, a framework is outlined for future designers of AI-based tourist solutions to define questions that guide the process of designing AI-based tourist accessible experiences, or understand their strengths and weaknesses. Moreover, this chapter offers insights from two most up-to-date practical case studies of implementing AI-powered technologies in the tourist sphere. These examples feature

pioneering industry stakeholders in Yorkshire, UK, who have been working together to explore possible AI-driven solutions to enhance accessible experience. Lastly, this chapter identifies gaps within the existing body of literature and paves the way for future research in accessible tourism via the technological lens.

## **2. Related research**

AI-driven technologies cover a range of advanced computational systems and techniques, such as machine learning, computer vision, natural language processing etc. (Murdick et al., 2020; Russell & Norvig, 2016). The adoption of these technologies has huge potential for accessible tourism by allowing people with different needs and abilities to have equitable opportunities to travel and enjoy tourist experiences. This development aligns with the commitment to promoting accessible tourism for all and fostering social inclusion by UN DESA (n.d.). By looking into the existing literature, this section highlights the ongoing discussion of the significant roles played by AI-driven solutions in making the tourist experience more accessible and inclusive as well as the challenges and ethical considerations when applying AI-powered technologies in real-life scenarios. The current state of academic discussion on the emerging yet rapidly evolving phenomenon lays the foundation for developing the framework of accessible tourist experiences enhanced by AI-enhanced technologies.

The integration of AI-enabled technologies into the service design and systems in the tourism and hospitality sectors has significantly enhanced digital accessibility (Sharma et al., 2020) and the quality of experiences for everyone, particularly for people with disabilities. During the design process, AI-enabled technologies have begun to consider and include the specific needs of people with disabilities from the beginning to make the experience more accessible and inclusive (Kinnula et al., 2021). Also, these technologies have huge potential to make the experience much more accessible and compatible with the existing assistive features. Moreover, by embedding AI in the design process, the system has the possibility to identify patterns and generate personalised preferences of consumers, and even design a digital profile for them, based on previous interactions and choices made on the platform and the comparison of other tourists who have similar needs (Ryndach et al., 2021), particularly for those with vision and hearing impairments.

Not only have AI-driven supportive technologies enhanced digital accessibility and inclusivity in service design in the context of tourism and hospitality, but they have also enhanced the tourist experience during service delivery. For example, technologies like voice control in a hotel setting and smart navigation systems at destinations, have significantly enhanced the accessible experience for vision-impaired tourists, allowing them to travel more independently and with more dignity (Lam et al., 2020; Liu et al., 2024). Also, vision-impaired tourists share similar needs and reasons with those sighted tourists in terms of taking photos and posting them on social media platforms (Pisoni et al., 2021), particularly when they explore new destinations and enjoy novel experiences. In this case, AI-assisted technologies, such as camera aiming via audio feedback during photo-taking and computer-generated descriptions for photo-sharing, have greatly facilitated this specific need by empowering them to independently browse their albums and upload photos to social media platforms (Zhao et al., 2017).

Moreover, the applications of novel technologies driven by the development of AI, such as chatbots, the Internet of Things, and virtual assistants, have been able to meet the needs of individuals experiencing speech and hearing difficulties (Shezi & Ade-Ibijola, 2020), which has been implemented in the tourism and hospitality industry to provide accessible experience in the forms of virtual assistants or concierges (Ryndach et al., 2021). Furthermore, AI-powered technologies have the ability to enhance the accessible interactions between tourists and destinations through smart tourism and cities (Nikitas et al., 2020; Tsaih & Hsu, 2018). The integration of digital 3D simulation powered by AI technologies allows people who have mobility issues or cannot endure long travels to explore physically inaccessible places (Ryndach et al., 2021). Also, tourist destinations can adopt AI-powered connected and autonomous vehicles that will revolutionise the transportation infrastructure to reduce social barriers such as age, disability and skills of driving vehicles (Nikitas et al., 2020).

AI-powered technologies have been extended to cultural attractions and museums to make cultural experiences more accessible and inclusive to everyone (Dal Falco & Vassos, 2017; Díaz-Rodríguez & Pisoni, 2020; Ryndach et al., 2021). The technology of AI has transformed the concepts of cultural accessibility in museums, particularly making virtual visits more interactive and inclusive for everyone (Dal Falco & Vassos, 2017). The application of eXplainable AI (XAI), together with advanced technologies

like natural language processing and computer vision, has a huge potential to bridge the gap in accessibility to cultural heritage for minority audiences and people with disabilities, such as vision and hearing impairments, and allow them to have a more personalised and meaningful engagement with the cultural sites (Díaz-Rodríguez & Pisoni, 2020). The mobile app MonuMAI on smartphones, powered by XAI technology, can offer visual explanations by detecting photos of different art and architectures, which will facilitate the dissemination of art and science to a wider audience, including those with vision impairments (Díaz-Rodríguez & Pisoni, 2020; Herrera et al., 2018). Moreover, researchers have begun to explore how mobile eye-tracking (MET) technology makes the experiences at arts and cultural venues more accessible for people with hearing impairments (Cumper et al., 2023). Through providing detailed explanations, AI-enabled technologies have huge potential for more profound interaction and engagement with cultural sites, making these experiences more accessible and inclusive for all, regardless of their abilities.

Although AI-powered technologies have substantially enhanced and will continue to exert significant impacts on enhancing the accessible experience for tourists, they also face challenges, risks and ethical considerations due to their rapid evolution (Chemnad & Othman, 2024). In particular, these key issues revolve around general usability, existing biases and discrimination, as well as data privacy concerns. Firstly, despite many promising and potential benefits, many people with disabilities may find the adoption of these technologies overwhelming or intrusive (Shew, 2023). Also, embedding AI-powered technologies in the system design could potentially make it more complex and less user-friendly, which can generate barriers for people with disabilities (Chemnad & Othman, 2024). Secondly, the functions of AI rely on the quality of the training data. The data used for training can potentially pose risks to AI-powered technologies and systems sustaining existing biases and/or generating new types of discriminatory practices, which will negatively affect the accessibility and inclusivity of tourists who deal with various disabilities (Milwood et al., 2023). Lastly, since training AI-powered assistive and supportive technologies for providing accessible and inclusive experiences needs to collect a large amount of data from people with disabilities, the implementation of these technologies could pose concerns and threats to data security and personal privacy, particularly with sensitive data from this group (Chemnad & Othman, 2024; Grundner & Neuhofer, 2021; Milwood et al.,

2023). Therefore, it is imperative to strictly adhere to data protection laws and ethically handle such sensitive data while training and implementing AI-driven technologies to enhance the accessible tourist experience, for all visitors.

This chapter synthesises the transformative impacts and substantial potential of AI-powered technologies in enhancing accessible and inclusive tourist experiences during the service design and delivery process as well as making cultural experiences more approachable to people with disabilities. However, there is a wide range of social challenges and ethical issues that are associated with the rapid evolution of AI-powered technologies. The rapid evolution of AI-powered technologies necessitates the call for developing a framework for enhancing accessible tourist experiences.

### **3. AI-enhanced accessible tourist experiences: A framework**

AI plays a transformative role in improving accessible experience design, helping to create more inclusive products, services, and environments for people with diverse needs, especially those with disabilities, examples include the use of assistive technologies (voice assistants, screen readers, typing assistants), content adjustments for different font sizes, subtitles, image descriptions, facial description and emotion detection, sign language and multi-language support, and support in terms of physical accessibility, like navigation assistants.

Having critically reviewed the current state of literature on AI-powered technologies in enhancing accessible experience, the following framework that encapsulates six dimensions (as shown in Figure 1) is proposed as a reflection tool to aid designers in conceptualising and creating visitor experiences at various tourist destinations. The framework is developed using service design methodology, in particular, blueprinting and touchpoint analysis, drawing on previous studies and experiences involving participants with different abilities (Pisoni, 2020; Pisoni et al., 2019). These studies analysed interactions customers had with cultural heritage and mapped visible and non-visible elements of the service, as well as how they interacted with users of all abilities.

All visitors have varying abilities, and AI can assist designers in enabling diverse interactions and responses to the presented content, allowing for meaningful

reflections and engagements. Considering the design processes used by leading interpretive design companies such as Bright White Ltd, one of the first questions for a designer creating AI-empowered visitor experiences is, “Which contents are critical components for the visitor experience?” Secondly, designers must consider the interplay between physical and digital spaces, and how AI can facilitate new forms of interaction. Generative AI can be extremely useful in this context, as it can produce different audio and visual outputs tailored to individuals with varying abilities.

“To what extent should objective and/or subjective information be included in an AI-enhanced experience?” This entails thinking about the broader experience in which the technology will be embedded and people’s actions and experiences as the centre of it. By combining objective data (factual, quantifiable information) and subjective data (personal opinions, feelings, and experiences), AI can create more engaging, personalised, and satisfying tourist experiences. AI in this sense can suggest and generate itineraries that cater to visitors and their specific abilities. AI in this respect can also provide real-time alerts and tips on navigating crowded areas, and unexpected barriers, or provide assistance for this kind of event. AI can incorporate personalised suggestions based on individual preferences and past experiences, ensuring that the itinerary is both enjoyable and accessible.

Another important question for visitor experience designers is, “How can we engage tourists in AI-enhanced experiences?” Designers have many ways to engage visitors and help them connect with places, providing multisensory and affective communications for all by engaging the entire sensory system (Kirshenblatt-Gimblett, 1998). AI can be utilised to mine for intellectual reflection prompts, generate abstractions, or provide visualisations, rhythms, and vibrations that ignite the imagination. All these elements should be considered to best engage and connect with visitors.

A further question for designers is, “How does the solution integrate different spatial and temporal elements for tourists?” This will significantly influence the visitor experience. Designers must consider how visitors will move through the space and interact with technology at the chosen location. Often, designers will need to employ “invisible technology” that subtly integrates with the environment. For example, voice

assistants that combine advanced AI, machine learning, and voice recognition to interpret and respond to user queries can be particularly useful for the diverse needs of different sites and settings.

The temporal organisation of such interactions should also be carefully considered. Some audio prompts can be designed to unfold in a chronological narrative, while others can be tailored to meet the specific needs of individuals, helping them experience visitor sites or tourist events in a personalised manner. This is especially important for visitors with different abilities; for instance, elderly visitors might have different attention spans compared to young adults. Internal interactions within groups of visitors are also important. Visual robots that adapt their presentations to people with different abilities may be another effective option.

Then there is the question, "How should AI models adapt when faced with missing data or the absence of important information?" Designers of visitor experiences need to plan how the AI will behave when information is missing, so to provide the best possible experience to all. One possibility may be to feed the AI with context-aware information, so AI is able to infer missing accessibility information based on the location, type of site, and user behaviour. Another strategy may be to use whatever partial data is available and to present it transparently to users, even incomplete information can be valuable to make informed recommendations when presented as such. By adopting these strategies, AI models can effectively manage and adapt to missing data, ensuring they provide valuable and accurate information to enhance the accessibility of touristic sites.

Designers must also reflect on the different levels of prior knowledge visitors may have and to what extent these gaps need to be addressed. Therefore, another key question is, "What is the prior knowledge of the tourists? Is there a need for adaptation?" AI can be used to identify the diverse backgrounds and knowledge levels of visitors, determining what information may be necessary to provide the best possible experience. Visitors not only have different abilities but may also come from various national and cultural backgrounds, potentially leading to misunderstandings of presented references. AI can help generate relevant descriptions and visual aids to

support visitors in understanding the content in the best possible way, making the experience more informative and engaging.

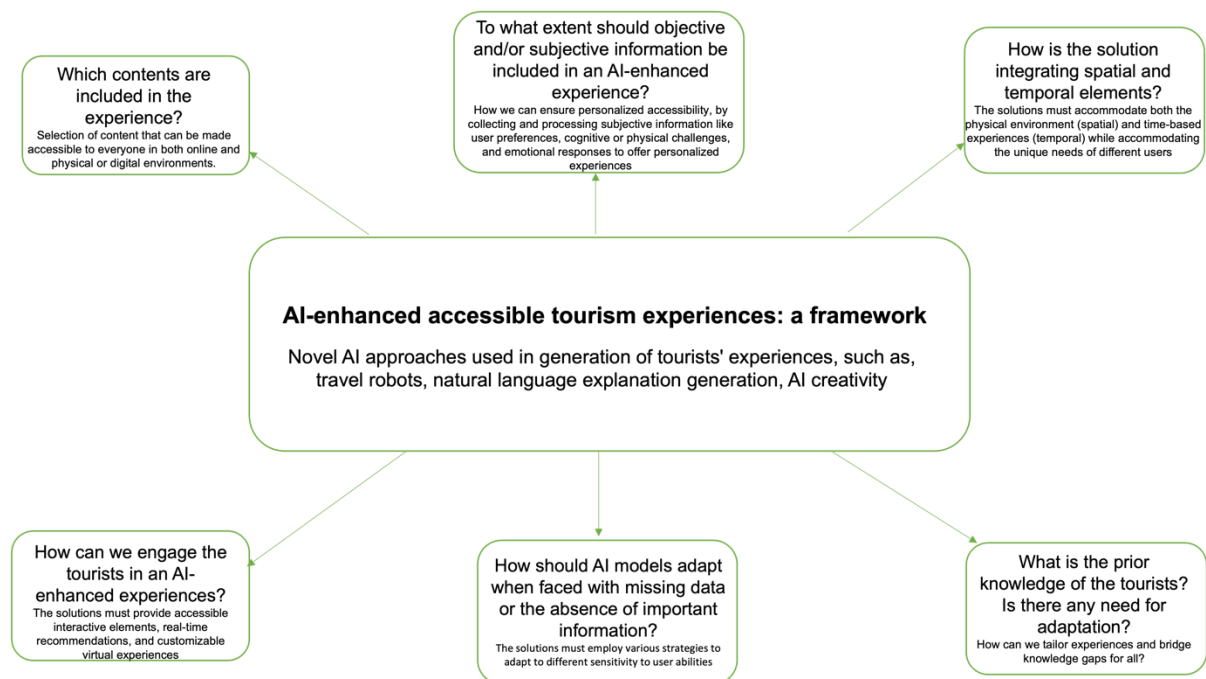


Figure 1: AI-enhanced accessible tourist experiences: A framework for designers consisting of six different elements/questions they should take into account when planning different visitors' experiences

#### 4. Practical applications: Two case studies featuring pioneering tourism stakeholders in Yorkshire, UK

Having proposed the framework that is intended to aid tourism practitioners in designing visitor experiences, this section now presents two case studies in this section that feature pioneering tourism stakeholders from Yorkshire, UK, in designing accessible tourist experiences. The leading player in the field, Bright White Ltd is an interpretive design company working in the global cultural sector from its UK base. Their mission is to "help individuals and communities to tell their stories", and "engage the next generation with the riches of the past and present, to help them live and learn" (Bright White Ltd, n.d.a). Bright White Ltd has been collaborating with forward-thinking practitioners in the field of AI-powered technologies on the following two projects, namely, The Forever Projects and XR Stories, which will be presented in detail.

### 1) The Forever Project

Bright White Ltd has been working in analogue and particularly the digital space and in 2016, The Forever Project, collecting and curating Nazi Holocaust survival stories, was awarded a place on the Nominet Trust NT100, a list that celebrates innovation and using digital technology to change the world. An award-winning interactive experience allows users to engage in a question-and-answer session with a survivor's digital projection, providing a dynamic encounter beyond passive observation. This experience, known as The Forever Project, enables interaction with life-sized digital projections that respond to questions with a wide array of pre-recorded answers, even after the survivor's passing. Through unique and authentic interactions, the project has significant educational implications by enhancing the understanding of the Holocaust and its relevance to contemporary issues like racism and prejudice among the public (Salter et al., 2018).

The success of The Forever Project has led to the development of new online and virtual reality (VR) versions ('In the Room with Nile Rodgers' as shown in Figure 2) in addition to the physical exhibition visitors can experience in person. It brought research on how to integrate video within VR to new standards and the company had to investigate how to integrate natural language processing, conversational agents, machine learning, sentence encoders and voice interaction, making the interaction for different audiences more seamless (The National Holocaust Centre and Museum, n.d.b).



Figure 2: In the Room VR (Image courtesy of Bright White Ltd: © Bright White Ltd 2024)

To date, the testimonies of thirteen Holocaust survivors have been recorded for The Forever Project. However, there remains a pressing need to document many more. With survivors now in their 80s and 90s, the urgency to capture their stories is increasingly critical.

In each of the cases, across all iterations of this approach, delivery to the audience was a pre-filmed clip in response to their prompt question. The approach did not involve putting words in the mouth of any of the subjects and did not involve generative AI.

How the framework was implemented in this exhibition and made more accessible for everyone

1. **What content is essential for the visitor experience?** Both the online and physical versions of the stories incorporated a wide range of accessible design

features, such as voice assistants and content adjustments, providing educational resources that address diverse learning needs.

2. **How much objective and/or subjective information should be included in an AI-enhanced experience?** The adaptive model driving the exhibit collected and processed data on participant interactions, personalising the experience to meet individual needs.
3. **How can we engage tourists in AI-enhanced experiences?** The designers ensured active engagement by facilitating a dynamic question-and-answer session with a digital projection of a survivor, creating an interactive experience beyond passive observation.
4. **How does the solution integrate various spatial and temporal elements for tourists?** Visitors interact with life-sized digital projections that respond to pre-scripted questions in a planned sequence, creating a cohesive and immersive experience.
5. **How should AI models adapt when faced with missing data or the absence of crucial information?** AI was used to interpret the question asked by the audience and matched it to a pre-defined set of questions.
6. **What is the tourists' prior knowledge, and is adaptation necessary?** The experience was designed to address knowledge gaps across different age groups, adjusting accordingly to offer a personalised and effective learning experience.

## 2) XR Stories – Responsive interpretive storytelling

A collaboration project between Bright White Ltd, The Science Museum Group (SMG), and Digital Creativity Labs at the University of York, funded by XR Stories (as shown in Figure 3), is investigating opportunities to use AI supported by machine learning to look at role automation to enhance the provision of *Explainers* around the museum: people answering visitors' questions and adding detail to the stories behind the exhibits. *Explainers* are acknowledged from SMG's visitor feedback research to benefit the visitor experience for all types of visitors, including those with physical or neurological impairments.



Figure 3: XR Stories in Situ (Image courtesy of Bright White Ltd: © Bright White Ltd 2024)

Collaborating with SMG, Bright White Ltd curated a gallery exhibit aimed at elucidating the significance of an early BBC microphone, evaluating various storytelling

techniques and interpretative approaches through audience engagement and feedback. This process culminated in the creation of over 20 succinct media clips, tailored to different age demographics and levels of scientific literacy, with culturally relevant content designed to resonate with both older visitors and those at the outset of their STEM exploration.

Utilising computer vision and computer audition technologies, the exhibit dynamically interacts with approaching visitors, initiating dialogue to gauge their prior knowledge of the microphone. This information is then processed by the DC Lab's Cutting Room platform, which employs demographic data to customise the sequence and content of media clips, fostering prolonged engagement tailored to the specific audience.

The microphone exhibit features AI-driven motion graphics displayed within a ColliderCase system, where images, text, and videos are rendered holographically around the microphone. This integrated system harnesses various forms of AI, currently undergoing evaluation to assess its efficacy and user experience (Bright White Ltd, n.d.b).

How the framework was implemented in this exhibition and made more accessible for everyone

1. **What content is critical for the visitor experience?** The stories included in physical versions utilised a full range of accessible design elements (such as voice assistants and content adjustments) and provided learning resources tailored to various learning needs.
2. **To what extent should objective and/or subjective information be included in an AI-enhanced experience?** The adaptive model behind the exhibit collected and processed information about participants' interactions, personalising the experience based on implicit and explicit individual needs.
3. **How can we engage tourists in AI-enhanced experiences?** The designers ensured active engagement by observing engagement through computer vision and diverting the delivery based on observable real-time audience behaviour.
4. **How does the solution integrate different spatial and temporal elements for tourists?** Visitor interact with something within their expectations – namely

an object display that fitted with the whole ethos of SMG exhibitions, but with the extra functionality of an automated *Explainer* role.

5. **How should AI models adapt when faced with missing data or the absence of key information?** The AI model was trained to compensate for any data gaps in observed behaviour, ensuring an optimal experience for individuals with a wide range of abilities.
6. **What prior knowledge do tourists have, and is adaptation necessary?** As mentioned, the experience was tailored to address cultural references used in the delivery of interpretation across different age groups, adapting the content accordingly.

## 5. Discussion and future research agenda

As discussed above, AI can provide great help to designers to provide engaging experiences for visitors and tourists with different abilities. Looking at the cases in relation to the framework, it becomes clear that designer choices in each setting enable different kinds of connections with audiences, sites and prior knowledge. Visitors' experiences are defined by connections between the sites and/or events and the visitors, therefore such design selections in this chapter include how to use the power of AI to engage, interpret, present knowledge, and stay in touch with visitors become important (Smith et al., 2018; Welch, 2014). The case studies showcased how AI helps bring places, events and sites to visitors through design choices.

AI is transforming numerous sectors, such as hospitality and tourism. Although there has been significant research on the customer journey, a comprehensive understanding of what it means to have an AI-empowered accessible tourist experience remains limited. Existing literature indicates that AI possesses features that can support improving the tourist experience. The diverse applications of AI-powered technology in tourism and hospitality present opportunities as well as challenges in the domain, therefore raising the following points as important to be further researched by practitioners in the field.

### 1) Personalisation and privacy concerns

Personalised recommendations generated by AI systems can occasionally lead users to feel that they do not exercise any power over their personal data, or for what reasons

their personal data is used for. Social media users often share tour photos with friends and family, which raises privacy concerns that can deter the use of recommender systems. Future research should examine tourists' privacy concerns regarding the potential loss of control over their personal information. Additionally, there is a lack of literature on the factors that moderate the impact of privacy concerns and awareness of such potential issues on the tourist experience.

## 2) Acceptance and customer perceptions towards robots

Robots offer an alternative to human guides, and they provide the possibility of personalisation and automation of tourist experiences (Karreman et al., 2012). Previous research has shown that the usefulness perceived of the guide robots directly impacted consumers' intentions to repeat the experience (Webster & Ivanov, 2022). One scenario for the tourist experience is where hospitality structures use robots to help visitors with carrying luggage, possible food or any other goods delivery, or any other application with respect to room service. These different aspects of such service robots may set high expectations in visitors, thus in turn dissatisfaction and potentially feelings of frustration if expectations are not met and if there are service failures. It is recognised that the potential impacts of AI-led robotics on tourism, hospitality and leisure experiences and management are considerable (Koo et al., 2021). Current literature is scarce on the study of factors and criteria for acceptance of guide robots in hospitality and tourism, or what would be conditions for successful deployments of such robots in different settings (Samara et al., 2020). Future research should study customer perception towards robots for different hospitality and tourism scenarios.

## 3) Integration of various technologies for smart tourism solutions

Integrating video, VR, and other interaction devices into a single smart tourism solution, as in one of the case studies, represents one future frontier for research exploration. The role of big data analytics and machine learning techniques in uncovering tourist experiences with AR/VR warrants further exploration (Yung & Khoo-Lattimore, 2019). Additional research is required to investigate the combination of different technologies to create smart tourism solutions. For instance, augmented reality and AI bots could introduce virtually embodied robots that provide a range of services to customers. The existing literature also lacks a comprehensive understanding of the elements of virtual travel for visitors of all abilities.

4) The economy behind the disabled customer journey and the opportunity for AI to positively influence the “Purple Pound”

Complete tourist experiences follow a customer journey model which includes physical and virtual environments and the development of authentic and immersive Servicescapes (Bitner, 1992) to influence behaviours, before during and after the service encounter of any tourist experience. Following the AIDA model (Doyle, 2011) to create Awareness, Interest, Desire and Action, and the Three Stage Model (Tsiotsou & Wirtz, 2015) which focuses on the three stages of customer choice when selecting services including tourist experiences:

- Pre-Purchase (weighing up the options and identifying the needs)
- Service Encounter (purchase and experience)
- Post-Encounter (evaluation)

In the past, tourism organisations through travel, accommodation and tourist experiences have developed communications, systems, processes and experiences focussed on the general population and not provided adjustments for those with physical or neurological impairments, above the legal requirements in respective destinations. The potential for AI to enrich and influence all elements of the tourism customer journey, particularly to initiate initial engagement, should be acknowledged. These start with the discovery, information gathering and decision-making phases, through travel, destination experiences including hospitality and cultural activities, to sharing experiences and long-term relationships and preferences that affect future visitor actions. It is acknowledged through literature and research that AI is being used to enhance all aspects of the tourist experience to benefit disabled people. A study centred on the development opportunities for tourism in Malaysia has identified that AI-powered solutions using large data sets can determine travel preferences and needs for disabled travellers. The insights gained will enable tourism businesses to optimise their service provision for this economically significant audience (Kazim, 2024).

This is beneficial to society, fulfilment of organisations’ diversity, equality and inclusion goals and to the commercial success of tourism businesses and destinations giving them greater access to disabled peoples’ leisure spend. The estimated spending

power of people with disabilities, known as the “Purple Pound”, to the UK visitor economy is worth £274 billion annually (Scope, 2023).

This global market is increasingly important to service, commercially and ethically, and facilitating physically, vision and hearing impaired individuals’ access to all aspects of tourist experiences is being seen as an opportunity for digital technologies to address across all three service encounter stages, particularly through the development of AI-driven apps: Such apps include driven wheelchair accessible routes wayfinding and locations which can generate alternative options and support networks, such as contact with taxi firms in real-time as wheelchair users travel through a destination; lipreading and audio text summarisation within the face-to-face situations such as hotel receptions and to aid people with mental impairments; and visualisation adjustments to graphics and colours for neurological and vision impairments (Martinez, 2022).

## **6. Conclusion**

This chapter has proposed a framework for designing accessible visitor experiences for all, empowered by AI. The framework consists of six dimensions that designers will need to consider when incorporating AI to provide the best experiences for all. The aspects are: contents and suited delivery for visitors with different abilities, the right balance of objective and subjective information needed to provide the best experience, visitor engagement for visitors with different abilities, spatial and temporal integration through different technological decisions for the best experience, strategies on how AI should models adapt when faced with missing data or the absence of important information, and prior knowledge and need for (cultural or any other) adaptation.

This chapter has elaborated on the dimensions and provided two case studies from Yorkshire on how AI-based designs have been incorporated into two different visitors’ experiences. The framework exposes some of AI’s intrinsic opportunities to improve experiences and serves as a reflection tool for designers on how AI can help tourist experiences be more inclusive: Responding to visitor reactions, inputs and needs with real-time adaptations for visitors with different impairments; Creating immersive experiences that enhance storytelling and experiences for all visitors; Developing increased opportunities for economic, cultural and social benefits for visitors,

destinations and tourist organisations. The framework and discussions will encourage future discussions in the domain, and thus act as a catalyst and contribute to improved tourist experiences for all.

## **Acknowledgement**

The authors would like to thank Chris Walker, Managing Director of Bright White Ltd, for the insights and clarification on how AI technologies were used in the case studies and providing the images of the case studies.

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