

The Influence of Artificial Intelligence on South Africa's Tourism Sector: A Review and Path Forward

Taemane Phoofolo and Joram Ndlovu

School of Social Sciences,
University of KwaZulu-Natal,
Durban, South Africa

Abstract

Tourism is a vital economic sector in South Africa, attracting a large number of visitors who come to experience the diverse range of tourist attractions the country has to offer. In its efforts to achieve sustainability and competitiveness, the industry is incorporating Artificial Intelligence (AI) into its operations. This review explores the transformative role of AI in South Africa's tourism sector, highlighting both current applications and future potential. This paper aims to illustrate how AI enhances the tourist experience and operational efficiency. Furthermore, it will map the way forward by identifying challenges and proposing strategic initiatives for stakeholders to harness AI's full potential in promoting sustainable tourism growth. A qualitative approach was employed in reviewing thirty articles published in peer-reviewed journals. The results indicate that AI has a significant potential to enhance the competitiveness of the tourism sector in South Africa. However, the integration of AI into the tourism sector might have a plethora of problems such as data privacy concerns, the fear of retrenchments and worker disenfranchisement. The paper suggests that significant measures are required to maximise the potential benefits of AI. The paper proposes collaboration between tech companies and tourism operators and the development of technology pro-policy initiatives to support AI integration. Further research is necessary to explore strategies for mitigating any adverse effects of AI in tourism, with a focus on boosting job opportunities and improving the socio-economic welfare of all stakeholders in the sector.

Keywords: artificial intelligence technologies, sustainability, competitiveness, tourism.

1. Introduction

Tourism is a vital economic sector in South Africa, attracting a large number of visitors who come to experience the diverse range of tourist attractions the country has to offer. However, the tourism sector is confronted by a myriad of problems and challenges to find innovative and creative ways to satisfy the ever-evolving needs and demands of travellers, maximise profits and remain sustainable and competitive. This pressure has triggered the need to integrate artificial intelligence as a strategic system

to keep abreast of times in the digital age and to achieve various goals including customer satisfaction, the production of new products and services, and to acceleration of digital transformation. According to Aly (2019) and Herrera et al., (2023), AI is a system designed by humans that given a complicated goal, acts by perceiving the environment through data acquisition, interpreting the collected data and deciding on the best possible action to take to achieve the desired goal. According to Moilanen et al., (2023), AI has the potential to democratise access to cutting-edge AI technologies, allowing businesses to harness the power of AI in the fields such as customer engagement, content creation and automation, thus levelling the playing field, and fostering creativity in traditionally resource-constrained economic sectors. This review therefore explored the transformative role of AI in the tourism sector in South Africa by highlighting both its current applications and future potential. By analysing AI-driven innovations such as personalised travel recommendations, smart chatbots for customer service and data analytics for market trends, the review sought to illustrate how AI enhances the tourist experience and operational efficiency of the tourism sector. Finally, it sought to chart the way forward by identifying the challenges associated with the use of AI and proposing strategic initiatives for stakeholders to harness AI's full potential and promote sustainable tourism growth.

2. Research methodology

Design

The methodology provided hereunder was intended to answer the research question: What is the influence of AI on the tourism sector in South Africa? To realise its key objective, a qualitative approach was employed in reviewing thirty articles dealing with AI and its impact on the tourism sector published in peer-reviewed journals.

Materials and procedure

The review was conducted in the following stages: The first search conducted in Google Scholar generated about eighty articles. The keywords "artificial intelligence" and "impact" were the focus. The second stage involved the addition of more words, namely, "tourism industry". The articles were then subsequently reduced to 30. During the filtering process, the following criteria were used to purposefully select the articles: Those that were published before 2014 were excluded as their findings might have been refined and updated by the latest ones. The articles published between 2014 and 2024, spanning 10 years, were included as research dealing with AI as a new emerging field, is evolving very fast. Articles written in English were considered while those written in other languages were excluded. The articles dealing directly with the research theme enjoyed consideration while those that did not match it were discarded, thus expediting the process of data collection, analysis, interpretation and presentation.

3. Review findings and discussions

The tourism industry and ICT enjoy a close-knit relationship which was brought about by the first computerised airline reservation system in the 1960s. Leung (2020), Boiano et al., (2019) and Herrera et al., (2023) argued that the dawn of the era of the Internet in the 1990s and the Global Distribution System in the 1980s have had a substantive

influence on the tourism sector. Herrera et al., (2023) highlighted the fact that the way in which tourists access information, plan, book tourism-related services and cascade their experiences to others is fundamentally attributable to ICTs. Therefore, the enterprises that use ITC platforms are increasingly able to access data related to the travellers' demands, age, demographics etc. to design effective strategies to market their respective tourist destinations (Herrera et al., 2023).

Decision-making process

The findings revealed that new technologies such as the Internet, AI-enabled smartphones, and portable device connectivity have significantly boosted the contribution that ICT has played in the tourism industry (Herrera et al., 2023; Kang et al., 2020). AI and new technologies therefore play a critical role in the decision-making process (Bulchand-Gidumal, 2020) and facilitate the development of new innovative ways to respond to the overall ever-evolving needs of the tourists. Additionally, the findings revealed that the profound influence of AI in the tourism industry is discernable in the domains or key areas such as knowledge representation (Amed et al., 2019), reasoning, travel recommendation systems, and facial recognition systems (Bulchand-Gidumal, 2020 & Herrera et al., 2023). Herrera et al., (2023) further added that AI benefits those sectors of the economy that handle vast amounts of data with results that give them a competitive edge by being able to anticipate, predict and proactively satisfy customers' needs. Bulchand-Gidumal (2020) cited the following reasons to illustrate the relevance of AI in travel and tourism. The tourists need to make decisions about future trips (Buhalis et al., 2019), for instance, by choosing a destination, mode of transport, type of accommodation and other activities. These decisions will have a profound impact on tourists' satisfaction level with the entire trip. It could therefore be safely inferred from Bulchand-Gidumal's assertion that such decisions might give rise to repeat visitation. Nevertheless, these decisions in turn pose a challenge to destination marketers to find the best possible match between customers and travel packages suited to their needs (Bulchand-Gidumal, 2020).

Cankurt et al., (2015) pointed out that the transformative potential of AI lies in its ability to forecast demand, and this inherently coincides with the reactivation of the tourism sector from 2020-2022 - an era that ushered in new tourist preferences and reinventions of tourism services. AI can forecast tourist experiences, determine profiles and forecast the number of arrivals at any given destination. The objective behind determining tourist arrivals is to solve the inconvenience that could potentially be generated by the arrival of several tourists exceeding the destinations' total carrying capacity (Bulchand-Gidumal, 2020 & Cankurt et al., 2015). The issue of forecasting demand serves as a key source of information for decision-making related to staffing, capacity, resource use and management and pricing regimes (Herrera et al., 2023). Additionally, accurate forecast facilitates the creation of effective strategies in tourism management, thus leading to sound planning and deployment of resources in the tourism sector (Liu et al., 2021).

Travel assistants

The review further considered the concept of smart travel assistants that have inadvertently gained popularity in the tourism sector. The results revealed that these technologies are familiar with the diverse interests, travel preferences and availability of the tourists, and are capable of taking the tourists from one place to another within a set budget (Bulchand-Gidumal, 2020). Furthermore, they offer natural language processing and speech recognition services. However, another system of marketing that could probably enhance the operation of travel assistants would need to be developed (Bulchand-Gidumal, 2020).

The role of service robots in hospitality

Hospitality is one of the key sub-sectors of the tourism industry that employs a substantive number of people in South Africa, and that is more amenable to the use of AI-enabled technologies. Bowen (2016) added more credence to the use of service robots in the hospitality sector by highlighting two major roles they play. Firstly, they play a supportive role, and secondly, serve as substitutive automation. Bowen (2016) maintained that technology can boost service encounters especially when used in conjunction with human capabilities. Robots do perform relatively simple, well-defined customer-facing tasks that comprise, inter alia, hotel customer check-ins, providing more information about products, and by extension services, taking orders and dealing with payments. These gadgets perform repetitive tasks with great precision while the workers can deal with complex tasks requiring problem-solving skills and emotional intelligence (Bowen, 2016 & Tuomi et al., 2021). However, in certain situations, the robots might be disturbing, e.g. a robot picking up empty utensils over and over again without dropping them anywhere. Tuomi et al., (2021) argued that the robots work well but still need additional human assistance or supervision, e.g. a robot might clean the floor but leave its corners and edges still dirty after it has finished.

According to Samala et al., (2022), robots are increasingly becoming popular in the tourism industry. The robots are intelligent physical devices with a degree of autonomy, mobility, and sensory capabilities that allow them to perform intended tasks without human intervention (Zlatanov et al., 2019). There are two types of service robots, namely, professional and personal service robots. The former is used in the tourism sector and hospitality industry for room-cleaning, self-check-in kiosks, border control gates at airports, and conveyor belt restaurants available in many cities (Zlatanov et al., 2019) while personal service robots are used by people for non-commercial purposes. Professional service robots also comprise, amongst others, a robotic suitcase which makes travelling a lot easier by following their owner by itself and avoiding any hindrances, thus eliminating suitcase-carrying obligations (Zlatanov et al., 2019). They serve as travel agents and offer airport security services, e.g. robot waiters and robotic hotel information agents. Moreover, robots can deliver necessities such as towels, toothpaste etc. to the guest rooms by using facial recognition systems to access and correctly identify the right rooms. Samala et al., (2022) and Kim et al., (2014) added that facial recognition technologies even provide easy check-in at airports and other strategic locations without any document

verifications by either the immigration or customs officials. Additionally, these technologies ensure data safety and security for tourists by employing blockchain technologies. Therefore, robots continuously enhance customer engagement and customer experience by providing novel services in the hospitality sector (Samala et al., 2022 & Lariviere et al., 2017). Some of them use speech recognition technology to respond to the guests' queries (Abo-Elsoud et al., 2022; Ivanov et al., 2017 & Ivanov et al., 2019). Robotic assistance devices are being trialled in travel agencies, e.g. AMADEUS' Pepper (Abo-Elsoud et al., 2022). One of the main advantages of AI is predictive analytics which enables tourism enterprises to forecast demand, boost pricing strategies and allocate resources more efficiently. Predictive analytics might also enable hotels, airlines as well as tour operators to make data-driven decisions to amplify revenue and minimise waste.

Tuomi et al., (2021) cautioned that, despite the positive role played by AI technologies in the tourism sector, these devices might also pose a psychological threat to the employees as they substitute the employees altogether in the service encounters, e.g., an autonomous bar manned by a virtual bartender and a coffee shop manned by a robot barista where ordering, serving and taking payments can be done without any human intervention. But on the positive side, robots may assist some businesses to innovate and offer distinctive services and position themselves as high-tech restaurants with a lot of tourist pulling power (Murphy et al., 2019). Robots arouse a lot of interest amongst customers as some of the people end up taking photos with them, and they are depicted in marketing campaigns (e.g. posters and signs) and fitted with hats, aprons, name tags and other attractive features to make them look like humans (Murphy et al., 2017). According to Tuomi et al., (2021), some food-service outlets install a robot personal assistant on every table so that consumers can interact with them while they are still waiting for their meals.

Regarding robots, the review found that the leading countries in robotics research are Germany, the United States of America (USA) China and Japan, particularly in engineering and computer science (Samala et al., 2022). There are different types of robots; hence, Garcia-Madurga (2023) proposed a taxonomy of robots in the hospitality sector, including accommodation (hotels) and restaurants marketing robots, entertainment robots, information robots and mobile navigation. Ivanov et al., (2019) supported this stance by highlighting the fact that the use of robots as museum guides, waiters, luggage-storage staff, delivery robots, receptionists, concierges, in-room assistants, as well as the use of robots as bartenders, play a pivotal role in the tourism sector. The cumulative influence of all these AI-enabled technologies leads to operational efficiency. However, Garcia-Madurga (2023) cautioned that even though the technologies play a pivotal role in the hospitality sector, their adoption involves exorbitant financial costs, that comprise inter alia, acquisition, installation, maintenance, software updates, adaptations to premises for robot mobility, hiring technicians and staff training. However, these costs may be mitigated by renting or leasing them.

The role of chatbots

According to Samala et al., (2022), the chatbot is a piece of software that conducts a conversation using auditory or textual methods. Chatbots are of two types, namely, text message-based chatbots that convey messages to the queries made by customers in the form of text messages, and voice-based ones. The latter conveys responses to the queries of the customers in the form of voice-based messages (Samala et al., 2022 & Liang et al., 2017). The greatest advantage of chatbots is that they are accessible daily for the entire year, thus eliminating the need for employees (Xiao et al., 2018). In certain countries some companies install the technology called Audio-tour that enables the travellers to ride the car on their own without any guide, thus affording more privacy to them. Samala et al., (2022) argued that personalisation is a key element that marketers incorporate into their services, for example, voice-based chatbots provide a high-personalised service to their customers. Chatbots can store the customers' previous data by which they can suggest recommendations based on past purchases and activities, and this also improves customer engagement and long-lasting quality experience (Samala et al., 2022).

Over and above the arguments posited above, the review revealed that tourists, more often, want to have a bird's eye view of the services provided by accommodation facilities, such as hotels. This is where the chatbots are quite useful in providing them with information about services such as appointments, ordering food services, scheduling tasks, setting up alarms, room services, and housekeeping services (Abo-Elvoud et al., 2022). To this effect, Samala et al., (2022) added another type of chatbot called chatbot concierge that specialises in the transmission of messages to tourists. In essence, the role played by these devices reduces the staff workload, thus enhancing the desired good quality visitor experience. The review further found that one of the major advantages of the chatbot is that it enhances the customer experience by providing real-time information and reduces the critical need on the part of all the employees to provide answers to the customers.

The significance of Google Maps

Google Maps uses Global Positioning System technology to guide travellers about directions, accidents and road traffic conditions such as congestion, thus offering a seamless journey. The old maps were erratic as drivers would sometimes end up being slightly lost and irritated. To offset that problem, the new maps incorporate the Visual Positioning System to minimise confusion and irritation experienced by travellers (Maroune et al., 2014). The latter device provides a real view of the world and visual features such as stores, recreational areas, residential areas, factories and so on (Leung, 2020). Consequently, drivers are increasingly being able to travel in the right direction without any hassle and can enjoy more privacy.

AI architecture in South Africa

As far as the AI architecture in South Africa is concerned, this review discovered the fact that this country does not have a clearly defined AI policy. However, the Department of Communication and Digital Technologies (DCDT) is spearheading the adoption of AI in the country (DCDT, 2023). This department has formed a strategic

partnership with tertiary institutions such as the University of Johannesburg, and Tshwane University of Technology to establish an Artificial Institute of South Africa whose overall responsibility is to introduce, fund and sustain digital technologies in the country (DCDT, 2023). Furthermore, the review revealed that one of the impacts of AI in the country is the establishment of several research hubs to carry out AI-related activities ranging from robotics and computation intelligence to knowledge representation and reasoning and language technologies (Ferrein et al., 2012). According to Ferrein et al., (2012), the Computational Intelligence Research Group, which is stationed at the University of Pretoria, specialises in research in computational intelligence, the Human Language Technologies group at the Meraka unit of the Council for Scientific and Industrial Research (CSIR Meraka), and North-West University focus on speech technology while the Robotics and Agents at the University of Cape Town handles computational intelligence architecture especially autonomous robots. The Centre for Artificial Intelligence at the University of KwaZulu-Natal deals with AI research. The review found that these initiatives point to the growth in various AI-related research endeavours (Ferrein et al., 2012) in South Africa.

Over and above this, the review discovered that the South African government is cognizant of the massive developmental opportunities that could potentially be ushered in by the integration of AI into the wider economy. To this effect, AI-dedicated investment channels identified by the national government have been put in place, and are divided into four categories (DCDT, 2023). First, the country, as stated earlier, has the potential to embrace AI technology for the benefit of all citizens. It could therefore be safely inferred from this assertion that the tourism sector would also derive some benefits from this investment scheme. Under this initiative, the danger that AI poses to jobs and the economy would be mitigated. Second, the country will invest in an AI skills generation plan to ensure that its education ecosystem is geared towards harnessing broad participation in AI opportunities. Here, the focus of the institution will be on offering STEM subjects – science, technology, engineering and mathematics. Third, vigorous efforts would be taken to identify jobs that will not be portable including the strategies to integrate displaced workers into the AI workforce. It is on this basis that this review found that many workers in the hospitality sector stand to benefit from such efforts. Fourth, the country will channel more investment in AI architecture to boost the economy and turn the AI sector into a new source of employment (DCDT, 2023).

According to the Pan Action Network (2020), AI and data are catalysing transformation and enhancing real-time and algorithmic-based decision-making and problem-solving. The PAN added that AI technologies such as chatbots, automated number plate recognition, dynamic traffic signalling and advanced waste management practices are increasing how the residents, and by inference, the tourists may interact with and consume services. The tourists in South Africa have access to new technologies such as social media, embedded sensors and AI-enabled smartphones to enhance their engagements, booking trips, communication channels and the like (PAN, 2020). Additionally, other AI technologies that are being used in

the country, comprise inter alia, Google Maps, drones and surveillance cameras. There are high-performance vehicles that are fitted with Google Maps to guide tourists in their journey, thus enhancing a seamless, stress-free travel and customer experience. The airports in major metropolitan areas such as Johannesburg, Cape Town and Durban use AI technologies to beef up security and to check tourists at their respective check-in points. AI has not yet permeated the tourism sector on a large scale. However, it is more used in sectors such as mining, agriculture and finance (DCDT, 2023).

Most of the commercial banks in South Africa use facial recognition systems for the safety and data security of their clients including tourists. The country has adopted data-driven systems and technologies, including AI, to foster inclusive economic growth (PAN, 2020). As for the challenges that are associated with the use of AI, the review discovered that they are, broadly speaking, applicable to countries across the board despite the differences that exist here and there as each country is unique, and as various countries are not on the same path of economic, social, cultural, political and technological development. But in South Africa, the following challenges might rear their ugly head: According to the PAN (2020), there are serious concerns about potential private-sector dominance of development and administration with the concomitant result of deepening technocratic governance, top-down AI management, exclusion and marginalisation of the poor, and deepening surveillance capacity.

The unequal integration of technology suggests that the historically disadvantaged communities might find it increasingly difficult to access services and reap the benefits of socio-economic development. Consequently, there have been calls for the adoption of a human-centred approach regarding the use of AI and related technologies that seek to achieve inclusivity of all people in the decision-making process, and entrench sound democratic accountability, transparency, development and civic empowerment (PAN, 2020). According to the PAN (2020), the government has noted with concern that participation and engagement in governance are unequal, bringing into sharp focus critical concerns about how the lack of inclusive interaction might be worsened in the advent of urban transitions characterised by automated technologies and data. The PAN further argued the government places its citizens at the centre of engagement in cities undergoing processes of technological transitions, and by inference, the tourism industry. It is against this background that ideas on 'data justice' and bottom-up technological approaches are emerging and regarded as the key building blocks for attaining a more inclusive strategy for AI and data adoption in the country (PAN, 2020).

Challenges for AI in the tourism sector

Although AI is rapidly infiltrating the markets worldwide and has proven to be impactful, it has its limitations (Bulchand-Gidumal, 2020). AI has the potential not only to support the workforce but also to substitute them in the workspace (Aly, 2019; Bulchand-Gidumal, 2020 & Herrera et al., 2023). The latter constitutes the greatest threat to the employees. AI is still an emerging area (Kim et al., 2023) that cannot supersede human intelligence. Some routine jobs such as front desk of hotels in the

tourism sector might even be eroded (Bulchand-Gidumal, 2020), and some authors argue that AI poses the largest threat to humankind. The workers will be disenfranchised and lose a sense of belonging, thus affecting their morale, and subsequently, productivity will decline. This will particularly be the case with low-skilled workers. But on the positive side, AI will liberate the employees from routine tasks, thus creating more space and time to execute complex tasks, and this is what is called AI augmentation and hybridisation. Xiao et al., (2018) and Moilanen et al., (2023) added that additional challenges include technological ones (lack of expertise, infrastructure constraints and integration with the existing systems), data challenges (availability, quality, security, management), regulatory and ethical compliance (legal compliance and ethical consideration), organisational and cultural challenges (resistance to change, lack of internal communication), external and market challenges (acceptance of user vendor dependency and market dynamics (Kang et al., 2020 & Moilanen et al., 2023)

Though AI technology is effective, technologically less-developed nations cannot afford the technologies as they are very expensive, and require a huge investment (Murphy et al, 2017). Another ethical dilemma associated with the integration of AI into the tourism sector is the issue of bias including that of the creators of AI algorithms, and this will include bias to race, age, gender and economic status. Therefore AI, according to Bulchand-Gidumal (2020), will amplify biases embedded in algorithms. Nevertheless, some experts suggest that these technologies need to be transparent and robust to withstand manipulation and predictability (Murphy et al., 2017). Another key challenge that the review revealed is that the integration of AI into the tourism sector poses serious safety and security concerns (Moilanen et al., 2023; Samala et al., 2022). For instance, some sectors of the economy are reluctant to use facial recognition technology due to privacy and data security issues (Kannan et al., 2019).

4. Conclusions

This review explored the transformative role of AI in the tourism sector in South Africa. AI technologies provide many developmental opportunities and challenges for the tourism sector. The AI-enabled technologies comprise, inter alia, robots, smart chatbots, travel assistants and predictive data analytics, which cumulatively enhance efficiency and operations in accommodation facilities. They amplify customer engagement and easy travelling patterns. They heighten the tourists' access to information, planning and booking tourism-related services. AI technologies in the tourism industry in South Africa may enhance processes such as knowledge representation, reasoning, voice and facial recognition systems if they are carefully adopted, and minimally intrude on user privacy, safety and security. These cutting-edge technologies make tourism enterprises highly competitive as they would be able to anticipate, predict and proactively meet travellers' needs.

Even though AI has a lot of potential to transform the tourism sector in South Africa, it has many challenges. It might threaten the low-skilled workers and push them out of employment, thus exacerbating high unemployment, poverty, inequality and the

digital divide. Some businesses may not be able to afford it due to exorbitant costs, lack of data, integration technical skills and infrastructure. These challenges point to the need to design technological pro-policy initiatives that will amplify its influence on the tourism sector and minimise its negative theoretical and practical underpinnings. More empirical studies need to be conducted to investigate various strategies of how to harness the full potential of AI in the tourism industry. There must be collaborative efforts between the AI research hubs, the industry and the government to strike a balance between creativity and responsibility in the integration of AI. Finally, this review suggests that future research endeavours must be initiated to investigate how to groom a techno-savvy generation that would specialise in AI and its effective use in the tourism sector.

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