

A Comparative Study of Artificial Intelligence-Driven Applications in Enhancing Tourist Experience and Compatibility to Indonesia's Tourism Sector

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Abstract. Tourism plays a significant role in contributing to national economic development. Following the growth of technology, Artificial Intelligence on the ICT Readiness aspect has become a newfound instrument in developing the tourism sector and enhancing tourist experiences in tourism applications like Visit Qatar and Grand Tour Switzerland. Regardless of AI development and positive user responses for both tourism applications, the effectiveness level and compatibility in Indonesia need to be explored thoroughly. This research aimed to analyze AI's advantages and disadvantages in tourism applications, including user-personalized content, AI-driven navigation systems, and other features powered by AI that have been successfully incorporated. In order to answer the research question of how impactful the performance of AI in tourism applications is, a comparative study based on the qualitative method through observation and application reviews was conducted to discover its strengths and weaknesses that will be a blueprint for developing future Indonesian travel applications.

Keywords: Tourism, Artificial intelligence, ICT readiness.

1 Tourism Trends

In recent years, the tourism industry has shown exceptional development after the decline caused by the Covid-19 pandemic. According to the latest UNWTO World Tourism Barometer, the number of international tourist arrivals has notably increased. From January to July 2022, there was an almost three-fold growth (+172%) compared to the same period in 2021. This increase represented a recovery of the tourism sector by nearly 60% of pre-pandemic levels, indicating a positive trend in the industry [1].

Based on the World Economic Forum (WEF), Indonesia experienced a remarkable increase in the tourism sector competitiveness, achieving the highest-ranking improvement among 117 other countries. Over the past two years, Indonesia's tourism competitiveness rating climbed 12 places, progressing from 44th in 2019 to 32nd in 2021 [2].

performance. One of the main challenges lies in the ICT Readiness aspect, which currently ranks 68th, as it plays a crucial role in utilizing Information and Communication Technology infrastructure. It includes digital platforms for trip planning, accommodation booking, and physical infrastructure like mobile network coverage and electricity supply.

In a digital era, the prevalence of internet usage among tourists is rapidly expanding. According to the Ministry of Tourism, around 70% of digital platforms are essential in disseminating information about tourist destinations and accommodations [3]. With the potential for digitalization, a solution that can be implemented is Artificial Intelligence (AI) for the ICT Readiness aspect in the tourism sector.

Through AI, the tourism sector undergoes enhancements across various areas, including service, management, development, and marketing. By analysing tourist data and preferences, AI has the capability to offer personalized tourist attractions recommendations, suggest travel routes, and provide travel itineraries. AI technology also ensures convenient real-time information updates, enabling tourists to have an effective travel experience [4].

Based on this, AI has the potential to significantly improve the ICT Readiness of mobile tourism applications, enhance the competitiveness of the industry, and promote equity within the sector. It was assumed that leveraging AI capabilities in future Indonesia's tourism applications could positively impact tourist experiences by providing personalized, optimized, and immersive experiences. To prove this hypothesis, the existing AI-driven features needed further exploration regarding their effectiveness and compatibility to be reflected in Indonesia's tourism application.

2 Artificial Intelligence in Tourism

AI was first introduced in 1956 after World War II and became one of the newest fields in science and engineering. This field isn't just focusing on understanding how the human mind works, but also attempting to build something similar like entities with the intelligence of a human being [5]. With the growth of technology, AI is often implemented in various platforms, such as mobile apps and websites. AI is also being used in multiple industries and activities, other than information and technology [6]. AI implementations can be seen in various aspects of daily life, such as self-driving vehicles, nurses, and navigation systems.

Foreign tourists' arrival on an international scale increased in 2022 after a substantial decline following the Covid-19 epidemic. International tourist arrivals, which totaled about 963 million in 2022, were still below pre-pandemic levels despite the notable annual growth [7]. As mentioned during the World AI Show in 2019, the tourism industry welcomed AI as an early adopter of technological advancements. AI is widely applied in the travel and tourism sector to achieve various objectives, such as enhancing personalization, customizing client recommendations, and ensuring responsiveness even when staff workers are unavailable. AI assists customers in traveling and also the tourism industry in serving their customers. Examples of AI within the travel industry are chatbots and online customer service, face-to-face customer service, data

processing, and data analysis, which help both the owners of travel industries and travelers [8].

An interesting example of this was Hilton's concierge service robot named Connie, which utilized AI and advanced speech recognition to provide personalized information to tourists. Moreover, AI can assist customers via the web when a service representative is unavailable and sort data such as customer feedback from surveys, reviews, online polls, and other data. Another powerful feature of AI and chatbots are the ability to generate a tour itinerary with the best tourist destinations based on the duration and location of the vacation.

There are some platforms that provide AI service in multiple forms in the tourism industry, such as Adobe Sensei Gen AI to generate images and personal experiences, Notion with its built-in AI, and ChatGPT to generate itineraries. Other examples of AI platforms that can be seen in Mapbox with its navigation system and MindBehind with its chatbots to assist customers are also considered to benefit the overall tourist experience. Based on the observation, two noticeable tourism applications can be considered preceding compared to others in utilizing AI in their features, namely Visit Qatar and Grand Tour Switzerland.

3 Comparative Study

This research aimed to explore the strengths and weaknesses of AI implementation in the existing tourism applications to be applicable in Indonesia. The effectiveness and compatibility of AI-driven tourism applications were verified through a comparative study, which involved a comparison of multiple qualitative variables. The study compared two tourist applications, namely Visit Qatar and Grand Tour Switzerland. Both applications served as tour guides to assist users in designing their travel itineraries by implementing AI.

The Visit Qatar application stood out as it utilizes AI technologies to enhance its functionality and user experience, such as MindBehind and Adobe Experience Manager. MindBehind serves as an AI-powered chatbot, functioning as an automatic virtual assistant to cater to user needs [9]. Additionally, Adobe Experience Manager is integrated into the application to enhance access to customer data, enabling effective audience segmentation based on their interests. The combined use of these AI technologies within the Visit Qatar application contribute to an improved user experience and personalized services. Conversely, The Grand Tour Switzerland application focuses on the navigation engine using AI GPX Data MapBox to automate the routes and travel tracks for users and AR-based gamification.

Table 1. Comparison of Features Between Visit Qatar and Grand Tour Switzerland

Features	Visit Qatar	Grand Tour Switzerland
Personalization	This app uses Adobe Sensei Gen AI in Adobe Experience Manager as a regulatory	This app's journey type is divided into the Road Trip type and the Adventurous type. The choice of the journey

	algorithm based on user needs and interests.	type affects the itinerary provided. Adventurous focuses on users who did many activities, and Road Trip is used for users who spend more time driving.
Navigation Engine	This app uses MapBox as its navigation engine, but redirect the users to third-party applications for route navigation.	This app utilizes Mapbox and GPX Data as its navigation engine. It can be used as route navigation based on a predetermined type of journey and does not redirect their users to third-party applications. GPX Data is also used to navigate outdoor activities like biking, hiking, and trekking.
Virtual Assistant	This app uses MindBehind as a chatbot, providing automatic message services to users and conversation services with live agents.	This app does not feature a virtual assistant.
Image and Voice Recognition	This app does not provide image and voice recognition AI.	Gamification of Augmented Reality (AR) is available in this app to collect virtual objects by scanning every landmark at the tourist destinations' photo spot.

3.1 Personalization

According to the provided table, several aspects required further argument as both applications served limited information and recommendations based on user preferences. Personalization, which tailors content according to user interests, is a crucial strategy to enhance user satisfaction and maximize opportunities in the future [10]. The inability to provide relevant content to users has a fatal impact, such as losing users and missing out on potential growth. According to the Adobe Personalization 2020 Survey of Consumers and Marketers, a significant number of respondents (35%) believed that personalization positively impacted brand perception. Additionally, 42% of the respondents considered personalized content essential in enhancing user experience [11].

In AI personalization, scalability is vital in handling large amounts of data and narrowing it down to provide a personalized experience based on user preferences [12]. With this system, AI personalization must effectively balance its operating processes and storage capacity. The Visit Qatar application is designed as a user-centric digital travel companion that utilizes the cloud-based Adobe Experience Manager to tailor user experiences using their data [13]. Regarding personalization, Adobe Experience Manager offers Adobe Sensei, which is Adobe's artificial intelligence tool that amplifies the application's capability to deliver personalized experiences and manages algorithms for users to make accurate decisions [14].

In contrast, the personalization feature in the Grand Tour Switzerland application is based on the selected journey type. The chosen journey type influences the AI-generated itinerary for the users. For Road Trip journeys, the AI-designed itineraries include driving experiences. Conversely, Adventurous journeys prioritize activities like hiking, resulting in customized itineraries tailored to those specific preferences.

3.2 Navigation Engine

The navigation engine is a powerful AI feature that offers users relevant information, activities, and accommodations for users based on data analysis results [15]. Both the Visit Qatar and Grand Tour Switzerland applications use Mapbox as their navigation engine. MapBox is an API service that provides custom digital maps similar to Google Maps, enabling users to navigate visually to their desired destinations and assisting creators in designing maps [16]. It provides various navigation features, such as navigation assistance, distance and travel time calculations, and route tracking. Regarding data visualization, Mapbox surpasses other navigation engines due to its superior flexibility in design customization, allowing users to personalize elements like colors, fonts, and camera angles [17]. Furthermore, Mapbox stands out in its strength in customizing Points of Interest (POIs) according to specific categories, thereby improving the display of relevant locations [18].

In the Visit Qatar application, the integration of Mapbox primarily serves as a visual map to display various tourist destinations. However, for navigation purposes, the application redirects users to third-party platforms, such as Google Maps, Sila, and Karwa Taxi, as it doesn't offer route navigation functionality. This collaboration enables Visit Qatar to enhance its services by leveraging the navigation feature and providing reliable transportation through these trusted third-party applications.

Conversely, the Grand Tour application utilizes Mapbox to highlight various tourist destinations, photo spots, e-charging stations, and overnight accommodations [19]. Compared to the Visit Qatar application, the Grand Tour application incorporates Mapbox's navigation feature and doesn't redirect users to third-party applications. Furthermore, the application provides GPX Data, allowing users to navigate the map through waypoint tracks and travel routes based on their created itinerary. GPX Data is commonly utilized in maps encompassing various outdoor activities, including hiking, tracking, and biking [20].

3.3 Virtual Assistance

Virtual assistant is a convenient service that offers remote assistance to users, eliminating the need for them to visit a physical location for support. Virtual assistants provide support regardless of geographical constraints and time limitations, making them highly accessible and flexible for users' needs [21]. The Visit Qatar application incorporates MindBehind, an automatic virtual assistant using AI bots to respond to user inquiries, and live agents as staff or human representatives addressing user conversations. This dual approach ensures that users receive assistance from automated and human sources. Conversely, Grand Tour Switzerland doesn't offer an AI-based virtual assistant feature.

3.4 Image and Voice Recognition

Image and voice recognition is a machine's ability to identify an image and sound. In the Grand Tour Switzerland application, image recognition is used for gamification based on AR and non-fungible tokens (NFT). The gamification of this application invites users to hunt digital objects that could only be collected by visiting several tourist destinations that Switzerland's Government had determined. Users can participate by scanning every landmark in each photo spot. After they scan the photo spot, the AR function is activated and the NFT virtual objects are collected in a personal wallet [22]. The gamification is designed to provide an enjoyable traveling experience. It can create an immersive and interactive user journey with personalization, storytelling, technology, and reward programs [23]. In contrast, Visit Qatar doesn't offer image and voice recognition features.

4 Discussion

In the previous section, a detailed features comparison is provided to see the strengths and weaknesses of each tourism application in implementing AI. Both apps were compared by the main features such as personalization, navigation engine, virtual assistants, and image and voice recognition related to AI. Generally, Visit Qatar performed more prevalent AI than Grand Tour Switzerland as the application focused on specific experience-based features, leading the app to a more practical side. This finding was covered with the online user reviews of both applications, as seen below.

Table 2. Comparison of Reviews Between Visit Qatar and Grand Tour Switzerland

Features	Visit Qatar	Grand Tour Switzerland
Personalization	Reviews said that the app was informative and provided updated information. However, users couldn't plan trips because the AI was just useful in providing more accurate options.	Users were helped by the information provided in the app without manually looking up the destinations, including riding and hiking trips—the itineraries tailored to the user's preferences.
Navigation Engine	Mapbox was quite worthwhile but it wasn't very effective because it redirected users to Google Maps.	Mapbox was very useful for users to navigate The Grand Tour of Switzerland routes. With Mapbox's POI sorting, users with electric vehicles found it easier to travel across Switzerland.
Virtual Assistant	The chatbot in Visit Qatar was beneficial for users to answer frequently asked questions though the options were limited and not everything could be answered.	This app didn't feature conversations with bots or AI.

Image and Voice Recognition	This app didn't provide image and voice recognition AI.	Users were intrigued by the Grand Tour Switzerland's gamification. Collecting pictures at the photo spots was rewarding and addictive.
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According to reviews in Google Play, Visit Qatar was overall very prominent with its comprehensive information equipped with functional AI features, such as Adobe Sensei Gen AI, GPX Data Mapbox, and MindBehind Chatbot. Whereas Grand Tour Switzerland's strength was the utilization of AI-Generated Itineraries, GPX Data Mapbox, and AI Image Recognition in AR gamification that played a key role in the application's sustainability which led the users to preserve the application in their phone over the extended period.

Other AI features that could potentially boost tourism apps are Dynamic Pricing and Sentiment Analysis. Dynamic Pricing provides a comparison on product prices with predictive analysis to compare changes in flight or hotel prices with prediction through a trained AI model. A prediction on market prices could attract more customers who are looking for a cheaper flight or hotel option. [24] Sentiment Analysis has the ability to analyze people's feelings and sentiments on social media or other online resources to gather opinions on travel-related topics that they post online. [25]

In Indonesia, digital information is one of the most impactful pull factors influencing domestic tourists, as they rely on photos and videos, tourist reviews, and trip suggestions before deciding their destinations [26]. Technology is crucial in providing personalized content, as domestic tourists prioritize a seamless digital experience while exploring tourist destinations [27]. Furthermore, Indonesia is an archipelago country with plenty of hidden attractions with a challenging track that is hard to explore without proper guidance. This consideration implies that personalized-AI content recommendation and handy navigation are highly recommended to be applied in Indonesia's tourism applications. Additionally, Indonesians also tend to have diverse preferences and circumstances that influence their travel choices. By incorporating AI features like virtual assistants and gamification into a tourism app, domestic tourists can travel more effectively in the long term.

In implementing AI features in Indonesia's tourism sector, localization is crucial to ensure that the features resonate with Indonesian culture because AI relies heavily on data, including local accents, languages, dialects, and images that vary across countries [28]. For instance, the personalization feature offers recommendations for tourist destinations in Indonesia and the navigation engine provides information on routes, traffic, toll rates, and public transportation schedules based on local Indonesian data. Additionally, AI can be utilized in halal tourism, considering that Indonesia is ranked as the top halal tourist destination worldwide according to the Global Muslim Travel Index (GMTI) 2023 [29]. These features include recommendations for Muslim-friendly tourist destinations, halal restaurants, and places of worship.

In Indonesia, President Joko Widodo launched the "Making Indonesia 4.0" roadmap in 2018 to develop a globally competitive national industry with AI as one of the core components [30]. The National Artificial Intelligence Strategy in Indonesia prioritizes the establishment of Smart City, including Smart Tourism [31]. By leveraging AI

features, Smart Tourism aims to optimize and promote tourist sites, enhance tourism services, and provide real-time information for the tourism industry. Furthermore, the country has seen significant integration of AI technology, with 24.6% of companies incorporating it into their operational systems, placing Indonesia at the forefront of AI adoption in Southeast Asia [32].

5 Conclusion

In the digital era, AI plays a crucial role in enhancing the tourism industry. Through the implementation of AI, a sophisticated application can be designed to boost tourism industry equalization. By analysing successful applications like Visit Qatar and Grand Tour Switzerland, it was proved that AI was highly impactful in enhancing user experience and helping users fulfill their needs. The key finding was the importance of sustainability, that ensured continuous benefits and enjoyment for the users. The research findings will serve as the basis for the upcoming project that aims to develop an AI-driven tourism application in Indonesia. By learning the abilities of AI to personalize the perfect trip based on tourists' preferences, guide the users throughout the journey, answer user's questions, and enhance the excitement through gamification, the future of Indonesia's tourist application holds a pronounced opportunity. This opportunity is also aligned with Indonesia's tourism goal to cover the abundance of culture, characteristics, and attractions of Indonesia and boost Indonesia's equalization in a sustainable manner.

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