

Framework and Strategic Approaches for Mazu Smart Tourism Using Artificial Intelligence

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ABSTRACT

As an important intangible cultural heritage of the Chinese nation, Mazu culture possesses a profound historical transmission value. However, in the context of modern tourism, its transmission path is relatively uncomplicated, and there is a deficiency in interaction and sense of participation. To address this, this study proposes an AI-enabled smart tourism model, which aims to enhance the tourist experience through intelligent tours, personalised recommendations and data analysis, and to promote the digital protection and innovative communication of cultural heritage. This study provides a theoretical framework and practical strategies for the inheritance, international communication and digital development of Mazu culture.

KEYWORDS

Mazu culture; Artificial intelligence; Smart tourism; Pattern framework; Strategy exploration

The tourism industry is currently undergoing a period of significant transformation, driven by the policy directives outlined in the "Smart Tourism Innovation and Development Action Plan (2024)" and the "Domestic Tourism Promotion Plan (2023-2025)". These plans are aimed at promoting diversified and high-quality development of tourism supply. In the context of rapid advancements in smart tourism, the opportunity to innovate and preserve traditional culture is at an unprecedented level. The integration of the concept of smart tourism into Mazu cultural tourism represents not only an innovative approach to the inheritance of traditional culture, but also a key strategy for driving local tourism economy towards high-quality development. Through the comprehensive application of cutting-edge technologies such as artificial intelligence, this study aims to establish a comprehensive framework of smart tourism, thereby enabling intelligent management and efficient allocation of Mazu cultural tourism resources, and providing tourists with more personalised and high-quality service experiences. This endeavour not only serves to augment the global communication power and influence of Mazu culture, but also furnishes a valuable theoretical reference point for the intelligent development of global cultural tourism. The majority of domestic and foreign research focuses on the macro level of smart tourism, with few in-depth discussions combining specific cultural attractions. This study aims to fill the research gap by building a systematic theoretical framework and strategy system, and providing a scientific basis for the integration and development of smart tourism and cultural heritage^[1-2].

1 Analysis of current situation of Mazu cultural tourism

1.1 Overview of Mazu cultural tourism resources

The historical origin of Mazu culture can be traced back to the Song Dynasty, and it was first established on Meizhou Island in Fujian Province, China. Mazu, formerly known as Lin Merniang, was regarded as the goddess of sea protection by local fishermen because of her superior sea rescue ability. The dissemination of Mazu culture has been instrumental in fostering cultural integration across various regions, thereby establishing a profound cultural foundation among the Chinese diaspora. Mazu has emerged as a seminal symbol of Chinese culture both within the country and internationally. The cultural tourism resources in and around Meizhou Island are manifold. The island not only serves as the birthplace of Mazu, but also functions as the crux of Mazu culture. The Mazu Temple on Meizhou Island attracts a significant number of pilgrims and tourists annually, and is regarded as a sacred site by adherents. Beyond Meizhou Island, Mazu temples in Southeast Asia, including those in Taiwan, Hong Kong, and Macao, have emerged as notable tourist attractions and cultural centres. These temples serve not only as venues for religious activities, but have also evolved into platforms for the exhibition of local folk culture and the promotion of cultural exchange.

1.2 Status quo of Mazu cultural tourism market

Recent years have seen the Mazu cultural tourism market continue to expand, with Meizhou Island and other Mazu

cultural centres attracting a significant number of domestic and foreign tourists, thus becoming prominent cultural tourism destinations. The Mazu cultural tourism market has exhibited a growth trajectory. The tourists' primary motivations are to experience the culture in depth, participate in Mazu cultural activities and visit historical sites, and to experience the unique charm and spiritual value of Mazu culture. In terms of tourism consumption, in addition to participating in traditional cultural activities, tourists also purchase a wide range of cultural derivatives, local specialties, souvenirs, etc. The integration of digital technology and smart tourism has led to the emergence of innovative services such as personalised customisation and virtual tours, which have become prevalent market trends. These developments have significantly enhanced the interactive experience and satisfaction of tourists, thereby promoting Mazu cultural tourism towards quality, depth of experience and diversification.

1.3 Problems in Mazu cultural tourism

Despite the profound historical background and wide-ranging emotional basis of Mazu culture, the rapid development of modern society, particularly the absence of artificial intelligence applications, has presented significant challenges to Mazu cultural tourism. This has emerged as a pivotal impediment to its high-quality development. Moreover, in the face of mounting tourism demand, Mazu temples and cultural heritage sites confront a dual challenge of over-exploitation of resources and inadequate protection. The absence of effective protection and reasonable management strategies has the potential to result in irreversible damage to these invaluable cultural resources. However, it is evident that the intelligence level of Mazu cultural smart tourism has not kept pace, particularly in the application of artificial intelligence technology, which is evidently lagging behind in the development of smart tourism market.

Specifically, the underutilisation of artificial intelligence in Mazu cultural smart tourism is primarily evident in the following domains: Firstly, the absence of an effective introduction to smart tour systems hinders tourists' ability to obtain personalised and accurate service experiences. Secondly, the failure to leverage artificial intelligence technology to thoroughly analyse tourists' behaviour optimises the layout and resource allocation of scenic spots. Thirdly, the utilisation of cutting-edge technologies, such as virtual reality, to provide immersive cultural experiences is inadequate, significantly reducing tourists' interactive and educational experiences.

In order to address the aforementioned issues, the cultural experience of virtual reality can utilise big data analysis, proactively incorporate intelligent navigation systems, and encourage tourists to enhance their service quality. The in-depth application of artificial intelligence technology, precise analysis of tourist behaviour, scientific guidance of scenic area planning and management, and vigorous promotion of VR technology will enhance visitors' understanding and emotional connection with Mazu culture, thereby providing a more profound and vivid cultural experience. The implementation of these measures is expected to revitalise the development of Mazu cultural smart tourism in the new era, promoting it to a new level of excellence and innovation.

2 Application potential of artificial intelligence technology in Mazu cultural tourism

2.1 Intelligent navigation system

In the process of designing the smart tourism system of Mazu cultural tourism, it is essential to adhere to the design principles of user centre. Firstly, the system should be designed to allow for wide expansibility. Secondly, it should be high in availability. Thirdly, it should have strong application ability. The architecture of the system is typically divided into three primary levels: the data acquisition layer, the data processing layer, and the application service layer.

The data acquisition layer is responsible for collecting a variety of data, including visitor behaviour, environmental conditions, and facility operating status. This data is collected through sensors, cameras, mobile devices, and various online interactive platforms, ensuring real-time and accurate data. The design of this layer is pivotal in ensuring the efficient collection of data from diverse sources and formats, while guaranteeing the comprehensiveness and representativeness of the data.

The data processing layer is responsible for processing and analysing the large amount of data collected by the data acquisition layer. At this level, Cloud Computing and Edge Computing technologies provide the necessary computing resources and data storage capabilities so that data can be processed and analysed quickly. Machine learning and deep learning models are utilised, with the capacity to learn models from data, predict future trends, and provide recommendations for optimising resource allocation and services in real time.

The application service layer is tasked with the conversion of processed data into services and information that are directly beneficial to visitors. The design of this layer involves the development of a user interface and application, including a personalised recommendation system, real-time navigation, intelligent customer service, and so on. Service design must consider the user's ease of operation and the intuitiveness of the interface to ensure that visitors can easily access the information they need to enhance the overall user experience^[3].

2.2 Intelligent recommendation system

The application of artificial intelligence technology in tourist behavior analysis has greatly improved the service quality and operating efficiency of scenic spots. The artificial intelligence system reveals the behavioral patterns and needs of tourists through deep learning and pattern recognition of a large amount of tourist data such as moving trajectory, stay time and preference Settings. This information is essential for the optimal design of tourist routes, the adjustment of scenic spot layout and the improvement of service response speed. For example, tourist gathering areas can be identified by artificial intelligence, and managers can reduce congestion and wait time by adjusting personnel deployment and service resources, thereby improving tourist satisfaction. Through real-time analysis of visitor feedback and online reviews, the AI system can also adjust and optimize services in real time to ensure the continuous improvement of the visitor experience.

Artificial intelligence applications can also include: the establishment of predictive models, automatic decision-making process and other content. Artificial intelligence systems can forecast and analyze future tourist trends and potential through real-time monitoring and analysis of key data such as tourist flow, meteorological conditions, and event schedules.

By leveraging historical data and trend analysis, artificial intelligence has the capacity to predict the flow of tourists for large-scale events or holidays, thereby assisting managers in the proactive deployment of manpower and resources. In terms of optimising resources, artificial intelligence can intelligently adjust the operation of the device or suggest maintenance plans, thereby reducing operating costs and improving energy efficiency. Furthermore, it can monitor energy consumption and facility usage. Furthermore, in the event of an emergency or extreme weather condition, advanced algorithms enable the prompt adjustment of tourist routes or the closure of specific areas, thereby ensuring the safety of tourists^[4-5].

2.3 Mazu cultural tourism application

The application of virtual reality (VR) technology in the context of Mazu cultural tourism shows great potential. The integration of virtual reality (VR) and augmented reality (AR) technologies has the capacity to facilitate an interactive Mazu belief experience, thereby enabling users to engage with the rich connotation of Mazu culture beyond the constraints of time and space. These technologies enable users to engage in traditional activities, such as the Mazu temple fair, within a virtual environment, or to witness the re-emergence of Mazu legends in historical scenes. This enhances the cultural appeal and educational value of the experience, making it a valuable addition to the field of cultural tourism.

3 Inheritance and development strategies of Mazu culture under the smart tourism model

3.1 Concept and characteristics of smart tourism

Smart tourism is defined as the utilisation of big data, the Internet of Things (IoT), artificial intelligence (AI), and other technological solutions to enhance the efficiency of tourism services and management. The objective is to provide tourists with a travel experience that is more personalised, convenient, and efficient. Notable features include real-time information acquisition, personalised recommendations, intelligent navigation, and data-driven decision support. The integration of smart services, the optimisation of tourism resource allocation, and the analysis of tourist behaviour, among other factors, are pivotal in promoting the development of tourism in a more intelligent, efficient, and sustainable direction.

The effective integration and implementation of technology is pivotal to the success of intelligent tourism systems. The integration of the Internet of Things (IoT) technology facilitates the system's capacity to collect real-time data concerning the flow of people, prevailing weather conditions, and the utilisation of facilities through networked devices such as sensors and cameras. This, in turn, enables the provision of intelligence, thereby providing the basis for the management of scenic spots to be more flexible and to respond more rapidly. The utilisation of cloud computing technology serves to enhance the system's data processing and storage capabilities. The provision of cloud services is pivotal in ensuring the scalability and flexibility necessary to support tasks ranging from basic data processing to complex data analysis and machine learning. The implementation of this technology enables smart tourism systems to manage substantial volumes of tourist data, encompassing metrics such as traffic during peak periods and data transmission in remote areas.

The integration of these technologies will result in the establishment of a smart tourism system that exhibits high service efficiency and ensures the security of data and the privacy of users. The continuous advancement of technology and the refinement of its applications will ensure that Smart Tour will serve and publicise Mazu culture more effectively, improve the management level of Smart Tour, enhance the management level of Smart Tour, and provide superior

services for Mazu culture^[6].

3.2 The positive effect of intelligent tourism on Mazu cultural inheritance

The process of the transformation of Mazu cultural tourism to wisdom has attracted significant attention, resulting in the active participation of domestic and foreign tourists. This has led to an improvement in the level of tourism consumption and the creation of a substantial number of new employment opportunities. The data-driven marketing strategy to be adopted by the smart tourism system is expected to significantly enhance the brand influence of Mazu culture and broaden the market space of tourism products and services. Specifically, the personalised service options and creative promotional activities that the smart tourism platform plans to provide are designed to accurately attract target tourist groups, which is expected to significantly increase the visit rate, bring more substantial tourism revenue and a more active business atmosphere to the local area. Furthermore, the implementation of smart tourism is anticipated to have a substantial impact on the promotion of related industries, including catering, accommodation, and retail.

The concept of intelligent tourism involves the integration and optimisation of the resources present within the industrial chain. This process is expected to generate economic growth, thereby injecting new vitality into the utilisation and integration of local resources. Consequently, this will form a sustained driving force for economic growth. This cross-integration and interactive integration is expected to enhance the overall competitiveness of Mazu cultural tourism, as well as providing a new opportunity for the diversified development of the local economy^[7]. The multi-party integration and interaction can provide a broader platform and means for Mazu culture to promote the trend and improvement of the local economy, and thus to promote the inheritance and promotion of Mazu culture.

3.3 Development strategy of Mazu culture under intelligent tourism mode

As a precious cultural heritage, the protection and inheritance of Mazu culture plays a core role in the development of smart tourism. The utilisation of digital technology to provide innovative solutions, particularly in the preservation of cultural materials and the promotion of visits, is of paramount importance. The establishment of digital archives is pivotal in this regard, as it facilitates the integration of documents, artworks and historical materials pertaining to Mazu culture. This integration not only enables academic research but also makes it more accessible to the general public, thereby fostering a deeper understanding of cultural heritage. The digital presentation of cultural materials is a strategy that ensures the longevity of these materials and facilitates efficient retrieval, thereby encompassing a comprehensive array of resources ranging from ancient texts to contemporary studies.

4 Construction of theoretical framework and improvement of strategy system

4.1 CAA theoretical framework construction

In the process of integrating the CAA model (capability, attribute, application) and artificial intelligence in the Mazu smart tourism project, the construction of the CAA theoretical framework necessitates meticulous consideration of the specific implementation of various dimensions. Firstly, from the perspective of ability, the introduction of artificial intelligence will greatly promote the informatization strength of Mazu intelligent tourism. The utilisation of big data analysis, machine learning and other advanced technologies will facilitate more accurate prediction of tourist behaviour, optimisation of the allocation of tourism resources and enhancement of service efficiency. Concurrently, the integration of artificial intelligence ensures a robust technical foundation for the digital showcase of Mazu culture, enabling visitors to immerse themselves in the cultural milieu and experience the allure of Mazu culture. Secondly, from the attribute dimension, the integration of artificial intelligence helps distinguish the public welfare and profitability of the Mazu smart tourism project. The integration of intelligent tour guides, online booking systems, and other public welfare initiatives serves to enhance the tourism experience for visitors, while concurrently alleviating the pressure on scenic spot management. This, in turn, facilitates the achievement of intelligent public management and services. Conversely, the utilisation of artificial intelligence for precision marketing, personalised recommendations and other applications can attract more tourists and promote the development of the tourism economy. Finally, the deep integration of artificial intelligence and the Mazu smart tourism project will give rise to more innovative applications in the application dimension.

Visitors have the capacity to access information regarding Mazu culture at any time and in any location by means of advanced technologies, including intelligent voice assistants and virtual reality. They can even participate in virtual blessing activities. These applications serve to enhance the tourism experience of visitors, thereby facilitating the transmission and inheritance of Mazu culture.

The integration of the CAA model and artificial intelligence within the Ma Zu smart tourism project has led to

significant advancements in the project's informatisation and scientific and technological strength. Furthermore, the project's public benefit and profit attributes have been clearly defined, thereby infusing new vitality into the protection and dissemination of Mazu culture.

4.2 Improvement of strategy system

In order to enhance the development strategy system of Mazu culture in accordance with the theoretical framework under the smart tourism mode, it is essential to firstly introduce technological innovation from big data, artificial intelligence, virtual reality technology and other aspects with a view to promoting tourists' experience and enhancing the cultural communication effect. Secondly, cultural heritage should be preserved through innovation in the domain of interactive cultural experiences, with a focus on the use of digital means to attract more tourists. Finally, in terms of market operation, there is a need to combine tourist behaviour data, paying close attention to precision marketing, promoting the global dissemination of cultural tourism, developing personalised services, and enhancing the influence of destination brands^[8-9].

5 Conclusion and prospect

5.1 Research Conclusions

The ongoing advancements in artificial intelligence technology, particularly in the domains of natural language processing, intelligent recommendation systems, and emotion recognition technology, are poised to unveil a novel paradigm for cultural transmission and visitor engagement. The advent of smart tourism models has the potential to enhance the sense of participation of tourists through the provision of personalised virtual experiences. Moreover, it can optimise the allocation of resources through the utilisation of big data analysis, thereby facilitating the intelligent protection and dynamic display of cultural heritage. In light of the challenges encountered in the context of Mazu cultural tourism, it is imperative to extend greater support to the implementation of artificial intelligence, big data and other technological solutions in the tourism sector. The development of smart tourism infrastructure should be prioritised. Local governments are encouraged to collaborate with enterprises to develop innovative applications such as smart guided tours and virtual reality, with a view to enhancing tourists' cultural experience and interactivity. Concurrently, efforts must be made to bolster the digital safeguarding of Mazu culture, promote its global dissemination and innovation, and expand the international market. It is imperative to ensure the privacy and security of tourists, whilst concurrently enhancing data management to facilitate the sustainable growth of smart tourism^[10].

5.2 Research Prospects

The continuous progression of artificial intelligence technology will enable higher levels of development in the future application of Mazu cultural tourism. Specifically, technological advancements such as deep learning, intelligent perception, and emotional computing will facilitate a more precise and personalised cultural experience for visitors. The advent of a smart tourism model will not only enhance the efficiency of services, but also transcend geographical and cultural boundaries, facilitating cross-cultural interaction and communication through global digital platforms. The present study will concentrate on the utilisation of AI to facilitate the preservation of cultural heritage, innovation, display and cross-border dissemination, as well as the identification of novel business models and optimisation strategies in global tourism big data.

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