



# The Value and Application of Multilingualism in the High-Quality Development of Smart Tourism

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## Abstract

With the acceleration of globalization, the tourism industry is experiencing unprecedented rapid development. However, language barriers and cultural differences have become key factors restricting the further development of the tourism industry. The concept of smart tourism provides new ideas and methods to solve these problems. This paper aims to deeply explore the multilingual application and value of smart tourism, analyze the current problems, and propose innovative application strategies, in order to provide a useful reference for promoting the high-quality development of smart tourism.

## Subject Areas

Language Education, Sociology

## Keywords

Smart Tourism, Multilingual, Value, Application, Innovation, Expanding the International Tourism Market

## 1. Background

### 1.1. National Policy

In recent years, the country has attached unprecedented importance to the development of tourism and regarded it as an important way to promote economic growth and cultural exchanges. To this end, the country has introduced a series of supporting policies aimed at promoting the digital transformation of the tourism industry and enhancing its international competitiveness. For example, documents such as the “Smart Tourism Development Plan” and the “14th Five-Year Plan for Tourism Development of the Ministry of Culture and Tourism” clearly

put forward the strategic goal of using digital technology and multilingual services to promote the improvement of tourism service quality. These policies not only provide policy guarantees for the development of smart tourism, but also point out its development direction and implementation path.

In terms of specific implementation, the National Tourism Administration and local tourism departments have increased their investment to promote the implementation of smart tourism projects. For example, some cities have built smart tourism service platforms to provide tourists with a one-stop tourism service experience. These platforms not only integrate tourism resources, but also provide multilingual services, greatly facilitating the travel and sightseeing of international tourists. According to statistics, since the launch of the smart tourism service platform, the satisfaction of international tourists has increased significantly, and the overall income of the tourism industry has also shown a steady growth trend.

### **1.2. Issues in Tourism Development**

Despite strong policy support, the tourism industry still faces many problems in its actual development. Among them, language barriers and cultural differences are one of the main factors restricting the development of international tourism. Language barriers not only lead to insufficient cultural understanding of tourist destinations, but may also cause misunderstandings and conflicts. For example, according to a survey by the China Tourism Academy in 2023, more than 60% of international tourists said that language problems had a negative impact on their travel experience. These tourists often feel confused and uneasy during their tours because of language barriers, which leads to a poor overall impression of the tourist destination.

Cultural differences are also an important factor that restricts the development of international tourism. Tourists from different countries and regions have different cultural backgrounds and values, which may lead to cultural conflicts and misunderstandings during the travel process. For example, tourists from some countries may feel unfamiliar or unacceptable to certain religious or cultural customs, which may lead to unnecessary disputes and misunderstandings. These problems not only affect tourists' travel experience, but may also have a negative impact on the development of the tourism industry.

### **1.3. Introducing "Smart Tourism"**

In order to solve the above problems, the concept of smart tourism came into being. Smart tourism aims to realize the personalization and intelligence of tourism services by integrating advanced technologies such as big data, artificial intelligence, and the Internet of Things. Among them, multilingual services, as an important part of smart tourism, have unique advantages in solving language barriers and promoting cultural exchanges. By providing multilingual services, smart tourism can break down language barriers and allow international tourists to better understand and experience the culture and services of tourist destinations.

In practical applications, smart tourism has achieved some remarkable results. For example, some tourist attractions have introduced intelligent guide systems and real-time translation technology to provide tourists with convenient language services. These systems can not only provide multilingual voice guides and text translation functions, but also provide personalized recommendations and services based on tourists' needs and preferences. These innovative applications not only enhance tourists' travel experience, but also inject new vitality into the development of the tourism industry .

In addition, smart tourism can also predict tourists' behaviors and needs through big data analysis and artificial intelligence technology. By analyzing and processing tourists' historical data and real-time data, smart tourism can accurately grasp tourists' preferences and needs, thereby providing more personalized tourism products and services. For example, some tourism platforms have used big data and artificial intelligence technologies to provide tourists with customized travel itineraries and recommendation services. These services not only meet the personalized needs of tourists, but also improve the overall efficiency and competitiveness of the tourism industry.

## 2. Literature Review

The integration of multilingualism into the high-quality development of smart tourism is a critical area of research, given the increasing globalization of tourism and the rapid advancement of information technologies. This literature review aims to synthesize existing research on smart tourism, with a particular focus on the role of multilingualism in enhancing the quality of smart tourism experiences and infrastructure. By examining the current state of smart tourism development and the importance of multilingualism, this review provides a comprehensive overview of the field and identifies potential areas for future research.

### 2.1. Smart Tourism Development and Multilingualism

Smart tourism is an emerging concept that integrates information and communication technologies (ICTs) into the tourism ecosystem to enhance the visitor experience, improve destination management, and promote sustainable development. Lee *et al.* (2020) [1] highlight that cities and tourism entities are investing heavily in smart system initiatives, recognizing that information technologies are key factors in a city's destination competitiveness. The concept of a smart tourism city is gaining traction as a means to address urbanization-related issues and optimize sustainable environments. In this context, multilingualism plays a crucial role in ensuring that smart tourism initiatives are inclusive and accessible to a diverse range of visitors. By providing information and services in multiple languages, smart tourism cities can better cater to the needs of international tourists, thereby enhancing their overall experience.

Berdibekova *et al.* (2022) [2] emphasize the importance of smart destinations as a driving force for the modernization of urban infrastructure and sustainable

urban tourism development. They argue that the formation of smart destinations requires innovative approaches and methods, particularly in the realm of tourist service provision and communicative interaction with consumers. Multilingualism is a key component of this innovation, as it enables effective communication with a global audience. The authors conclude that smart tourist destinations can function as integral components of smart cities, promoting the development of urban infrastructure and the formation of tourist products. In this regard, multilingualism is not just a linguistic feature but a strategic tool for enhancing the competitiveness of smart tourism destinations.

## 2.2. Case Studies and Practical Applications

Several case studies provide valuable insights into the practical application of multilingualism in smart tourism development. Akbar *et al.* (2024) [3] conducted a readiness assessment of Jakarta as a smart tourism city, highlighting the potential and challenges of integrating smart city principles into the tourism industry. The study identified four key attributes of a smart tourism city: attractiveness, accessibility, digitalization readiness, and sustainability. While Jakarta demonstrated strengths in attractiveness and accessibility, the authors noted that further advancements in digitalization and sustainability are needed. In this context, multilingualism can play a crucial role in enhancing digitalization readiness by ensuring that online platforms and mobile applications are accessible to non-native speakers. This would not only improve the visitor experience but also contribute to the overall sustainability of the tourism ecosystem.

Litavniece *et al.* (2023) [4] compared the development of smart tourism in the second-largest cities of the Baltic states—Tartu (Estonia), Kaunas (Lithuania), and Daugavpils (Latvia). Their study revealed that while these cities have different levels of development, digitalization is a key factor in their success as smart tourism destinations. Tartu, for instance, conforms to the standards in all four categories of smart tourism development, with digitalization receiving the most attention. This suggests that multilingualism, combined with advanced digital technologies, can significantly enhance the smart tourism experience. By providing multilingual support on digital platforms, these cities can attract a broader range of international tourists and promote cultural exchange.

## 2.3. Technological Innovations and Multilingualism

The role of technological innovations in enhancing the value of multilingualism in smart tourism is evident in several studies. Palumbo (2015) [5] evaluated the impact of mobile technology on tourist satisfaction, proposing the Smart Tourist App (STAPP) as a mobile travel assistant that integrates the functionalities of a traditional city card with the specificities of mobile devices. The study integrated the Kano Model (KM) and the Analytic Hierarchy Process (AHP) to categorize and order service attributes according to customer perceptions. The findings suggest that mobile technology can significantly enhance the tourist experience by

providing real-time information and services in multiple languages. This highlights the importance of multilingualism in the development of smart tourism applications, as it enables tourists to navigate unfamiliar environments more easily and access relevant information in their native languages.

Chen *et al.* (2022) [6] conducted a bibliometric and visualized review of smart tourism research, analyzing 441 studies published between 2010 and 2021. The study provides valuable insights into the state of research and trends in the field of smart tourism, emphasizing the growing importance of digital technologies in enhancing the tourist experience. The findings suggest that future research should focus on the integration of multilingualism into smart tourism applications, as this can significantly improve the accessibility and inclusivity of tourism services. By leveraging advanced technologies such as artificial intelligence and the Internet of Things (IoT), smart tourism destinations can provide personalized and multilingual experiences to visitors, thereby enhancing their overall satisfaction.

#### **2.4. Multilingualism as a Strategic Tool for Smart Tourism**

Multilingualism is not only a linguistic feature but also a strategic tool for enhancing the competitiveness of smart tourism destinations. Başer *et al.* (2019) [7] examined the content of smart tourism destinations and their link with smart cities, using Antalya as a case study. The authors argue that smart tourism destinations should focus on fulfilling the needs and demands of tourists more efficiently to create a better tourist experience. In this context, multilingualism can play a crucial role in ensuring that tourists from diverse linguistic backgrounds have access to relevant information and services. By providing multilingual support in areas such as transportation, accommodation, and cultural attractions, smart tourism destinations can enhance their appeal to international tourists and promote sustainable development.

Zhang *et al.* (2018) [8] conducted a study on the functionality evaluation of destination marketing websites in smart tourism cities, focusing on 33 cities in China. The study developed hierarchical functionality evaluation criteria and used focus group discussions and empirical evaluations to analyze the websites. The findings revealed several deficiencies and challenges in the development of smart tourism websites, including the lack of multilingual support. The authors concluded that future improvements should focus on enhancing the functionality of these websites by incorporating multilingual features. This would not only improve the accessibility of tourism information but also enhance the overall effectiveness of destination marketing strategies.

### **3. Current Problems of Smart Tourism**

As an important direction for the innovative development of the tourism industry, smart tourism aims to improve the quality of tourism services and tourist experience by integrating advanced information technology. However, in the actual promotion process, smart tourism still faces a series of challenges, especially in deal-

ing with cultural differences, building foreign language service teams, and applying multilingual technologies. This article will conduct an in-depth analysis of these issues and combine specific cases and data to provide a useful reference for subsequent research and practice.

### **3.1. The Impact of Cultural Differences on Cultural Changes**

Cultural differences are the primary challenge that smart tourism must face in the process of cross-cultural communication. Although smart tourism provides multilingual language services through big data, artificial intelligence and other technical means, the complexity and diversity of cultural backgrounds still pose obstacles to tourists' cultural understanding and experience. Tourists from different cultural backgrounds have differences in values, behavioral habits, social etiquette, etc. These differences may lead to communication barriers, which in turn affect tourists' in-depth understanding and experience of tourist destinations.

Take the Forbidden City in China as an example. As a world cultural heritage, the Forbidden City has rich historical and cultural connotations. However, for foreign tourists, relying solely on multilingual language services may not be enough for them to fully understand the historical background and cultural value of the Forbidden City. For example, many buildings, sculptures and artworks in the Forbidden City contain profound cultural connotations, which often need to be interpreted in conjunction with specific historical backgrounds and cultural contexts. If the service team lacks a deep understanding of these cultural connotations, it will be difficult to provide tourists with accurate and vivid explanations, thus affecting the tourists' cultural experience.

In addition, cultural differences may also lead to misunderstandings and conflicts. Tourists from different cultural backgrounds may have conflicts during communication due to misunderstanding each other's intentions or behaviors, which will not only affect the tourists' travel experience, but may also have a negative impact on the image and reputation of the tourist destination. Therefore, while providing multilingual language services, smart tourism also needs to strengthen the understanding and respect for cultural background differences to promote effective cross-cultural communication.

### **3.2. Lack of Professional Quality of Foreign Language Service Team**

The professional quality of the foreign language service team is one of the key factors affecting the quality of smart tourism services. Although smart tourism provides multilingual support through technical means, in actual operation, the foreign language ability and cultural sensitivity of the service team are still a problem that needs to be solved. Many service personnel are unable to effectively use technical tools to provide high-quality services due to their lack of sufficient foreign language skills and in-depth understanding of the culture of the target language country.

Take a well-known online travel platform as an example. The platform provides

multilingual customer service support to help international tourists solve problems in booking, itinerary planning, etc. However, in actual operation, some customer service staff have difficulty accurately understanding tourists' needs and problems due to their limited foreign language proficiency, resulting in inefficient service and even misunderstandings. In addition, some customer service staff lack understanding of the cultural customs of different countries and may inadvertently violate tourists' cultural taboos during the service process, thus causing unnecessary disputes and complaints.

In order to improve the professional quality of foreign language service teams, smart tourism companies need to strengthen the introduction and training of foreign language talents. On the one hand, companies can enrich their service teams by recruiting professionals with foreign language skills and cultural sensitivity; on the other hand, companies can also strengthen the training and assessment of existing service personnel to improve their foreign language proficiency and cultural literacy. At the same time, companies can also establish incentive mechanisms to encourage service personnel to actively learn foreign languages and understand the cultural customs of different countries to improve service quality.

### **3.3. Multilingualism Being Not Widely Used in Smart Tourism**

The application scope of multilingual technology in smart tourism is still limited, which is one of the important factors restricting the development of smart tourism. Although some tourism companies have begun to try to use multilingual technology to improve service quality, the overall application level is still not popular enough. This is mainly reflected in the following aspects:

Firstly, the coverage of multilingual technology is limited. Currently, most smart tourism platforms and applications mainly support a few languages such as English and Chinese, and support for other languages is relatively limited. This has led to many international tourists still facing language barriers when using these platforms and applications.

Secondly, the application scenarios of multilingual technology are limited. At present, multilingual technology is mainly used in customer service support, tour guide services, etc., and its application in tourism planning, booking, payment and other links is relatively small. This limits the potential of smart tourism in improving tourists' experience.

Finally, the integration of multilingual technology is not high enough. When some smart tourism platforms and applications introduce multilingual technology, they often simply embed the translation function into the existing system without achieving deep integration and collaboration with other functions. This leads to problems such as inconsistent information and cumbersome operations during the application of multilingual technology, which affects the tourists' experience.

In order to promote the widespread application of multilingual technology in smart tourism, enterprises need to strengthen technology research and develop-

ment and innovation, and improve the coverage and integration of multilingual technology. At the same time, the government and relevant institutions also need to increase their support for smart tourism and promote the popularization and application of multilingual technology in the tourism industry. By strengthening technology research and development, talent training and policy guidance, we can promote smart tourism to make greater progress and breakthroughs in multilingual services.

## **4. Overview of Smart Tourism**

Smart tourism, as a product of the deep integration of modern tourism and information technology, is gradually reshaping the face of the tourism industry and providing tourists with more convenient, efficient and personalized service experience. The core lies in the word “smart”. This concept is rich in connotation and is not only reflected in the application of technological innovation, but also runs through the entire process of tourism services. It aims to solve the pain points in traditional tourism through technical means and improve the quality of tourism experience. This article will explore the “smartness” of smart tourism in depth, especially the application of speech synthesis technology, AloT technology, Beidou positioning and blockchain technology, and further elaborate on the value of multilingual services in the development of smart tourism, including its cultural value and service value.

### **4.1. Smart Tourism Embodies Smartness**

#### **4.1.1. Speech Synthesis Technology**

As an important part of smart tourism, speech synthesis technology provides great convenience for tourists to obtain information in different language environments by converting text information into speech. The application of this technology makes multilingual voice guides possible, greatly reducing language barriers and improving tourists’ travel experience. For example, in famous Chinese scenic spots such as the Forbidden City and the Summer Palace, by introducing speech synthesis technology, tourists can hear vivid and accurate multilingual guides in Chinese, English, etc., which not only deepens their understanding of the attractions, but also enhances the fun and interactivity of the tour. According to relevant data, the tourist satisfaction of scenic spots that use speech synthesis technology has increased by about 20% compared with before it was adopted, which fully reflects the positive role of this technology in improving the quality of tourism services .

#### **4.1.2. AloT Technology**

AloT (Artificial Intelligence of Things) technology, as a deep integration of artificial intelligence and the Internet of Things, has brought revolutionary changes to smart tourism. Through AloT technology, tourism services have been upgraded to be intelligent. For example, the smart guide system can provide personalized tour route recommendations based on tourists’ interests and behavioral habits;

the real-time translation function allows tourists to communicate smoothly in different language environments, eliminating language barriers. Take the West Lake Scenic Area in Hangzhou as an example. The scenic area uses AloT technology to build a smart scenic area management platform, which not only realizes real-time monitoring of data such as the flow of people and the environment in the scenic area, but also greatly improves tourists' tour experience and satisfaction through smart guides and real-time translation services. According to statistics, since the launch of the smart scenic area management platform, the satisfaction of tourists in the West Lake Scenic Area has continued to rise, and the proportion of international tourists has also increased significantly.

#### **4.1.3. BeiDou Navigation Satellite System**

BeiDou Navigation Satellite System, as a satellite navigation system independently developed by China, its application in smart tourism cannot be ignored. Beidou Positioning can provide high-precision location services to help tourists navigate and locate, especially in complex terrain or large scenic spots, this function is particularly important. Combined with multilingual services, Beidou Positioning can provide tourists with more accurate navigation information, such as multilingual voice prompts, route planning, etc., which greatly improves the efficiency and safety of tourists' tours. In natural scenic spots such as Jiuzhaigou and Zhangjiajie, the application of BeiDou Navigation Satellite System not only improves the tourists' tour experience, but also effectively reduces the incidence of safety accidents such as getting lost and getting lost. The application of the Beidou navigation satellite system has significantly improved the travel experience of tourists and played an important role in reducing safety accidents such as getting lost and getting lost. Yang, S. R. (2020) [9] taking the "Beidou Thailand Smart Tourism" project as an example, the system provides a one-stop smart tourism solution for overseas tourists through real-time push, navigation and positioning, intelligent audio guide and other functions. With the help of the Beidou terminal, tourists can realize accurate route planning, three-dimensional map navigation of scenic spots and automatic explanation in their native language, which greatly improves the convenience of obtaining information for foreign tourism. Empirical studies show that the location service based on Beidou can improve the itinerary planning efficiency of inbound tourists in Thailand and shorten the stay time in scenic spots.

In terms of safety protection, the Beidou system realizes real-time location monitoring of special groups of people through wearable devices. Wang Y X. (2023) [10] shows that the positioning accuracy of the electronic signage equipped with the Beidou module is up to 10 meters, and the historical trajectory playback function can shorten the response time for the search of lost persons, especially the "electronic fence" technology designed for children and the elderly, when the target enters the present danger area, the system can trigger an alarm instantly, and the function has successfully prevented potential lost events in the pilot application in Nanjing. These technological innovations not only verify the practical

value of Beidou in the field of tourism security, but also reflect the broad prospects of the “Beidou + Internet of Things” integration model in public services.

#### **4.1.4. Blockchain Technology**

Blockchain technology, with its decentralized and tamper-proof characteristics, provides a strong guarantee for the information security and transparency of smart tourism. In the tourism industry, blockchain technology can implement smart contracts to ensure the security of transactions between tourists and service providers, such as online bookings and ticket purchases. At the same time, blockchain technology can also record tourists’ travel footprints, evaluations and other information, providing valuable user data for tourism companies, which helps to optimize services and improve tourist satisfaction. Take a well-known online travel platform as an example. The platform uses blockchain technology to build a transparent tourism evaluation system. Every evaluation and feedback from tourists are recorded on the chain and cannot be tampered with. This not only enhances tourists’ sense of trust, but also prompts tourism companies to pay more attention to service quality and user experience. The integration of AIoT (Artificial Intelligence Internet of Things) and blockchain technology in smart tourism has demonstrated remarkable practical benefits, which can be verified through numerous successful cases. Chen, H., Song, K., Liu, S., *et al.* (2023) [11] show that using virtual reality technology (VR), tourists from all over the country can experience the tourist attractions of Zhangjiajie in an immersive way, allowing people to have a deeper understanding of the role of metaverse tourism. In addition, blockchain technology can also make metaverse tourism more transparent and credible, and the application of blockchain technology to metaverse tourism marketing efforts can make people more trust and support this type of tourism. Marriott International Group’s blockchain decentralized identity verification system adopted in some of its hotels in Asia has reduced the check-in processing time by 40%, while enhancing data security by relying on immutable transaction records. Liu, Z., Wang, Y., & Wu, Q. (2024) [12] manifest that Blockchain technology can realize the secure, transparent and traceable sharing of tourism-related data in Sanya. Various tourism business entities, such as tourist attractions, hotels, travel agencies, etc., can store data on the blockchain to ensure the authenticity and credibility of the information. Such a data-sharing mechanism will help establish and promote the synergies needed for the development of all-for-one tourism in Sanya.

## **4.2. The Value of Multilingualism in the Development of Smart Tourism**

### **4.2.1. Cultural Value**

#### **1) Strengthen cross-cultural communication**

The value of multilingual services in smart tourism is first reflected in strengthening cross-cultural exchanges. Language is the carrier of culture. Through multilingual services, tourists can overcome language barriers and understand and

experience the culture of the destination more deeply. This not only helps to improve the cultural literacy of tourists, but also promotes understanding and respect between different cultures and enhances international friendship. For example, in Paris, France, through the multilingual guide system, tourists can listen to French, English, Chinese and other multilingual explanations, and have a deep understanding of the history and cultural background of attractions such as the Louvre and the Eiffel Tower, which greatly enriches their travel experience.

#### **2) Protect and spread local culture**

In addition, multilingual services can also help protect and spread local culture. Through multilingual technology, local culture can be spread in multiple languages, increasing its influence and popularity around the world. This is of great significance for protecting and inheriting intangible cultural heritage and promoting local economic development. Take Lijiang, Yunnan as an example. The area has a rich Naxi culture. Through multilingual tourism services, the Naxi Dongba culture, music and dance can be displayed to domestic and foreign tourists, which not only attracts a large number of tourists to experience it, but also promotes the development of local tourism and cultural inheritance.

### **4.2.2. Service Value**

#### **1) Improving the quality of tourism services**

The role of multilingual services in improving the quality of tourism services cannot be ignored. Through multilingual technology, tourism companies can provide more accurate and personalized services to meet the diverse needs of tourists.

#### **2) Expanding the international tourism market**

Finally, multilingual services are of great significance to the expansion of the international tourism market. With the deepening development of globalization, the international tourism market is becoming increasingly prosperous, and multilingual services have become one of the key factors in attracting international tourists. By providing multilingual services, tourism companies can better meet the needs of tourists from different countries and regions and enhance their attractiveness and competitiveness to the destination. Take Thailand as an example. The country has attracted a large number of international tourists with its enthusiastic service and rich tourism resources, among which multilingual services have played a vital role. The Thai Tourism Department actively promotes multilingual tourism services, including multilingual guides and consulting services in Chinese, English, Japanese, etc., which not only improves the satisfaction of tourists, but also greatly promotes the development of Thailand's tourism industry.

In summary, the "wisdom" of smart tourism lies in its integration of a series of advanced technologies such as speech synthesis technology, AIoT technology, BeiDou positioning and blockchain technology, providing tourists with a more convenient, efficient and personalized service experience. The value of multilingual services in the development of smart tourism is reflected in strengthening cross-cultural exchanges, protecting and spreading local culture, improving the quality of tourism services and expanding the international tourism market. In the future,

with the continuous advancement of technology and the in-depth expansion of applications, smart tourism and multilingual services will continue to inject new vitality and impetus into the development of the tourism industry.

## 5. Innovation and Research Value

### 5.1. Innovation

In the field of smart tourism, technological innovation is the core driving force for the development of the industry. The several innovations proposed in this article not only represent the cutting-edge trends in the current development of smart tourism, but also indicate the direction of future changes in the tourism industry. The following is a detailed explanation of these innovations.

#### 5.1.1. Personalized Travel Experience

As big data analysis and artificial intelligence technologies continue to mature, smart tourism can provide more personalized travel recommendations and customized services. This innovation is mainly reflected in the following aspects:

**1) Accurate recommendations:** Big data analysis technology can collect and analyze massive amounts of data such as tourists' travel behaviors and interest preferences, thereby generating personalized travel recommendations. For example, if a tourist is particularly interested in historical and cultural attractions, the smart tourism system can intelligently recommend relevant historical sites, museums and other attractions based on their behavior patterns. This kind of accurate recommendation can not only improve tourists' satisfaction, but also effectively reduce tourists' blindness and time waste during the travel process.

**2) Customized services:** Artificial intelligence technology can further realize the personalized customization of tourism services. Through machine learning algorithms, the smart tourism system can predict tourists' needs, such as transportation methods, accommodation preferences, and food and beverage tastes, and thus provide customized tourism services. This customized service not only improves tourists' comfort, but also enhances their loyalty and return rate.

**3) Case support:** Take Ctrip Travel as an example. The platform uses big data and artificial intelligence technology to launch two major services: "Smart Recommendation" and "Customized Travel". By collecting and analyzing tourists' travel records, search behavior and other data, Ctrip can generate personalized travel recommendations and customized plans. According to Ctrip's official data, since the launch of these two services, tourists' satisfaction and loyalty have increased significantly.

#### 5.1.2. Real-Time Translation and Language Selection

As an important part of smart tourism, real-time translation technology can solve language barriers instantly and improve the convenience of tourism services. At the same time, tourists can also choose the appropriate language according to their needs, further enhancing the personalization of tourism services.

**1) Real-time translation:** Real-time translation technology uses technologies

such as speech recognition and natural language processing to translate tourists' voice or text information into the target language in real time. This real-time translation function is not only applicable to communication between tourists and tour guides and local residents, but also to tourists' self-guided tours and information inquiries in scenic areas.

**2) Language selection:** In addition to the instant translation function, the smart tourism system also provides a variety of language options to meet the different needs of tourists. Tourists can choose the appropriate language for communication and guidance based on their language preferences or the official language of the destination country. This language selection function not only improves the convenience of tourists, but also enhances tourists' cross-cultural communication ability.

### 5.1.3. Smart Navigation

As another important innovation in smart tourism, the intelligent tour guide system can provide services such as voice explanations and map navigation, greatly improving tourists' navigation and information acquisition experience.

**1) Voice explanation:** The intelligent tour guide system uses speech synthesis technology to convert text information into speech, providing tourists with vivid explanation services. This voice explanation function is not only applicable to the introduction of scenic spots in scenic areas, but also to the explanation of exhibits in museums, exhibition halls and other places. For example, in the Forbidden City in Beijing, tourists can hear detailed explanations of scenic spots and historical stories through the intelligent tour guide system.

**2) Map navigation:** In addition to voice explanations, the smart tour guide system also provides a map navigation function. Visitors can use the map application on their mobile phones or smart devices to view the distance, route and other information between their location and the destination in real time. This map navigation function not only improves the navigation efficiency of tourists, but also reduces the phenomenon of tourists getting lost and taking detours in the scenic area.

**3) Case support:** The Palace Museum is one of the typical application cases of the intelligent tour guide system. Zhai, Y., & Yang, Z. (2024). [13] use virtual digital human technology to enhance the tourist experience. The high-tech technology used by virtual digital humans can better satisfy their curiosity and desire to explore, and create a more engaging travel experience. In addition, through the study of the collection and traditional culture, the virtual digital human can understand the history and cultural background of the Palace Museum in an all-round way, and can also bring a better interactive experience to tourists by answering the questions raised by tourists in real time. On October 10, 2017, the Palace Museum developed the Duanmen Digital Pavilion of "Discovery, Nourishing the Heart—Theme Digital Experience Exhibition", a feast of the integration of traditional culture and modern technology, which won unanimous praise from visitors. The Palace Museum is a huge area, and uses virtual technology to build a

tour space, allowing visitors to have freer tour experience in a three-dimensional space. At the same time, through interactive design, visitors can use AR and other devices to immerse themselves in historical scenes or cultural backgrounds, stimulate visitors' interest in learning and participation, and deepen their understanding of the Palace Museum and traditional culture.

## 5.2. Research Value

The application of multilingual technology in smart tourism is not only innovative and practical, but also has important research value. The following is a detailed explanation of these research values.

### 5.2.1. Improving Tourist Experience

The application of multilingual technology can significantly enhance tourists' overall experience, enabling them to better understand and enjoy the services of the tourist destination.

**1) Language barrier-free:** Through the application of technologies such as real-time translation and intelligent guide, tourists can communicate and obtain information freely in different language environments, eliminating language barriers. This language barrier-free experience not only improves the convenience of tourists, but also enhances their self-confidence and satisfaction.

**2) Cultural immersion:** Multilingual services can also help tourists gain a deeper understanding and experience of the destination culture. By providing cultural explanations and guided tours in multiple languages, tourists can gain a deeper understanding of local history, customs and habits, thereby enhancing their sense of identity and belonging to the destination culture.

**3) Case support:** Zhou, X. W. (2024). [14] research shows that multi-language cultural interpretation systems enabled by AI technology can effectively enhance tourists' cultural understanding. Taking the China Grand Canal Museum as an example, the AI-assisted VR/AR immersive experience system it has developed supports multi-language switching, allowing tourists of different language backgrounds to deeply understand the historical context and cultural connotations of the Grand Canal. This application of technology not only breaks through language barriers but also enhances the depth and breadth of cultural transmission through contextualized narratives.

The practices of virtual digital humans like "Jiayao" from the Digital Dunhuang and "Ai Wenwen" from the National Museum have further demonstrated that multi-language intelligent interpretation systems can significantly enhance the effectiveness of cultural dissemination. These digital interpreters, through multi-language explanation services, transform complex historical and cultural information into knowledge systems understandable by users of different languages, enabling visitors to accurately grasp the cultural symbolic meanings and social values behind the exhibits. This cultural translation mechanism not only meets the personalized cognitive needs of visitors but also establishes an emotional connection between visitors and the exhibited culture.

### 5.2.2. Enhancing Cultural Adaptability

Through multilingual services, tourists can better adapt to different cultural environments and improve the effectiveness of cross-cultural communication.

**1) Cultural understanding:** Multilingual services can help tourists better understand and adapt to different cultural environments. Tourists can understand local cultural customs and etiquette norms through technical means such as real-time translation and intelligent guides, thereby reducing cultural conflicts and misunderstandings. This cultural understanding not only helps to improve tourists' cross-cultural communication skills, but also promotes communication and integration between different cultures.

**2) Cultural respect:** Through multilingual services, tourists can have a deeper understanding of the local cultural background and historical origins, thereby enhancing their respect and understanding of local culture. This cultural respect not only helps to improve tourists' civilization and moral standards, but also promotes the protection and inheritance of the culture of tourist destinations.

**3) Case support:** From the perspective of cultural cognition, multilingual services, through precise translation and localized expression (such as museum explanations and foreign language guide materials), help foreign tourists deeply understand the historical background, cultural symbols and folk traditions of scenic spots. You, Z. H., Hu, R., Sun, M. T., *et al.* (2019) [15] take an instance, the Dalian Museum offers multilingual explanation services, foreign tourists can go beyond surface-level observation during their visit and systematically perceive the ritual significance of Chinese bronze vessel patterns, the trade network of the ancient Maritime Silk Road and other deep cultural information. This process of cultural decoding significantly enhances tourists' cultural literacy and cognitive depth.

### 5.2.3. Promoting Technological Progress

Research on multilingual technologies in smart tourism can promote the development and application of related technologies and provide a reference for future technological advances.

**1) Technological innovation:** The research and application of multilingual technology requires continuous technological innovation and support. Through in-depth research and practical application of technologies such as real-time translation and smart guides, the continuous development and improvement of related technologies can be promoted. This technological innovation not only helps to improve the service quality and efficiency of smart tourism, but also provides reference for technological progress in other fields.

**2) Industry upgrading:** The application of multilingual technology can also promote the upgrading and transformation of the tourism industry. By introducing advanced technical means and service models, the competitiveness and added value of the tourism industry can be improved. This kind of industrial upgrading not only helps to improve the overall development level of the tourism industry, but also provides inspiration and reference for the transformation and upgrading of other industries.

**3) Case support:** Yu, P. P. (2024) [13] taking practice of smart scenic spots represented by the Huangshan Scenic Area shows that the multi-language service system based on advanced digital technologies such as the Internet of Things, artificial intelligence and big data can not only effectively solve the language barrier problem for cross-border tourists, but also promote the intelligent upgrade of tourism services through technological innovation. Through the analysis of the digital transformation case of the Huangshan Scenic Area, this study finds that the application of technologies such as real-time translation and intelligent navigation has achieved remarkable results. The practice of building a digital smart scenic area in Huangshan has achieved remarkable results. According to the Huangshan Tourism Revenue Yearbook and various annual reports of Huangshan Tourism Development Co., Ltd., the profit situation of the Huangshan Scenic Area has been good in recent years. As of September 30, 2023, the cumulative number of tourists received by the Huangshan Scenic Area in the year exceeded 3.5 million, setting a new historical record. In August 2023 alone, the number of tourists received by the Huangshan Scenic Area reached 635,000, also setting a new record for monthly tourist reception.

## 6. Application Strategies of Multilingualism in Smart Tourism

In the field of smart tourism, the effective application of multilingual services is the key to improving tourist experience and promoting international exchanges. In order to achieve this goal, a series of scientific and systematic application strategies need to be formulated. The following is a detailed discussion of the application strategies of multilingual services in smart tourism.

### 6.1. Multilingual Translation and Localization

Multilingual translation is the foundation of smart tourism services, but simple translation is not enough to meet the needs of tourists. In order to ensure that the translated content conforms to local cultural habits and language style, multilingual translation localization is required.

**1) Cultural adaptability:** Localized translation is not just a conversion of words, but also a cultural adaptation. In the translation process, it is necessary to fully consider the cultural background, idioms and expressions of the target language to ensure that the translated content is both accurate and in line with local cultural habits. For example, when translating the introduction of tourist attractions, the commonly used expressions and vocabulary in the local area should be used to avoid using translations that are too stiff or do not conform to local cultural habits.

**2) Market demand orientation:** Localized translation should also be adjusted according to the needs of different markets. Tourists from different countries and regions have different needs and preferences for tourism information, so the translation content needs to be customized according to the characteristics of the

target market. For example, for European and American tourists, more emphasis can be placed on the translation of history, culture, and art; while for Asian tourists, more emphasis can be placed on the introduction of food, shopping, and other aspects.

**3) Case support:** In the practice of multi-language tour guide services in Dongsha Ancient Town, the localization translation strategy has been systematically applied as the core link for enhancing the international service level. Wang, R. (2024) [16] takes this case as the research object and discovers that it has achieved in-depth localization of translation content through three dimensions: Firstly, at the level of human resource allocation, the ancient town not only requires multi-language tour guides to pass standardized language proficiency tests, but also focuses on assessing their cognitive level of the cultural customs of the source countries, ensuring that the interpretation content can actively avoid cultural taboos (such as the differentiated handling of shrines and temples by Japanese tour guides). Secondly, in terms of text material localization, the multi-language guidebooks developed by the scenic area in English, French, Spanish, Japanese, etc. are not simply literal translations, but are content-reconstructed based on the cultural cognitive characteristics of the target audiences of each language version. For example, the English version focuses on the historical status of the fishing and trading culture in Zhejiang in the Maritime Silk Road, while the Spanish version strengthens the comparative analysis with the port buildings during the colonial period in Latin America. Finally, through the establishment of a dynamic cultural adaptation mechanism, regular feedback data from major source countries of tourists are collected, and the information presentation methods of each language version are continuously optimized (such as adjusting the artistic symbolic interpretation of the traditional residential “horse-head wall” for French tourists). Monitoring data shows that after implementing the localization translation strategy, the satisfaction index of international tourists has increased by 27%, and the multi-language positive review rate of the scenic area on international tourism platforms has increased by 41%. This case confirms that the translation localization based on the theory of cultural adaptation not only eliminates cross-cultural communication barriers but also effectively enhances the international brand value of cultural heritage sites through the precision of knowledge transmission and the strengthening of emotional resonance. This practice provides a replicable model reference for the construction of language service systems in similar cultural heritage scenic areas.

## 6.2. Strengthening Professional Training of Service Teams

The service team is an important part of multilingual services in smart tourism. In order to ensure service quality and cultural adaptability, the service team needs to be professionally trained in multilingual and cultural backgrounds.

**1) Multilingual training:** The service team should master at least one foreign language in order to communicate with tourists. During the training process, pro-

professional foreign language teachers or translators can be invited to give lectures to improve the language level of the service team. At the same time, the practical application ability of the service team can also be strengthened through simulated dialogues, role-playing and other methods.

**2) Cultural background training:** In addition to language training, the service team also needs cultural background training. Understanding the cultural customs, religious beliefs, etiquette norms, etc. of different countries and regions will help the service team better adapt to the needs and habits of different tourists. For example, when receiving Muslim tourists, they should understand their dietary taboos and religious etiquette to avoid violating their cultural taboos.

**3) Case sharing and experience exchange:** During the process of enhancing the quality of tourism services, professional training for service teams with multilingual and multicultural backgrounds has been proven to be highly effective. Wang, R. (2024) [17] taking the multilingual tour guide service in Dongsha Ancient Town as an example, by recruiting tour guides with multilingual capabilities and implementing strict language proficiency tests, the accuracy and fluency of tour guiding explanations were ensured, thus meeting the needs of major international tourist markets such as English, French, Spanish, and Japanese. In addition, with the support of multilingual guidebooks and information signs, the negative impact of language barriers on tourists' experiences was further reduced. More importantly, through systematic language training for the existing tour guide team, their cross-cultural communication skills were significantly improved, enabling them to interact more efficiently with tourists from different cultural backgrounds. This series of measures not only optimized the professionalism and personalization level of tour guide services but also significantly enhanced the satisfaction of international tourists, thereby promoting the international development of the tourism destination. Empirical evidence shows that professional multilingual and cross-cultural training can effectively enhance the overall quality of the service team and ultimately achieve an overall improvement in service quality and sustainable development of the tourism industry.

**4) Data support:** As a globally leading online travel service platform, Ctrip attaches great importance to the cultivation of language proficiency and cultural sensitivity of its international service team. Through the implementation of regular multilingual training and cultural adaptability training programs, the company has significantly enhanced the professional performance of the service team in cross-cultural communication scenarios. According to the internal monitoring data of Ctrip (2020-2023), the service personnel who received systematic training showed significant performance improvement in the international tourist reception business: the accuracy of language communication increased by 37.2%, the occurrence rate of cultural conflicts decreased by 28.6%, and ultimately, the international customer satisfaction index (CSI) rose from 82.4 before the training to 91.7 (on a 100-point scale). This empirical data validates the effect of systematic cross-cultural training on the improvement of tourism service quality and pro-

vides a quantifiable reference paradigm for the optimization of the industry's talent training system.

### 6.3. Providing Multilingual Personalized Recommendations

With the continuous development of big data analysis and artificial intelligence technology, smart tourism has been able to achieve accurate analysis of tourist behavior and personalized recommendations. On this basis, it can further provide multilingual personalized recommendation services based on tourist preferences.

**1) Big data analysis:** By collecting and analyzing tourists' travel behaviors, search records, consumption habits and other data, we can understand tourists' preferences and needs. For example, by analyzing tourists' search keywords and browsing records on travel platforms, we can determine which attractions, food, shopping places, etc. tourists are interested in.

**2) Artificial intelligence technology:** Based on the results of big data analysis, artificial intelligence technology can be used to generate personalized recommendation plans. These recommendation plans can be customized according to tourists' preferences and needs, including scenic spot recommendations, food recommendations, shopping place recommendations, etc. At the same time, multilingual recommendation services can also be provided according to tourists' language needs.

**3) Case application:** Take Ctrip Travel as an example. The platform uses big data analysis and artificial intelligence technology to provide tourists with personalized recommendation services. In the recommendation process, Ctrip will generate recommendation plans in different languages according to tourists' preferences and needs. These recommendation plans not only meet tourists' expectations, but also improve tourists' satisfaction and loyalty. According to Ctrip's official data, since the launch of personalized recommendation services, tourists' satisfaction and return rates have increased significantly.

## 7. Conclusions

Multilingual applications in smart tourism provide an effective solution for improving tourism service quality and enhancing tourist experience. Through in-depth research on the application and innovation of multilingual technology, we can provide strong support for the high-quality development of smart tourism.

First of all, multilingual translation localization is the basis for realizing smart tourism multilingual services. By considering cultural adaptability and market demand orientation, it can ensure that the translated content is both accurate and in line with local cultural habits. This will not only help improve tourists' satisfaction, but also enhance the international visibility and influence of tourist destinations.

Secondly, strengthening the professional training of the service team is the key to improving the quality of smart tourism multilingual services. Through multilingual and cultural background training, the service team can better adapt to the

needs and habits of different tourists. This will not only help improve tourists' satisfaction and loyalty, but also improve the overall competitiveness of travel companies.

Finally, providing multilingual personalized recommendations is an innovative direction for smart tourism multilingual services. Through the application of big data analysis and artificial intelligence technology, accurate analysis of tourist behavior and personalized recommendations can be achieved. This not only meets the expectations and needs of tourists, but also improves their satisfaction and loyalty.

In the future, we should further explore the actual effects and application strategies of multilingual services. By continuously optimizing and improving the quality and efficiency of multilingual services, we can promote the development and improvement of smart tourism. At the same time, we should also strengthen exchanges and cooperation with other countries and regions to promote the internationalization and globalization of smart tourism jointly. This will help to improve the overall level and international competitiveness of my country's tourism industry and provide tourists with better quality and more convenient tourism services.

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## Conflicts of Interest

The authors declare no conflicts of interest.

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