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Research on Promoting the Sustainable Development of the Rural Revitalization Strategy through Rural Ecotourism Entrepreneurship Based on Artificial Intelligence

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Abstract: The root of the problem of sustainable rural development lies in the long-term dual system, which makes the relationship between rural population and land become uncoordinated and the ratio of social subjects weakens. Therefore, it has become the current focus to explore and develop a new urbanization development model dominated by tourism as a new economic growth point and pillar industry. This paper used the intelligent tourism terminal application to solve the problems existing in rural ecotourism, and promote the development of rural ecotourism, so as to realize the sustainable development of the rural revitalization strategy. The rural ecotourism entrepreneurship based on artificial intelligence (AI) promotes the sustainable development of the rural revitalization strategy. The results showed that in the survey results of the basic attributes of tourists, the proportion of each content tends to be balanced, not as big as the previous data. In the survey results of tourists' travel decision-making, repeat tourists also increased from 7.61% to 9.21%, and the probability of tourists driving by themselves also increased from 33.15% to 40.21%. In the survey results of tourist experience, the comfort of three kinds of experience tourists has been improved: environmental experience, equipment experience and service experience. In the survey results of tourists' follow-up behavior, the proportion of tourists willing to come again increased from 48.12% to 60.45%, and the proportion of tourists willing to recommend to friends increased from 46.32% to 58.23%. These data showed that AI can well promote the development of rural ecotourism, thereby realizing the sustainable development of the rural revitalization strategy.

1. Introduction

In the new development stage, rural revitalization is a key strategy for modernizing China, especially following the elimination of absolute poverty. To ensure its sustainable development, it is essential to align rural revitalization with local characteristics and fully leverage rural ecotourism. Traditional promotional methods like TV ads are outdated in today’s digital era; thus, this study applies AI to enhance rural ecotourism and support sustainable rural development.

Rural revitalization emphasizes state leadership, farmers' interests, and village sustainability. Prior studies have examined related aspects: Li L explored cultural development in Daqing and the role of university libraries [1]; Zeng X proposed village planning strategies tailored to local needs [2]; Yang J analyzed rural community evolution using tourism data [3]; Ren-Wei H E used regression models to examine survival strategies in Liangshan Yi Autonomous Prefecture [4]; Liu Y investigated economic-ecological dynamics under rural revitalization [5]. While informative, these studies lack specific implementation methods, which AI-driven rural ecotourism can address.

With rapid Internet development, AI plays a growing role in tourism and sustainable revitalization. Goralski M A assessed AI's contribution to sustainable development goals from a business and policy standpoint [6]. Chen X highlighted ecotourism's role in rural economic growth and proposed evaluation metrics [7]. Jingke Y U focused on tourism needs in central Yunnan, emphasizing demand, industry, and culture [8]. Zhang J discussed peasant organization limitations and advocated local models [9]. Ma A stressed scientific land management to sustain agriculture amid declining soil fertility [10]. Despite progress, challenges like poor tourist experiences and inadequate signage persist, highlighting the need for AI integration.

Survey data from a rural tourist site in Jiangxi, collected before and after implementing an intelligent tourism terminal, showed improvements in visitor demographics, experiences, and behavior. Valid responses increased from 184 (93.87%) to 194 (97%). Post-implementation, age, occupation, and income distribution became more balanced. Repeat visitors rose from 7.61% to 9.21%, and self-driving tourists increased from 33.15% to 40.21%. Visitor satisfaction also improved significantly across environmental (21.16% to 34.57%), equipment (22.42% to 40.98%), and service experiences (23.31% to 40.12%). These outcomes support AI's role in enhancing rural ecotourism and advancing sustainable rural revitalization.

2. About the Sustainable Development of the Rural Revitalization Strategy under the Intelligent Tourism Terminal

2.1. Overview of Sustainable Development of Rural Revitalization Strategy

The sustainable development of rural revitalization is a key innovation in China's modern rural development, requiring a comprehensive approach based on the complexity of rural systems and the coupled development of "people-land-industry" [11]. A rural regional system tailored to local characteristics and development stages is needed to enhance resilience. Key challenges include: (1) linking grassroots people and government to foster cooperation, and maintaining farmers' motivation after poverty alleviation; (2) connecting rural areas internally and externally by turning agricultural products into commodities and strengthening rural networks; (3) retaining and attracting talents with social and human capital to support long-term rural development. Ultimately, these issues highlight the importance of rural ecotourism development, effective governance, market access, and talent retention.

2.2. Rural Ecotourism Based on Artificial Intelligence

Rural eco-tourism is a kind of rural tourism activity that relies on the countryside, relies on the rural environment, takes the rural eco-tourism as the carrier, and takes its unique rural eco-tourism resources as the carrier [12]. As an emerging ecotourism method, rural ecotourism is gradually becoming a new research field in today's tourism field. However, China's rural ecotourism development currently faces many problems.

1) Problems existing in rural ecotourism

Rural ecotourism faces several challenges: complex routes and scattered attractions make

navigation difficult; a shortage of tour guides limits cultural understanding; too many points of interest dilute the experience; and long queues, especially when shopping, along with slow internet, reduce tourist satisfaction.

2) The corresponding solution

AI-powered solutions include smart navigation with immersive audio-visual guidance, real-time virtual tour guides to reduce labor costs, personalized scenic spot recommendations, and interactive smart shopping systems that promote local products and improve the visitor experience. These approaches support rural tourism development and align with sustainable rural revitalization goals.

3) Overview of AI

AI, including BP neural networks [13], plays a growing role in tourism. Intelligent tourism terminals, which continuously learn from sample data, use 3D simulation to provide users with immersive sensory environments [14]. This study also builds a tourist experience model with key elements—ethnic environment, facilities, and services—to evaluate satisfaction and predict future tourist behavior. Therefore, this paper proposes the general idea model of this paper on this basis, as shown in Figure 1 [15].

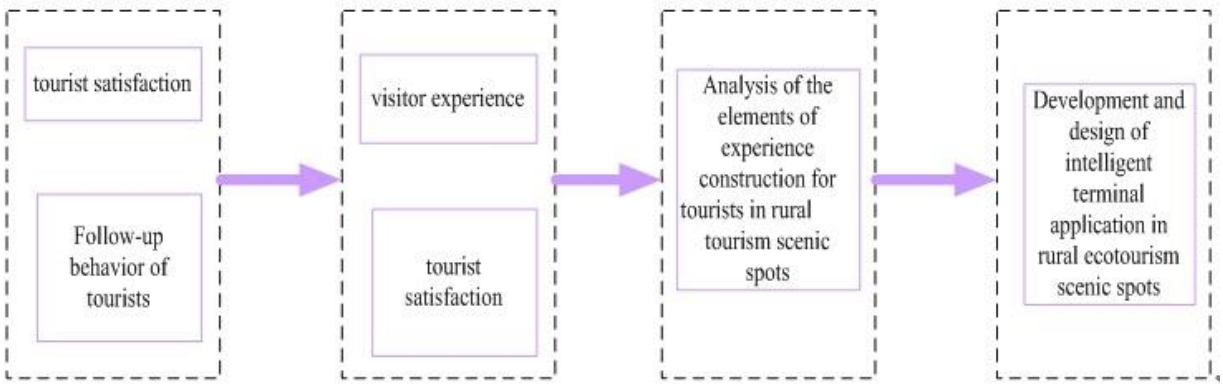

Figure 1 General concept model

This study focuses on tourists' experience, satisfaction, and behavior to construct a basic model for rural ecotourism. A questionnaire survey was conducted to identify issues in tourist experiences and propose AI-based solutions. Tourist satisfaction was evaluated using metrics such as likelihood of return visits, suggestions, and complaints. These factors guided the design of the intelligent tourism terminal, aiming to enhance satisfaction, improve rural ecotourism, and support sustainable rural revitalization [16].

2.3. Operation of Intelligent Tourism Terminal Application

With rapid social and economic development, travelers seek novel, personalized experiences beyond traditional methods. This paper categorizes rural ecotourism users by consumption ability and personality into groups such as active exploratory and independent types. Survey results indicate most tourists are enthusiastic explorers but face various challenges during their visits [17]. Through the analysis of the problems that tourists may have during the travel process, the corresponding countermeasures are given, as shown in Table 1.

To address existing issues, this paper utilizes a service blueprint in the design of the intelligent tourism terminal. The blueprint outlines the full tourist journey based on an analysis of the tourism information system, ensuring visitors can navigate the entire scenic area effectively. It also distinguishes between visible services (e.g., staff assistance) and invisible background services that tourists typically cannot access. Given the complexity and diversity of tourist needs, the blueprint incorporates technologies such as QR code scanning, mixed reality (MR), and POS payment

systems to enhance the overall experience [18]. Figure 2 shows the service blueprint specially drawn for the smart tourism terminal application of rural ecotourism.

Table 1 Problems & Solutions

travel period	Scenes	solution
before travel	Searching for scenic spots	Collect information online, make travel planning, and arrive at scenic spots through GPS navigation.
	Finding a parking spot	Ask the management to find the parking entrance.
traveling	Orientation of scenic spots	Read the description boards of the attractions and find relevant introduction materials online.
	Significance and history of attractions	Look at the description of the scenic spot information pictures, ask the scenic spot service staff to explain, and check it yourself online
	Attractions National Costume Experience Questions	Try it on, take a photo
	Attraction specialties purchase questions	Ask local guides, merchants or villagers to post specialties.
	Restaurant and accommodation issues	Ask other tourists or businesses, or search online
after travel	Taxi problem when leaving	Ask the area management for help.

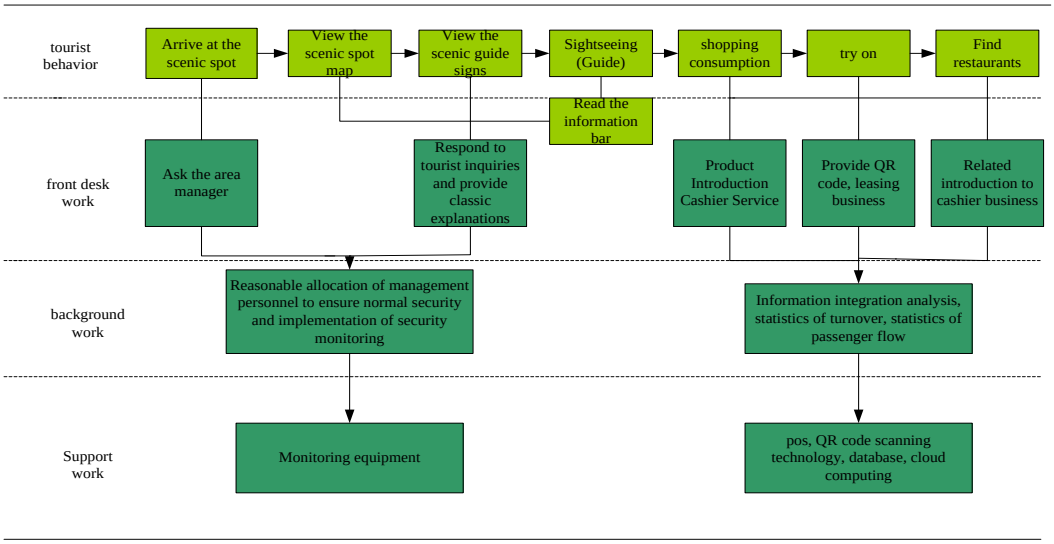

Figure 2 Service blueprint

In the design of the intelligent tourism terminal, the behaviors of tourists arriving at the scenic spot, viewing the scenic spot guide map, viewing the scenic spot sign, visiting the scenic spot, shopping and consumption, trying on clothes, finding hotel accommodation, and leaving the scenic spot are introduced in detail. In the drawing of the service blueprint, the behavior of tourists in the scenic spot and the contact points with the service interface are analyzed by using the intelligent tourism terminal, and the work of the service provider in the background control end is combined with the related technical support process [19]. Thus, there is a service orientation of the overall

tourism terminal application system based on service planning.

According to the intelligent tourism terminal application software in Figure 2, after sorting and analysis, nine different tourism processes can be obtained. On this basis, according to the service content of each stage, the design of the hardware service contact point is discussed preliminarily.

In terms of application functions of intelligent travel terminals, it is necessary to achieve systematization of functional services, easy operation and emotional interface. The specific process and the points that should be possessed are shown in Figure 3:

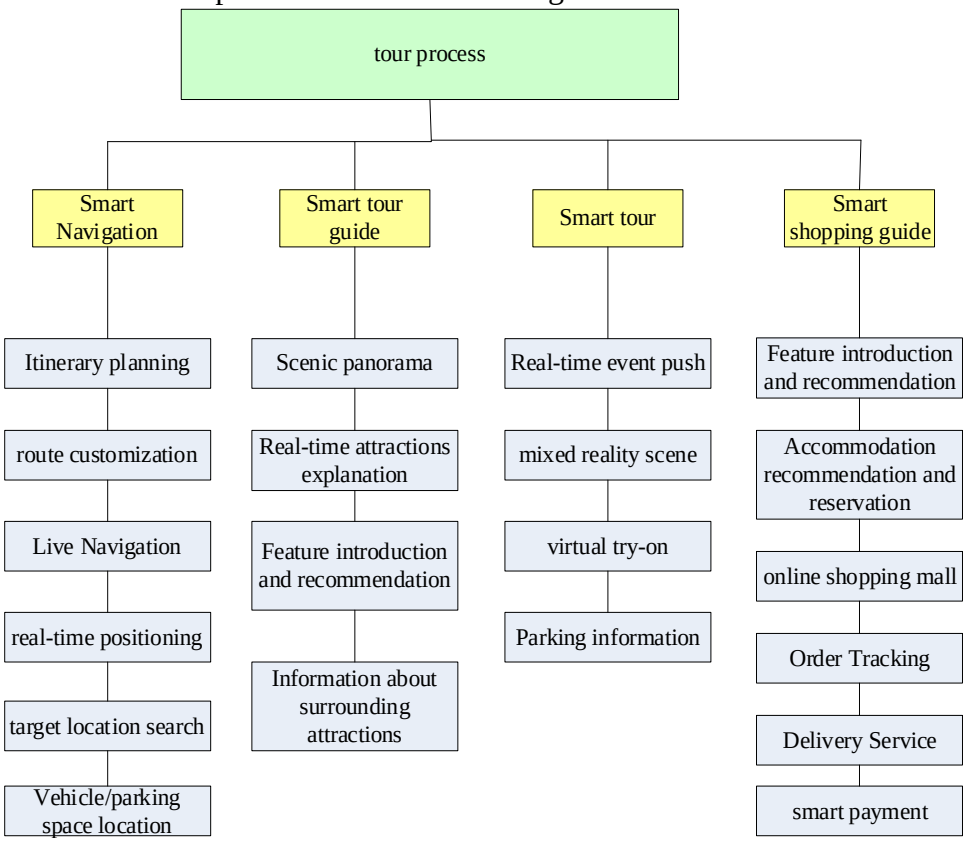

Figure 3 Software function module concept

The intelligent tourism terminal application is designed with four functional modules: smart navigation, smart tour guide, smart tour, and smart shopping guide. Based on tourist experience elements, identified problems, and service blueprints, the application integrates advanced technologies such as mixed reality, IoT databases, and sensors, presented through both hardware and software. This system offers personalized, self-guided services to enhance tourist experience and cultural engagement in rural ecotourism sites. As a result, smart tourism terminals play a key role in modernizing rural ecotourism and advancing the sustainable development of the rural revitalization strategy.

3. Operation Verification of Smart Travel Terminal Application

This study categorized measured variables into four groups: tourist demographics (age, occupation, education, origin, income), decision-making (trip awareness, visit frequency, transport, cost, stay duration), experience (environment, facilities, services), and follow-up behavior (willingness to revisit or recommend). To ensure data accuracy, on-site surveys were conducted twice at a rural tourist site in Jiangxi—before and after implementing the smart tourism terminal—six months apart. Surveys targeted tourists in local restaurants, hotels, and recreational

areas. A total of 200 questionnaires were distributed each time, with 184 valid responses in the first round (93.87%) and 194 in the second (97%).

The results of the survey on basic attributes of tourists are analyzed as follows:

The survey results of the basic attributes of tourists when the smart travel terminal application is not used are:

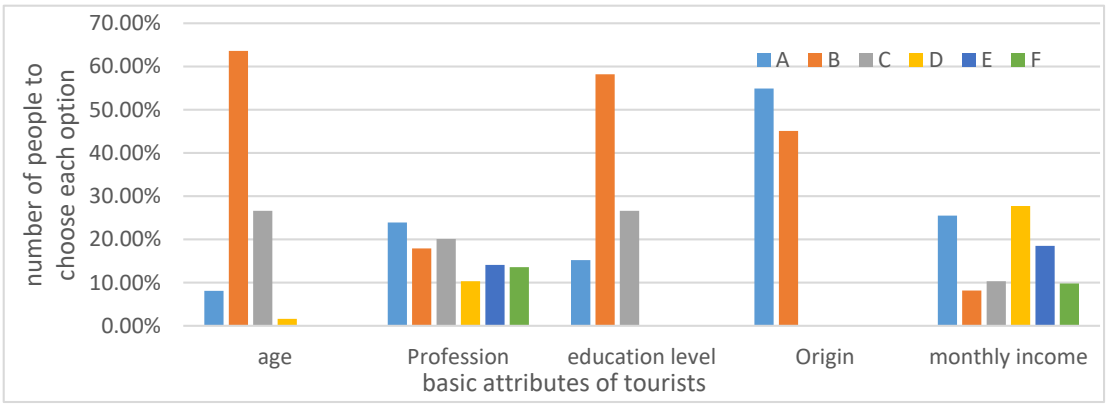

Figure 4 Survey results of basic attributes of tourists before using the app

The survey results of the basic attributes of tourists after using the smart tourism terminal application are:

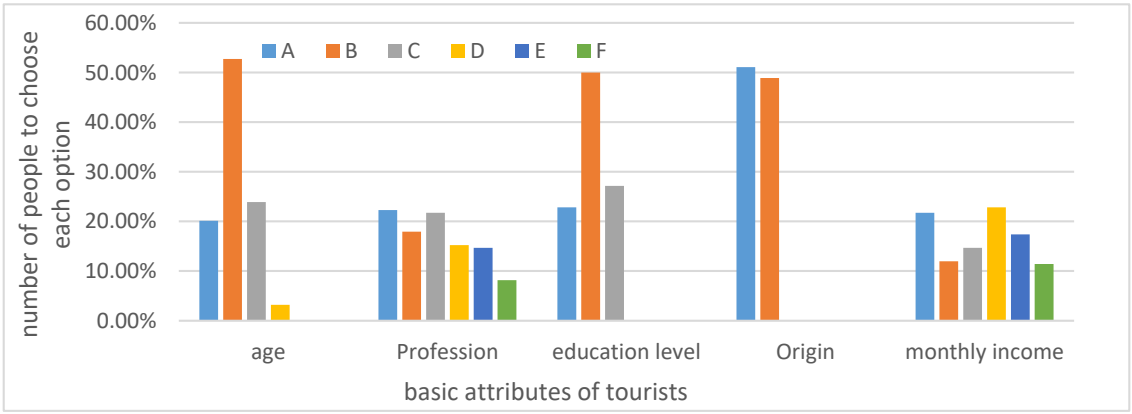

Figure 5 Survey results of basic tourist attributes after using the app

The survey data from Figures 4 and 5 show that before using the smart tourism terminal, young and middle-aged tourists were the main visitors. After its implementation, while this group remains dominant, participation from other age groups increased, indicating a more balanced age distribution. Similarly, tourist occupations diversified beyond mainly civil servants, and educational backgrounds became more varied. Notably, the proportion of tourists with a high school education or below rose from 15.2% to 22.83%. Additionally, the number of out-of-province tourists increased. Overall, the smart tourism terminal broadened and balanced the rural ecotourism audience, supporting sustainable rural revitalization.

The survey results and analysis of tourists' travel decision-making are as follows:

The survey results of tourists' travel decision-making without the use of smart travel terminal applications are: (fig.6)

The survey results of tourists' travel decision-making after using the smart travel terminal application are as follows: (fig.7)

From the data in Figure 6 and Figure 7, it can be seen that the way for people who travel to the rural area to learn about the rural attractions is more through the introduction of online platforms

and relatives and friends. It means that the operation of smart tourism terminal applications still promotes the development of rural tourism, more people know about it and there are more repeat customers. Repeat tourists to the village also rose to 9.21% from 7.61% previously. Due to the application of intelligent tourism terminals, the problem of tourists' parking has been solved, and the probability of tourists driving by themselves has also increased from 33.15% to 40.21%. Tourists want to stay longer when they visit. This means that the operation of smart tourism terminal applications makes rural ecotourism more able to retain people, promotes the development of rural ecotourism, and thus promotes the sustainable development of the rural revitalization strategy.

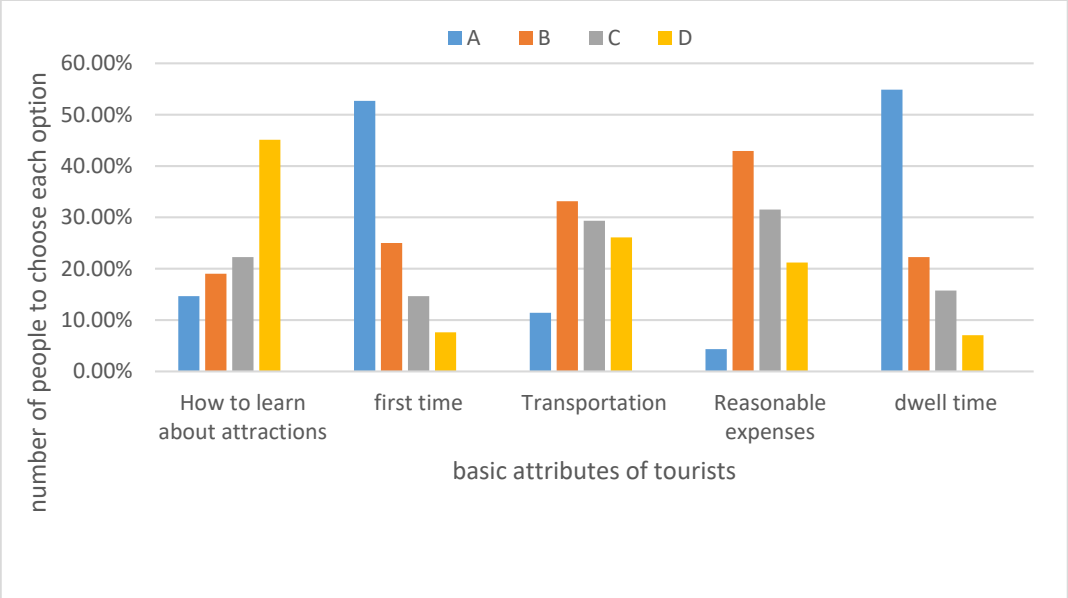

Figure 6 Tourist travel decisions when not using the app form findings

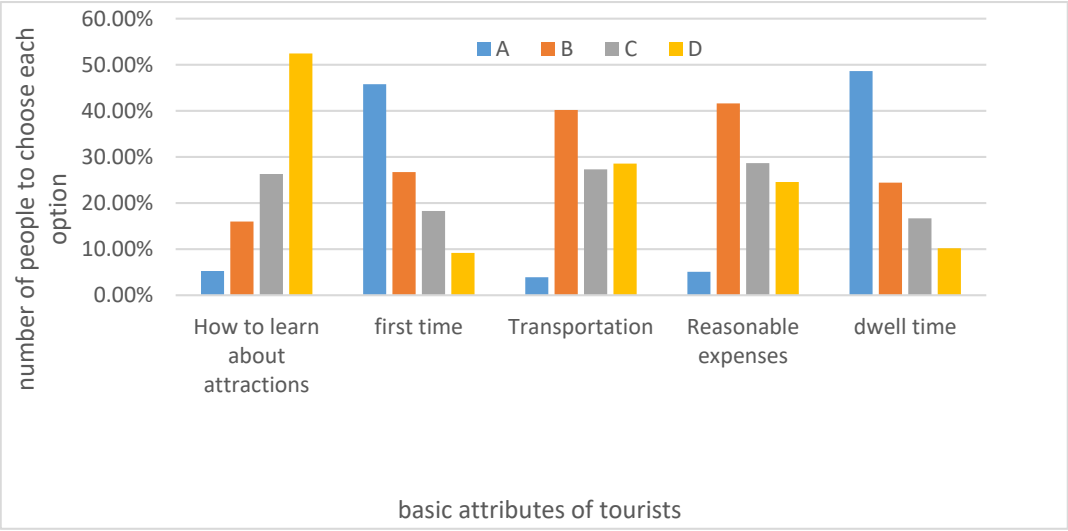

Figure 7 Tourist travel decisions after using the app form survey results

The results and analysis of the tourist experience survey are as follows:

The results of the tourist experience survey when the smart travel terminal application is not used are: (fig.8)

The results of the tourist experience survey after using the smart tourism terminal application are: (fig.9)

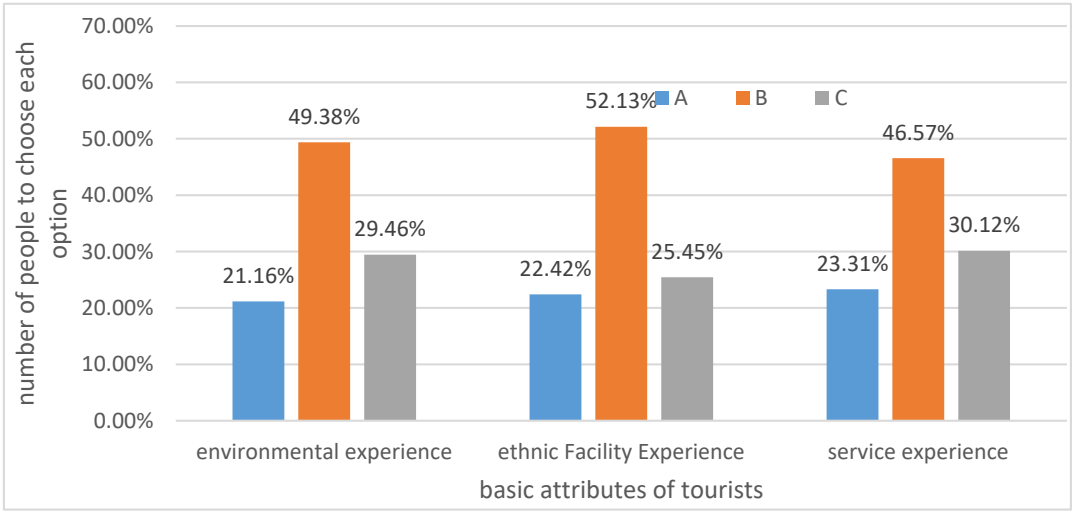

Figure 8 Visitor experience survey results before using the App

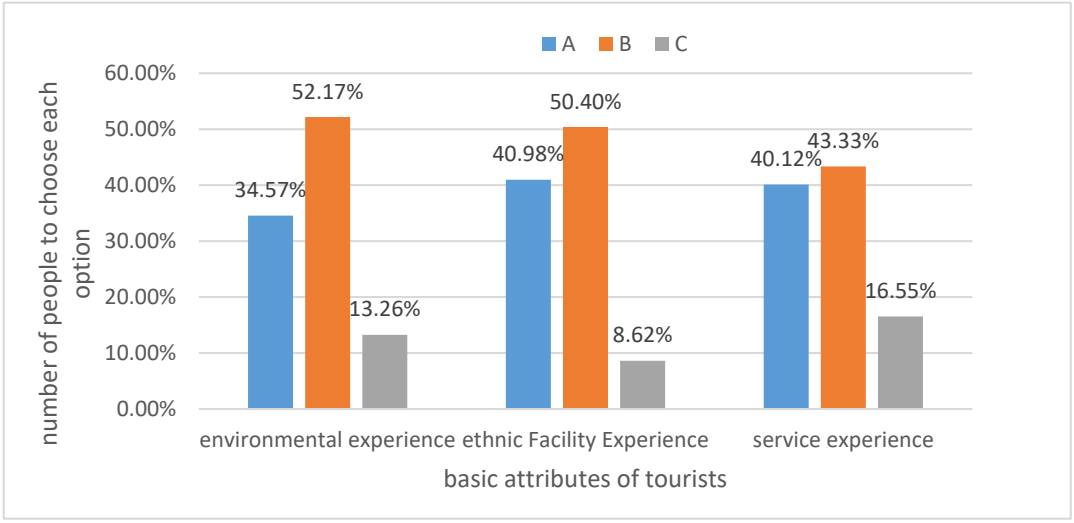

Figure 9 Survey results of visitor experience after using the app

From the comparison data in Figure 8 and Figure 9, it is found that in the environmental experience, the comfort level of tourists increased from 21.16% to 34.57%. In the equipment experience, the comfort level of tourists increased from 22.42% to 40.98%. In the service experience, the comfort level of tourists increased from 23.31% to 40.12%. In addition, the dissatisfaction level of tourists in all three experiences decreased to a certain extent. It can be explained that the intelligent tourism terminal application provides tourists with higher environmental quality, equipment quality and service quality, and the tourism experience of tourists is greatly improved. It can also be seen that intelligent tourism terminals play a huge role in rural eco-tourism. This makes it possible to further promote the sustainable development of the rural revitalization strategy.

The results and analysis of the follow-up behavior of tourists are as follows:

The survey results of tourists' follow-up behavior when the smart tourism terminal application is not used are: (fig.10)

The results of the follow-up behavior survey of tourists after using the smart tourism terminal application are: (fig.11)

As can be seen from the data in Figure 10 and Figure 11, after the application of the smart travel terminal application, the affirmative answer of tourists when asked whether they would like to come

again has increased from 48.12% to 60.45%, and when asked if they would recommend it to a friend, the affirmative answer rose from 46.32% to 58.23%. These data fully demonstrate that the smart tourism terminal application can meet the various needs of tourists and make tourists feel the value of this trip. Therefore, AI can effectively promote the development of rural ecotourism, thereby promoting the sustainable development of the rural revitalization strategy.

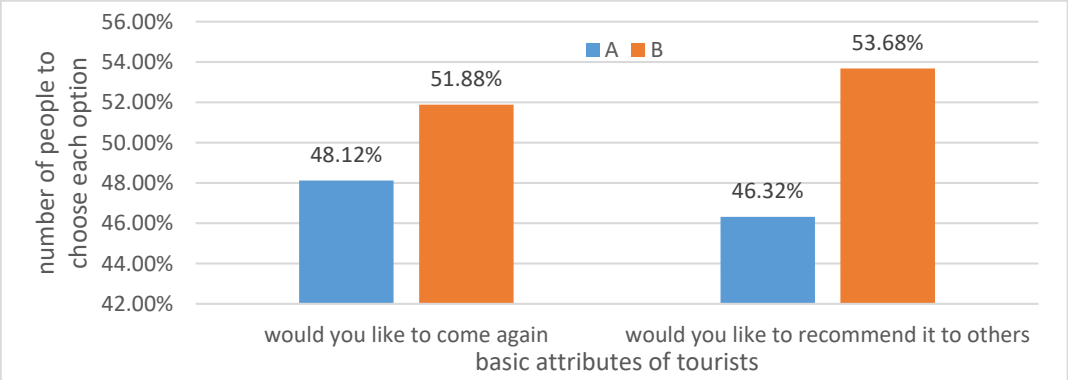

Figure 10 Visitor follow-up behavior survey results when the app is not in use

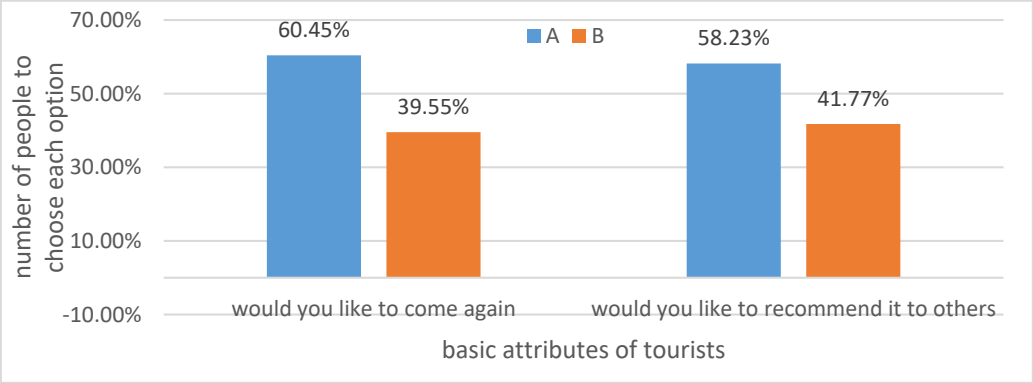

Figure 11 The results of the survey on the follow-up behavior of tourists after using the app

4. Conclusions

This paper explores how AI can address challenges in the rapid development of rural ecotourism and support the sustainable implementation of the rural revitalization strategy. By applying intelligent tourism terminals, the transformation from traditional to smart tourism was analyzed. Results show that AI significantly enhances rural ecotourism and contributes to balanced, sustainable development. However, issues with data reliability remain, highlighting the need for improved data collection methods. Future research will focus on optimizing these methods and incorporating advanced practices to support more credible planning for rural revitalization.

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