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Evaluation and Analysis of the Development Level of Smart Tourism in Huangshan Scenic Area from the Perspective of Tourist Experience

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Abstract: Through the analysis of tourist experience evaluation, the existing problems of smart tourism in scenic spots are summarized, and the development level of smart tourism in Huangshan Scenic area is understood. In this paper, through literature review, field investigation, consultation and interview and other methods, the evaluation index of the development level of smart tourism in Huangshan Scenic area is preliminarily constructed. By using factor analysis and simulation comprehensive evaluation method, the problems in the construction of smart tourism in scenic areas during tourist experience are summarized, and optimization strategies are provided for the construction of smart tourism in Huangshan Scenic area.

1 Introduction

In the context of big data, the continuous development of information technology and the transformation of traditional tourism modes have spawned emerging markets such as smart cities and smart scenic spots, and the construction of smart tourism has become a new driving force for the sustainable development of tourism [1]. Huangshan Scenic Spot, as a very representative mountain tourist spot in China, has been undergoing digital transformation since 2018, and the intelligent construction of the scenic spot is becoming an important force to promote the transformation and upgrading of Huangshan tourism. In the era of experience economy, paying attention to the experience process and evaluation of tourists has become an important starting point for the construction of smart tourism in scenic spots [2].

Smart tourism is a new form of tourism that uses intelligent technology to optimize and innovate the supply of tourism products and services, provide tourists with better services and experiences, and achieve comprehensive improvement of tourism economic, social, cultural and ecological benefits [3-4]. While exploring the new model of smart tourism, domestic scenic spots actively carry

out smart tourism construction, improve service level and quality by changing their own management, operation, service and infrastructure, etc., so that tourists' demand for tourism services can be better met, and the concept of smart scenic spots comes from this [5]. At present, most literatures at home and abroad regard smart tourism as the construction of smart cities

Part of this paper focuses on the study of specific cases. However, the research on the smart tourism evaluation system has just started, and most of the existing evaluation indicators are based on the smart city evaluation index system. The research on the development evaluation and development strategy of smart tourism in a single scenic spot is very limited, and the index evaluation system is still in the exploratory stage [6].

In view of the above problems, this paper investigates the tourist experience in the construction of smart tourism in Huangshan Scenic area, so as to understand the problems existing in the process of providing smart tourism services in the scenic area, and puts forward corresponding optimization countermeasures and suggestions to further improve the tourist experience and promote the development of smart tourism in the scenic area.

2 Overview of the research area and research design

2.1 Selection of research cases

This study chooses Huangshan Scenic Spot as a case study to discuss and analyze the level of smart tourism construction and related optimization development strategies of Huangshan Scenic spot under tourist experience.

(1) Huangshan Scenic Area is a representative mountain scenic area in China, with excellent scenery and enduring reputation. Located in Huangshan City in southern Anhui Province, Huangshan Mountain is a world cultural and natural Heritage site, a world geopark and a world biosphere reserve. It is also a national scenic spot, a national 5A tourist attraction and a national civilized scenic spot. It ranks alongside the Yangtze River, the Great Wall and the Yellow River, demonstrating the outstanding style of China's magnificent mountains and rivers and splendid culture. Known by the world as "fairyland on earth" and "the first strange mountain under heaven", it is famous for the five wonders of pine, strange rocks, sea of clouds, hot springs and winter snow.

(2) Huangshan Scenic Area is representative in the development of smart tourism construction in mountain scenic spots. Huangshan City, as the first batch of smart tourism pilot cities in the country, has over the years accelerated the digital construction of scenic spots, made full efforts to build smart management, smart services, smart marketing and other aspects to promote the realization of digital transformation and development of scenic spots, so that tourists to enjoy higher quality tourism services and tourism experience.

In terms of intelligent management, Huangshan Scenic Area has carried out information construction for many years, built an information system, and provided corresponding data support and technical support services for the digital management of the scenic area. First of all, the scenic area has developed and started the construction of the scenic area big data command center platform, which focuses on the mobile terminal, introduces the AI convolutional neural network, and trains the network traffic simulation model and congestion state analysis and prediction model through AI big data analysis, so as to build an intelligent passenger flow early warning system. Build a handheld regional co-governance and grid system architecture, complete forecasting and early warning, emergency command, scenic area governance and emergency services, etc., to achieve one-button delivery and one-screen control. Secondly, in terms of tourist consultation and complaints, Huangshan Scenic Area has built a scenic protection management command and dispatch center, integrated all tourism-related functions and services, and launched a tourism

consultation and complaint service platform, which is uniformly accepted, assigned and answered. Finally, in terms of tourism resource protection and ecological environment monitoring, Huangshan Scenic Area vigorously implements forest resources, ecological environment and biodiversity protection projects, and builds automatic forest fire monitoring and alarm system, scenic area ecological environment observation station, 3D digital modeling of guest pine and other protection projects to effectively maintain the authenticity and integrity of Huangshan ecological resources.

In terms of intelligent services, Huangshan Scenic Area and Huangshan Tourism Development Co., Ltd. have launched Huangshan Tourism official platform, actively integrating Huangshan Scenic Area and its surrounding cultural and tourism resources and elements, and applying Internet +, big data, artificial intelligence and other technologies to build one-stop tourism products and convenient intelligent service platforms for "eating, living, traveling, traveling, shopping and entertainment". As of 2023, the platform products cover more than 60 scenic spots in and around the city, more than 220 hotels and guest houses, and more than 800 types of special commodities. Secondly, the Huangshan Scenic area has built a service platform to welcome visitors, and adopted Beidou and multi-frequency and multi-mode integration positioning to effectively solve the problem of difficult positioning of mountain scenic spots, and completed the country's first lightweight navigation plan for the small program end of the mountain scenic spot to forecast the congestion of the play route, the scenic spot heat map display, and the real-time passenger flow of scenic spots.

In terms of smart marketing, Huangshan Scenic Area has developed Alipay activities, launched the "first visit, pay later" credit tour, and created the first "first visit, pay later" scenic spot in the country. The development of "Huangshan Tourism official platform", actively play the leading role of "Dahuangshan" regional cultural tourism, has become the total flow of Huangshan City tourism, registered users have more than 7.2 million people, online transactions have exceeded 2.6 billion yuan. Huangshan Scenic Area in line with the Internet digital transformation, explore the launch of digital collections, issued the world's first digital cultural and creative memorial tickets, and then launched its own IP "welcome the world, welcome pine", smelly mandarin fish and other digital collections.

In terms of smart infrastructure, Huangshan Scenic area has already realized the use of scanning code into the park and face into the park recognition system, the main nodes in the scenic area achieve full coverage of free WIFI, full coverage of digital broadcast control system, and full coverage of smart scenic spot broadcast, so that passenger flow diversion and dredding information can be released in time and provide various emergency services in a timely manner. At the same time, the scenic spot also installs a visual large screen at the tourist gathering place such as the ticket gate of the scenic spot, so that tourists can timely understand and grasp various information such as tourist flow, congestion degree, real-time weather and so on through the large screen.

In addition, Huangshan Scenic area continues to strengthen the exploration of new scientific and technological products, explore the application of drone transportation, forest fire prevention, emergency rescue, and emergency disaster prevention in mountain scenic areas, and plan to build 5G+VR application scenarios. Strengthen standardization construction, lead or participate in the formulation of 2 international standards, 4 national standards, 2 industry standards and 14 regional standards, such as "Smart Scenic Area Evaluation Standards", "Scenic Area Public service Marketing Platform", "Scenic Area Public Service self-service tour Information Service", and export Huangshan experience.

It can be seen that the construction of Huangshan scenic area wisdom started early, and the construction effect is great, and it is the vanguard of the development of wisdom tourism in China's traditional mountain scenic area. As a mountain scenic spot, the development of information technology and the construction of wisdom provide more possibilities for the personalized and

information needs of tourists. Therefore, Huangshan Scenic area is selected as a case of smart tourism evaluation and analysis to provide optimization strategies for the smart construction of Huangshan Scenic area, promote better progress and development, and provide reference experience for the smart construction of other mountain scenic areas in China to open a win-win situation of smart tourism construction.

2.2 Index design

By combing the literature and combining the evaluation indicators of Smart Scenic Spots and the Guide to the smart Construction of Tourist Scenic Spots, the evaluation system of the development level of smart tourism in Huangshan Scenic Spot was initially established. First, according to the stage characteristics of tourism experience, the tourist experience process is divided into pre-experience stage, on-site experience stage and post-experience stage. Combined with the characteristics of different scenic spots, the smart marketing means, smart management guarantee, smart infrastructure construction, smart services, smart products and other modules are focused on the scenic spots. Following the comprehensive, systematic, targeted, scientific and operational principles established by the indicators, from the perspective of tourists and combined with the actual situation of the intelligent construction of Huangshan Scenic area, 34 specific indicators of tourist experience are sorted out and summarized. The pre-experience stage includes Huangshan Scenic spot official website, "Huangshan Tourism Official platform" wechat mini program, Alipay mini program, scenic spot self-media scenic spot publicity, scenic spot cooperation media scenic spot publicity, scenic spot digital tickets, scenic spot digital collections, product recommendation and customized services, real-time ticket reservation system, scenic spot passenger flow monitoring, scenic spot telephone consultation, scenic spot online customer service consultation, tour guide Reservation service; The on-site experience stage includes wireless broadband network, mobile communication signals, large visual screen in the scenic spot, ticketing system in the scenic spot, intelligent parking lot in the scenic spot, electronic navigation explanation, intelligent hotel in the scenic spot, catering service in the scenic spot, supervision and protection of scenic spot resources, personal safety supervision of tourists, real-time online monitoring of natural disasters, real-time weather forecast reminder, sunrise in Huangshan, probability of sea of clouds, and scenic spot Traffic guidelines; The post-experience stage includes services such as tourist help, alarm and emergency rescue, online tourism complaint handling, tourist satisfaction survey, online sharing platform and interactive experience, information security guarantee, repeated purchase of e-commerce products in scenic spots, and recommendation sharing.

2.3 Data sources and research methods

2.3.1 Data source

The questionnaire was officially issued from September 2 to September 7, 2023, at the South Gate and North Gate parking lot area of Huangshan Scenic Area, and the main research time was 13:00-19: During 2000, 383 questionnaires were issued. After screening the recovered questionnaires, 350 questionnaires were effectively recovered after excluding invalid questionnaires that did not meet the requirements, with an effective rate of 91.4%.

2.3.2 Reliability and validity analysis and factor analysis

In order to ensure the rationality and reliability of the data, SPSS 29.0 was used for reliability analysis of the questionnaire, Klonbach coefficient =0.923 > 0.9, indicating that the questionnaire

has strong internal consistency, indicating that the questionnaire design has high reliability and rationality. After the validity analysis, the KMO value of the questionnaire was 0.883 > 0.8, indicating that the validity test result of the questionnaire was very good. The significance of Bartlett sphericity test P=0 < 0.001, the correlation between variables is significant, suitable for further factor analysis.

When data need to be condensed in data analysis, more general dimensions can be used to reflect most of the information of the original questionnaire data. When the number of variables involved is large, the dimensionality of variables can be reduced in this way to make the result more concise. The following uses exploratory factor analysis to process the data of the questionnaire indicators, extracts 10 public factors, and names the 10 public factors based on the content classification of the evaluation system for the development level of smart tourism in scenic spots based on tourist experience, as shown in Table 1.

Table 1. Exploratory factor analysis of load coefficients after rotation

Common factor	Measurement index	The factor after
Intelligent marketing platform	Huangshan tourism official platform	0.793
	Alipay mini program	0.778
	Huangshan Scenic Area official website	0.749
	Scenic spot from the media scenic spot	0.735
	Cooperate with media to promote	0.714
Smart infrastructure	Mobile communication signal	0.836
	Scenic ticketing system	0.734
	Visual scenic area large screen	0.730
	Wireless broadband network	0.728
	Smart parking in the scenic area	0.703
Intelligent security management	Real-time online monitoring of natural	0.796
	Supervision and protection of scenic	0.790
	Supervision of personal safety of	0.737
	Visitor help, alarm and emergency	0.696
Smart feature products	Scenic area digital collection	0.855
	Scenic spot digital ticket	0.836
	Product recommendations and	0.725
Intelligent after-sales service	Share platforms and interactive	0.751
	Information security guarantee	0.719
	Tourist satisfaction survey	0.645
	Online travel complaint handling	0.620
Wisdom for convenience tips	Huangshan sunrise, cloud sea	0.877
	Scenic traffic guide	0.861
	Live weather forecast alerts	0.858
Intelligent product equipment	Scenic hotel facilities	0.806
	Scenic dining facilities	0.784
	Electronic navigation explanation	0.731

Intelligent consulting services	Scenic spot online customer service	0.780
	Scenic spot telephone consultation	0.758
	Guide reservation service	0.699
Intelligent after-sales marketing	Recommendation sharing	0.961
	Repeat purchase of e-commerce	0.959
Intelligent appointment	Ticket real-time reservation system	0.870
	Tourist flow monitoring in scenic spots	0.846

3 Analysis of research results and problems

3.1 Sample statistical characteristics analysis

The basic personal information of tourists includes gender, age, education level, occupation, and origin information. The questionnaire information was analyzed and processed by SPSS 29.0 software. The specific data are shown in the following chart.

Table 2. Basic information of tourist survey samples (N=350)

item	category	frequency	percent (%)	item	category	frequency	percent (%)
sex	male	185	52.9	occupation	Managers of enterprises and institutions	72	20.6
	female	165	47.1		Service sales staff	29	8.3
age	15-24 years old	96	27.4		Professional/cultural, educational and technical personnel	46	13.1
	25-34 years old	142	40.6		Civil servant	22	6.3
	35-44 years old	59	16.9		Worker	35	10
	45-64 years old	36	10.3		Retired personnel	27	7.7
	Over 65 years old	17	4.9		Peasant	5	1.4
Receive education degree	Junior high school and below	19	5.4		soldier	2	0.6
	High School (Technical/Vocational/Technical School)	57	16.3		Pupil	85	24.3
	Bachelor's degree, junior college	225	64.3		other	27	7.7

	Postgraduate and above	49	14				

(1) Gender structure: As shown in Table 2, there are 185 male tourists, accounting for 52.9% of the total number of tourists, and 165 female tourists, accounting for 47.1% of the total number of tourists. Male tourists outnumber female tourists by 5.8%. There is little difference between the two. As a mountain scenic area, Huangshan mountain is steep, and tourists with certain physical strength and endurance are required to complete the tour plan. Male tourists have advantages in this aspect, so there are more male tourists among the research objects.

(2) Age structure: As shown in Table 2, the largest number of tourists in this survey is 25-34 years old, accounting for 40.6%, followed by 15-24 years old, accounting for 27.4%, 35-44 years old and 45-64 years old, accounting for a total of 27.1%, the smallest number of tourists over 65 years old, accounting for only 4.9%. Huangshan scenic area peak forest competition show, rockery forest, there are more than a kilometer of 88 peaks, "Lotus peak", "bright top" and "Tiandu peak" three main peaks, more than 1800 meters above sea level, more suitable for young people to challenge, 25-34 years old tourist group is young, vigorous, strong, with a certain challenge and adventure spirit, Huangshan is more suitable for this age group of tourists to visit, Therefore, the number of people is the largest, accounting for the largest proportion. Secondly, as the survey time was selected in early September, some schools had not yet opened, and students were the main group, most of them traveled with peers and were energetic, so tourists aged 15-24 accounted for a large proportion. Tourists in the 35-44 age group, most of them have stable jobs, sufficient time and certain economic strength, and will choose to visit well-known scenic spots, mostly family Tours, backpackers and mountaineering enthusiasts. 45-64 year old tourist group, but due to age physical limitations, accounted for a relatively small. Finally, due to the low popularity of the theme of smart tourism among elderly tourists, it has been found in the pre-survey that most elderly tourists do not understand such concepts and will not choose to experience them. Most of them are guided by the team and have a low perception of the construction of smart tourism in Huangshan Scenic Area. Therefore, in the selection of research objects, we have tried to avoid investigating elderly tourists, so the proportion of tourists aged 65 is the least.

(3) Education level: As shown in Table 2, among the survey objects, 64.3% are tourists with bachelor's or junior college degrees. Secondly, the proportion of postgraduate education and high school education is similar, respectively, 14% and 16.3%, and the proportion of tourists with junior high school education and below is relatively small, only 5.4%. Among them, the tourists in Huangshan Scenic area generally have a high level of education, which may be due to the fact that Huangshan Scenic Area, as a world cultural and natural heritage, has beautiful natural scenery and rich cultural background, and the tourist attractions have the ability to attract tourists with high cultural level. In addition, the high-culture group has more freedom in terms of travel time and travel expenses than the low-culture group. Therefore, the tourists who choose Huangshan Scenic area to travel have a large proportion of college education or above.

(4) Occupation distribution: As shown in Table 2, among the tourist groups surveyed in this survey, students take up the largest proportion, accounting for 24.3%, while enterprise managers take up the second place, accounting for 20.6%. These two types of survey objects are the main tourist groups. Followed by professional/cultural, educational, scientific and technological personnel, workers, accounting for 13.1% and 10%, respectively, service sales personnel, civil servants, retirees and other (survey objects did not indicate their own occupation) accounted for little difference, 8.3%, 6.3%, 7.7%, 7.7%, the least proportion of farmers and soldiers, a total of 2%. Compared with other professional tourist groups, students and business managers pay more

attention to the need of self-realization and determine the motivation of travel from the personal spiritual level, while the latter have sufficient leisure time and disposable income to meet the needs of travel from the material level. Other tourist groups, which account for a relatively small number, may choose to travel to enjoy the corresponding occupational welfare benefits and preferential policies of scenic spots.

3.2 Tourist experience degree analysis based on fuzzy comprehensive evaluation method

This paper evaluates the level of smart tourism construction in Huangshan Scenic area based on tourist experience, including multiple evaluation factor sets such as smart marketing platform, smart infrastructure, smart safety management, smart feature products, smart after-sales service, smart convenience tips, smart products and equipment, smart consulting services, smart after-sales marketing, and smart reservation management. In addition, there is corresponding fuzziness under the influence of various personal factors such as tourist evaluation, so the fuzzy comprehensive evaluation method is selected, and the final comprehensive evaluation results are shown in Table 3: The survey questionnaire adopts Likert five-level scale, requiring the survey subjects to evaluate each index with 1-5 levels. Generally, 1-3 belongs to the negative experience emotions of tourists, and 3-5 belongs to the positive experience emotions of tourists.

Table 3. Comprehensive evaluation results of the development level of smart tourism in Huangshan Scenic Area based on tourist experience

Target layer	Target	Project	Item	Factor layer	Factor
Evaluation of the development level of smart tourism in Huangshan Scenic Area based on tourist experience	3.39	Intelligent marketing platform	3.41	Huangshan tourism official	3.32
				Alipay mini program	3.32
				Huangshan Scenic Area	3.14
				Scenic spot from the media	3.68
				Cooperate with media to	3.60
		Smart infrastructure	3.55	Mobile communication signal	3.84
				Scenic ticketing system	3.72
				Visual scenic area large	3.33
				Wireless broadband network	3.41
				Smart parking in the scenic	3.51
		Intelligent security manag	3.67	Real-time online monitoring	3.56
				Supervision and protection of	3.73
				Supervision of personal	3.80
				Visitor help, alarm and	3.62
		Smart feature product s	3.00	Scenic area digital collection	2.90
				Scenic spot digital ticket	2.93
				Product recommendations	3.13
		Intelligent after-sales service	3.43	Share platforms and	3.58
				Information security	3.62
				Tourist satisfaction survey	3.40
				Online travel complaint	3.17

		Wisdom for convenience	3.48	Huangshan sunrise, cloud sea	3.43
				Scenic traffic guide	3.55
				Live weather forecast alerts	3.49
		Intelligent product equipment	3.17	Scenic hotel facilities	3.20
				Scenic dining facilities	3.28
				Electronic navigation	3.03
		Intelligent consulting	3.17	Scenic spot online customer	3.10
				Scenic spot telephone	3.11
				Guide reservation service	3.31
		Intelligent	3.35	Recommendation sharing	3.41
				Repeat purchase of	3.29
		Intelligent	3.41	Ticket real-time reservation	3.45
				Tourist flow monitoring in	3.37

First of all, according to Table 3, the comprehensive evaluation value of smart tourism development level of Huangshan Scenic area based on tourist experience is 3.39. The evaluation value of smart tourism in Huangshan scenic area is generally lower than 4, and is in 3-4. It can be seen that tourists have a general experience of the current development level of smart tourism in Huangshan Scenic area, indicating that there is a large space for improvement and development of smart tourism construction in Huangshan Scenic area, and it is necessary to further strengthen the construction of smart tourism level.

Second, The ranking of Huangshan Scenic area's intelligent tourism development level project level based on tourist experience is intelligent safety management 3.67> intelligent infrastructure 3.55> intelligent convenience tips 3.48> intelligent after-sales service 3.43> Intelligent marketing platform 3.41= intelligent reservation management 3.41> intelligent after-sales marketing 3.35> Intelligent products 3.17= Intelligent consulting service 3.17> Intelligent feature products 3.00. The score of tourist experience of different projects is also different, among which the experience score of intelligent products including equipment and feature products is lower; Intelligent service including consultation and after-sales service tourists report less experience; The intelligent marketing method is backward, and the marketing effect of scenic spots is general; There is a slight gap in the construction of smart infrastructure compared with other smart scenic spots; Although the smart management technology has been recognized by tourists, it needs to be further strengthened.

4 Conclusion

The construction of smart tourism in scenic spots is difficult to promote in mountain scenic spots. Huangshan Scenic spot covers a large area, has a high altitude, and has rich natural and cultural tourism resources but is relatively dispersed. Although the objects of this survey are in the youth stage, the concept of smart tourism is academic and the popularity is low. During the tour, they mainly climb mountains to enjoy the scenery and stay for a short time. Most tourists do not pay attention to the smart construction of scenic spots. It is also possible that due to limited publicity and promotion, most tourists do not understand the use of smart tourism-related infrastructure and the application of related platforms, and do not enjoy the smart travel experience.

To sum up, this paper puts forward the following suggestions: First, innovate the smart marketing model, accurately locate the needs of tourists, build a smart marketing platform, increase marketing publicity, and regularly evaluate the marketing effect; Second, attach importance to the

research and development of smart products, create scenic spot characteristic smart products, and promote the smart transformation of scenic spot products; Third, develop new technologies of smart management, optimize the monitoring and management technology of scenic spots, develop dispersed passenger flow technology, solve the congestion of scenic spots, and promote the transformation and upgrading of scenic spots; Fourth, upgrade the smart service channels, provide differentiated tourist services, set up personalized reminder and guidance services for scenic spots, and optimize the smart tourism experience; Fifth, build smart infrastructure, upgrade smart infrastructure, set up special cultural pavilions in smart scenic spots, and improve the construction level of scenic spots.

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