

Article

An Analysis of Public Service Satisfaction of Tourists at Scenic Spots: The Case of Xiamen City

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Abstract: The outbreak of the COVID-19 epidemic has greatly hindered the development of the tourism industry. It is urgent for the city to improve the quality of public service in scenic spots, so as to attract more tourists and achieve sustainable development. With a literature review and reference to some guidance, the evaluation indicator system of public service satisfaction of scenic spots was constructed based on the analytic hierarchy process. Then, we distributed two questionnaires to complete the study. The first is the expert questionnaire for the evaluation indicator system. We used YAAHP software to process the questionnaire data and calculated the weight of each indicator, which provided a basis for the following analysis. The second is the questionnaire distributed to tourists of Xiamen. Then, we used the fuzzy comprehensive evaluation method to analyze the satisfaction of public services in scenic spots. The outcomes show that tourists are overall satisfied with the public services of scenic spots in Xiamen. However, there are still some problems, such as lagging information service, inadequate security, and supervision in the scenic spot. Therefore, the city and scenic spots should improve the level of smart tourism service, strengthen the construction of hardware and software facilities, and focus on the protection of tourists' rights and interests.

Keywords: tourism; scenic spots; public service; satisfaction



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1. Introduction

Local tourism is a new model stating that cities take tourism as the leading industry and optimize tourism public services to meet the personalized needs of tourists [1]. Xiamen is a world-renowned tourism city, and it takes local tourism as one of the guidelines and strategies for its future development. In 2019, Xiamen received more than 100 million domestic and foreign tourists, a 12.5% increase since 2018. The total tourism revenue reached RMB 165.59 billion in 2019, an 18.1% increase over the previous year [2,3]. It seems that tourism has been one of the major sources of revenue for Xiamen. Meanwhile, tourists have changed from sightseeing to a high-quality tourism experience in recent years. Although Xiamen has been rated as a “National Famous Tourism City”, there are still some problems, such as insufficient public facilities at scenic spots and a lag of smart tourism, which makes it difficult to meet tourists' diverse needs [4].

The outbreak of the COVID-19 epidemic has greatly hindered the development of the tourism industry. In 2021, Xiamen only received 89.40 million tourists, and the total tourism revenue was RMB 130.01 billion. Both tourists and tourism revenue have regressed compared to 2019. It is urgent for the city to improve the quality of public service at scenic spots in a hard time, so as to attract more tourists and achieve sustainable development.

After the literature review, we conducted a telephone interview with the directors of some scenic spots in Xiamen and consulted experts in the tourism field in order to understand the exact situation. Further, we referred to the Guidance of the State Council on Promoting Regional Tourism Development and the national 5A scenic spot evaluation standard of China. Thus, the assessment of the public service of scenic spots can be considered a problem of multiple-criteria decision analysis (MCDA). It has been confirmed

that the analytic hierarchy process (AHP) is appropriate to assist decision-making problems characterized by a number of interrelated factors. We used it to build a public service satisfaction evaluation system for scenic spots.

In addition, the evaluation of tourists' satisfaction may involve a large number of fuzzy concepts and various factors. Satisfaction is the subjective perception of tourists, so it is difficult to take quantitative calculations. Therefore, the fuzzy comprehensive evaluation method is a good choice to identify tourist satisfaction with public service.

Finally, we discuss how to improve public service satisfaction of tourists by importance–performance analysis (IPA). IPA has been widely used to explore the relationship between importance, performance, and overall satisfaction in tourism destinations. It is simple and allows for easy interpretation.

In summary, exploring the public service satisfaction of tourists at scenic spots can better reveal the demand preference of tourists, and then the city and scenic spots may try to improve public service following the research results and improve the satisfaction of tourists, finally realizing the sustainable development of local tourism.

This paper aimed to:

1. Build an evaluation system of public service satisfaction of scenic spots using the AHP method and calculate the weight of each indicator with expert questionnaire data.
2. Conduct an analysis of tourist satisfaction with public services of scenic spots. According to the evaluation indicator system, the fuzzy comprehensive evaluation method is used to analyze tourist satisfaction with tourist questionnaire data.
3. Considering the tourist satisfaction value and the weight of each indicator as importance, it tries to conduct an IPA and discuss the existing problems at scenic spots of Xiamen, finally putting forward some suggestions for improving public service satisfaction of tourists.

The remainder of this paper is organized as follows. Section 2 contains a brief literature review of public service at scenic spots. Section 3 elaborates on the evaluation system of scenic spots based on previous studies, as well as considers experts' advice and references some important guidance. Section 4 is the methodology of the AHP, introducing the AHP method used in this study and determining the weight of evaluation indicators. Section 5 does a fuzzy comprehensive evaluation of public service satisfaction of tourists and an importance–satisfaction analysis according to the results. Finally, Section 6 presents the conclusions of the paper.

2. Literature Review

2.1. The Definition and Classification of Public Service at Scenic Spots

Public services at scenic spots are the supporting facilities and services provided to tourists at scenic spots [1]. It comprises five elements: tourism information service, tourism safety guarantee, tourism traffic service, tourism convenience service, and tourism supervision and management.

2.2. Tourism Information Service

Tourism information service means the service agency delivers detailed information about scenic spots to tourists [5]. For example, the tourism service agency discloses information about scenic spots to help tourists develop travel planning. Moreover, the tourism consulting center provides consulting services to tourists, using cloud computing, big data, and other new technologies to improve the efficiency of information services [6]. Professional interpreters, multi-language electronic interpreters, and other facilities can effectively improve the sense of pleasure of tourists at scenic spots [7]. However, the information disclosure channels about scenic spots are limited, and the construction of smart scenic spots also needs to be strengthened.

2.3. Tourism Safety Guarantee

The tourism safety guarantee service provides tourists with a guarantee about their personal, property, psychology, and other safety at scenic spots [8,9]. Medical and health assistance can reflect the safety guarantee and rescue efficiency of scenic spots [10]. Safety facilities, safety notices, and forecasts play an important role in tourist safety and in shaping the safe image of scenic spots [11]. The importance of travel insurance is realized as it provides tourist accident insurance and salvage insurance at scenic spots [12]. However, many scenic spots in China have weak emergency rescue capacity, imperfect safety facilities, and an untimely release of safety information [8]. Therefore, strengthening tourism security guarantees is one of the key elements to developing scenic spots.

2.4. Tourism Traffic Service

Tourism traffic service is a spatial connection service tool for tourists to shuttle between scenic spots [13]. Scenic spots should have travel lines or flexible transfers [7]. Traffic guidance signs help tourists improve travel efficiency [14]. The layout of traffic hub facilities, such as visitor centers and parking lots, should be reasonable [12]. However, with the increase in self-driving travel, traffic jams and accidents are prone to occur during holidays. Thus, scenic spots should pay attention to the improvement of the traffic service. They must release timely and correct traffic information, equip with clear traffic signs, and provide traffic guiding services.

2.5. Tourism Convenience Service

Tourism convenience services provide convenient facilities and services for tourists, which include clean and sufficient toilets at scenic spots [10]. Moreover, scenic spots should improve their communication facilities to provide better Internet and communication services to tourists [14]. Facilities such as tables, chairs, self-service vending machines, and smoking zones should be provided at scenic spots [11]. At present, many scenic spots still lack tourism service facilities for special groups, such as imperfect blind road construction and braille instructions [15]. Waste management is critical for scenic spots as it relates to the travel experience. Thus, scenic spots must pay attention to sanitation facility construction [12]. In summary, tourism convenience services affect tourists' travel experience and satisfaction.

2.6. Tourism Supervision and Management

Tourism supervision services deal with complaints, the supervision of service quality, and the management of markets around scenic spots [16]. Presently, there are some problems, such as vicious competition and cheating tourists. These problems reduce tourists' satisfaction with scenic spots, and they destroy the tourism image [17]. Thus, the tourism management department should strengthen staff consciousness and improve service efficiency. In a word, it is imperative to complete the public service system of tourist destinations, improve tourist satisfaction, and promote local tourism.

3. Evaluation System of Scenic Spots

We use keywords including scenic spots, public service of scenic spots, and tourist satisfaction to conduct a literature review. Most studies about public service satisfaction focused on tourism information, tourism traffic, tourism safety, and tourism convenience. Five dimensions and twenty indicators of the public service satisfaction evaluation system of scenic spots are finally determined following the literature, as well as considering experts' advice and a reference to the Guidance of the State Council on Promoting Regional Tourism Development and the national 5A scenic spot evaluation standard of China, as shown in Table 1.

Table 1. The public service satisfaction evaluation indicator system at scenic spots.

Dimension	Indicator	Indicator Definition	References
Tourism Information Service	Information Disclosure	Detailed information released on major tourism e-commerce platforms, WeChat official accounts, TV, and other media.	[18,19]
	Tourism Information Center	Perfect services such as buying tickets, consulting information, and depositing luggage.	[20,21]
	Self-service of Information Inquiry	The self-service query of each scenic spot facility and service is convenient.	[15,22]
	Interpretation System	There are professional interpreters, panoramic interpreters, and multi-language graphic interpreters in the scenic spot.	[20,23]
Tourism Safety Guarantee	Safety Forecast	Services are timely and accurate about disaster weather, traffic conditions, flight delays and cancellations, and other safety notifications.	[24,25]
	Emergency Medical and Health Assistance	The scenic spot has perfect emergency medical and health rescue facilities and medical teams.	[15,21]
	Tourism Safety Facilities and Signatures	There are sufficient fire extinguishers, guardrails, safety helmets, life jackets, and other safety facilities. Safety reminders are eye-catching and complete.	[19,22]
	Travel Insurance Services	It is convenient to buy travel accident insurance and travel rescue insurance.	[15,22]
Tourism Traffic Service	Traffic Guidance of Scenic Spot	The route sign, guide board, and other facilities are perfect.	[20,25]
	Transportation Hub Facilities	The distribution center, tourist center, parking lot and other traffic hubs in the scenic spots are reasonably planned and well-constructed.	[18,26]
	Transfer Between Scenic Spots	The scenic spots have a direct travel line and flexible means of transfer.	[21,22]
Tourism Convenience Service	Toilets	The toilets are sufficient, the layout is reasonable, and the environment is clean and hygienic.	[15,24]
	Communication Facilities	Wi-Fi and other communication signals are perfect.	[23,25]
	Tourist Rest Area	The number of tables and chairs for rest and vending machines is sufficient.	[11,18]
	Service Facilities for Special Groups	Braille interpretation, blind lanes, wheelchairs, and barrier-free toilets are available.	[15,19]
	Waste Management	Complete sewage discharge facilities, plenty of garbage cans, and timely cleaning.	[23,25]
	Tourism Consumption Service	There are a sufficient number of restaurants and hotels, and the dining and accommodation environment is clean and comfortable; shopping around the scenic spot is convenient.	[23,24]
Tourism Supervision and Management	Tourists' Complaints and Comments	At the scenic spot, whether you complain by phone or at the service center, it can be handled quickly.	[15,21]
	Regulation of Products and Services	The service of the scenic spot is good and the quality of the product is guaranteed.	[12,27]
	Market Order Around Scenic Spots	Prohibit price gouging and other violations.	[11,19]

4. Determining the Weight of Evaluation Indicators Based on AHP

The analytic hierarchy process (AHP) is a procedure designed to combine qualitative and quantitative methods. It was first proposed by Saaty in the 1970s [28]. It is effective in solving complex problems and decision-making [29]. Through the AHP, the evaluation indicator system of the target, dimension, and indicator tiers is constructed (Figure 1), the indicator weight is determined with expert scoring, and the multi-indicator evaluation system can be used to identify the demand preference of tourists. Specifically, the hierarchical analysis model is established by YAAHP 12 software, and according to the scores of

experts, it constructs a judgment matrix. Then, the consistency of the matrix is checked, and finally, the evaluation indicator weight is determined.

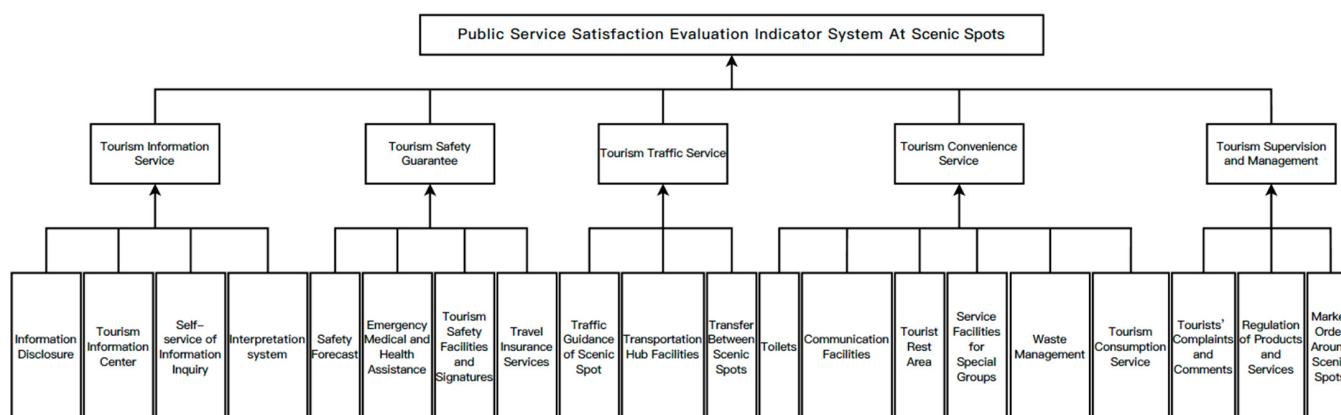


Figure 1. Public service satisfaction evaluation indicator system at scenic spots.

4.1. Constructing a Hierarchy Analysis Model

According to the research framework, a three-tier model is constructed. The first is the target tier, which is the public service satisfaction evaluation indicator system at scenic spots. The second is the dimension tier and the third is the indicator tier [27]. Figure 1 shows the AHP model of public service satisfaction at scenic spots.

4.2. Constructing Judgment Matrix

The expert judged the relative importance of evaluation indicators at different tiers. Moreover, the 1–9 scale was used for making a pair-wise comparison, from “equally important” to “absolutely important”. In this study, a total of fifteen experts responded to the questionnaires, seven of them were local tourism research experts, and eight were executives in the tourism industry. Thirteen valid questionnaires were collected and two questionnaires were excluded because of logical errors.

4.3. Calculating the Weight of Indicators

We imported the questionnaire data of each expert into YAAHP, and the average weight of each expert’s score was taken as the aggregation result. The calculation steps and formula are as follows [30].

Calculate the product T_i of all elements in each row of the judgment matrix.

$$T_i = \prod_{j=1}^n A_{ij} \quad (i = 1, 2, 3, \dots, n)$$

Calculate W_t , the n square root of the product T_i of each row.

$$W_t = \sqrt[n]{T_i} \quad (i = 1, 2, 3, \dots, n)$$

Calculate the sum of W_t of the judgment matrix.

$$W = \sum_{i=1}^n W_t \quad (i = 1, 2, 3, \dots, n)$$

The judgment matrix is normalized to obtain the indicator weight W_i .

$$W_i = \frac{W_t}{W}$$

From the above steps, the weight of each expert’s score was calculated, and its mean value was calculated as the indicator weight after aggregation of the judgment matrix, as shown in Table 2.

Table 2. Indicator weight.

Dimension	Weight	Indicator	Weight
Tourism Information Service	0.1686	Information Disclosure	0.4286
		Tourism Information Center	0.2212
		Self-service of Information Inquiry	0.2389
		Interpretation System	0.1114
Tourism Safety Guarantee	0.4259	Safety Warning and Forecast	0.3198
		Emergency Medical and Health Assistance	0.3017
		Tourism Safety Facilities and Signature	0.3347
		Travel Insurance Services	0.0438
Tourism Traffic Service	0.1830	Traffic Guidance	0.2447
		Transportation Hub Facilities	0.5151
		Transfer Between Scenic Spots	0.2402
Tourism Convenience Service	0.1600	Toilets	0.3509
		Communication Facilities	0.0713
		Tourist Rest Area	0.2035
		Service Facilities for Special Groups	0.0825
		Waste Management	0.1735
		Tourism Consumption Service	0.1183
Tourism Supervision and Management	0.0625	Complaints and Comments Handling	0.3509
		Regulation of Products and Services	0.0713
		Market Order around Scenic Spots	0.2035

4.4. The Consistency Test of the Judgment Matrix

The consistency test of the judgment matrix is presented. When $CR < 0.1$, the consistency test is passed, and the weight is valid. We calculated the maximum eigenvalue $\lambda_{\max} = \frac{1}{n} \sum_{i=1}^n \frac{(AW)_i}{W_i}$ of the judgment matrix A. The consistency indicator of the judgment matrix is $CI = \frac{\lambda_{\max} - n}{n - 1}$ (n is the matrix order). Then, the consistency ratio is $CR = \frac{CI}{RI}$, $RI = 1.12$. Following the formula, the consistency of all expert judgment matrices is less than 0.1, which meets the requirements.

4.5. General Weight Ranking

General weight is the product of the weight of each dimension and the weight of each indicator under this dimension, which represents the importance of the public service satisfaction indicator at scenic spots. Table 3 shows the general weight and ranking.

Table 3. General weight and ranking of indicators.

Indicator	General Weight	Ranking
Tourism safety facilities and signature	0.1426	1
Safety warning and forecast	0.1362	2
Emergency medical and health assistance	0.1285	3
Transportation hub facilities	0.0943	4
Information disclosure	0.0722	5
Toilets	0.0561	6
Traffic guidance	0.0448	7
Transfer between scenic spots	0.0440	8
Self-service of information inquiry	0.0403	9
Tourism information center	0.0373	10
Complaints and comments handling	0.0333	11
Tourist rest area	0.0326	12
Waste management	0.0278	13
Tourism consumption Service	0.0189	14
Interpretation system	0.0188	15
Travel insurance services	0.0186	16
Regulation of products and services	0.0156	17
Market order around scenic spots	0.0137	18
Service facilities for special groups	0.0132	19
Communication facilities	0.0114	20

5. Evaluation of Public Service Satisfaction of Tourists in Xiamen City

5.1. Questionnaire Design

A questionnaire for tourists was designed according to the evaluation system of public service satisfaction at scenic spots. A total of 270 questionnaires were distributed, and 265 were valid. The questionnaire consists of two parts. The first part is the demographic information of tourists. The respondents are mainly young people under the age of 35 at a percentage of 73.59%. A total of 80.76% of them are from Xiamen and other cities in Fujian Province. A total of 69.06% of the tourists choose self-service or self-driving travel, as shown in Table 4.

Table 4. The demographics of respondents (N = 265).

Profiles	Options	Frequency	Percentage
Gender	Male	117	44.15%
	Female	148	55.85%
Age	25 or Younger	133	50.19%
	26~35	62	23.40%
	36~45	40	15.09%
	46~55	20	7.55%
	55 or Older	10	3.77%
Tourist From	Xiamen	88	33.21%
	Other cities in Fujian	126	47.55%
	Other provinces	51	19.25%
Travel Style	With group	18	6.79%
	Self-service	84	31.70%
	Self-driving	99	37.36%
	Others	64	24.15%

The second part consists of 20 items to measure public service satisfaction using the Likert five-point scale consisting of “very dissatisfied”, “dissatisfied”, “average”, “satisfied”, and “very satisfied”. The percentage of tourist satisfaction evaluation of each indicator was shown in Table 5.

Table 5. Tourists’ satisfaction evaluation of public services at scenic spots in Xiamen.

Indicator	Very Dissatisfied	Dissatisfied	Average	Satisfied	Very Satisfied
Information disclosure	0.75%	9.06%	40.38%	30.57%	19.25%
Tourism information center	0.38%	1.51%	35.09%	47.17%	15.85%
Self-service of information inquiry	0.00%	13.96%	43.77%	27.55%	14.72%
Interpretation system	1.89%	21.51%	43.77%	19.25%	13.58%
Safety warning and forecast	0.00%	0.75%	41.89%	40.75%	16.60%
Emergency medical and health assistance	0.75%	3.77%	49.43%	27.55%	18.49%
Tourist safety facilities and signature	0.00%	2.64%	30.94%	47.55%	18.87%
Travel insurance services	4.91%	18.49%	32.45%	27.92%	16.23%
Traffic guidance	0.00%	1.13%	25.28%	57.36%	16.23%
Transportation hub facilities	0.75%	3.40%	36.60%	46.04%	13.21%
Transfer between scenic spots	0.38%	3.77%	31.70%	46.04%	18.11%
Toilets	0.75%	4.15%	18.11%	49.06%	27.92%
Communication facilities	12.08%	27.17%	31.70%	18.49%	10.57%
Tourism rest area	0.00%	3.77%	37.36%	46.04%	12.83%
Service facilities for special groups	2.64%	24.53%	38.49%	22.64%	11.70%
Waste management	0.00%	5.28%	32.08%	47.92%	14.72%
Tourism consumption service	0.75%	2.64%	19.62%	52.83%	24.15%
Complaints and comments handling visitors	1.13%	7.92%	50.57%	29.81%	10.57%
Regulation of products and services	1.89%	14.34%	44.53%	28.68%	10.57%
Market order around scenic spots	0.75%	6.42%	45.66%	35.85%	11.32%

5.2. Tourist Satisfaction Evaluation

As satisfaction is the subjective perception of tourists, it is difficult to take quantitative calculations [31]. This paper adopts the fuzzy comprehensive evaluation method [32] to

calculate the indicators of satisfaction, and draws the four-quadrant diagram of importance–satisfaction for scenic spots in Xiamen, which reveals the elements of public service development and the existing problems. The steps are as follows [33].

1. Determine the evaluation factor set U and satisfaction evaluation grade set V

Indicator tier U is the set of satisfaction evaluation factors, $U = \{\text{tourist information service, tourist safety guarantee, tourist traffic service, tourist convenience service, tourist supervision, and management}\}$; evaluation grade set $V = \{\text{very dissatisfied, dissatisfied, average, satisfied, very satisfied}\}$; and V is assigned as $V = [1-5]$. Thus, the weight of each indicator can be calculated.

$U = \{\text{tourist information service, tourist safety guarantee, tourist traffic service, tourist convenience service, tourist supervision, management}\} = \{0.1686, 0.4259, 0.1830, 0.1600, 0.0625\}$.

$U_1 = \{\text{scenic spot information disclosure, tourist information center, self-service of information inquiry, interpretation system}\} = \{0.4286, 0.2212, 0.2389, 0.1114\}$

$U_2 = \{\text{safety warning and forecast, emergency medical and health assistance, tourist safety facilities and signature, travel insurance services}\} = \{0.3198, 0.3017, 0.3347, 0.0438\}$

$U_3 = \{\text{traffic guidance, transportation hub facilities, transfer between scenic spots}\} = \{0.2447, 0.5151, 0.2402\}$

$U_4 = \{\text{toilets, communication facilities, tourist rest area, service facilities for special groups, waste management, tourism consumption service}\} = \{0.3509, 0.0713, 0.2035, 0.0825, 0.1735, 0.1183\}$

$U_5 = \{\text{complaints and comments handling, regulation of tourism products and services, market order around scenic spots}\} = \{0.5325, 0.2491, 0.2184\}$.

2. Construct a comprehensive fuzzy evaluation matrix

$R_n = \{R_1, R_2, R_3, R_4, R_5\} = \{\text{tourist information service, tourist safety guarantee, tourist traffic service, tourist convenience service, tourist supervision and management}\}$.

$$R_1 = \begin{pmatrix} \text{Information disclosure} \\ \text{Tourism information center} \\ \text{Self-service of information inquiry} \\ \text{Interpretation system} \end{pmatrix} = \begin{bmatrix} 0.0075 & 0.0906 & 0.4038 & 0.3057 & 0.1925 \\ 0.0038 & 0.0151 & 0.3509 & 0.4717 & 0.1585 \\ 0.0000 & 0.1396 & 0.4377 & 0.2755 & 0.1472 \\ 0.0189 & 0.2151 & 0.4377 & 0.1925 & 0.1358 \end{bmatrix}$$

$$R_2 = \begin{pmatrix} \text{Safety warning and forecast} \\ \text{Emergency medical and health assistance} \\ \text{Tourism safety facilities and signature} \\ \text{Travel insurance services} \end{pmatrix} = \begin{bmatrix} 0.0000 & 0.0075 & 0.4189 & 0.4075 & 0.1660 \\ 0.0075 & 0.0377 & 0.4943 & 0.2755 & 0.1849 \\ 0.0000 & 0.0264 & 0.3294 & 0.4755 & 0.1887 \\ 0.0491 & 0.1849 & 0.3245 & 0.2792 & 0.1623 \end{bmatrix}$$

$$R_3 = \begin{pmatrix} \text{Traffic guidance} \\ \text{Transportation hub facilities} \\ \text{Transfer between scenic spots} \end{pmatrix} = \begin{bmatrix} 0.0000 & 0.0113 & 0.2528 & 0.5736 & 0.1623 \\ 0.0075 & 0.0340 & 0.3660 & 0.4604 & 0.1321 \\ 0.0038 & 0.0377 & 0.1700 & 0.4604 & 0.1811 \end{bmatrix}$$

$$R_4 = \begin{pmatrix} \text{Toilets} \\ \text{Communication facilities} \\ \text{Tourist rest area} \\ \text{Service facilities for special groups} \\ \text{Waste management} \\ \text{Tourism consumption service} \end{pmatrix} = \begin{bmatrix} 0.0075 & 0.0415 & 0.1811 & 0.4906 & 0.2792 \\ 0.1208 & 0.2717 & 0.3170 & 0.1849 & 0.1057 \\ 0.0000 & 0.0377 & 0.3736 & 0.4604 & 0.1283 \\ 0.0264 & 0.2453 & 0.3849 & 0.2264 & 0.1170 \\ 0.0000 & 0.0528 & 0.3208 & 0.4792 & 0.1472 \\ 0.0075 & 0.0264 & 0.1962 & 0.5283 & 0.2415 \end{bmatrix}$$

$$R_5 = \begin{pmatrix} \text{Complaints and comments handling} \\ \text{Regulation of tourism products and services} \\ \text{Market order around scenic spots} \end{pmatrix} = \begin{bmatrix} 0.0113 & 0.0792 & 0.5057 & 0.2981 & 0.1057 \\ 0.0189 & 0.1434 & 0.4453 & 0.2868 & 0.1057 \\ 0.0075 & 0.0642 & 0.4566 & 0.3585 & 0.1132 \end{bmatrix}$$

3. Construct a comprehensive fuzzy evaluation subset

To evaluate the satisfaction of the indicator tier, the fuzzy comprehensive evaluation matrix R_n is multiplied by the weight U_n of evaluated factors to determine the comprehensive fuzzy evaluation subset B_n , and the formula is $B_n = R_n \times U_n$ ($n = 1, 2, 3, 4, 5$).

$$B_n = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \\ B_5 \end{pmatrix} = \begin{pmatrix} \text{Tourist information service} \\ \text{Tourist safety guarantee} \\ \text{Tourist traffic service} \\ \text{Tourist convenience service} \\ \text{Tourist supervision and management} \end{pmatrix} = \begin{bmatrix} 0.0062 & 0.0995 & 0.4040 & 0.3226 & 0.1679 \\ 0.0044 & 0.0307 & 0.4009 & 0.3849 & 0.1792 \\ 0.0048 & 0.0293 & 0.3265 & 0.4881 & 0.1513 \\ 0.0143 & 0.0741 & 0.2728 & 0.4433 & 0.1954 \\ 0.0124 & 0.0919 & 0.4799 & 0.3085 & 0.1073 \end{bmatrix}$$

4. Construct a comprehensive fuzzy evaluation set

To evaluate the overall satisfaction of public service at scenic spots in Xiamen, the comprehensive fuzzy evaluation subset B_n is multiplied by the set U of evaluation factors to determine the comprehensive fuzzy evaluation set A , and the formula is $A = B_n \times U$.

$$A = [0.0069 \quad 0.0528 \quad 0.3723 \quad 0.3979 \quad 0.1703]$$

5. Defuzzification

In this process, the commonly used method is the principle of maximum affiliation degree, that is, the evaluation level is determined by the maximum value of the final affiliation degree matrix of $1 \times m$.

(1) Perceived comprehensive evaluation of the target tier

The fourth item of the comprehensive fuzzy evaluation set A , 0.3979, is the largest one, and comparing it with the evaluation set $V = [\text{very dissatisfied, dissatisfied, average, satisfied, very satisfied}]$, we find that tourists' comprehensive evaluation of the public service can be seen as satisfied.

(2) Perceived comprehensive evaluation of the indicator tier

The comprehensive fuzzy evaluation subset B has five lines. The first line is tourism information service, the third item 0.4040 is the largest, that is to say that the tourist satisfaction evaluation of tourism information service is average. The second line is tourism security guarantee, the third item 0.4009 is the largest, that means the tourist satisfaction evaluation of tourism security guarantee is average. The third line is tourism traffic service, the fourth item 0.4881 is the largest, that means tourists are satisfied with tourism traffic service. The fourth line is tourism convenience service, the fourth item has the largest value 0.4433, that means tourists are satisfied with tourism convenience service. The fifth line is tourism supervision and management, the value of the third item 0.4799 is the largest, that means the tourist satisfaction evaluation of tourism supervision and management is average.

(3) Tourist satisfaction with the indicators

Multiply the percentage of tourist satisfaction evaluation of each indicator (see Table 5) with the evaluation set V to calculate the satisfaction value of all indicators, and obtain their ranking as shown in Table 6.

6. Importance–satisfaction analysis

The importance–performance analysis (IPA) is one of the most ubiquitous methodological tools in the tourism literature. The IPA allows researchers to visually identify gaps between stakeholders' perceptions of the importance of a specific attribute and the actual performance of that attribute. Tourist satisfaction is seen as the performance in this paper. By being able to simultaneously graph the mean importance and performance results for attributes, we are able to see in which of the four quadrants the attribute falls: Quadrant I: "Concentrate Here", Quadrant II: "Keep Up the Good Work", Quadrant III: "Low Priority", and Quadrant IV: "Possible Overkill".

Table 6. Tourist satisfaction and ranking of indicators.

Indicator	Tourist Satisfaction	Ranking
Toilets	3.9922	1
Tourism consumption service	3.9696	2
Traffic guidance	3.8869	3
Tourism safety facilities and signature	3.8265	4
Transfer between scenic spots	3.7773	5
Tourism information center	3.7660	6
Safety warning and forecast	3.7317	7
Waste management	3.7208	8
Tourist rest area	3.6793	9
Transportation hub facilities	3.6756	10
Emergency medical and health assistance	3.5923	11
Information disclosure	3.5854	12
Market order around scenic spots	3.5057	13
Self-service of information inquiry	3.4303	14
Complaints and comments handling	3.4077	15
Travel insurance services	3.3207	16
Regulation of products and services	3.3173	17
Interpretation system	3.2112	18
Service facilities for special groups	3.1623	19
Communication facilities	2.8833	20

Considering the tourist satisfaction value in Table 6 and the weight of each indicator as importance in Table 2, we used SPSS 24 to make a four-quadrant graph. Importance was the horizontal axis and satisfaction was the vertical axis. The mean value of importance was 0.2500 and the mean value of satisfaction was 3.5721 in the quadrant dividing line. The quadrant was used to distinguish the satisfaction level of the indicators. Then, we can find the indicators of public service which need to be improved [34]. The four-quadrant diagram is shown in Figure 2. The numbers in the diagram are indicators as following.

1 stands for Information Disclosure (0.4286, 3.5854), 2 stands for Tourism Information Center (0.2212, 3.7660), 3 stands for Self-service of Information Inquiry (0.2389, 3.4303), 4 stands for Interpretation System (0.1114, 3.2112), 5 stands for Safety Warning and Forecast (0.3198, 3.7317), 6 stands for Emergency Medical and Health Assistance (0.3017, 3.5923), 7 stands for Tourism Safety Facilities and Signature (0.3347, 3.8265), 8 stands for Travel Insurance Services (0.0438, 3.3207), 9 stands for Traffic Guidance (0.2447, 3.8869), 10 stands for Transportation Hub Facilities (0.5151, 3.6756), 11 stands for Transfer Between Scenic Spots (0.2402, 3.7773), 12 stands for Toilets (0.3509, 3.9922), 13 stands for Communication Facilities (0.0713, 2.8833), 14 stands for Tourist Rest Area (0.2035, 3.6793), 15 stands for Service Facilities for Special Groups (0.0825, 3.1623), 16 stands for Waste Management (0.1735, 3.7208), 17 stands for Tourism Consumption Service (0.1183, 3.9696), 18 stands for Complaints and Comments Handling (0.3509, 3.4077), 19 stands for Regulation of Products and Services (0.0713, 3.3173), 20 stands for Market Order Around Scenic Spots (0.2035, 3.5057).

5.3. Tourist Satisfaction Analysis

According to the above analysis, the comprehensive evaluation of the public service of Xiamen scenic spots is satisfied, but some experiences of scenic spots still need to be improved. We will discuss using five aspects from the dimension tier.

5.3.1. Tourism Information Service

The comprehensive evaluation of information service is average for Xiamen tourist scenic spots, indicating that the tourism information service and facilities must be improved. From the perspective of tourism information disclosure at scenic spots, the first quadrant reveals high importance and high satisfaction. At present, Xiamen city uses WeChat public accounts, such as “Xiamen Tourism Distribution Service Center” and “Marine

Garden Poetic Xiamen”, to push the scenic spots and activity arrangements to tourists to facilitate their travel planning. The tourist consultation center at scenic spots is located in the second quadrant, with low importance and high satisfaction. The function of the Xiamen scenic area of the tourism consultation center comprises tourism consultation, complaints and comments handling, early warning information, and other services. The function is relatively perfect to meet the needs of tourists. The convenience degree of scenic spot tourism self-service of information inquiry is located in the third quadrant, with low importance and low satisfaction. At present, approximately 35% of scenic spots in Xiamen are underdeveloped in terms of intelligent facilities, such as Jimei Aoyuan, Beichen Mountain, Lingling International Circus City, and other scenic spots, which have imperfect tourist self-service of information query facilities [4]. The scenic spot tourism interpretation system is located in the third quadrant, with low importance and low satisfaction. At present, most scenic spots in Xiamen lack service facilities, such as panoramic maps and multi-language interpretation. Although equipped with tourism interpreters, tourists can only enjoy free interpretation services during some regular periods, and they have to pay for interpretation services at other times.

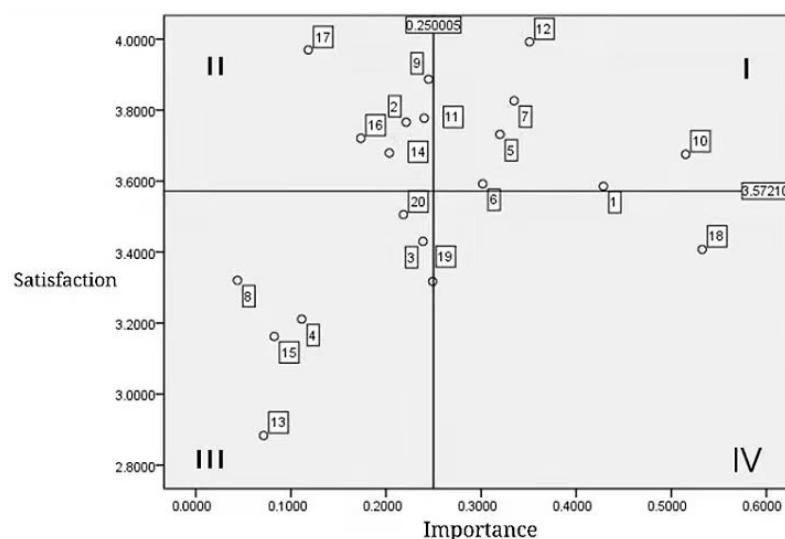


Figure 2. Importance–satisfaction analysis.

5.3.2. Tourist Safety Guarantee

From the comprehensive evaluation, tourists’ perception of tourism security is average, indicating that the security systems should be improved. The scenic spot safety forecast is located in the first quadrant, with high importance and high satisfaction. In recent years, Xiamen city has accelerated the safety management system improvement. Xiamen city distributes safety information to tourists through the tourism consulting center, and sends short messages of safety information to remind tourists [35]. The emergency medical and health assistance at scenic spots is located in the first quadrant, with high importance and high satisfaction. Each major scenic spot has set up a clinic to provide medical assistance for tourists in case of sudden disease or injury. From the perspective of tourist safety facilities and signatures, scenic spots are located in the first quadrant, with high importance and high satisfaction. The tourist safety facilities and signatures of most scenic spots are relatively perfect, which provide safety protection and reminders for tourists. Travel insurance services at scenic spots are in the third quadrant, with low importance and low satisfaction. This suggests that insurance services at scenic spots can improve tourist satisfaction, but about 20% of scenic spots do not provide travel insurance services, such as Beichen Mountain. However, other scenic spots provide travel insurance regularly, such as the Tianzhu Mountain Forest Park, Huli Mountain Fort, etc. [36].

5.3.3. Tourist Traffic Service

The comprehensive evaluation of the tourist traffic service at Xiamen scenic spots is satisfied, indicating that the tourist traffic service and facilities at Xiamen scenic spots are relatively perfect and can provide high-quality traffic services for tourists. Traffic guidance signatures at scenic spots are located in the second quadrant, with low importance and high satisfaction. At present, traffic guidance signatures in most scenic spots in Xiamen can meet the tourists' needs. The transportation hub facilities are located in the first quadrant, with high importance and high satisfaction. With the rise of self-driving travel, Xiamen city has promoted transportation integration inside and outside the island to facilitate tourists since 2010 [37]. The convenience of transfer between scenic spots is located in the second quadrant, with low importance and high satisfaction. At present, scenic spots of Xiamen are relatively concentrated. For example, the distance between Wanshi Botany Garden and Nanputuo Temple is 3 km. Tourists can choose buses, BRT, Metro, taxis, and other ways to travel freely.

5.3.4. Tourist Convenience Service

The comprehensive evaluation of tourists' perception of tourist convenience service is satisfied. Toilets at scenic spots are located in the first quadrant, with high importance and high satisfaction. According to the data released by the Xiamen Culture and Tourism Bureau, the completion rate of Xiamen tourist toilets reached 134.78% in 2019, which shows remarkable achievements in the toilet revolution [38]. WiFi and other communication facilities provided by the scenic spot are located in the third quadrant, with low importance and low satisfaction. In recent years, Xiamen has tried hard for full coverage of WiFi at scenic spots [39]. However, approximately 26% of scenic spots do not provide free WiFi, especially in Beichen Mountain, Xiang Mountain, Tianzhu Mountain, and other mountain scenic spots. Due to the terrain, mobile phone communication signals are poor in these areas [40]. Tourism rest areas in the scenic spots are located in the second quadrant, with low importance and high satisfaction. At present, most scenic spots in Xiamen have perfect tourist rest areas and provide light meals. Service facilities for special groups at the scenic spot are located in the third quadrant, with low importance and low satisfaction. In addition to toilets for the disabled, Xiamen city lacks human services, such as blind lanes and wheelchairs for special groups such as the blind and the elderly at scenic spots. Waste management at scenic spots is located in the second quadrant, with low importance and high satisfaction. During the holidays, there are more tourists and they may make a mess. Therefore, volunteers always help to clean scenic spots. Garbage classification has become regular management. Tourism consumption services, such as environmental hygiene, the convenience of hotels, and the convenience of supermarkets around scenic spots are located in the second quadrant, with low importance and high satisfaction. By 30 December 2019, there were a total of 4307 hotels in Xiamen, and tourists are satisfied with the accommodation and the surrounding facilities [41].

5.3.5. Tourist Supervision and Management

The comprehensive evaluation of tourists' perception of tourism supervision and management is average, indicating the supervision of service personnel and enterprises around scenic spots is not in place. Complaints and comments handling are located in the fourth quadrant, with high importance and low satisfaction. At present, the main channels for tourism complaints in Xiamen are hotlines 12301, 12315, and 12345. Regulation of products and services and market order around scenic spots are in the third quadrant, with low importance and low satisfaction. Although Xiamen has established a tourism market supervision mechanism, the tourists may suffer from false high prices or forced consumption in some scenic spots, such as Zengcuo'an and Zhongshan Road, resulting in a poor experience [42].

5.4. Suggestions for Improving the Public Services at Scenic Spots in Xiamen

5.4.1. Improve the Level of SMART tourism Services at Scenic Spots

First, the scenic spot information release channel must be improved. It is crucial to strengthen the construction of the Xiamen Tourism website (www.visitxm.com, accessed on 20 May 2020), the Xiamen local tourism app, and WeChat official accounts such as “Garden on the Sea, Poetic Xiamen”, and the “Xiamen Tourism Distribution Service Center”. Moreover, it is important for promotion to improve the use rate of apps and WeChat official accounts of tourism.

Second, the construction of smart scenic spots is critical. Self-service of tourism information and tourism electronic interpretation services are important to provide tourists with intelligent and efficient information. The construction of communication facilities at scenic spots is vital to achieve full coverage of WiFi and avoid poor network signals and slow network speeds at scenic spots when the tourist flow is large during holidays.

5.4.2. Strengthen the Construction of Hardware and Software Facilities at Scenic Spots

First, the safety service at scenic spots must be improved. The Xiamen local tourism app and WeChat official accounts such as “Garden on the Sea, Poetic Xiamen”, and the “Xiamen Tourism Distribution Service Center” can be used to push efficient safety warnings to tourists. Cooperation with insurance companies is vital to develop optional travel insurance services to ensure tourist security during the trip and improve the travel experience.

Second, facilities for special groups at scenic spots should be improved, such as accessible toilets, blind lanes, and preventing blind lanes from being occupied. The scenic spots should provide wheelchairs for the elderly and strollers for infants, and there should be baby care rooms for breastfeeding.

5.4.3. Focus on the Protection of Tourists’ Rights and Interests

First, the scenic spots should provide more channels, including a hotline and online and mobile terminal platforms to facilitate online acceptance of tourists’ complaints, offline processing, and feedback to tourists. The scenic spots should keep complaint channels unblocked, focus on the training for complaint handling specialists, and improve the professional service quality. Second, for tourism supervision and management, it is necessary to train the staff and improve their professional service. Establishing the performance assessment and evaluation mechanism is essential as well. Tourists can evaluate the staff’s service, which can make the staff improve their service attitude. The supervision department should increase the frequency of random inspections of the merchants to identify if there are some problems with the products and push forward rectification.

6. Conclusions

Improving tourists’ satisfaction at scenic spots has become an inevitable choice for the sustainable development of Xiamen’s tourism industry. With a literature review and references to the national policy documents, this paper establishes the evaluation indicator system of public service satisfaction at scenic spots using an analytic hierarchy process. Then, it conducts research in two steps. The first is distributing the expert questionnaire for the evaluation indicator system and using YAAHP software to calculate the weight of each indicator. The second is distributing the tourist questionnaire for satisfaction evaluation, then using the fuzzy comprehensive evaluation method to analyze the satisfaction of public services at scenic spots, and putting forward some suggestions, according to the results of the IPA.

In general, the public service of Xiamen scenic spots is rated “satisfied” by tourists, but we find some problems from the tourist satisfaction evaluation results at the dimension level as well. Therefore, we propose to improve the public service in three aspects: “improving the level of smart tourism service”, “paying attention to the construction of software and hardware facilities”, and “focus on the protection of tourists’ rights and interests”, which

may promote tourist satisfaction and finally realize high-quality tourism development in Xiamen.

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