



An Empirical Analysis on Scenic Spots' High-Quality Development Under the Background of Smart Tourism – Based on Fuzzy Comprehensive Evaluation Method

Xue Xia, Nenghui Luo, Yanxiu Liu, and Genjin Sun(✉)

Business and Tourism School, Sichuan Agricultural University, Dujiangyan, Sichuan, China
41406@sicau.edu.cn

Abstract. Internet technology has helped transform China's tourism industry from traditional tourism to smart tourism. High-quality development of tourist attractions is the main content of China's smart tourism construction. Based on the concept and connotation of high-quality development of scenic spots, this paper constructs the evaluation index system of high-quality development of scenic spots, and empirically analyzes the high-quality development level of Qingchengshan-Dujiangyan scenic spots by using fuzzy comprehensive evaluation method. According to the empirical results, this paper puts forward targeted suggestions for the scenic spots.

Keywords: Smart Tourism · High-Quality Development of Scenic Spots · Evaluation Index System · Fuzzy Comprehensive Evaluation · Digital Scenic Spot

1 Introduction

China's tourism industry has moved from a stage of rapid development to one of high-quality development. Smart tourism is an important means of high-quality development of tourism. The Internet and mobile Internet technologies provide a guarantee for promoting the development of smart tourism in China. Scenic spots are the core carrier of tourism. The high-quality development of scenic spots is an important part of the high-quality development of China's tourism industry. In the context of smart tourism, the construction of the evaluation index system for the high-quality development of tourist attractions is of great significance to promote the construction of tourist attractions in China and the high-quality development of tourism.

The research on the high-quality development of tourism mainly focuses on two aspects. One is to conduct high-quality development research on tourism industry [1, 10] and other macro levels. The second is to explore the research path of high-quality development in rural tourism [9, 11], ecological tourism [3] and other formats. Researches on the high-quality development of scenic spots are mainly qualitative researches to explore countermeasures and suggestions for the high-quality development of scenic spots [15].

© The Author(s) 2023

D. Qiu et al. (Eds.): ICBEM 2022, AHIS 5, pp. 1297–1305, 2023.

https://doi.org/10.2991/978-94-6463-030-5_129

Few literatures have conducted empirical studies on the high-quality development of scenic spots [4]. In recent years, scholars have proposed that intelligent tourism can enable high-quality development [5, 6], believing that informatization is the key to improving the quality of economic growth, and intelligent tourism is the advanced stage of tourism informatization [6], providing a new idea for the study of high-quality development of tourism. The research on smart scenic spots mainly focuses on the concept and connotation [2] and construction [8] of smart scenic spots, and there is little literature on the evaluation index system of smart scenic spots. And the relevant research lacks the use of mathematical methods for quantitative analysis. Therefore, the relevant quantitative research on smart scenic spots needs to be strengthened.

The existing literature provides good enlightenment for this study. At present, there is a lack of systematic research on the development index system of scenic spots. This paper constructs a high-quality development evaluation index system of scenic spots under the background of smart tourism, and makes an empirical analysis with Qingchengshan-Dujiangyan scenic spots as the research object.

2 Description of Index Construction of Evaluation Index System

The development of China's tourism industry needs to pursue high quality, emphasizing quality first and efficiency first, so as to enhance the competitiveness of tourism development [12]. Therefore, based on the background of smart tourism, this paper defines the connotation of high-quality development of scenic spots from the following four aspects. Firstly, strengthening the intelligent operation of scenic spots is the prerequisite to promote the high-quality development of scenic spots. Secondly, to improve the tourist experience is the fundamental driving force for the high-quality development of scenic spots. Thirdly, improving the cultural connotation of scenic spots is an important task for the high-quality development of scenic spots. Fourthly, strengthening the ecological quality protection of scenic spots is the basic guarantee for the high-quality development of scenic spots. In conclusion, the high-quality development of scenic spots is characterized by digitalization of operation, connotation of theme, ecological environment and entertainment experience. Based on the understanding of the connotation of high-quality development of scenic spots, this paper constructs the index system of high-quality development of scenic spots from four dimensions: digitization, connotation, ecologicalization and experiential.

3 Analysis on the High-Quality Development Level of Qingchengshan - Dujiangyan Scenic Spot

3.1 Research Object - Qingchengshan-Dujiangyan Scenic Spot

Qingchengshan-Dujiangyan scenic spots is located in the northwest of Chengdu. It is a national key scenic spot and a national 5A scenic spot. It is only 50–65 km away from Chengdu, and the traffic is very convenient. The scenic spot is rich in resources. Therefore, choosing it as the evaluation object of this study has great representativeness and reference value.

3.2 Data Sources

In this evaluation, the data of the index comes from the questionnaire of tourists and residents in the scenic spot. The setting of the questionnaire is based on the basic level indicators. The answers are in the form of Likert level 5 scale, with 5–1 points assigned according to “very agree”, “relatively agree”, “general”, “relatively disagree” and “very disagree”. A total of 302 questionnaires were distributed to tourists and residents, and 293 valid questionnaires were finally recovered, with an effective recovery rate of 97.02%. Meanwhile, the cronbach' salpha coefficient of the questionnaire is 0.807, indicating that the survey results are valid.

3.3 Determining the Weight of Evaluation Index

Entropy weight method can make the evaluation results comprehensive and objective, retain the difference information to the greatest extent, distinguish the importance of each index, and avoid the interference of human factors [7]. Therefore, this paper gives weight according to the principle of entropy weight method, and the specific steps are as follows.

3.3.1 Construct the Initial Indicator Matrix

On the premise of designing the evaluation rules in advance, the evaluation data of N evaluation indexes of M tourists are set to form the initial evaluation index data matrix R:

$$R = (r_{ij}), (i = 1, 2, \dots, m; j = 1, 2, \dots, n) \tag{1}$$

Where: R_{ij} is the evaluation data of the i th tourist on item J .

3.3.2 Calculate Index Entropy

Calculate the entropy value of the j -th index in the evaluation system according to the evaluation data:

$$H_j = -K \sum_{i=1}^m p_{ij} \ln p_{ij} \tag{2}$$

Where: $p_{ij} = r_{ij} / \sum_{i=1}^m r_{ij}$, $K = 1 / \ln m$, By choosing K , the entropy is satisfied $0 \leq H_i \leq 1$.

3.3.3 Determine Index Weight

Calculate the j -th index difference coefficient according to the calculated entropy [14].

$$f_j = 1 - H_j \tag{3}$$

Table 1. Weight of high-quality development evaluation index of Qingchengshan—Dujingyan scenic spot.

Criterion Layer	Weight	Index Layer	Weight
Digitization	0.2391	Intelligent parking system integrity	0.1199
		Integrity of smart tour system	0.2529
		Integrity of communication system	0.3066
		Integrity of intelligent navigation system	0.3205
connotation	0.2985	The degree of cultural richness in scenic spots	0.3154
		The degree of cultural connotation of facilities and buildings	0.2661
		Number of types of cultural and creative products	0.3268
		Theme characteristics of scenic spots	0.0918
Ecologicalization	0.1834	Degree of green coverage	0.3310
		Cleanliness of environment	0.3714
		Degree of protection of natural landscape	0.2976
Experiential	0.2790	Interactive participation in entertainment projects	0.1379
		Catering supply	0.2611
		Shopping order in scenic spots	0.4489
		Variety of tourism commodities	0.1522

Therefore, the entropy weight of index J should be:

$$W_j = f_j / \sum_{i=1}^n f_i (j = 1, 2, 3, \dots, m) \quad (4)$$

The index weight of the whole evaluation system can be obtained through sequential calculation:

$$W_n = (w_1, w_2, \dots, w_n) \quad (5)$$

Determine the weight of evaluation indicators, and calculate the weight of each indicator and dimension according to the survey data (Table 1).

It can be seen that at the dimension level, the weight of connotation is the largest, which reflects that connotation is the focus of high-quality development. At the index level, the shopping order in scenic spots has the highest weight, indicating that the shopping order in the scenic spot greatly reflects the high-quality development of the scenic spot.

3.4 Fuzzy Comprehensive Evaluation of High-Quality Development Level of Qingchengshan - Dujiangyan Scenic Spot

The fuzzy comprehensive evaluation method is used to evaluate the current level of high-quality development of the scenic spot. The specific steps are as follows.

- 1) Integrated evaluation factor: Form a set of evaluation factors at the target level: $W = (W_1, W_2, W_3, W_4)$, where $W_1 =$ Digitization, $W_2 =$ Connotation, $W_3 =$ Ecologicalization and $W_4 =$ Experiential. Comprehensive layer evaluation factor set $W_1 = (w_{11}, w_{12}, w_{13}, w_{14})$, Where $w_{11} =$ Intelligent parking system integrity, $w_{12} =$ Integrity of smart tour system, $w_{13} =$ Integrity of communication system, $w_{14} =$ Integrity of intelligent navigation system. Similarly, the comprehensive layer evaluation factor sets W_2, W_3 and W_4 can be obtained.
- 2) Explicit comment set: $N = (N_1, N_2, N_3, N_4, N_5)$. And the comment set is divided into five levels, representing $N =$ (Low quality, Relatively low quality, General quality, Relatively high-quality, High-quality). Referring to the research of Wu Xiaotong [13], this paper divides the grading into five grades: Low quality [0–2 points], Relatively low quality [2–4 points], General quality [4–6 points], Relatively high-quality [6–8 points] and High-quality [8–10 points]. Then, the questionnaire data scores are summarized to obtain the project level index membership, and the project level index membership is multiplied by the scoring vector $F = (9, 7, 5, 3, 1)$ to obtain the comprehensive score of the project level index (Table 2)
- 3) Carry out fuzzy comprehensive evaluation of comprehensive layer: Use the data in Table 2 to establish the digital relationship matrix W_1 .

$$W_1 = \begin{bmatrix} 0.4266 & 0.5427 & 0.0273 & 0.0034 & 0.0000 \\ 0.5597 & 0.4300 & 0.0102 & 0.0000 & 0.0000 \\ 0.3311 & 0.6519 & 0.0171 & 0.0000 & 0.0000 \\ 0.4300 & 0.5495 & 0.0205 & 0.0000 & 0.0000 \end{bmatrix},$$

Then extract the digitization weight vector $Q_1 = (0.1199, 0.2529, 0.3066, 0.3205)$, and the digitization membership degree is $X_1 = Q_1 \times W_1 = (0.4321, 0.5499, 0.0177, 0.0004, 0.0000)$. Then, multiply X_1 by the scoring vector $F = (9, 7, 5, 3, 1)$, and the digital comprehensive score of the high-quality development level of the scenic spot is $C_1 = 7.8272$, which belongs to a relatively high-quality level. Similarly, it can be calculated that the score levels of connotation, ecologicalization and experiential are 7.6536 (Relatively high-quality), 7.3875 (Relatively high-quality) and 6.7416 (Relatively high-quality) respectively.

- 4) Carry out the fuzzy comprehensive evaluation of the target layer: Build the target layer relationship matrix w according to X_1, X_2, X_3 and X_4 , and extract the target layer weight vector $Q = (0.2391, 0.2985, 0.1834, 0.2790)$. The membership degree of the target layer is $L, L = Q \times W = (0.4394, 0.4737, 0.0237, 0.0010, 0.0000)$. Finally, the comprehensive score of high-quality tourism development level of Qingchengshan-Dujiangyan scenic spots is $S = L \times F = 7.392$ points, belonging to a relatively high-quality development level.

Table 2. Membership and comprehensive score of high-quality development projects in Qingchengshan—Dujingyan scenic spot.

Dimension	Index	High-quality	Relatively high-quality	General quality	Relatively low quality	Low quality	Comprehensive score
Digitization	Intelligent parking system integrity	0.4266	0.5427	0.0273	0.0034	0.0000	7.7850
	Integrity of smart tour system	0.5597	0.4300	0.0102	0.0000	0.0000	8.0990
	Integrity of communication system	0.3311	0.6519	0.0171	0.0000	0.0000	7.6280
	Integrity of intelligent navigation system	0.4300	0.5495	0.0205	0.0000	0.0000	7.8191
connotation	The degree of cultural richness in scenic spots	0.3857	0.5768	0.0375	0.0000	0.0000	7.6962
	The degree of cultural connotation of facilities and buildings	0.4471	0.5290	0.0239	0.0000	0.0000	7.8464
	Number of types of cultural and creative products	0.3857	0.5734	0.0410	0.0000	0.0000	7.6894
	Theme characteristics of scenic spots	0.4983	0.4881	0.0068	0.0068	0.0000	7.9556
Ecologicalization	Degree of green coverage	0.5563	0.4334	0.0102	0.0000	0.0000	8.0922
	Cleanliness of environment	0.4846	0.5017	0.0137	0.0000	0.0000	7.9420
	Degree of protection of natural landscape	0.5529	0.4437	0.0034	0.0000	0.0000	8.0990
Experiential	Interactive participation in entertainment projects	0.3345	0.5939	0.0648	0.0068	0.0000	7.5119

(continued)

Table 2. (continued)

Dimension	Index	High-quality	Relatively high-quality	General quality	Relatively low quality	Low quality	Comprehensive score
	Catering supply	0.6041	0.3686	0.0273	0.0000	0.0000	8.1536
	Shopping order in scenic spots	0.3823	0.5495	0.0683	0.0000	0.0000	7.6280
	Variety of tourism commodities	0.2662	0.6587	0.0614	0.0137	0.0000	7.3549

4 Conclusions and Recommendations

4.1 Conclusion

Firstly, this paper discusses the connotation characteristics of high-quality development of scenic spots. On this basis, this paper constructs an evaluation index system of high-quality development of scenic spots, which includes four secondary indicators of digitization, connotation, ecologicalization and experiential and 15 secondary indicators. Finally, the index system is used to evaluate the high-quality development level of Qingchengshan-Dujiangyan scenic spots.

The main conclusions are as follows: (1) this paper constructs a high-quality development evaluation index system of scenic spots including 15 indexes from four aspects: digitization, connotation, ecology and experience. (2) The comprehensive evaluation results of high-quality development of Qingchengshan—Dujingyan scenic spot show that the comprehensive evaluation score is 7.392, which belongs to the relatively high-quality development level; The scores of the four target levels are: digitization (7.8272) > Connotation (7.6536) > Ecologicalization (7.3875) > Experiential (6.7416), and the four items are between high-quality and relatively high-quality; Among the 15 indicator layers, only four indicators, including the integrity of smart tourism system, degree of green coverage, degree of protection of natural landscape and catering supply, are at a high-quality development level.

Overall, the high-quality development of tourism in Qingchengshan—Dujingyan scenic spot is generally good, but most of the index items still do not reach the high-quality level, which still needs to be further improved.

4.2 Proposal

Based on the above research conclusions, this paper puts forward the following three suggestions:

- 1) Improve the intelligent management of scenic spots through multiple ways. Scenic spots can use big data technology to strengthen the digital management of scenic spots, and use artificial intelligence to promote the fine operation of scenic spots.

- 2) Excavate the cultural connotation of scenic spots and further promote the cultural construction of scenic spots. In the context of the construction of smart scenic spots, scenic spots need to be fully based on their own resources, create high-quality cultural activities so as to make the scenic spot develop from distinctive characteristics and differentiation.
- 3) Pay attention to the green development of scenic spots and ensure the quality of ecological environment. For the management of scenic spots, corresponding measures should be taken to build the ecological environment. For tourists and residents in the scenic spot, it is necessary to improve their awareness of environmental protection and strengthen their personal quality.
- 4) Enhance tourism attraction and enhance tourists' tourism entertainment experience. By optimizing tourism products in scenic spots, tourists' sense of gain, happiness and safety will be continuously enhanced. Continuously innovate the content of the scenic spot, ensure the attraction of the scenic spot and contribute to the high-quality development of the scenic spot.

Acknowledgments. This work was supported by Li Bing Research Center, which is the Key Research Base of Sichuan Social Science. The title of the project is Research on High-Quality Development of Qingchengshan-Dujiangyan scenic spots under the Double Circular Pattern, and its grant number is LBYJ2021-006.

This work was supported by Sichuan Tourism Development Research Center, which is the key research base of philosophy and Social Sciences in Sichuan Province and the key research base of Humanities and social sciences of Sichuan Provincial Department of Education. The title of the project is Research on the path of cultivating new driving forces for high-quality tourism development in Sichuan, and its grant number is LY21-03.

This work was also supported by Students' Innovation and Entrepreneurship Training Plan Project form Sichuan Agricultural University. The title of the project is Research on the Impact of Large Sports Events on Dujiangyan Tourism—Take the Double Heritage Marathon as an example, and its grant number is 202110626145.

References

1. Geng, S. T and Zhang, H. X. (2022). High-quality development of China's tourism industry: a strategic mission, driving factor and promotion path. *Macroeconomic Research*, 2022(01): 91–101.
2. Huang, J.F., Lu, L., Zhang, Y. (2015). Research on the connotation system and construction strategy of the smart scenic spot based on the perspective of technology acceptance. *Research on Science and Technology Management*, 2015, 35(11): 164–168+178.
3. Long, Z. and Zeng, S. L. (2020). The evaluation of tourism development quality and high-quality development path from the perspective of ecological civilization. *Ecological Economy*, 36(04): 122–128+162.
4. Ming, Q. Z., Zheng, B. M. (2022). Construction of high-quality tourism development driving system and horizontal measurement in mountain scenic spots. *Journal of Central China Normal University (Natural Science Edition)*, 2022, 56(01): 91–104.
5. Ming, Q.Z., Wei, J. F. (2021). "Blockchain +" enables the high-quality development of smart tourism. *Academic Exploration*, 2021(09): 48–54.

6. Qiao, X. J. (2022). Smart tourism enables the high-quality development of tourism. *Tourism Journal*, 2022, 37(02): 10–12.
7. Sun, Y., Wang, C. M. (2021). Empirical research on the high-quality development of agricultural industry under the new development concept. *Journal of Xi'an University of Finance and Economics*, 34(05): 52–61.
8. Wang, M. L., Liu, H. B. (2021). Problems and Countermeasures in the construction of smart scenic spots—— takes Wuhan East Lake Ecological Scenic Area as an example. *Modern Business*, 2021(05): 46–48.
9. Wang, T., Yao, M., Zhang, Q, Ning, Z. Z. (2021). Problems and countermeasures of rural tourism development under the perspective of high-quality development. *Agricultural Resources of China and Divisions*, 42(08):140–146.
10. Wang, Y. (2020). Thinking on the path of promoting rural tourism development from the perspective of high-quality development. *Rural Economy*, 2020(08):75–82.
11. Wang, Z. F. (2020). The realization path of high-quality development of tourism under the background of “double cycle”. *Enterprise Economy*, 1–7.
12. Wei, M., Li, S. H., Xu, J. (2021). The remeasurement of provincial tourism competitiveness under high-quality development is based on PROMETHEE method. *Commercial Research*, 2020(02): 91–100.
13. Wu, X. T. (2020). Study on the development suitability of mountain tourism products in Yulong Snow Mountain Tourism Area of Yunnan Province. *Yunnan University of Finance and Economics*.
14. You, D. M., Xu, F. (2005). Comparative analysis of regional tourism economy benefit based on entropy method. *Mathematical Statistics and Management*, (03): 82–85.
15. Yue, R. B. (2022). Study on High-quality tourism development in Mount Wutai Scenic Spot. *The Collective Economy of China*, 2022(03): 141–143.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

