Scientific Research Publishing

Open Journal of Social Sciences, 2019, 7, 418-428
http://www.scirp.org/journal/jss
ISSN Online: 2327-5960
ISSN Print: 2327-5952

Study on the Evaluation Index System of Guangdong's All-for-One Tourism Destination Competitiveness Based on Factor and Cluster Analysis

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How to cite this paper: Ye, Y. (2019) Study on the Evaluation Index System of Guangdong's All-for-One Tourism Destination Competitiveness Based on Factor and Cluster Analysis. *Open Journal of Social Sciences*, **7**, 418-428.
https://doi.org/10.4236/jss.2019.73035

Received: February 25, 2019
Accepted: March 23, 2019
Published: March 26, 2019

Abstract

As a new development mode and concept of tourism industry, all-for-one tourism is helpful to provide new ideas and directions for the development of tourism industry in Guangdong Province. Based on the data of 21 cities in Guangdong province, this paper uses factor analysis method to construct the evaluation index system, and gets the ranking of each region in the all-for-one tourism destination competitiveness. According to the scores of all-for-one tourism competitiveness, the competitiveness of 21 cities was classified by cluster analysis. This paper mainly provides suggestions for the development of tourism industry in 21 cities of Guangdong Province from the two systems of tourism competitiveness reality and tourism competitiveness potential.

Keywords

All-for-One Tourism, Tourism Competitiveness, Factor Analysis, Cluster Analysis, Evaluation Index System

1. Introduction

All-for-one tourism was first put forward by Shaoxing City in 2008 as a development strategy, and then all cities have taken all-for-one tourism as a new strategy for tourism development. The Notice on the Establishment of "National All-for-one Tourism Demonstration Zone" in 2015 symbolizes that the concept of all-for-one tourism has entered the stage of national practice. In this context, the necessity of the research on the evaluation index system of the competitive-

ness of Guangdong's all-for-one tourism destinations is mainly embodied in the following two points: Theoretically, by evaluating the all-for-one tourism competitiveness of cities in Guangdong Province, the competitiveness of destinations can be assessed and taken as a reference for the follow-up development. In practical application, most of the existing all-for-one tourism studies adopt qualitative methods, while a small number of quantitative studies mostly adopt subjective weighting method to construct evaluation index system. This paper makes an empirical study on the whole region tourism data of Guangdong Province, which is less studied, and has certain practical significance.

2. Theoretical Background

All-for-one tourism refers to taking tourism as the dominant industry in a certain administrative region, realizing the organic integration of regional resources, the deep integration of industries and the participation of the whole society. A new concept and mode of regional tourism development, is driven by tourism and even guides the all-round development of economy and society.

Li Xinjian [1] (2013) put forward the all-for-one tourism concept system of "Four New Eight Quantities". Four new ideas refer to a brand-new view of resources, products, industries and markets. Eight Quantities are all elements, all trades, all processes, all time, all directions, all society, all sectors and all tourists.

In the construction of the evaluation index system of tourism competitiveness, scholars divide tourism competitiveness into the elements of tourism competitiveness performance, competitiveness potential, support and so on. Yang Yingbao [2] (2002) divided urban tourism competitiveness into tourism competitiveness performance, tourism competitiveness potential and tourism environment support. Su Weizhong [3] (2003) divided urban tourism competitiveness into urban tourism competitiveness performance, urban tourism competitiveness potential and urban tourism competitiveness environment support. Ding Lei [4] (2006) divided urban tourism competitiveness into hard competitiveness and soft competitiveness. In terms of evaluation methods, scholars using factor analysis methods, such as Zang Dexia [5] (2009), used factor analysis method to study the evaluation index system of tourism destination competitiveness. In terms of the literature on All-for-one tourism evaluation, Zhang Jing [6] (2017) made a qualitative analysis of Henan's tourism competitiveness from the perspective of All-for-one tourism and gave relevant countermeasures to improve it. Wang Guangwei [7] (2016) used the AHP method to assign the weight of the index system to evaluate the All-for-one tourism competitiveness of Yueyang based on niche analysis. Yi Huiling [8] used the diamond theory model to calculate the competitiveness index of Yongzhou and Guilin. Jiang Xiaoli [9] and others used the dynamic share-migration model to quantitatively analyze the All-for-one tourism competitiveness of Hainan Province from 2011 to 2016.

This paper has four points of significance: 1) All-for-one tourism is a new concept and model of traditional tourism development, which has been pro-

moted to one of the strategic development directions of provincial and national level; 2) Academic circles mostly study the evaluation index system of traditional tourism industry, and adopt the research framework of SWOT, diamond theory model, etc., lacking the evaluation of tourism competitiveness from the perspective of All-for-one tourism. Price index system research; 3) At this stage, there are few studies on All-for-one tourism in Guangdong Province; 4) Most of the existing studies use subjective weighting method to evaluate, which cannot avoid the correlation between the evaluation indicators, and cannot excavate the relationship behind the evaluation indicators data.

3. Evaluation Index System and Evaluation Method

3.1. Evaluation Index System Framework

The construction of evaluation index system needs to meet three principles: 1) scientificity and objectivity. The selected evaluation indicators should have scientific and objective characteristics, which can accurately reflect the overall tourism situation. 2) Data comparability and operability. Indicators should fully consider comparability. For some non-comparable indicators, they can be converted into comparable indicators in a reasonable way, so that the evaluation process and results can be consistent, so that such indicators can be operable. 3) Reflect the characteristics of All-for-one tourism. The characteristics and connotations of All-for-one tourism should be reflected in the indicators, which should be distinguished from the traditional tourism indicators.

According to the competitiveness theory, the All-for-one tourism competitiveness is divided into competitiveness reality A1 and competitiveness potential A2. In the selection of indicators, 36 indicators in five sub-categories are adopted, which are consistent with the connotation of All-for-one tourism. In the selection of the final evaluation index, we consider not only the commonly used evaluation index in academic circles, but also the new form evaluation of All-for-one tourism, as shown in Table 1.

3.2. Evaluation Method and Process

Scholars generally use analytic hierarchy process, subjective weighting method, structural equation method and other methods. In this paper, factor analysis and cluster analysis are used. Factor analysis belongs to objective weighting method, which can avoid the disadvantage of repeated calculation of index contribution caused by the correlation between data. Cluster analysis can mine the relationship between data structures and classify data. Structural equation method is more concerned with the interaction between systems, which is not suitable for this paper.

- **Evaluation method**

1) Factor analysis

In this paper, factor analysis method is selected to determine the weight by mining the internal structural relationship between data, which not only avoids

Table 1. All-for-one tourism destination Competitiveness Evaluation Index System.

System layer	Feature layer	Indicator layer	Indicator code
Realistic Tourism Competition A1	Performance competitiveness X_1	Foreign tourism income	X_{11}
		Domestic tourism income	X_{12}
		Foreign tourism income growth rate	X_{13}
		Domestic tourism income growth rate	X_{14}
		Number of overnight inbound tourists	X_{15}
		Number of overnight domestic tourists	X_{16}
		Growth rate of overnight visitors to inbound tourists	X_{17}
		The growth rate of overnight visitors to domestic tourists	X_{18}
	Resource competitiveness X_2	Number of scenic spots of level 2A and above	X_{21}
		National and provincial intangible cultural heritage	X_{22}
		Number of national scenic spots	X_{23}
		National Red Tourism Classic Scenic Area	X_{24}
		Number of artistic performance organizations	X_{25}
		Number of Cultural center institutions	X_{26}
		Number of public library institutions	X_{27}
		Number of museum institutions	X_{28}
		Number of archives institutions	X_{29}
	Facility competitiveness X_3	Number of hotels	X_{31}
		Number of travel agencies	X_{32}
		Number of star hotels	X_{33}
		Taxi operating vehicle	X_{34}
		Private car ownership	X_{35}
		Rural harmless toilet penetration rate	X_{36}
		Number of hotels of four stars and above	X_{37}
Potential Tourism competition A2	Service competitiveness X_4	Number of employees in the accommodation and catering industry	X_{41}
		Number of employees in the cultural sports and entertainment industry	X_{42}
		Number of employees of travel agencies	X_{43}
		Number of employees in tourist attractions	X_{44}
	Economic competitiveness X_5	Per capita GDP	X_{51}
		Per capita disposable income of all permanent residents	X_{52}
		Per capita consumption expenditure of all permanent residents	X_{53}
		Total GDP	X_{54}
		The tertiary industry accounts for the proportion of GDP	X_{55}
		GDP growth rate	X_{56}
		Fiscal revenue	X_{57}
		Fiscal revenue growth rate	X_{58}

the artificial bias of subjective evaluation, but also makes up for the defect that it cannot deal with the large correlation between data. The factor analysis model is as follows:

$X^* = \left(X_1^*, X_2^*, \cdots, X_n^*\right)'$, which is the standardized data;

$X^* = \left(F_1, F_2, \cdots, F_m\right)'$, which is the component;

$E = \left(e_1, e_2, \cdots, e_m\right)'$, which is the Special factor, that is, the part that cannot be explained by the component;

$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1m} \\ a_{21} & a_{22} & \cdots & a_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nm} \end{pmatrix}$, which is the component matrix;

Assume that the following properties are met: E(X^*) = 0, VAR(X^*) = 1; E(F) = 0, Cov(F) = 1; E(E) = 0, Cov(E) = Σ; Cov(e_p, F) = 0.

Then:

$$\begin{cases} X_1^* = a_{11}F_1 + a_{12}F_2 + \cdots + a_{1m}F_m + e_1 \\ X_2^* = a_{21}F_1 + a_{22}F_2 + \cdots + a_{2m}F_m + e_2 \\ \vdots \\ X_n^* = a_{n1}F_1 + a_{n2}F_2 + \cdots + a_{nm}F_m + e_n \end{cases}$$

2) Cluster analysis

Cluster analysis is a multivariate statistical analysis method for data classification. It is carried out without prior knowledge and reasonably classified according to their respective characteristics.

- **Evaluation process**

1) Single factor analysis

Firstly, it is judged whether the data is suitable for factor analysis (KMO value > 0.5 and factor correlation coefficient > 0.5). For the components to be more explanatory, the model is rotated using the varimax rotation method. According to the component score coefficient matrix, the component formula can be written. By using the ratio of the variance contribution rate of each indicator after rotation to the total variance contribution ratio of all indicators as the weight, each factor layer score formula can be derived;

2) Calculate the comprehensive score and rank it by taking the ratio of the variance of each factor layer to the total variance as the weight;

3) Clustering analysis of 21 cities' data by using the scores of each factor layer as input variables.

3.3. Data Acquisition and Processing

The data mainly comes from the "Guangdong Province Statistical Yearbook 2018", the Guangdong Provincial Culture and Tourism Office official website, the Guangdong Provincial Cultural Center, the "Guangdong Provincial Health and Family Planning Statistical Yearbook 2018", and the Guangdong Provincial Agricultural and Rural Office official website. In order to eliminate the influence

of data dimension and order of magnitude, the data was standardized using SPSS 22.0 software before analysis. The following statistical methods such as factor analysis and cluster analysis are also performed using the software in conjunction with Excel.

3.4. Evaluation Process

- **Single factor analysis**

1) Performance competitiveness X_1

Factor rotation is performed on the model, and the varimax rotation method of variance is adopted. The regression method is used to estimate the factor score coefficient, and the output factor score result is obtained. Table 2 shows the Component Score Coefficient Matrix.

Based on Table 2, the following factor analysis score function can be written as:

$$F_{11} = 0.271 * X_{11} + 0.274 * X_{12} + 0.054 * X_{13} + 0.072 * X_{14} + 0.259 * X_{15} + 0.292 * X_{16} + 0.083 * X_{17} + 0.040 * X_{18} \quad (1)$$

$$F_{12} = 0.023 * X_{11} + 0.081 * X_{12} + 0.357 * X_{13} + 0.377 * X_{14} + 0.091 * X_{15} + 0.084 * X_{16} + 0.314 * X_{17} + 0.338 * X_{18} \quad (2)$$

Taking the proportion of variance contribution rate of each factor to total variance contribution rate as the sum of weights, the comprehensive score formula is obtained as follows.

$$X_1 = 0.61 * F_{11} + 0.39 * F_{12} \quad (3)$$

The scores and ranking results in the All-for-one tourism performance competitiveness of the cities in Guangdong Province are as follows Table 3.

Due to space limitations, the following single factor analysis is no longer a list statement.

Table 2. Component score coefficient matrix.

Indicators	Component	
	1	2
X_{11}	0.271	0.023
X_{12}	0.274	0.081
X_{13}	0.054	0.357
X_{14}	0.072	0.377
X_{15}	0.259	0.019
X_{16}	0.292	0.084
X_{17}	0.083	0.314
X_{18}	0.040	0.338

Table 3. Scores and ranking of tourism performance competitiveness.

Ranking	City	Total amount competitiveness	Ranking	City	Growth competitiveness	Ranking	City	Performance competitiveness
1	Guangzhou	3.35	1	Maoming	2.35	1	Guangzhou	1.95
2	Shenzhen	2.34	2	Chaozhou	1.93	2	Shenzhen	1.16
3	Huizhou	0.12	3	Jieyang	1.37	3	Maoming	0.80
4	Jiangmen	0.08	4	Shantou	1.15	4	Chaozhou	0.67
5	Zhuhai	(0.04)	5	Zhanjiang	0.71	5	Jieyang	0.51
6	Jieyang	(0.04)	6	Huizhou	0.31	6	Shantou	0.40
7	Dongguan	(0.07)	7	Zhongshan	0.27	7	Zhanjiang	0.23
8	Zhanjiang	(0.07)	8	Meizhou	0.16	8	Huizhou	0.19
9	Shantou	(0.08)	9	Jiangmen	0.06	9	Jiangmen	0.07
10	Chaozhou	(0.13)	10	Guangzhou	(0.25)	10	Meizhou	(0.07)
11	Foshan	(0.14)	11	Yangjiang	(0.31)	11	Zhongshan	(0.16)
12	Maoming	(0.18)	12	Shanwei	(0.34)	12	Zhuhai	(0.29)
13	Meizhou	(0.22)	13	Foshan	(0.61)	13	Foshan	(0.32)
14	Zhongshan	(0.43)	14	Heyuan	(0.62)	14	Dongguan	(0.44)
15	Shaoguan	(0.54)	15	Shaoguan	(0.63)	15	Yangjiang	(0.48)
16	Yangjiang	(0.59)	16	Shenzhen	(0.69)	16	Shaoguan	(0.57)
17	Heyuan	(0.62)	17	Zhuhai	(0.69)	17	Shanwei	(0.59)
18	Qingyuan	(0.65)	18	Qingyuan	(0.74)	18	Heyuan	(0.62)
19	Yunfu	(0.66)	19	Dongguan	(1.02)	19	Qingyuan	(0.68)
20	Zhaoqing	(0.69)	20	Yunfu	(1.10)	20	Yunfu	(0.83)
21	Shanwei	(0.75)	21	Zhaoqing	(1.30)	21	Zhaoqing	(0.93)

2) Resource competitiveness X_2

From the rotated component matrix, $X_{21}, X_{22}, X_{23}, X_{25}$ have higher loads at the first factor, corresponding to the number of scenic spots of 2A and above, the number of national and provincial intangible cultural heritages, the National Red Tourism Classic Scenic Area, and the museum institutions. They can be interpreted as traditional tourism resources. The load of the second factor of X_{24}, X_{26}, X_{27} is relatively high. The corresponding original indicators are the number of cultural institutions, the number of archives institutions, which can be interpreted as community tourism resources. The comprehensive score formula is obtained as

$$X_2 = 0.61 * F_{21} + 0.39 * F_{22} \tag{4}$$

3) Facility competitiveness X_3

From the rotated component matrix, the load of $X_{31}, X_{32}, X_{33}, X_{34}, X_{37}$ is higher in the first factor, corresponding to the number of hotels, the number of travel agencies, the number of star hotels, the number of taxi-operated vehicles, and the number of hotels with four or more stars, which can be interpreted as a

traditional tourist facility. The load of X_{35}, X_{36} is higher in the second factor, and the corresponding original indicators are private car ownership and rural harmless toilet penetration rate, which can be interpreted as community tourism facilities. The comprehensive score formula is obtained as

$$X_3 = 0.68 * F_{31} + 0.32 * F_{32} \tag{5}$$

4) Service competitiveness X_4

From the matrix of the rotated components, the load of X_{41}, X_{42}, X_{43} is higher in the first factor, which corresponds to number of employees in the accommodation and catering industry, number of employees in the cultural sports and entertainment industry, and number of employees of travel agencies, which can be interpreted as the related demand industry service capability. The load of X_{44} in the second factor is higher, and the corresponding original indicator is number of employees in tourist attractions, which can be interpreted as the service ability of the attraction. The comprehensive score formula is obtained as

$$X_4 = 0.73 * F_{41} + 0.27 * F_{42} \tag{6}$$

5) Economic competitiveness X_5

From the matrix of the rotated components, $X_{51}, X_{52}, X_{53}, X_{54}, X_{55}, X_{57}$ have higher loads at the first factor, corresponding to Per capita GDP, Per capita disposable income of all permanent residents, Per capita consumption expenditure of all permanent residents, Total GDP, The tertiary industry accounts for the proportion of GDP and Fiscal revenue which can be explained as the competitiveness of the economy. The load of X_{56}, X_{58} is higher in the second factor, and the corresponding original indicator is GDP growth rate and fiscal revenue growth rate, which can be interpreted as economic growth competitiveness. The comprehensive score formula is obtained as

$$X_5 = 0.77 * F_{51} + 0.23 * F_{52} \tag{7}$$

- **Establishment of evaluation index system**

By calculating the variance of five factors, the proportion of variance to total variance is taken as the weight, and then the proportion of reality and potential of tourism competitiveness is calculated. Table 4 shows the specific ranking.

The scores of the five factor indicators X_1, X_2, X_3, X_4, X_5 are used as input data to cluster the 21 cities in Guangdong Province. The Dendrogram of cluster analysis is shown below:

From the the result of Cluster analysis Figure 1, we can divide the 21 cities in Guangdong Province Table 5.

4. Evaluation Results

Based on the theory of competitiveness and the characteristics of all-for-one tourism, this paper establishes the evaluation index system of Guangdong's all-for-one tourism destination. By using factor analysis method, this paper evaluates the all-for-one tourism competitiveness of 21 cities in Guangdong Province, and draws the following three conclusions.

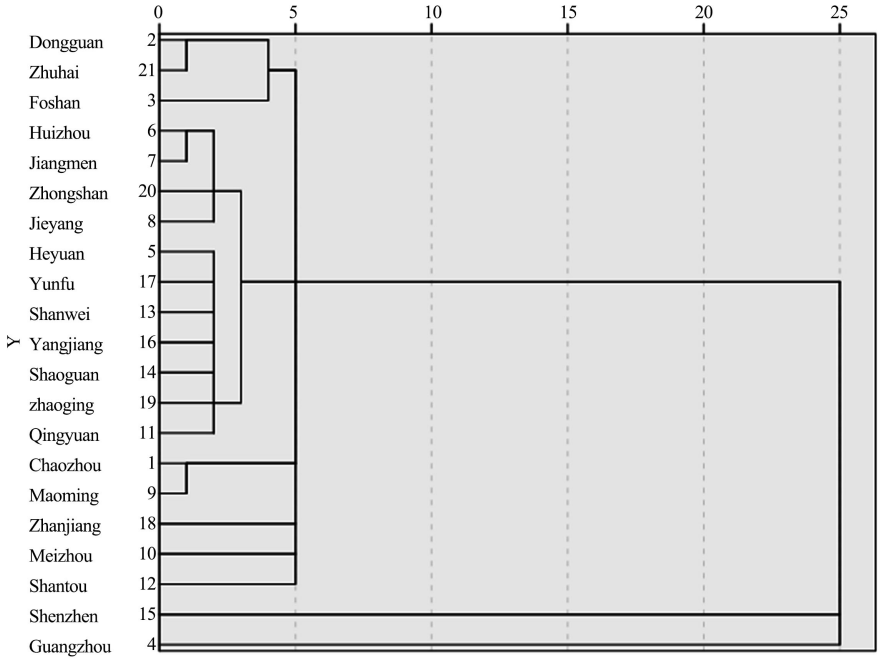

Figure 1. Dendrogram of cluster analysis.

Table 4. Ranking of all-for-one tourism destination competitiveness.

City	X_1	X_2	X_3	X_4	X_5	A1	A2	Composite score
Guangzhou	1	1	1	1	2	1	1	1
Shenzhen	2	17	2	2	1	2	2	2
Maoming	3	12	21	4	3	8	3	3
Foshan	13	2	3	3	10	3	6	4
Chaozhou	4	14	15	5	4	9	4	5
Meizhou	10	3	10	13	5	7	5	6
Zhuhai	12	6	5	7	8	6	8	7
Zhanjiang	7	11	11	15	6	10	7	8
Shantou	6	5	9	10	13	4	12	9
Dongguan	14	4	4	9	12	5	10	10
Yangjiang	15	7	17	19	7	14	9	11
Huizhou	8	19	6	11	17	12	16	12
Jieyang	5	15	16	20	15	11	19	13
Jiangmen	9	16	12	14	16	13	18	14
Zhongshan	11	18	8	6	18	15	13	15
Shanwei	17	10	19	8	19	16	15	16
Yunfu	20	9	20	21	9	19	14	17
Heyuan	18	13	18	18	14	20	17	18
Qingyuan	19	21	13	12	11	21	11	19
Shaoguan	16	20	7	17	20	18	20	20
Zhaoqing	21	8	14	16	21	17	21	21

Table 5. Destination competitiveness intensity distribution.

Competitive strength	City
Strong	Guangzhou, Shenzhen
Normal	Maoming, Foshan, Chaozhou, Meizhou, Zhuhai, Zhanjiang, Shantou, Dongguan
Weak	Yangjiang, Huizhou, Jieyang, Jiangmen, Zhongshan, Shanwei, Yunfu, Heyuan, Qingyuan, Shaoguan, Zhaoqing

1) The first tier cities with strong tourism competitiveness include Guangzhou and Shenzhen, and their competitiveness and potential are particularly prominent. From the point of view of each factor level, Guangzhou ranks first among the five elements, which is more balanced. Although Shenzhen ranks second, it lacks in the competitiveness of tourism resources, ranking only 17. It is suggested that Shenzhen should pay more attention to the accumulation and development of tourism resources, especially community tourism resources.

2) Maoming ranks third among the second-tier cities with strong tourism competitiveness. However, the actual competitiveness is not satisfactory. The main reason is that the score of resources and facilities is low, especially the score of facilities is the last of the sample cities. Similar to Maoming, Chaozhou also has a higher total score and a lower resource and facilities. Therefore, Maoming and Chaozhou should pay more attention to the development of tourism resources and the construction of tourism facilities. The comprehensive scores of Shantou and Dongguan are at the median level in the study sample, mainly because of the better performance of competitiveness indicators. Due to the limited competitive potential, it is suggested that the city should be properly adjusted and other industries should be laid out in advance to seek new breakthroughs.

3) In the cities with weaker competitiveness in the third echelon, the competitiveness reality and competitiveness potential are basically similar to the comprehensive score ranking. Huizhou's facility competitiveness ranks sixth, Jieyang's performance competitiveness ranks fifth, and Zhongshan's service competitiveness ranks sixth. Under the background of developing all-for-one tourism, we can explore the unique tourism elements and leisure needs of the local areas, make full use of the advantages and avoid the disadvantages, so as to achieve the balanced development and construction of all-for-one tourism.

According to the research results of this paper, scholars can deepen from the following aspects: 1) Using multi-period evaluation to evaluate the spatial and temporal development process of the competitiveness of cities at all levels; 2) Comparing the two equivalent models of traditional tourism and all-for-one tourism, revealing the advantages of the all-for-one tourism development model; 3) Considering the spatial relationship and interaction between cities.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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