

## ORIGINAL RESEARCH ARTICLE

# Empirical analysis on construction level of intelligent tourism industry in Jiangsu Province

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### ABSTRACT

In 2010, Zhenjiang city of Jiangsu Province took the lead in creatively proposing the concept of “smart tourism”, which is a new proposition. The economic and resource situation of tourism industry in Jiangsu Province was analyzed, and then a SWOT analysis of the current situation of tourism industry in Jiangsu Province was also analyzed. Then, based on the perspective of tourists, six main influencing factors were selected, and SPSS software was used to analyze the data. From the results of factor analysis, tourism auxiliary services explain the 82.579% influencing factors. Finally, according to the factor score data, K-means clustering was conducted on 13 cities in Jiangsu Province, and it can give some suggestions for the development of intelligent tourism industry in various cities.

**Keywords:** smart tourism; SWOT analysis; factor analysis; K-means clustering

## 1. Introduction

“Smart tourism” is a new tourism form that combines emerging technologies such as Internet of things, cloud computing, high-performance information processing and intelligent data mining with the tourism industry, so that tourism resources can be highly systematically integrated and deeply developed and activated, and serve the public. The proposal of “smart tourism”<sup>[1]</sup> comes from the construction of “smart city”<sup>[2]</sup>. Smart tourism is to combine advanced emerging technologies with tourism industry and informatization tourism resources and services<sup>[3]</sup>. At present, the construction

of tourism industry is lagging. In order to effectively support the tourism industry, the key lies in the macro control of the construction of smart tourism industry. According to the general situation of the development of “smart tourism” in various provinces in China, the development status of smart tourism in Jiangsu Province is at the leading level in the country. Nowadays, tourism has become the biggest feature and brand of Jiangsu Province and an important economic pillar supporting the economic and social development of Jiangsu Province. In recent years, Jiangsu Provincial Tourism Administration has made great efforts to build the tourism industry in various urban areas. It is required

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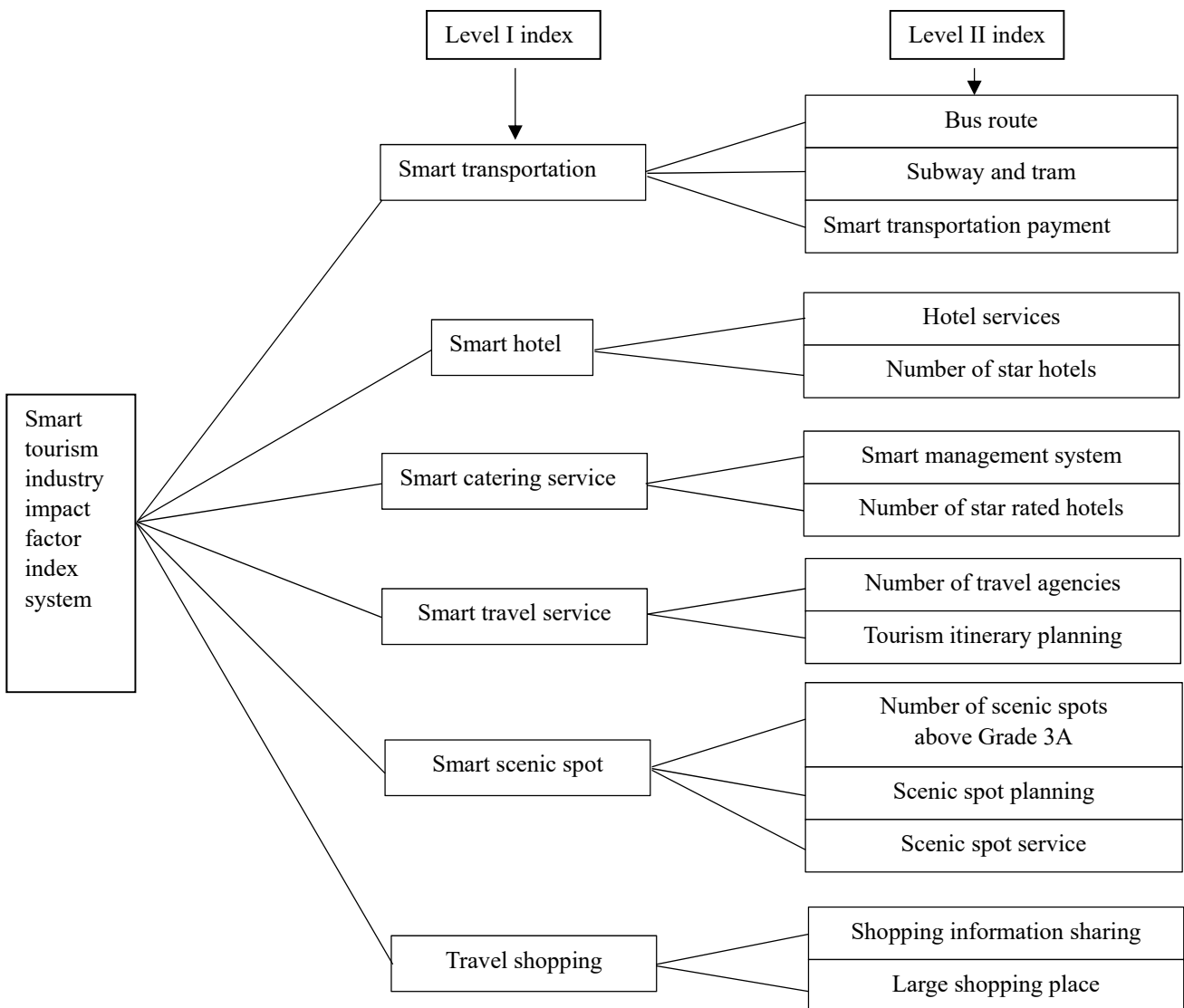
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to plan and actively connect according to the characteristics of local resources, so as to continuously optimize the construction of tourism industry.

Jiangsu Province is in the economic belt of the Yangtze River Delta. With good water conservancy conditions, a long history, developed economy and culture, Jiangsu Province gathers many landscapes, gardens and scenic spots, and is extremely rich in tourism resources. However, the degree of intellectualization of tourism industry in various regions of Jiangsu Province is uneven, and the relevant theoretical research of smart tourism is not enough to support the optimization and development of smart tourism industry. Based on the tourism data of 13 cities in Jiangsu Province, this study establishes the

influencing factor index system of smart tourism industry in Jiangsu Province, and carries out correlation analysis on the data through cluster analysis and factor analysis<sup>[4]</sup>. According to the research results, we can find the deficiencies in the development of smart tourism industry in various cities in Jiangsu Province, put forward targeted countermeasures, and put forward guiding and targeted suggestions and countermeasures for the development of smart tourism industry in Jiangsu Province as a whole, provide relevant theoretical guidance for the construction of smart tourism industry in Jiangsu Province, so as to promote the sustainable, healthy and stable development of smart tourism industry in Jiangsu Province.



**Figure 1.** Index system of influencing factors of smart tourism industry.

## 2. Construction of impact indicators of smart tourism industry

Smart tourism is to apply new technologies such as cloud computing and Internet of things<sup>[5]</sup> to tourism, so that tourists can obtain various tourism resources such as tourism destinations through mobile devices<sup>[6]</sup>, plan and arrange tourism activities in advance, and improve tourists' tourism experience. From the perspective of tourists, this study selects the factors affecting the development of tourism industry in Jiangsu Province under the background of smart tourism<sup>[7]</sup>.

For tourists, they are most concerned about

specific tourism services such as food, housing, transportation, shopping and tourism. This study selects influencing factor indicators<sup>[8]</sup> from these specific aspects: intelligent transportation, intelligent hotel, intelligent catering service, intelligent travel service, intelligent scenic spot and tourism shopping<sup>[9]</sup>. See **Figure 1** for details.

If the primary indicators in **Figure 1** are from top to bottom and the secondary indicators are from top to bottom, the data collection of six primary indicators is obtained by weighted synthesis of their corresponding secondary indicator data. By consulting the data, set the weight of secondary indicators as shown in **Table 1**:

**Table 1.** Weight of secondary indicators in smart tourism index system

Primary index	Secondary index	Weight	Secondary index	Weight	Secondary index	Weight
Intelligent transportation	y <sub>1</sub>	0.42	y <sub>2</sub>	0.42	y <sub>3</sub>	0.16
Smart hotel	y <sub>4</sub>	0.65	y <sub>5</sub>	0.35		
Intelligent catering service	y <sub>6</sub>	0.70	y <sub>7</sub>	0.30		
Smart travel service	y <sub>8</sub>	0.30	y <sub>9</sub>	0.70		
Intelligent scenic spot	y <sub>10</sub>	0.30	y <sub>11</sub>	0.20	y <sub>12</sub>	0.50
Travel shopping	y <sub>13</sub>	0.75	y <sub>14</sub>	0.25		

## 3. Empirical Study on the influencing factors of smart tourism industry in Jiangsu Province

### 3.1. Current situation of tourism industry in Jiangsu Province

#### *Economic situation of tourism industry in Jiangsu Province*

In recent years, the development of tourism in Jiangsu Province has made great progress. In 2018, Jiangsu Province received more than 4 million inbound tourists, with a year-on-year increase of 8.3%. Specifically, the monthly number of tourists received by Jiangsu Province remained basically stable in 2018, including 383,600 inbound overnight tourists in May, the highest number in a year, an increase of 22.8% compared with the same period in 2017.

#### *Overview of tourism resources in Jiangsu Province*

As of December 31, 2018, national resorts in Jiangsu Province are mainly in Suzhou, Nanjing, Wuxi and Changzhou; there are 47 provincial-level resorts in Jiangsu Province, far more than other provinces; the national ecotourism demonstration areas in Jiangsu Province are mainly in Suzhou, Xuzhou, Taizhou, Changzhou and Wuxi; Suzhou and Xuzhou have the largest number of provincial-level eco-tourism areas in Jiangsu Province, followed by Yangzhou, Yancheng and Wuxi.

Generally speaking, Jiangsu Province is rich in tourism resources. There are 5 national resorts, 47 provincial resorts, 5 national ecotourism demonstration areas and 34 provincial ecotourism areas in Jiangsu Province. As of October 17, 2018, the National Tourism Administration has identified 259 national 5A scenic spots, including 34 5A scenic spots in Jiangsu Province, accounting for about 13.13%, which is the province with the most 5A scenic spots in China.

The advantages of Jiangsu Province’s tourism industry are: Jiangsu Province is located in the Yangtze River Delta, with superior geographical location and rich tourism resources; the disadvantages are: In the tourism industry, the capital investment is insufficient, the tourism product structure is unreasonable, the development efficiency of the tourism industry is low, and its sustainable development is threatened; the opportunity lies in: Economic growth drives the increase in tourism demand. At the same time, the implementation of national strategies such as the “the Belt and Road” and the construction of the Yangtze River economic belt has brought broader development space for the development of tourism; the challenge

lies in the arrival of the information age, the increase of tourism demand structure and the challenge of information and sustainable development.

### 3.2. Data acquisition

Data sources: the website of Urban Public Transport Corporation, Ctrip tourism network, from the city selection network, tuniu tourism network, the 2018 statistical yearbook of Jiangsu Provincial Bureau of statistics and the 2018 statistical yearbook of Jiangsu Municipal Bureau of statistics. Through the above data, the six indicators are comprehensively scored<sup>[10]</sup>, and the results are shown in **Table 2**.

**Table 2.** Comprehensive data on tourism industry impact factor indicators by region in Jiangsu Province

Region	Tourism income (100 million yuan)	Intelligent transportation (points)	Smart hotel (points)	Intelligent catering service (points)	Smart travel service (points)	Smart scenic spot (points)	Travel shopping (points)
Suzhou City	2327.58	85.5	75.6	78.2	77.4	73.1	70.5
Nanjing City	2168.9	85.9	62.6	66.4	89.3	57.0	72.3
Wuxi City	1743	60.2	53.4	42.3	58.4	36.4	36.7
Changzhou City	853.65	35.5	38.8	44.5	42.2	31.6	42.1
Zhenjiang City	822.37	31.2	29.4	32.8	32.0	63.0	33.6
Yangzhou City	796.72	46.6	28.8	43.7	39.4	30.9	44.5
Xuzhou City	666.64	39.7	23.4	50.2	51.4	35.4	22.8
Nantong City	614.9	30.5	25.6	63.4	45.0	42.8	34.2
Lianyungang City	458.82	27.8	18.7	46.1	32.4	32.8	35.7
Huai'an City	357.33	32.7	17.0	36.5	32.0	34.6	38.6
Taizhou City	325.94	28.1	19.7	30.7	34.4	37.6	38.2
Yancheng City	320.07	29.5	22.0	34.3	39.2	26.4	25.3
Suqian City	240	29.3	17.1	24.6	26.2	20.4	50.7

### 3.3. Factor analysis

Using SPSS25.0 software filters and analyzes data: **Table 3**.

**Table 3.** KMO and Bartlett test

Bartlett sphericity test	KMO sampling suitability quantity	0.809
	Approximate chi square	85.195
	Freedom	15
	Significance	0.000

Through the KMO and Bartlett sphericity test, it is found that the KMO test of the influencing factors of smart tourism industry is 0.809, and the Bartlett sphericity test value is 85.195, with significance = 0.000, indicating that it is very significant. It is feasible to conduct factor analysis on the six influencing factors of the development of smart tourism industry in Jiangsu Province. See **Table 4**.

From the eigenvalue and variance contribution table, when the score is 2, the variance contribution

rate of common factors exceeds 90%, indicating that the extraction of two principal components by

factor analysis can explain most of the information of six original variables. See **Table 5**.

**Table 4.** Eigenvalue and variance contribution table

Component	Initial characteristic value: Total	Initial eigenvalue: Variance percentage /%	Initial characteristic value: Cumulative /%	Rotating load squared: Variance percentage /%
1	4.955	82.579	82.579	64.988
2	1.537	8.951	91.531	26.543
3	0.311	5.184	96.715	
4	0.132	2.208	98.923	
5	0.047	0.778	99.700	
6	0.018	0.300	100.000	

**Table 5.** Factor load matrix after rotation

	Component 1 (%)	Component 2 (%)
Intelligent transportation	0.904	0.380
Smart hotel	0.873	0.407
Intelligent catering service	0.807	0.331
Intelligent travel service	0.930	0.214
Intelligent scenic spot	0.329	0.942
Travel shopping	0.835	0.491

Factor score and comprehensive factor score: The comprehensive factor score is  $F$ , which is calculated

and sorted by SPSS “conversion → calculation score”. The results are shown in **Table 6**:

**Table 6.** Factor scores and comprehensive factor scores

City	$F_1$	$F_2$	$F$	Comprehensive sorting
Suzhou City	1.444 07	2.158 28	1.51	2
Nanjing City	2.325 66	0.10298	1.54	1
Wuxi City	0.490 48	-0.87506	0.09	3
Changzhou City	-0.09254	-0.36349	-0.16	6
Zhenjiang City	-1.38247	1.74936	-0.43	10
Yangzhou City	-0.09473	-0.39900	-0.17	7
Xuzhou City	0.38638	-1.36110	-0.11	5
Nantong City	0.04736	-0.28087	-0.04	4
Lianyungang City	-0.95833	0.52109	-0.48	12
Huai'an City	-0.62683	-0.02261	-0.41	9
Taizhou City	-0.73923	0.16530	-0.44	11
Yancheng City	-0.33881	-0.62590	-0.39	8
Suqian City	-0.46101	-0.76898	-0.50	13

**Table 6** shows the ranking of tourism industry development status of 13 cities in Jiangsu Province based on six influencing factors of smart tourism industry. Among them, the smart tourism industry in Nanjing, Suzhou and Wuxi is developing well; the development of smart tourism industry in Nantong, Xuzhou, Changzhou and Yangzhou is general; Yancheng, Huai'an, Zhenjiang, Taizhou, Lianyungang and Suqian have poor development of smart tourism industry.

### 3.4. K-means cluster analysis

According to the score data of 2 factors of 13 cities in Jiangsu Province given in Table 5, K-means clustering is carried out for the smart tourism industry of 13 cities in Jiangsu Province by using MATLAB software. The results are shown in **Figure 2**.

As can be seen from **Figure 2**, 13 cities are divided into three categories Category 1: Suzhou and Nanjing; class 2: Zhenjiang, Lianyungang, Huai'an,

Taizhou; category 3: Wuxi, Changzhou, Yangzhou, Xuzhou, Nantong, Yancheng and Suqian.

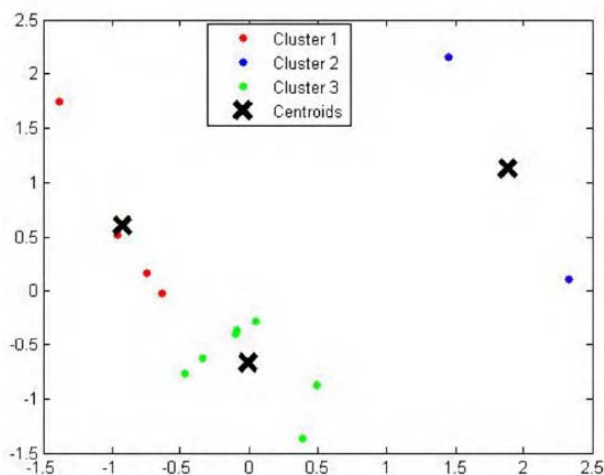


Figure 2. K-means clustering of 13 cities in Jiangsu.

### 3.5. Development countermeasures of smart tourism in cities of Jiangsu Province

#### *Suzhou City, Nanjing City*

As leading cities, Nanjing and Suzhou should continue to improve the supervision system and services of smart tourism cities to ensure the sustainable and healthy development of smart tourism cities. On the other hand, we should have greater responsibility and action. We should further promote and take greater steps in creating a high-level global tourism demonstration area and improving the level of tourism internationalization, and promote the construction of important international tourism destinations and national tourism central cities.

#### *Zhenjiang City, Lianyungang City, Huai'an City, Taizhou City*

The government should strengthen the awareness of Urban Smart tourism industry construction, further formulate relevant tourism industry development plans, and increase the proportion of financial support. On the other hand, we should increase the development of tourism resources and create tourism projects with local characteristics to attract more domestic and foreign tourists. At the same time, maintain the urban environmental quality and pay more attention to the environmental protection

and optimization of scenic spots.

#### *Wuxi City, Changzhou City, Yangzhou City, Xuzhou City, Nantong City, Yancheng City and Suqian City*

First, all municipal governments should strengthen the construction of tourism infrastructure to provide strong support for smart tourism cities; secondly, we should strengthen the investment in science, technology and capital in the construction of smart tourism cities; finally, strengthen information communication and regional cooperation in the construction of smart tourism city to achieve win-win cooperation.

## 4. Conclusions

(1) According to the results of factor analysis, the first factor contains five indicators, which explains 82.579% of the information of the original variable. The first factor is named tourism auxiliary service factor according to the comprehensive index information. In the context of smart tourism, the influencing factors of tourism industry in Jiangsu Province are mainly concentrated in transportation, hotels, restaurants, travel agencies and other tourism auxiliary services.

(2) Through K-means clustering, 13 cities in Jiangsu Province are classified in terms of tourism intelligence. Combined with the actual situation, the development level of Urban Smart tourism in Jiangsu is obviously differentiated, which is closely related to the tourism resource development and tourism development planning of each city. Therefore, each city should pay more attention to its own characteristics, constantly develop tourism resources with local characteristics and make more perfect tourism development planning, promote the development of smart tourism industry in Jiangsu to a higher level.

## Conflict of interest

The authors declare no conflict of interest.

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