

Measurement of Coupling Coordination Degree Between Cultural Industry and Tourism Industry Under Big Data

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ABSTRACT

The coupling and coordinated development of cultural industry and tourism industry can effectively promote the deep integration of culture and tourism, make cultural resources become the tourism capital to enrich tourism connotation, optimize tourism experience and expand tourism realm, and realize the common development of traditional cultural industry and tourism industry. In this paper, taking Liaoning province as an example, through extensive collection of relevant data of culture and tourism industry, a coupling coordination degree model is established to systematically analyze the coordinated development of culture and tourism industry. The result shows that the degree of development coordination between the two industries is very poor. In order to deal with this phenomenon, this paper also puts forward corresponding solutions.

Keywords: Cultural industry, Tourism industry, Coupling model, Big data

1. INTRODUCTION

Under certain conditions, the two systems of cultural industry and tourism industry interact and influence each other through their coupling elements, forming the coupling development of cultural industry and tourism industry. Cultural industry needs tourism industry to promote, tourism industry also needs cultural industry as a support. The coupled and coordinated development of cultural industry and tourism industry can promote cultural resources to become tourism capital and promote the common development of cultural undertakings, cultural industries and cultural relics. China has been committed to promoting the integrated development of culture and tourism, which is of strategic significance to its research.

"Big data" is the information asset with more powerful decision-making power, insight and discovery power and process optimization after being processed through the new processing mode. In the measurement and analysis of the coupling coordination degree between cultural industry and tourism industry, this paper firstly established the coupling coordination degree model of cultural industry and tourism industry through extensive collection of big data related to the two industries, and systematically analyzed the coordinated development of cultural industry and tourism industry, so as to realize the deep integration of cultural industry and tourism industry [1].

2. CONSTRUCTION AND MEASUREMENT OF COUPLING COORDINATION MODEL

2.1. Construction of Coupling Coordination Model

The range standardization method is used to standardize the original data. In order to avoid the lack of comprehensiveness due to the different properties and measurement units of each index, the original data of each index was dimensionless processed in this

paper:
$$X_{ij} = \frac{A_{ij} - A_{jmin}}{A_{jmax} - A_{jmin}}$$

(1)
 (i= 2011, 2012...2017; j = 1,2,...m)

In formula A_{ij} represents the original data of item j in year i; A_{ijmax} and A_{ijmin} respectively represent the maximum and minimum value of item j in each year from 2011 to 2017, and X_{ij} * represents the data after standardized processing. In order to make the logarithmic curve in formula (2) meaningful, it is necessary to avoid the possible occurrence of "0" value after standardization, so all the normalized data are shifted to the right by 0.01 units, that is, $X_{ij} = X_{ij} * + 0.01$. The weight of each index in the

evaluation system is calculated, and the weight of each index is determined by the utility value of each index. The utility value F of an index is calculated according to the following formula.

$$P_{ij} = 1 + \frac{1}{\ln m} \sum_{2011}^{2017} [x_{ij} / \sum_{2011}^{2017} x_{ij} \ln(x_{ij} / \sum_{2011}^{2017} x_{ij})] \quad (2)$$

The weight G of an index in the evaluation system is the ratio between the utility value of the index and the sum of the utility values of all the indexes. The calculation formula is as follows:

$$W_j = P_{ij} / \sum_{j=1}^6 P_{ij} \quad (3)$$

2.2. Construction of Coupling Coordination Model

According to the weight of the index and the standardized data, the comprehensive evaluation value of the industrial development level can be calculated [2]. the calculation formula is as follows the calculation formula is below :

Function of comprehensive development level of tourism industry:

$$G_{(u)} = \sum_{j=1}^6 W_j U_{ij} \quad (4)$$

The results are shown in the table 1.

Table 1 Comprehensive development level function of tourism industry

U _{ij}	j=1	j=2	j=3	j=4	j=5	j=6
i=2017	0.7296	0.0961	0.0848	1.01	1.01	1.01
i=2016	0.4841	0.0764	0.0635	0.7033	0.1484	0.8072
i=2015	0.2369	0.0448	0.0236	0.4126	0.1609	0.7146
i=2014	1.01	0.01	0.01	0.7624	0.1421	0.4869
i=2013	0.6370	1.01	1.01	0.4529	0.01	0.2983
i=2012	0.2969	0.8520	0.8863	0.2194	0.01	0.0207
i=2011	0.01	0.5991	0.6272	0.01	0.2553	0.01
G(u)	0.1825	0.6317	0.7042	0.1729	0.4905	0.4027

Where, G_(u) represents the function of the comprehensive development level of tourism; j (j=1,2,3, ..., 6) represents the number of tourism evaluation indicators; W_j represents the entropy value weight of the evaluation index; U_{ij} represents the dimensionless value of tourism item j in year i.

Function of comprehensive development level of cultural industry:

$$F_{(x)} = \sum_{j=1}^6 W_j X_{ij} \quad (5)$$

The results are shown in the table 2.

Table 2 Comprehensive development level function of cultural industry

X _{ij}	j=1	j=2	j=3	j=4	j=5	j=6
i=2017	0.3840	0.01	1.01	0.01	0.01	1.01
i=2016	0.1590	0.3850	1.01	0.9406	0.21	1.01
i=2015	0.01	0.6384	0.76	1.01	0.21	0.6767
i=2014	0.2715	1.0099	0.51	0.7814	0.3433	0.01
i=2013	1.01	1.01	0.51	0.8018	0.21	0.3433
i=2012	0.0940	0.7474	0.26	0.5692	0.4767	0.3433
i=2011	0.1430	0.9233	0.01	0.7529	1.01	0.01
F(x)	0.7550	0.1830	0.3563	0.0249	0.5238	0.9940

Coupling degree model: $Z = \frac{\sqrt{F_{(x)} - G_{(u)}}}{\sqrt{F_{(x)} + G_{(u)}}} \quad (6)$

Where, Z represents the degree of integration between cultural and creative industry and tourism, and the calculated value range is [0,1]. The larger the Z value is,

the better the degree of integration is; on the contrary, the smaller the Z value is, the lower the degree of integration is.

The formula to calculate the coupling coordination degree of two systems is as follows:

$$E = 0.5Z(c) + 0.5 Z(t) \quad (7)$$

The coupling coordination degree is as follows

$$D = \sqrt{Z \times E} \quad (8)$$

The value of coupling coordination degree is between 0 and 1. The closer the value is to 1, the higher the degree of industrial integration between tourism industry and cultural industry is, and the closer to 0, the lower the

degree of industrial integration between the two systems is.

In order to compare the degree of coupling and coordination between tourism industry and cultural industry in different periods, it is necessary to classify the degree of coupling and coordination between the two systems (see table 3).

2.3. Coupling Degree and Coupling Coordination Degree Classification

Table 3 Classification standard of coupling degree polar coupling coordination degree

Coupling coordination degree interval D	Coordination level	Type	Coupling degree interval	Coupling phase
0.00≤D≤0.09	Extreme imbalance	Maladjusted recession type	R=0.00	Very low coupling
0.10≤D≤0.19	Major disorder		0.00 < R≤0.29	Low level coupling phase
0.20≤D≤0.29	Moderate disorder			
0.30≤D≤0.39	Mild disorder			
0.40≤D≤0.49	On the verge of disorder	Transitory type	0.29≤R < 0.49	Running-in phase
0.50≤D≤0.59	Barely coordination			
0.60≤D≤0.69	Primary disorder			
0.70≤D≤0.79	Intermediate coordination	Coordinated ascending type	0.79≤R < 0.99	High level coupling phase
0.80≤D≤0.89	Good coordination			
0.90≤D≤1.00.	High quality coordination		0.99≤R≤1.00	Very high coupling phase

3. CASE EMPIRICAL STUDY

3.1. Data Mining on Coupling Coordination Degree in Liaoning Province

In order to calculate the coupling and coordination degree of cultural industry and tourism industry in Liaoning province, a lot of data mining is carried out in this paper.

The data in table 4 and table 5 are from National Bureau of Statistics of the People's Republic of China, Ministry of Culture and Tourism and Liaoning statistics bureau.

Table 4 Main tourism industry data of Liaoning province from 2011 to 2017

Year	j=1	j=2	j=3	j=4	j=5	j=6
2017	4620.7	177806	2788464	50318	671	1443
2016	4122.2	174141	2736658	44873	534	1386
2015	3620.1	168272	2640052	39711	536	1360
2014	5190.2	161800	2607019	45925	533	1296
2013	4432.6	347713.6	5031268	40427	512	1243
2012	3742.0	318345	4731340	36282	512	1165
2011	3159.3	271314	4103329	32564	551	1162

Note:

- j=1: The index evaluation system of tourism industry
- j=2: Domestic tourism revenue (100 million yuan)
- j=3: International tourism revenue (us \$10,000)
- j=4: Number of inbound tourists (10,000)

j=5: Number of Domestic tourists (10,000)

j=6: Number of hotels (unit)

Table 5 Main data of cultural industry in Liaoning province from 2011 to 2017

Year	j=1	j=2	j=3	j=4	j=5	j=6
2017	33654	56532	65	18	23	125
2016	28820	62190	65	246	26	125
2015	25618	66014	64	263	26	124
2014	31236	71620	63	207	28	122
2013	47102	71622	63	212	26	123
2012	27423	67659	62	155	30	123
2011	28475	70313	61	200	38	122

Note:

- j=1: Culture and art business revenue (ten thousand yuan)
- j=2: Number of cultural undertakings staff (unit)
- j=3: Number of museums (unit)
- j=4: Number of performing arts organizations Arts
- j=5: Arts performance venues (unit)
- j=6: Total number of cultural centers and art galleries(unit)

3.2. Measurement of Coupling Coordination Degree in Liaoning Province

According to the above formula, the index of coupling coordination degree between tourism industry and cultural industry in Liaoning province is calculated and summarized, as shown in table 6.

Table 6 Indexes of coupling coordination degree between culture and tourism industry in Liaoning province

year	2011	2012	2013	2014	2015	2016
Coupling coordination	0.2448	0.4736	0.3812	0.2966	0.2042	0.4245
coupling degree	0.1125	0.6068	0.5556	0.3849	0.0697	0.4786

From table 6, it can be seen that the coupling coordination degree of cultural industry and tourism industry in Liaoning province from 2011 to 2012 showed a sharp drop in the trend of cultural industry and tourism industry between 2012 and 2015 of the coupling coordination degree show linear downward trend, from 2015 to 2016 between the coupling coordination degree again rose significantly, the coupling coordination degree of both dropped again after 2016. In general, the degree of coupling and coordination between tourism industry and cultural industry in Liaoning province fluctuated greatly from 2011 to 2016. At the same time, it is undeniable that there is a big gap between Liaoning province and other provinces with high coupling and coordination degree and the overall development level is low. The cultural and tourism-related policies issued by the national and provincial governments in different year [3]. Province commissar of Liaoning province, the provincial government attaches great importance to the cultural industry development, from the policy level have issued "about a number of policies to promote the development of cultural industry regulations," industry investment fund set up plan of Liaoning province "and so on a series of accelerating the development of cultural industry policies and

measures, these measures are for 2011 to 2012 and the coupling development of cultural industry and tourism industry in Liaoning province provides guiding principles.

According to relevant documents [4], the numerical grade of coupling coordination degree is divided into standards as shown in table 2.

4. CONCLUSION

4.1. Conclusion

Through comparison, it can be seen that the degree of coupling and coordination between cultural industry and tourism industry in Liaoning province hovers between moderate imbalance and near imbalance. The type of coupling coordination degree is maladjusted recession type. The coupling stages between the two industries are mainly low-level coupling, antagonism and running-in. It is self-evident that there is still a gap between Liaoning's cultural industry and tourism industry in terms of coordinated development, mutual benefit and win-win, and high coupling.

The result shows that the degree of development coordination between the two industries is very poor, and the development level is too low and the gap is large. In order to deal with this phenomenon, this paper also puts forward corresponding solutions.

4.2 Countermeasures

4.2.1 Develop Cultural Tourism Creative Product.

Promote the development of national cultural industry through the development of cultural tourism creative products. IN Liaoning province, cultural tourism creative products started late, with a slow speed and few development areas. In Liaoning province, all scenic areas of the Chinese product is no doubt a higher visibility of Shenyang imperial palace. Therefore, with the Shenyang imperial palace as the core, an organization should be established to promote the development of cultural and creative products in other scenic areas of Liaoning province. Through the development organization of cultural tourism creative products, the tourism industry in the province will eventually become an important carrier to fulfill cultural mission, carry cultural functions, enhance cultural quality and cultivate cultural power.

4.2.2. Overall Plan Regional Cultural and Tourism.

China has a long history and a long history, which can provide a perfect point for the development of global tourism. On the basis of national macro-control, related departments of cultural tourism should link up the development of tourism industry in all regions and make scientific planning with the cultural industry as the link. For example, Liaoning province actively increases the number of regional tourist attractions to realize the common development of tourism in all cities of the province [5].

4.2.3. Build Cultural Tourism Industry with Local Characteristics.

It is far from enough for tourists to understand the tourist attractions only from travel agencies. The cultural institutions and tourist attractions should take history, geography, religion, food, architecture, homestay and other aspects as the entry point to enrich the cultural and tourist industry structure, so as to build a cultural tourism industry that can reflect the local characteristics. At the same time, it is necessary to avoid destructive and predatory over-exploitation while creating local culture, so as to lay a solid

foundation for the continuous development of the coupling and coordination degree between culture and tourism industry[6].For example, Manchu culture in Liaoning province has local characteristics, so it is necessary to build a cultural tourism industry with local characteristics.

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