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Research on the Competitiveness Evaluation of China's Cultural Service Industry's Sub-sectors Based on Factor Analysis

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***Abstract*—*Cultural service industry is an important industrial sector integrating culture and service industry. The improvement of its comprehensive competitiveness is of great significance to optimize the industrial structure and promote the transformation and upgrading of economy. On the basis of establishing the evaluation index system of the competitiveness of cultural service industry's sub-sectors, this paper makes a comprehensive evaluation and comparative analysis on the competitiveness of China's cultural service industry by factor analysis and cluster analysis, and reveals the problems and shortcomings existing in the development of different cultures Service industry's competitiveness. Finally, the countermeasures and suggestions are put forward to promote the overall competitiveness of China's cultural service industry.*

***Keywords*—** *Cultural Services Industry; Competitiveness Evaluation; Factor Analysis; Cluster Analysis.*

I. INTRODUCTION

With the steady advancement of supply-side structural reforms and the full implementation of the "Internet+" action plan, China's cultural service industry has shown a rapid development trend. By the end of 2015, the added value of the cultural services industry had reached 136 billion yuan, and increased by 14.1% over the previous year. Among the cultural and related industries' value-added composition, the cultural service industry accounts for about 50.1% of the total and is in a dominant position. Among them, the cultural leisure and entertainment service industry and the cultural information transmission service industry with "Internet +" as the main form developed the fastest, with the growth rate reaching 19.4% and 16.3% respectively. The cultural service industry is an industrial sector that integrates culture and service industries. It has the characteristics of high added value, high knowledge, low energy consumption, high integration and linkage. The cultural service industry specifically includes 26 sub-sectors such as news service industry, publishing service industry, radio and television service industry, film and film recording service industry, and advertising service industry. China's cultural service industry drives industrial development with innovative ideas, continuously improves the overall competitiveness of the industry, and plays an important role in promoting the optimization and upgrading of the cultural industry structure and transforming the economic development mode. However, due to the unbalanced development of various industries in the cultural service industry, there are significant differences in the competitiveness among industries, which seriously restricts the improvement of the overall competitiveness of the industry. Therefore, studying the competitiveness of China's cultural service industry in different industries and formulating corresponding policies to further enhance the overall competitiveness of the cultural service industry has important theoretical and practical significance for improving the quality of cultural service supply from the supply side and promote the transformation and upgrading of cultural service industry to high-end service industry.

II. LITERATURE REVIEW

At present, foreign studies on cultural services or knowledge-intensive services mainly focus on the development of cultural creative industries, and most of them apply the case analysis method in research. Based on the corporate case of the film and digital game industry, Kerr and Flynn (2003) analyzed the globalization trend and implementation path of the cultural service industry. Both Scott (2006) and Pratt (2010) have studied the relationship between cultural creative industry agglomeration and urbanization, and agreed that the accumulation of cultural creative industries is conducive to the promotion of urbanization, and there is a synergistic relationship between the two. Tsang and Michael (2016) examined the development of two cultural creative clusters in Hong Kong and studied the root causes of sustainable creative clusters in densely populated cities by establishing a 3Cs model of sustainable cultural creative clusters. These studies have clarified the importance of developing cultural creative industries from different perspectives. But Chinese scholars have studied the development of productive cultural service industry, the integration of cultural industry and service industry, and the relationship between modern information service industry and cultural industry. First, research on the development of productive cultural services. Du Chuanzhong and Wang Fei (2014) revealed that the development of productive cultural service industry is restricted by factors such as system, technology, talents and policies. They also pointed out that we should accelerate the development of China's productive service industry from the aspects of innovating institutional mechanisms, optimizing development strategies, cultivating professional talents, and promoting industrial integration. Second, research on the integration of cultural industries and service industries. Zhou Jian (2015) systematically proposed the motivation and constraints of the fusion development of service industry and culture from the two aspects of cultural service product and service industry culture enhancement. Third, research on the relationship between the modern information service industry and the cultural industry. Ding Linghua (2014) conducted an empirical study on the relationship between the modern information service industry and the cultural industry in Guangdong Province by establishing a coupling coordination degree model. The research shows that the modern information service industry and cultural industry in Guangdong Province are at a lower coupling and coordinated development stage. The development of the cultural industry lags behind the development of the information service industry.

The Literature research shows that the current academic research on cultural service industry mainly focuses on the theoretical analysis of industrial integration and the development of cultural service industry. The empirical analysis is relatively lacking and is still in the stage of exploration and initiation. In addition, there are few studies on the comprehensive evaluation of the competitiveness of the cultural service industry in the micro-level, and there is still room for further improvement in the systematic comprehensiveness of the indicator system. Based on the preliminary design of the cultural service industry competitiveness index system, this paper uses the factor analysis method to further explore the potential factor structure, constructs the evaluation system of the cultural service industry's sub-sector competitiveness, then clusters the comprehensive factor scores to divide the categories of China's cultural service industry's competitiveness, and finally proposes countermeasures to improve the overall competitiveness of China's cultural service industry.

III. FACTOR ANALYSIS

A. Index System Construction and Data Preparation

In order to analyze and compare the competitiveness of various industries in China's cultural service industry, this paper follows the principles of objectivity, comprehensiveness, operability and pertinence to selects 13 indicators from the level of industry development and industry profitability to form an evaluation index system according to the connotation and evaluation purpose of the cultural service industry in terms of industry competitiveness. These indicators are as follows, X1: business tax and surcharges, X2: year-end practitioners in the industry, X3: number of business units, X4: main business income, X5: total industry assets, X6: cost and expense profit margin, X7: main business profit margin, X8: return on total assets, X9: total asset growth rate, X10: industrial labor productivity, X11: main business income growth rate, X12: total asset turnover, X13: liquidity turnover.

This paper selects 25 specific industries (lack of library and archives service industry data) including news service industry, publishing service industry, broadcasting service industry, film and film recording service industry included in China's cultural service industry as China's cultural service industry. The evaluation unit of the industry's competitiveness is comprehensively evaluated. (The original data is from the Chinese Culture and Related Industry Statistical Yearbook 2015 and related calculations).

B. KMO Statistics and Bartlett Sphericity Test

Considering the correlation between the above indicators, this paper uses the factor analysis method in statistical analysis software SPSS22.0 to reduce the original data of 13 indicators. The Kaiser-Meyer-Olkin (KMO) statistics and Bartlett's sphericity test of the correlation matrix are selected, and the common factor is extracted and analyzed by principal component analysis.

In order to test the suitability and validity of the factor analysis, the raw data was subjected to KMO test and Bartlett sphericity test. The value of KMO statistic is between 0-1. The closer the KMO value is to 1, the stronger the partial correlation between variables, and the better the effect of factor analysis. In the Bartlett sphericity test, if the Sig value is 0, it indicates that there is a correlation between the selected index variables and is suitable for factor analysis. As can be seen from Table I, the KMO statistic is equal to 0.641 (>0.5), and the Sig value is 0.000 and significant at the 0.05 level, which shows that the original variables are more suitable for factor analysis.

TABLE I. KMO and Bartlett's spherical inspection.

Sample a sufficient Kaiser-Meyer-Olkin metric		0.641
Bartlett's Sphericity Test Approximate	**Chi-square**	338.884
	df	78
	Sig.	0.000

C. Extraction and Naming of Common Factors

According to the principle that the eigenvalue is greater than 1, four common factors are extracted, and the cumulative contribution rate reaches 89.450%, indicating that these four common factors contain the vast majority of information of 13 indicators, which can fully reflec the level of competitiveness of various sectors in the cultural service industry. However, due to the large correlation coefficient between the original data, in order to facilitate the effective interpretation of the common factor, the variance maximization orthogonal rotation method is used to maximize the difference between the factors. The rotated factor load is sorted according to the size, and eigenvalues and contribution rates of the common factor is are shown in Table II.

The first common factor F1 has the largest contribution rate of 33.2%, which is the most important factor. It has a higher load on the five indicators such as business tax and surcharge, industry employees at the end of the year, number of business units, main business income, and total industry assets. These indicators reflect the overall scale and level of development of various sectors in China's cultural service industry from different aspects, so they are named as industry scale and development factor.

The contribution rate of the second common factor F2 is 20.2%, which is the second most important factor. It has a higher load on the three factors such as cost and profit margin, main business profit margin and total asset return. These indicators are closely related to the production profitability of various sectors in the cultural service industry, reflecting the production profitability of major cultural service industries. Therefore, it was named as the industry production

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profitability factor.

The contribution rate of the third common factor F3 is 18.2%, and the load on the total asset growth rate, industry labor productivity, and main business income growth rate is higher. These three indicators are used to measure the growth rate of production value and production efficiency of various sectors in the cultural service industry, which can reflect the development potential of major cultural service industries. Therefore, the third common factor is considered to be the industry growth potential factor.

The contribution rate of the fourth common factor F4 is 17.8%. It has a higher load on the two indicators of total asset turnover and liquidity turnover, reflecting the efficiency of capital and asset utilization in various sectors of the cultural services industry. So, it is called the industry operational efficiency factor.

TABLE II. Factorial load matrix, characteristic value, contribution rate, cumulative contribution rate after rotation.

Index	First common factor F1: industry size and development factor	Second public factor F2: industry production profitability factor	Third public factor F3: industry growth potential factor	Fourth common factor F4: industry operational efficiency factor
X1: business tax and surcharges	**0.944**	0.136	0.164	0.044
X2:year-end practitioners in the industry	**0.924**	0.028	0.053	-0.022
X3: number of business units	**0.919**	-0.168	0.019	0.128
X4: main business income	**0.903**	0.102	0.133	0.277
X5: total industry assets	**0.883**	0.217	0.175	-0.216
X6: cost and expense profit margin	0.039	**0.954**	0.170	-0.146
X7: main business profit margin	0.091	**0.941**	0.098	-0.171
X8: return on total assets	0.081	**0.826**	0.085	0.482
X9: total asset growth rate	0.150	0.065	**0.942**	0.124
X10: industrial labor productivity	0.277	0.133	**0.881**	-0.039
X11: main business income growth rate	-0.020	0.113	**0.747**	0.133
X12: total asset turnover	0.126	0.001	0.104	**0.977**
X13: liquidity turnover	-0.006	-0.088	0.109	**0.951**
Eigenvalues	4.316	2.626	2.367	2.319
Contribution rate (%)	33.199 %	20.203 %	18.208 %	17.839 %
Cumulative contribution rate (%)	33.199 %	53.403 %	71.611 %	89.450 %

D. Factor Score and Ranking

In order to effectively compare and further explain the competitiveness of China's cultural service industry, the factor scores are calculated for the four common factors, and then the weighted sum is obtained by the principal component analysis model according to the weight of each component. value. The formula is as follows:

$$F = 0.33199 \times F_1 + 0.20203 \times F_2 + 0.18208 \times F_3 + 0.17839 \times F_4$$

According to the formula, the comprehensive scores and rankings of the 25 cultural service industries' competitiveness are shown in Table III.

The first common factor F1— the industry scale and development factor, which reflects the scale and level of development of various sectors in China's cultural service industry. The top six rankings of the factor scores are the advertising service industry, architectural design service industry, cultural software service industry, Internet information service industry, scenic tour service industry, and publishing service industry. The rapid development of these industries is mainly due to the implementation of the "Internet +" project and the policy promotion of the country to encourage the development of cultural creativity and innovative design industries.

The second common factor F2—the industry production profitability factor, which reflects the production profitability of various sectors of the cultural services industry. The top six rankings are the Internet information service industry, copyright service industry, art creation and performance service industry, cultural brokerage agency service industry, radio and television service industry, and cultural software service industry.

The third common factor F3— the industry growth potential factor, which mainly measures the development potential and growth of various sectors of the cultural services industry. The top six industries ranked by this factor are the other cultural auxiliary services, professional design services, Internet information services, mass cultural services, other cultural and art services, and value-added telecommunications services. It shows that cultural and art services, cultural information transmission services and cultural creativity and design services are receiving more and more attention from people. These new cultural service industries are growing fast and have high labor productivity.

The fourth common factor F4— the industry operation efficiency factor, which reflects the utilization efficiency of the capital assets of various sectors in the cultural service industry and the operation of various cultural service industries. The top six factors in the ranking are advertising service industry, photography and printing service industry, culture and art training service industry, professional design service industry, copyright service industry and cultural rental service. It shows that the capital assets of these industries have a faster turnover rate and higher operational efficiency.

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TABLE III. Factor score, overall evaluation score, and sorting table.

Industry	First common factor F1: industry size and development factor		Second public factor F2: industry production profitability factor		Third public factorF3: industry growth potential factor		Fourth common factor F4: industry operational efficiency factor		Comprehensive factor F	
	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking	Score	Ranking
News service industry	-0.4263	14	-1.9306	25	-1.8757	24	-1.0140	21	-1.0540	25
Publishing service industry	0.9307	6	-0.0755	12	-0.2014	15	-0.9334	20	0.0906	8
Radio and television service industry	-0.3810	13	0.8184	5	-0.6278	21	-0.2885	13	-0.1269	15
Film and film recording service industry	0.1962	8	0.2099	10	-0.3480	17	-0.4318	15	-0.0328	11
Literary creation and performance service industry	-0.3523	12	1.0095	3	-1.8411	23	-0.6394	19	-0.3623	23
Cultural heritage protection service industry	-0.8547	23	-0.2323	16	0.1774	11	-1.2789	24	-0.5265	24
Mass culture service industry	-0.8500	22	-0.4187	17	0.8647	4	-0.5718	18	-0.3113	21
Cultural research and community service industry	-0.6663	16	0.5250	7	-1.8798	25	0.8608	7	-0.3038	20
Culture and art training service industry	-0.9325	24	-0.1265	14	0.2555	10	1.5662	3	-0.0092	10
Other cultural and art service industries	-0.6686	17	-0.1170	13	0.7698	5	-0.3860	14	-0.1743	16
Internet information service industry	1.2534	4	2.9498	1	1.1623	3	-0.0064	11	1.2226	1
Value-added telecommunication service industry	-0.7550	18	0.5030	8	0.7249	6	0.5505	8	0.0812	9
Radio and television transmission service industry	0.2681	7	-0.1668	15	0.0572	12	-0.5577	17	-0.0338	12
Advertising service industry	2.3035	1	-0.9575	23	-0.2589	16	1.8132	1	0.8476	2
Cultural software service industry	1.3583	3	0.5494	6	-0.4251	20	0.3147	10	0.5407	4
Architectural design service industry	2.2857	2	-0.7635	19	-0.3521	18	0.5030	9	0.6302	3
Professional design service industry	0.0173	10	-1.1379	24	1.6681	2	1.3117	4	0.3136	5
Scenic tour service industry	1.2141	5	0.1358	11	0.4680	9	-1.7840	25	0.1974	7
Entertainment and leisure service industry	0.1948	9	-0.9502	22	0.4831	8	-1.1071	23	-0.2368	18
Photographic printing service industry	-0.7875	20	-0.6655	18	-0.0202	14	1.5710	2	-0.1193	14
Copyright service industry	-1.0516	25	1.4967	2	0.6848	7	1.0062	5	0.2574	6
Cultural brokerage agency service	-0.7768	19	0.8674	4	-1.1437	22	-0.0265	12	-0.2956	19
Cultural rental service industry	-0.8095	21	-0.8560	20	-0.3658	19	1.0016	6	-0.3296	22
Exhibition service industry	-0.1394	11	0.2185	9	-0.0179	13	-0.4502	16	-0.0857	13
Other cultural auxiliary services	-0.5706	15	-0.8854	21	2.0415	1	-1.0232	22	-0.1791	17

IV. Cluster Analysis

Cluster analysis is essentially an exploratory statistical analysis method that divides data into several categories according to distance, so that the difference in data within the category is as small as possible, and the difference between categories is as large as possible. In order to present the above evaluation results more intuitively and clearly, this paper uses the Ward method (distribution square sum method) of SPSS22.0 cluster analysis to optimize the scores of the comprehensive factors in Table 4, which can be used in 25 cultural service industries in China. The competitiveness status is divided into three categories, as shown in Table IV.

The first category includes the Internet information service industry, advertising service industry, cultural software service industry, and architectural design service industry, which are among the strongest competitive industries. The Internet information service industry belongs to the cultural information transmission service industry with “Internet +” as the main form. It is a new format based on the development of the Internet and has strong policy advantages and great development potential. The advertising service industry, cultural software service industry and architectural design service industry belong to the cultural creative and design service industry. It is a new high-end service industry that the state encourages and supports. The development of these industries has adapted to the new requirements of today's economic development and new trends in industrial integration. Therefore, their comprehensive competitiveness is at the leading level.

The second category includes publishing service industry, radio and television service industry, film and film recording service industry, culture and art training service industry, value-added telecommunication service industry (cultural part), radio and television transmission service industry, professional design service industry, scenic tour service industry, photography and printing services, copyright services, exhibition services, which are among the stronger competitive industries. The industries with relatively balanced development of various factors include film and film recording service industry, radio and television transmission service industry, and exhibition service industry. The scores of

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various factors are at a medium level, so their comprehensive competitiveness is also at a medium level. The publishing service industry, the broadcasting and television service industry, and the photo-expanding service industry have only a few factors that are prominent in the level of factors, while other factors rank relatively backward. For example, the radio and television service industry ranked fifth in the production profitability factor, while other factors were at the lower-middle level. Therefore, this kind of cultural service industry should continue to maintain its existing advantages, make up for its own shortcomings, balance and enhance the competitiveness of all aspects, and strive to move closer to the first category of industries.

The third category includes news service industry, literary and artistic creation and performance service industry, cultural heritage protection service industry, mass cultural service industry, cultural research and community service industry, other cultural and art service industry, entertainment and leisure service industry, cultural brokerage agency service industry, cultural rental service industry and other cultural auxiliary service industries, which are classified as weaker comprehensive industries. Most of these industries belong to the cultural and art service industry. They are characterized by large differences in industry factors or large gaps between factors and high-level industry factors. They are lagging behind in the evaluation and need to be strengthened in terms of development scale, profitability, and operational efficiency.

TABLE IV. Classification table of China's cultural service industry's competitiveness in different sectors.

Category	Cultural service industry
Class I	Internet information service industry, Advertising service industry, Cultural software service industry, Architectural design service industry
Class II	Publishing service industry, Radio and television service industry, Film and film recording service industry, Culture and art training service industry, Value-added telecommunication service industry, Radio and television transmission service industry, Professional design service industry, Scenic tour service industry, Photocopying service industry, Copyright service Industry, Exhibition service industry
Class III	News service industry, Literary and artistic creation and performance service industry, Cultural heritage protection service industry, Mass cultural service industry, Cultural research and community service industry, Other cultural and art service industry, Entertainment and leisure service industry, Cultural brokerage agency service industry, Cultural rental service Industry, Other cultural auxiliary services

V. SUGGESTIONS AND COUNTERMEASURES

In summary, China's cultural service industry has a large imbalance in its competitiveness. The scale of industry development, the level of production profitability, and the potential of industry development have not formed a convergence with industry competitiveness. To improve the overall competitiveness of China's cultural service industry, the following measures should be taken:

Firstly, enhancing the ability of service innovation and promoting the transformation and upgrading of the cultural service industry. Cultural service innovation is the “energy agent” for the development of cultural service industry, and also the “booster” for the transformation and upgrading of cultural service industry. There is a certain degree of administrative monopoly in the news service industry and cultural heritage protection service industry, and its traditional management system and profit model have been unable to meet the new requirements of economic development. These industries urgently need to carry out service innovation, fully develop their own cultural resources, rely on the “Internet +” platform to optimize the management system, innovate the profit model, and firmly grasp the consumer demand of the cultural service industry, and exert their efforts from the supply side to effectively improve the added value of the cultural service industry.

Secondly, optimizing the internal structure of the industry and promoting the coordinated development of various industries in the cultural service industry. The above analysis shows that there is a big difference between the development scale, production profitability, growth potential and operational efficiency of various industries in China's cultural service industry. Therefore, we should rationally arrange and coordinate the development process of its industry competitiveness, and adopt a targeted improvement strategy for the development of different industries. For industries with strong competitiveness, such as: Internet information service industry, advertising service industry, cultural software service industry, it should be regarded as a leading industry in the cultural service industry, focusing on development, and constantly accelerating the innovation of its main business and profit model. To further promote the development of other industries. For industries with a competitive ranking, we must work hard to make up our own development shortcomings and further enhance our competitiveness on the basis of giving full play to our comparative advantages. For industries with weak competitiveness, such as news service industry, literary and artistic creation and performance service industry, cultural heritage protection service industry, we should increase government financial support and policy inclination, tap the development potential of the industry, and concentrate resources to create superior products or services.

Thirdly, accelerating the cultivation and introduction of innovative professionals in the cultural service industry. High-quality innovative talents are an important condition for industrial transformation and development. We should vigorously rely on the cooperation of industry, university and research to cultivate innovative talents in the cultural service industry, establish a talent training base and a talent transfer mechanism, and effectively improve the knowledge level and professional quality of talents. At the same time, relevant government departments should actively introduce a series of talent introduction policies and establish corresponding talent incentive mechanisms to create favorable external conditions for absorbing and introducing talents from cutting-edge cultural service industries at home and abroad.

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