Research Article

Research on the Coupling and Coordinated Development of Sports Tourism and Cultural Industry under the Background of Artificial Intelligence Era

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In the new era of rapid development of intelligent information, sports tourism and cultural industry have become a new goal to improve China’s urban competitiveness and realize the development of urban industry. Based on the integration of sports tourism industry and cultural industry, this paper establishes the relevant information data interface mode. This paper constructs the information coupling system model of sports tourism industry and cultural industry under the background of artificial intelligence era and obtains the corresponding data results by using the invisible statistical logic computer independent judgment (IDIJA) method of artificial intelligence system under the condition of incomplete data. The application of the coordinated development system of coupling industry can realize the rapid development of sports tourism and cultural reconstruction mode and achieve the new effect of intelligent sports tourism cultural comprehensive experience. It can not only improve the people’s quality of life but also provide feasible suggestions for improving the continuous development of the coupling and coordination of sports tourism and cultural industry.

1. Introduction

In recent years, with the rapid development of China’s intelligent era, the integration of culture and sports tourism has become a new trend and model of the development of intelligent socioeconomic industry, as well as a new direction and new bright spot of comprehensive industrial economic development. Sports tourism is one of the important parts of sports industry and a special way of tourism in modern people’s tourism. The mutual penetration of sports industry and tourism has formed a new economic market, which belongs to the category of economic service industry. The purpose is to obtain social and economic income by providing relevant services for sports tourism activities of sports tourism. Cultural industry is a production activity that takes culture as the core content and is aimed at meeting people’s spiritual and cultural needs. Cultural industry is not only the inevitable product of the development of productive forces but also a special cultural form and economic form. It is one of the emerging industries formed by the gradual improvement of social and economic market and the improvement of production mode. Under the background of artificial intelligence, the integration of sports tourism and cultural industry stems from the improvement of educational and cultural level and the increase of sports tourism demand. It is a comprehensive symbiotic industry with more spiritual and entertainment based on the sports tourism industry with single original function. The new trend of the integration and development of the two industries directly promotes the coupling and coordinated development of tourism industry and cultural industry.

Wang said in his new thinking research in the era of artificial intelligence that big data and artificial intelligence in the era of intelligence have been closely integrated and pushed to the development direction of “intelligence” and “personalization” from different angles. New changes in the era of artificial intelligence actively adapt to the new environment of intelligence and build a new direction of
collaborative growth of intelligence [1]. In the research on the integrated development of urban tourism and sports tourism, Chen believes that based on the internal motivation of the industrial integration and integrated development of tourism and sports tourism, he puts forward the urban integration development strategy, including integrating the new cultural characteristics formed by resources, giving full play to the “Internet +” mode, and breaking the existing bottleneck of urban economic development, and provide new ideas for the integrated development of sports tourism [2]. Yulan and Keyin pointed out that the online business model of sports tourism should be activated from the aspects of market demand, reform and innovation, industrial integration, and so on; improve the management level of sports tourism; and improve the user experience effect of sports tourism consumers [3]. The integrated development of sports tourism and cultural industry has become the internal driving force for the development of China’s sports industry, and there are many aspects and factors in the actual integration process. In the research on the integrated development of sports tourism and cultural industry, Yao et al. pointed out that the new integrated development model with culture as the soul and sports tourism as the support carrier has become the inevitable trend of building the current economic development. The coupled and coordinated development of sports tourism and cultural industry presents a new situation of steady development year by year, so as to create a new consumption ecological system of “new consumption, new mode, and new business form” and drive a new driving force of social and economic growth [4]. Lei and Xiujuan analyzed the evaluation research on the coupled and coordinated development of sports tourism and cultural industry. It is said that the resource coupled and coordinated development of sports tourism and cultural industry is a practical problem to be solved in the process of academic and industrial economic development. Through the demonstration of the coupled and coordinated development, it is concluded that the degree of coupling and coordination between industries is still in the initial stage of coupling. However, it has a certain level of development and also puts forward targeted suggestions for improving the evaluation of the coupling and coordinated development of sports tourism and cultural industry [5].

Yi anf Yiying said in the exploration of urban organic renewal path guided by cultural rejuvenation that with the urbanization process entering the stock era, realizing urban high-quality development and building high-quality life have become the main goal of urban organic renewal. Under the guidance of building a park city, the urban construction mode has changed from simple space construction to complex scene construction. Cultural rejuvenation has become an important part of the organic renewal of the old urban area, comprehensively driving the industrial upgrading and vitality improvement of the area [6]. Zhenghen and Shuhan analyzed the innovation strategy of the deep integration of culture and science and technology in Chengdu. In their research, they believed that the deep integration of culture and science and technology can not only promote new business forms, stimulate new driving forces, and cultivate new engines of economic growth but also help to realize the transformation, upgrading, and innovative development of the cultural industry; promote the deep integration of culture and science and technology; and help the cultural industry achieve high-quality development [7].

2. Evaluation System for the Coupling and Coordinated Development of Sports Tourism and Cultural Industry under the Background of Artificial Intelligence Era

2.1. Logical Structure of Tourist Signature Code. Under the background of artificial intelligence era, sports tourism has changed from passive guidance mode to tourists’ active experience mode. Various tourism platforms and humanized tourism methods have also become the mainstream development direction, and network tourism information data has gradually become an important information feature source. According to the big data of tourists on the tourism platform and relevant data such as tourists’ relevant signature information, the coupling analysis of artificial intelligence (IDIJA) data results is carried out for tourists. The data analysis results can be used to directly extract relevant tourists’ signature codes from the big data of the platform and judge the information of key customers of the tourism platform. The evaluation results of the intelligent characteristic information data can provide a reference basis for better in-depth positioning and research of sports tourism in practice. Under the background of artificial intelligence, the tourist feature code of sports tourists can eliminate irrelevant or redundant feature information and improve the accuracy of platform tourist information. The logical architecture of tourist feature code extraction algorithm is shown in Figure 1:

In Figure 1, the logical structure of tourist feature code shows that the historical data of tourists visiting the scenic spot can be obtained from the API database of the tourism platform, and the feature code of tourists entering and leaving the scenic spot can be obtained. The data information of tourist feature code can be obtained through fuzzy neural network algorithm. It can also calculate the tourist signature information directly by fuzzy neural network through the historical data and frequency of scenic spots on the tourism platform.
2.2. Logic Architecture of Key Customer Judgment Algorithm.

In view of the travel platform system under the background of the intelligent era, the visit frequency and relevant characteristic codes of sports tourists in the scenic spot are analyzed by IDIJA data to judge the key customers of the scenic spot, as shown in Figure 2:

In Figure 2, the logical structure of key customer judgment algorithm shows that according to the feature code of the scenic spot and the feature code information data of tourists, the coupling degree result of information data is obtained after fuzzy neural network calculation and binarization, and the coupling degree result is binarized again to obtain the judgment information result of key customers on the tourism platform. The probability of recent visitors can also be obtained through fuzzy neural network calculation and binarization according to the results of visitors’ visit frequency and platform data coupling. The judgment information results of key customers can be obtained by binarization of recent visitors’ probability again.

2.3. Statistical Methods. Using fuzzy neural network to control the recent change law of time series data, or using the minimum number of nodes to realize fuzzy convolution of data, it is necessary to use the sixth-order polynomial depth iterative regression basis function expression, and the formula of the sixth-order polynomial depth iterative regression fuzzy neural network is as follows:

\[ y = \sum_{i=1}^{n} \sum_{j=0}^{5} A_j x_i^j. \]  

Among them, \( A_j \) is the coefficient to be regressed of the \( j \)-order polynomial; that is, each node in the formula contains 6 coefficients to be regressed from \( A_0 \) to \( A_5 \); \( j \) is the polynomial order; \( n \) is the number of nodes of the upper neural network.

The binarization formula is shown in

\[ y = \sum_{i=1}^{n} \frac{1}{A + Be^{e_i}}. \]  

Among them, \( e \) is the natural constant. Other mathematical symbols have the same meaning as formula (1).

The statistical significance of the binarization function is to make the projection points of all results fully shift towards both ends in the [0,1] interval without changing the sequence order, so as to obtain the binarization and fully logical results. The neural network model can judge the convergence degree of neural network training.

3. Coupling Characteristics of Sports Tourism and Cultural Industry in the Intelligent Era

The core feature of the coupled development of sports tourism and cultural industry under the background of intelligent era is the mutual penetration, intersection, and reorganization of new industrial chain. The coupled new industry has more economic value and competitive advantage than the original single industry. According to the nature and function of industrial coupling resources, the new industry promotes the coordinated development of the mutual integration of culture and sports tourism and promotes the process of the integration of the new industry.

Figure 3 shows the coupling relationship of new industries. The cultural industry, sports industry, and tourism industries are closely related and traction each other in space, and the industrial elements play a driving role. The higher the mutual resource utilization rate of the coupled new industries, the more market value and economic benefits will be obtained.

4. Effect of Coordinated Development after Industrial Coupling

4.1. Effective Communication Rate of Tourism Platform. In the research on the coupling and coordinated development of sports tourism and cultural industry in the era of artificial intelligence, relying on the Internet system, intelligent technical means such as artificial intelligence and information big data are used to optimize the allocation and upgrading of resources for the coupled new industry, to open a new mode of deep integration of offline experience, online services, and resource values of various sports tourism industries. In order to analyze the evaluation of coordinated development after
industrial coupling, Beijing sports tourism industry and Hainan sports tourism industry are selected to compare the effective communication rate effect of tourism platforms before and after coupling in practical application under the same number of tourism platforms, as shown in Table 1:

In Table 1, it is obvious that there are obvious differences between the selected Beijing sports tourism industry and Hainan sports tourism industry before and after coupling. The effective communication rate of the new industry after coupling on the tourism platform is better than that before coupling, and the \( t \) value < 10.000 and \( P \) value < 0.05. It is considered that there is statistical significance between the two, and the comparison results are statistically significant.

In the evaluation of the coupling and coordinated development of sports tourism and cultural industry, according to the coupling analysis of artificial intelligence (IDIJA) data results in the evaluation system, it can not only extract different tourist feature codes and key customer information results of the tourism platform from big data to accurately locate the platform tourists and judge the relevant characteristic behaviors, but also in the investigation and evaluation of the effective communication rate and customer satisfaction of the big data tourism platform, it is believed that the coupled new industry can accelerate the effective integration of sports tourism industry and cultural industry, and can effectively promote the coupled development of the industry.

### Table 1: Comparison before and after cultural tourism industry coupling.

| Group                        | \( n \) | Before coupling | After coupling |
|------------------------------|--------|----------------|----------------|
| Beijing sports tourism industry | 12    | 48.5 ± 4.5     | 67.2 ± 2.3     |
| Hainan sports tourism industry | 12    | 50.3 ± 4.1     | 63.8 ± 2.4     |
| \( t \) value               | 8.579  | 9.134          |
| \( P \) value               | 0.009  | 0.008          |

The method of arithmetic mean and standard deviation rate is adopted, as shown in the following formula:

\[
\sigma = \frac{1}{n-1} \sqrt{\sum_{i=1}^{n} (x_i - \mu)^2}, \quad \mu = \frac{1}{n} \sum_{i=1}^{n} x_i, \quad (3)
\]

Among them, \( \sigma \) is the calculation result of the standard deviation rate of input sequence \( x \); \( n \) is the number of elements of the input sequence \( x \); \( x_i \) is the \( i \) input value of the input sequence \( x \); and \( \mu \) is the arithmetic mean of the input sequence \( x \).

Results of the bivariate \( t \)-check under SPSS are shown in the following formula:

\[
t = \frac{\mu_1 - \mu_2}{\sqrt{(\frac{(n_1 - 1)\sigma^2_1 + (n_2 - 1)\sigma^2_2}{n_1 - 1})\sigma^2_1 + (n_2 - 1)\sigma^2_2/((n_1 + n_2 - 2)n_1 + n_2 - 2)\times((1/n_1) + (1/n_2))}} \quad (4)
\]
Among them, $\mu_1\mu_2$ is the arithmetic mean of the two compared series, $n_1n_2$ is the number of elements of the two compared sequences, $\sigma_1\sigma_2$ is the standard deviation rate of two compared series (see formula (4) for details); and $t$ is the bivariate $t$ verification result.

Visual comparison is made before and after the coupling of the Beijing sports tourism industry and Hainan sports tourism industry, as shown in Figure 4.

In Figure 4, in the visualization of sports tourism industry in Beijing and Hainan, the effect after coupling has an obvious growth trend than that before coupling, which shows that the coupling and coordination of sports tourism and cultural industry under the background of artificial intelligence era are an effective way for the development of industrial economy, improve the market value of sports tourism industry, and further meet the diversified needs of customers.

### 4.2. Customer Satisfaction Survey

In order to better understand the evaluation effect of the coupling and coordinated development of sports tourism and cultural industry under the background of artificial intelligence era, some customers were selected from the travel platform integrated into the new industry for satisfaction survey, as shown in Table 2.

In Table 2, in the survey of customer satisfaction with the travel platform in the intelligent era, it can be seen that in the process of customers’ experience of the coupled new sports tourism industry, the overall satisfaction with the service level, service attitude, problem handling, cost economy, and security of the online travel platform is better. It proves the feasibility of the evaluation of the coupling and coordinated development of sports tourism and cultural industry under the background of artificial intelligence and can improve the satisfaction of tourists.

### 5. Discussion

Due to the rapid development of the national economy, people’s consumption level is growing, and diversified and personalized sports tourism projects are also emerging, showing an upward trend. Under the background of this intelligent era, the coupling of cultural industry and sports tourism is also an inevitable trend of industrial economic development.
Cultural industry is an industry with economic prospects, while sports tourism industry is a related leisure and entertainment industry. The former can meet the needs of tourists’ spiritual culture, while the latter brings tourists tactile and visual practical experience. The coupling and coordinated development of sports tourism and cultural industry, on the basis of industrial integration, broke the traditional management mode of the respective development of single industries in the past; innovated the management mode of new industries after coupling; made the cultural and sports tourism industries drive each other, tolerate each other, and share resources in the industrial coupling; and built a good new industrial mutual help and mutual assistance management mechanism. In the evaluation of the coupled and coordinated development of sports tourism and cultural industry, according to the coupling analysis of artificial intelligence (IDJIA) data results in the evaluation system, the relevant tourist feature codes can be extracted from the big data and the key customer information of the tourism platform can be judged. The results can accurately locate the platform tourists and judge the relevant characteristic behaviors. In the survey and evaluation of the effective communication rate of big data tourism platform and customer satisfaction, it is considered that the coupled new industry can accelerate the effective integration of sports tourism industry and cultural industry and can effectively promote the coupling and interaction of the industry. Although the coupling degree is still in the embryonic development stage, which restricts the rapid development of the integrated industry, it needs to continue to innovate and reform the mechanism, break the existing unfavorable development situation, realize the coupling and interaction between cultural industry and sports tourism industry, and vigorously promote the sustainable development of China’s economy.

6. Summary

In the era of artificial intelligence, high-tech network technology is used to deeply develop the sports tourism industry, so that people can enhance their personal experience of the sports tourism platform; deeply integrate the sports tourism industry with network big data, artificial intelligence, and cultural industry on the basis of traditional industries; and focus on tourists to realize the optimal upgrading and allocation of sports tourism resources. This study evaluates the coupling and coordinated development of sports tourism and cultural industry under the background of artificial intelligence. Based on the integrated development of sports tourism industry and cultural industry, this paper establishes the information data interface mode of tourism platform, establishes the coupling technology mode of intelligent information technology, analyzes it, and judges the required tourism platform data results. The results show that the application of this coupling technology can systematically evaluate the effect of the new industry after the integration of sports tourism and cultural industry and improve the intelligent level of sports tourism in all aspects. The deep integration of sports tourism industry has become a new driving force for the high-quality economic development of China in the new era and a new change in people’s lifestyle, life attitude, and spiritual culture. It marks that the integrated development of China’s sports culture industry and tourism industry has entered a new stage and also provides new ideas for the development of urban industry.

Data Availability

The data underlying the results presented in the study are available within the manuscript.

Conflicts of Interest

There is no potential conflict of interest in our paper.

Authors’ Contributions

All authors have seen the manuscript and approved to submit to your journal.

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