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## China sports industrial structure development status and influence factor analysis based on AHP

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### ABSTRACT

With development of science and technology, China sports have gradually taken the path to industrial development, sports industry began to be brought into national economic development system. Adopt AHP hierarchical analysis; it explores China sports industrial structure correlation problems. According to sports industry each element department primary and secondary differences, it divides sports industry into three large kinds, sports class one industry is sports goods and building; Sports class two industry is commercial sports; sports class three industry is leisure sports. For China sports industry's industrial structure that are industry structure, product structure, employment structure and consumption structure as well as other problems, it makes analysis through establishing analytic hierarchy process model. Research result is that according to received weight, sports goods and building weight is 0.29, commercial sports weight is 0.157, leisure sports weight is 0.553, therefore leisure sports has the maximum contribution to sports industry, while to leisure sports, it includes sports lottery industry, sports tourism and so on.

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### KEYWORDS

Sports Industry;  
Analytic Hierarchy Process;  
Structure upgrading;  
Leisure Sports;  
Sports tourism.

### INTRODUCTION

Sports industry development becomes more and more prosperous, from which it includes sports material industry and spiritual industry, as one part of national economy, sports industry puts more emphasis on market efficiency. But different from other industries, sports industry has features as improving residents' quality, developing social productive forces, realizing individual and nation integrated development.

In America, Brazil and other sports developed countries, sports industry has been rapidly developed, and sports industry has become domestic mainstay indus-

try. In 1980s, American sports industry ranked 22 in national industry gross output, in 90<sup>th</sup>, gross product arrived at more than 300 billion. Since this century, global sports industry gross product has been rapidly increasing with the proportion of 20% per year. Canada, Britain and other developed countries, as well as North America, Europe and other most countries, sports industry gross product has already arrived at more than 1% of GDP. Since reform and opening-up, with China economic strength constantly improving, sports industry has also gradually been developed. China sports industry gross product was 300billion RMB and accounted for 0.7% of whole nation GDP five years ago,

FULL PAPER

while at this time American proportion was more than 7%. By comparing, China sports industry's proportion of GDP still has huge gap with regard to developed countries, development potentials are still large.

Through more than decades rapidly development process, China sports industry has accumulated many experiences. However, due to historical reasons, China sports industry started late, development was extremely uneven, there was a relative large gap existing between China and western developed countries, the gap not only constrained China sports industrial development, but also constrained China economical overall development. Therefore, seriously summary sports industrial development process experiences, puts forward corresponding problems' solution strategy and method that have important theoretical and practical significances to sports industry sound development.

**SPORTS INDUSTRIAL ANALYSIS AHP MODEL ESTABLISHMENT**

**Establish hierarchical structure**

Establish objective layer, criterion layer and project layer relationships. As Figure 1 show.

Object layer: Leading sports industry.

Criterion layer: Project influence factors,  $c_1$  is the sports industry employment figure,  $c_2$  is the sports industry influences on economy,  $c_3$  is the industry possessed amount of resources,  $c_5$  is the sports industry relational policies' perfection level.

Project layer:  $A_1$  sports goods and building,  $A_2$  Commercial sports,  $A_3$  Leisure sports.

**Weight analysis**

**Employment structure**

So-called employment structure refers to a comparable element that formed by labor force and industry two aspects elements combination. Global economic development history shows that labor force as a resource has similarity to capita, which industry labor forces flow into, it will get better development. Industry without sufficient labor forces, its development will get certain constraints. But labor forces has differences on

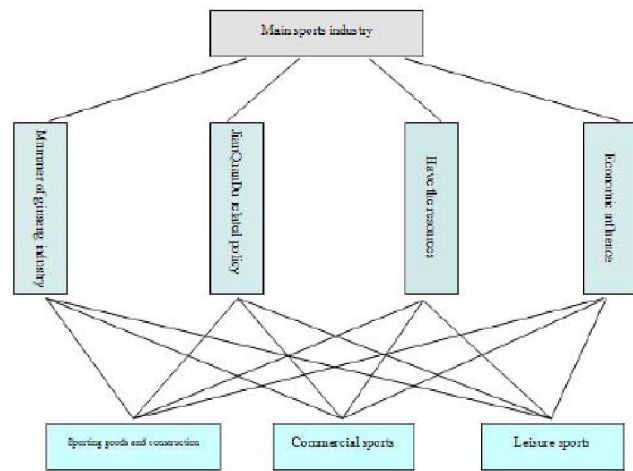
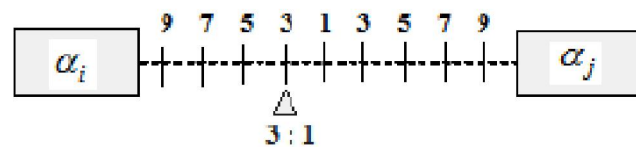


Figure 1: Hierarchical structure



$$a_{ij} = 3, a_{ji} = \frac{1}{3}$$

Figure 2 : 1-9 scale Figure

the aspects of quality and quantity, while also in structural layers, as a kind of high plasticity essential productive factor labor forces' differences in quantity and quality will generate different influences on industry forming and developing.

Due to imbalanced world development, sports industrial development status has also distinctions, different sports industrial levels reflect different labor changes. Labor forces changes, especially structure and flowing changes, has important influences on sports industrial structure adjustment and change tendency.

Employment ability that brought by sports industry has a profound connection with China labor forces structure. On a whole, China labor forces have special structural features that are oversupplying, high employment rate, low production efficiency and poor labor quality.

**Sports products**

In sports products, the most universal, basic layer is industrial structure, from each kind of economic resources (material resources, talents resources and so on) condensation, its structural changes function as a structure change in sports industry practical status. Sports goods structure changes' elements changes finally are generated by sports industrial structure change

and transformation, and it is also the result of sports goods' quality, kinds, scale and other structure changes, so sports industrial development tendency and industrial structure changes start point and breakthrough are up to sports goods structures rationality.

Sports goods structure exists distinction between visible structure and invisible structure, they are classified according to products' material forms, from which expressed by sports labor is invisible product structure. If it expressed mainly by sports goods physical form, it is visible product structure, most are sports aspect audio-visual publish and others provided visible sports goods, building industry, goods manufacturing industry and so on.

At this stage, China visible sports goods basically can meet market demands, for invisible sports goods that sports labor, it can be divided into two kinds, one kind is participant sports labor product, the other is ornamental sports labor product. The two kinds of labor have their own features by comparing, invisible sports product's sports labor product participating producers are sport stadium service industry, sports fitness recreational industry, sports rehabilitation health care industry and so on.

At present, nation puts different emphasizes on

participating sports labor product each department sports aspect, due to national favor policies in these aspects are not so high, and investment is not big, it let large scale product not yet produced, therefore, participating sports labor products have not met market demands in China.

**Sports building**

By far, China has more than 0.6 million sports fields, average possession is relative too fewer, and indoors, outdoors fields types distribution is not reasonable, facilities are not intact, indoor sports swimming pools, indoor tennis fields, indoor shooting ranges and others are only over 20 thousands, which are obviously less than outdoor fields. From the perspective of recently 20 years' China sports fields' new construction status (as TABLE 1 shows), new constructed each kind of sports field total amount is still too fewer, only 6679, it primarily cannot meet people increasing demands on sports fields. Many new constructed stadiums are limited in single traditional sports events, which are not fit for newly-developed sports events organization. China sports stadiums servers' demand exceeds the supply. While in foreign countries, it is very popular for people to take regular sports training in public sports clubs, by comparing, China is still in downturn state.

**TABLE 1 : Recently 20 years' China sports fields' new constructions**

| Year | Total | Sports fields | Sports stadiums | Swimming Pools | Indoor swimming pool | With fixed bleachers |
|------|-------|---------------|-----------------|----------------|----------------------|----------------------|
| 1980 | 709   | 10            | 9               | /              | 44                   | 96                   |
| 1985 | 700   | 47            | 29              | 1              | 135                  | 137                  |
| 1990 | 3691  | 27            | 34              | 4              | 105                  | 60                   |
| 1995 | 1007  | 36            | 37              | 1              | 80                   | 43                   |
| 1999 | 572   | 6             | 24              | /              | 15                   | 14                   |

**TABLE 2 : 1-9 Scale table**

| Scale $a_{ij}$ | Definition  |
|----------------|---|
| 1              | factor i and factor j have equal importance   |
| 3              | factor i is slightly more important than factor j   |
| 5              | factor i is relative more important than factor j   |
| 7              | factor i is extremely more important than factor j  |
| 9              | factor i is absolute more important than factor j   |
| 2, 4, 6, 8     | Indicates middle state corresponding scale value of above judgments                             |
| Reciprocal     | If compare factor i with factor j, it gets judgment value as $a_{ji} = 1/a_{ij}$ , $a_{ii} = 1$ |

FULL PAPER

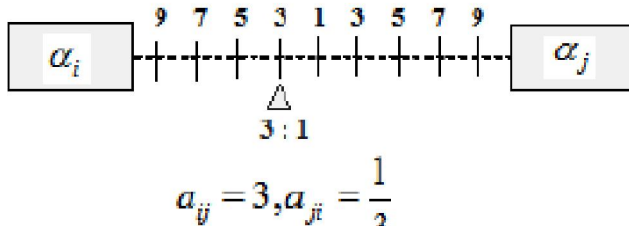


Figure 2 : 1-9 scale Figure

Construct judge (paired comparison) matrix

Judgment matrix refers to: Describe every layer each element relative import degree to its previous layer element in the form of matrix. Concrete index degree can refer to TABLE 2.

Refer to Figure 2 scale Figure from 1 to 9.

At first, solve judgment matrix, according to above principle, reference 1-9 scale setting, and according to experts' experiences and refer to lots of documents, it gets paired comparison matrix under 4 criterions that are respective as TABLE 3 to TABLE 7.

Hierarchical single arrangement and consistency test

Use consistency indicator to test:  $CI = \frac{\lambda_{max} - n}{n - 1}$ . From

TABLE 3 : G comparison matrix

| G              | c <sub>1</sub> | c <sub>2</sub> | c <sub>3</sub> | c <sub>4</sub> |
|----------------|----------------|----------------|----------------|----------------|
| c <sub>1</sub> | 1              | 8              | 5              | 3              |
| c <sub>2</sub> | 1/8            | 1              | 1/2            | 1/6            |
| c <sub>3</sub> | 1/5            | 2              | 1              | 1/3            |
| c <sub>4</sub> | 1/3            | 6              | 3              | 1              |

TABLE 4 : c<sub>1</sub> comparison matrix

| c <sub>1</sub> | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> |
|----------------|----------------|----------------|----------------|
| A <sub>1</sub> | 1              | 5              | 1/5            |
| A <sub>2</sub> | 1/5            | 1              | 1/5            |
| A <sub>3</sub> | 5              | 5              | 1              |

TABLE 5 : c<sub>2</sub> comparison matrix

| c <sub>2</sub> | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> |
|----------------|----------------|----------------|----------------|
| A <sub>1</sub> | 1              | 3              | 3              |
| A <sub>2</sub> | 1/3            | 1              | 3              |
| A <sub>3</sub> | 1/3            | 1/3            | 1              |

TABLE 6 : c<sub>3</sub> comparison matrix

| c <sub>3</sub> | A <sub>1</sub> | A <sub>2</sub> | A <sub>3</sub> |
|----------------|----------------|----------------|----------------|
| A <sub>1</sub> | 1              | 5              | 3              |
| A <sub>2</sub> | 1/5            | 1              | 3              |
| A <sub>3</sub> | 1/3            | 1/3            | 1              |

which  $\lambda_{max}$  is comparison matrix maximum feature root, n is comparison matrix order. CI Value gets smaller; judgment matrix gets closer to completely consistent. On the contrary, judgment matrix deviation degree from completely consistent would become larger.

Hierarchy total sorting and its consistency test

$$A = \begin{pmatrix} 1 & 8 & 5 & 3 \\ 1/8 & 1 & 1/2 & 1/6 \\ 1/5 & 2 & 1 & 1/3 \\ 1/3 & 6 & 3 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{Column vector normalization}} \begin{pmatrix} 0.603 & 0.470 & 0.526 & 0.667 \\ 0.075 & 0.059 & 0.053 & 0.037 \\ 0.121 & 0.118 & 0.105 & 0.074 \\ 0.201 & 0.353 & 0.316 & 0.222 \end{pmatrix}$$

$$\xrightarrow{\text{According to the row sum}} \begin{pmatrix} 2.266 \\ 0.224 \\ 0.418 \\ 1.092 \end{pmatrix}$$

$$\xrightarrow{\text{Normalized}} \begin{pmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{pmatrix} = W^{(0)}$$

$$AW^{(0)} = \begin{pmatrix} 1 & 8 & 5 & 5 \\ 1/8 & 1 & 1/2 & 1/6 \\ 1/5 & 2 & 1 & 1/3 \\ 1/3 & 6 & 3 & 1 \end{pmatrix} \begin{pmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{pmatrix} = \begin{pmatrix} 2.554 \\ 0.225 \\ 0.422 \\ 1.110 \end{pmatrix}$$

TABLE 7 :  $c_4$  comparison matrix

|       |       |       |       |
|-------|-------|-------|-------|
| $c_4$ | $A_1$ | $A_2$ | $A_3$ |
| $A_1$ | 1     | 1/5   | 1/8   |
| $A_2$ | 5     | 1     | 1/3   |
| $A_3$ | 8     | 3     | 1     |

TABLE 8 : RI value

|    |   |   |      |      |      |      |      |      |      |      |      |
|----|---|---|------|------|------|------|------|------|------|------|------|
| n  | 1 | 2 | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   | 11   |
| RI | 0 | 0 | 0.58 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 | 1.51 |

$$\lambda_{\max}^{(3)} = 3.30, \omega_3^{(1)} = \begin{cases} 0.624 \\ 0.240 \\ 0.136 \end{cases}$$

$$\lambda_{\max}^{(4)} = 4.05, \omega_4^{(1)} = \begin{cases} 0.185 \\ 0.240 \\ 0.575 \end{cases}$$

Use consistency indicator to test:  $CI = \frac{\lambda_{\max} - n}{n - 1}$ ,  $CR = \frac{CI}{RI}$

(1) For judgment matrix  $A$ ,  $\lambda_{\max}^{(0)} = 4.073, RI = 0.9$

$$CI = \frac{4.073 - 4}{4 - 1} = 0.24$$

$$CR = \frac{CI}{RI} = \frac{0.024}{0.90} = 0.027 < 0.1$$

It shows A inconsistency degree within permissible range, at this time it can use A feature vector to replace weight vector.

(2) Similarly, to judgment matrix  $B_1, B_2, B_3, B_4$ , all passed consistency test by using above principle. Utilize hierarchical chart drawing out calculation results from object layer to project layer, as Figure 3:

Calculation structure as following:

$$\omega^{(1)} = (\omega_1^{(1)}, \omega_2^{(1)}, \omega_3^{(1)}, \omega_4^{(1)}) = \begin{cases} 0.624 & 0.185 & 0.252 & 0.575 \\ 0.234 & 0.240 & 0.089 & 0.286 \\ 0.136 & 0.575 & 0.66 & 0.139 \end{cases}$$

$$w = w^{(1)}w^{(0)} = \begin{cases} 0.252 & 0.575 & 0.624 & 0.185 \\ 0.089 & 0.286 & 0.240 & 0.240 \\ 0.66 & 0.139 & 0.136 & 0.575 \end{cases} \begin{cases} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{cases} = \begin{cases} 0.290 \\ 0.157 \\ 0.553 \end{cases}$$

According to received weight, sports buildings and goods weight is 0.29, commercial sports weight is 0.157, leisure sports weight is 0.553, therefore leisure sports has the maximum contribution to sports industry, while to leisure sports, it includes sports lottery industry, sports tourism and so on.

ANALYSIS AND DISCUSSION

Increase formal institutions innovation, provide

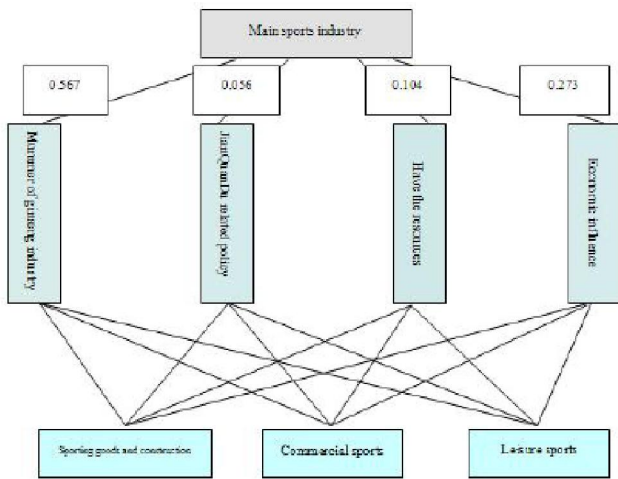


Figure 3 : Hierarchical chart

$$\lambda_{\max}^{(0)} = \frac{1}{4} \left( \frac{2.354}{0.567} + \frac{0.225}{0.056} + \frac{0.422}{0.104} + \frac{1.110}{0.273} \right) = 4.073$$

$$w^{(0)} = \begin{pmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{pmatrix}$$

Similarly, it can calculate judgment matrix

$$B_1 = \begin{pmatrix} 1 & 5 & 1/5 \\ 1/5 & 1 & 1/5 \\ 5 & 5 & 1 \end{pmatrix}, B_2 = \begin{pmatrix} 1 & 3 & 3 \\ 1/3 & 1 & 3 \\ 1/3 & 1/3 & 1 \end{pmatrix}, B_3 = \begin{pmatrix} 1 & 5 & 3 \\ 1/5 & 1 & 3 \\ 1/3 & 1/3 & 1 \end{pmatrix}, B_4 = \begin{pmatrix} 1 & 1/5 & 1/8 \\ 5 & 1 & 1/3 \\ 8 & 3 & 1 \end{pmatrix}$$

Corresponding maximum feature value and feature vector in successive are:

$$\lambda_{\max}^{(1)} = 3.31, \omega_1^{(1)} = \begin{cases} 0.252 \\ 0.089 \\ 0.66 \end{cases}$$

$$\lambda_{\max}^{(2)} = 3.12, \omega_2^{(1)} = \begin{cases} 0.575 \\ 0.286 \\ 0.139 \end{cases}$$



## FULL PAPER

### powerful guarantee for sports industrial structure upgrading

Speed up structural reform, provide conditions for sports industrial structure optimization, it should be implemented from several aspects. At first it should standardize government regulation, eliminate drawbacks of integration of management with handling as well as government administration with enterprise.

In China, sports are developed by regarding as public good programs for a long-term, ignore its industrial function. Developed countries' sports industrial development status shows that sports functions are not only strengthening people's physical quality, the more important is to create economic values. However, China sports industry economic values always have not been better exploited, which has great relationships with its current management system.

### Reference developed countries' advanced experience

Developed countries have features as earlier starting, big scales and others in sports industry, developed countries experiences show that advanced management mode is the basis to sports industrial structure optimization and upgrading; from perspective of present situation, China sports industrial management model exist lots of drawbacks, industrial management system is not perfect. Therefore, it is in urgent need of referencing some advanced experience industries to develop its own sports industry. Developed countries have long-term accumulation in sports industry development concept, management system, policies and regulations, investment mechanism; therefore, developed countries experience is of guiding significance to perfect China sports industry management mode and development direction.

### Improve independent innovation capability

In today's world, science contribution rate to economic growth is constantly increasing; it becomes endogenous variable in economic growth. Developed countries apply science and technology to melt scientific elements into sports construction. It can be thought that sports industrial scientific levels is one of important criterions to measure one country sports industrial development level, and is also main factors to promote industrial structure evolution. But China sports indus-

trial science and technology independent innovative capacity is still lower by comparing with developed country. But it is just for the sake of China. Sports industry available independent innovative capacity is still lower.

With increasingly fierce competition, strengthen independent innovative capacity and cultivate self-owned brand are the fundamental way to promote China sports industrial competitive advantages. Combine innovation with sports industry, improve independent innovative capacity, and speed up construct Enterprise-led, market oriented technology innovation system through amalgamation of industry, education, and research. And absorb global innovative resources and latest achievement through multiple channels; strive for sports industrial international new competitive advantage.

## CONCLUSIONS

Sports industrial structural change affected fundamental elements include national economy development level, natural resources, population structure, demand elasticity and supply elasticity, national policy and law effects, inter industries' mutual driving. Sports industry is a newly-developed industry, its healthy and fast development; it plays important roles in expanding China sports consumption and increasing domestic demands, propelling national economic progress as well as socialist spiritual civilization. Multiple factors restricted sports industrial coordinate development. Therefore, we should fully recognize that sports industry is potentially sunrise industry; it has important contributions to national economy development. China sports industry that during early market economy construction stage, though troubling with lots of unprecedented new problems in the economy tide, the trouble can breed new life. Only seize opportunity, timely make sports industrial development strategic planning, speed up sports market mechanism and competitive mechanism reform pace, sports industry will surely get remarkable good result and economic efficiency.

## REFERENCES

- [1] Chen Lin-xiang; Study on Sports Industrial Structure and Industrial Distribution Policy Selection in

- China[J]. *China Sport Science*, **27(3)**, 75-82 (2007).
- [2] Liu Yuan-xiang; Analysis of Governmental Behavior to Optimize the Structure of Our Sports Industry[J]. *Journal of Chengdu Physical Education Institute*, **34(4)**, 24-28 (2008).
- [3] Du Chang-liang, Wu Guang-liang, XIE Yun; Speculations on Development of Sports Industry and Government Intervention[J]. *Journal of Capital College of Physical Education*, **21(1)**, (2009).
- [4] Zheng Zhi-qiang; Overview of researches on sports industrial policies of China[J]. *Journal of Physical Education*, **17(6)**, (2010).
- [5] Qin Li-ping, Yu Wen-bin; On Economic Value of Leisure Industry of Sports[J]. *Productivity Research*, **23**, (2008).
- [6] Cheng She-lig; A Research on the Integration and Coordinated Development Model of Sports Leisure Market in Yangtze River Delta[J]. *Journal of Beijing Sport University*, **5**, (2010).
- [7] Tan Guang-xin, Liu Yan-wu; Government organizationps choice of sports leading industry[J]. *Journal of Wuhan Institute of Physical Education*, **41(1)**, 15-18 (2007).
- [8] Yang Qiang; Problems existing in the development of the sport industry in China and their solutions[J]. *Journal of Physical Education*, **4**, 30-38 (2012).
- [9] Zhu Han-yi; Practical Selection of Sport Industry Structure from the Sport Consumption in China[J]. *China Sport Science and Technology*, **42(3)**, 14-16 (2006).