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# Chinese new pattern urbanization process medium and small towns sports industrial development strategy research

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## ABSTRACT

With the deepening of Chinese new pattern urbanization, it also plays leading roles in small towns sport industrial development, but due to gap exists between cities and countryside, because of urban and rural economic development imbalance, small towns' sports industrial development needs to be more concerned and input. The paper utilizes analytic hierarchy process obtained weights, from which sports goods and construction industry are 0.29, commercial sports' is 0.157, leisure sports' is 0.553, therefore leisure sports have biggest contributions to sports industry, and to leisure sports, it includes sports lottery, sports tourism and so on.

## KEYWORDS

New pattern urbanization; Analytic hierarchy process; Sports industry.



## INTRODUCTION

By analyzing, it is clear that Chinese present small towns sports development status is that small towns' fitness facilities are little, small towns residents fitness awareness is relative weak, Chinese management mode on small towns' fitness is to be improved. Therefore, with respect to the above problems, we can adopt optimize small towns consumption level; enlarge small towns sports awareness strengthening and other ways. The paper utilizes analytic hierarchy process to make quantitative and qualitative researches, and makes quantization on decision-makers experiences. Obtained results have stronger correlations, and consider numerous factors to analyze.

## MODEL ESTABLISHMENT

### Establish hierarchical structure

Establish target layer, criterion layer, scheme layer relations.

Target layer: The main sports industry in small towns.

Criterion layer: Scheme influence factors, $c_1$ is the sports industry's number of employees、$c_2$ is the sports industry's influence on the economy、$c_3$ is the industry owned amount of resources、$c_5$ is the sports industry's soundness of relevant policies.

Scheme layer: $A_1$ Sports goods and construction 、$A_2$ commercial sports、$A_3$ leisure sports

As Figure 1 show

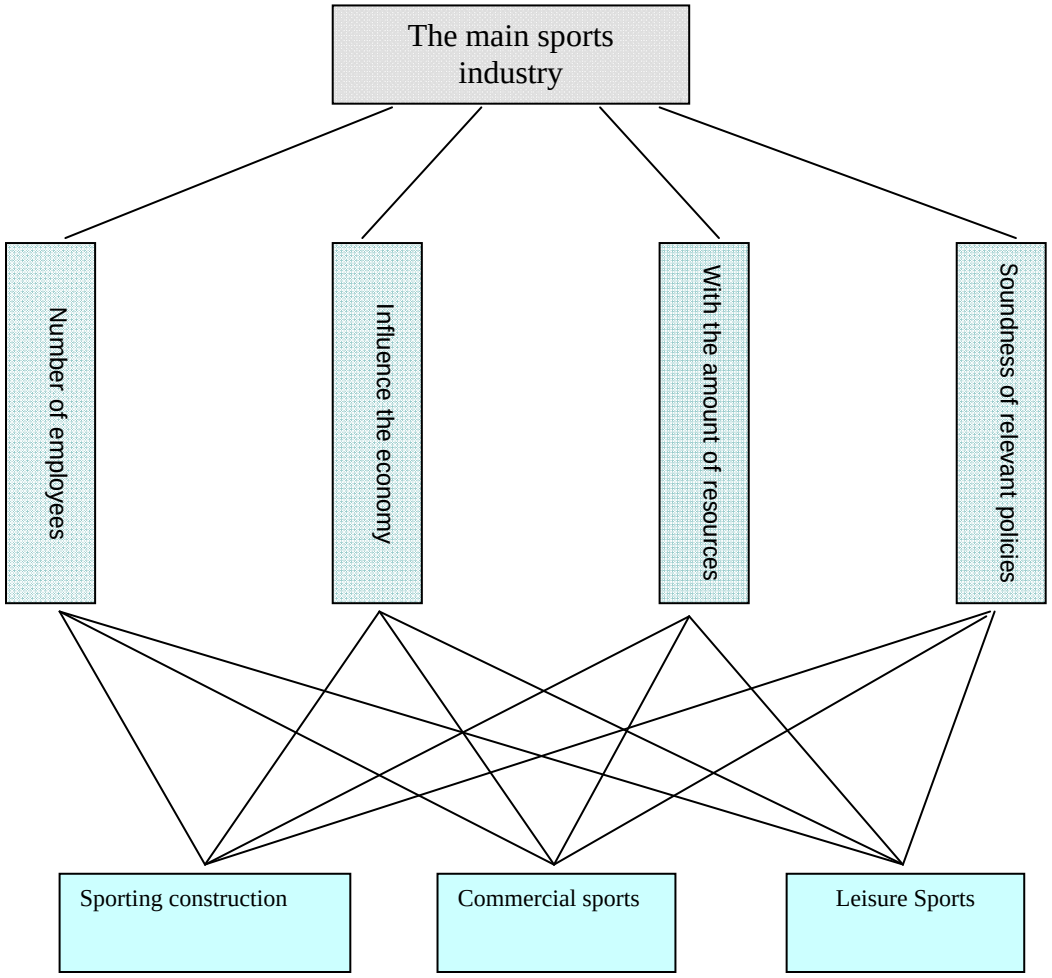

**Figure 1 : Hierarchical structure**

**TABLE 1: Recent twenty years' Chinese sports venues new construction**

| Year | Total | Stadium | Gym | Swimming center | Indoors and outdoors swimming pools | 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 |

By TABLE 1, it is clear that for Chinese sports venues construction, Chinese sports venues construction are decreasing by year, on one hand, it can show Chinese sports facilities perfection, on the other hand, though Chinese sports facilities are perfect, with respect to small towns sports industry, sports venues construction still have more space to be improved.

**Construct each layer judgment matrix**

In criterion layer, each criterion target occupies different proportions, by researchers researching on criterion layer, and according to number 1~9 and its reciprocal to judge each criterion target occupied weights.

The paper takes TABLE 2 showed 1~9 scale table as evidence, it makes weight analysis.

**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 factor i and factor j are relative weak, obtained judgment is reciprocal |

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 that are respective as TABLE 3-7.

Among them, TABLE 3 is target layer and criterion layer comparison matrix, TABLE 4-7 are criterion layer and scheme layer's comparison matrixes.

**TABLE 3 : Comparison matrix**

| G | $C_1$ | $C_2$ | $C_3$ | $C_4$ |
|---|---|---|---|---|
| $C_1$ | 1 | 1/5 | 3 | 3 |
| $C_2$ | 5 | 1 | 8 | 7 |

| | | | | |
|---|---|---|---|---|
| $c_3$ | 1/3 | 1/8 | 1 | 1 |
| $c_4$ | 1/3 | 7 | 1 | 1 |

**TABLE 4 : Comparison matrix**

| $c_1$ | $A_1$ | $A_2$ | $A_3$ |
|---|---|---|---|
| $A_1$ | 1 | 1 | 1/5 |
| $A_2$ | 1 | 1 | 1/8 |
| $A_3$ | 5 | 8 | 1 |

**TABLE 5 : Comparison matrix**

| $c_2$ | $A_1$ | $A_2$ | $A_3$ |
|---|---|---|---|
| $A_1$ | 1 | 8 | 7 |
| $A_2$ | 1/8 | 1 | 5 |
| $A_3$ | 1/7 | 1/5 | 1 |

**TABLE 6 : Comparison matrix**

| $c_3$ | $A_1$ | $A_2$ | $A_3$ |
|---|---|---|---|
| $A_1$ | 1 | 8 | 6 |
| $A_2$ | 1/8 | 1 | 5 |
| $A_3$ | 1/6 | 1/5 | 1 |

**TABLE 7 : Comparison matrix**

| $c_4$ | $A_1$ | $A_2$ | $A_3$ |
|---|---|---|---|
| $A_1$ | 1 | 2 | 7 |
| $A_2$ | 1/2 | 1 | 5 |
| $A_3$ | 1/7 | 1/5 | 1 |

From above TABLE 3 to TABLE 7, it can get each factor weight comparison value.

**Solve hierarchical single arrangement and its consistency test**

The paper uses consistency indicator to test:

The paper assumes that in comparison matrix, $\lambda_{\max}$ is maximum feature value, n is comparison matrix order, it can get

$$CI = \frac{\lambda_{\max} - n}{n-1}$$

By formula it can get that $CI$ value gets smaller; Judgment matrix gets closer to completely consistent. $CI$ gets bigger, it shows that known degree is lower.

## SOLVE HIERARCHICAL TOTAL ARRANGEMENT AND ITS CONSISTENCY TEST

Use matrix A to carry on a series of computation, and get:

$$A=\begin{Bmatrix} 1 & 1/3 & 3 & 3 \\ 3 & 1 & 5 & 5 \\ 1/3 & 1/5 & 1 & 1 \\ 1/3 & 1/5 & 1 & 1 \end{Bmatrix}$$

$$\xrightarrow{\text{Column vector normalization}} \begin{Bmatrix} 0.214 & 0.192 & 0.3 & 0.3 \\ 0.075 & 0.577 & 0.5 & 0.5 \\ 0.121 & 0.115 & 0.1 & 0.1 \\ 0.201 & 0.115 & 0.1 & 0.1 \end{Bmatrix}$$

$$\xrightarrow{\text{Solve sum by line}} \begin{Bmatrix} 1.066 \\ 2.22 \\ 0.386 \\ 0.386 \end{Bmatrix}$$

$$\xrightarrow{\text{Normalization}} \begin{Bmatrix} 0.2515 \\ 0.555 \\ 0.0965 \\ 0.0965 \end{Bmatrix} = W^{(0)}$$

The paper obtained result is:

$$AW^{(0)}=\begin{Bmatrix} 1 & 1/3 & 3 & 3 \\ 3 & 1 & 5 & 5 \\ 1/3 & 1/5 & 1 & 1 \\ 1/3 & 1/5 & 1 & 1 \end{Bmatrix}\begin{Bmatrix} 0.2514 \\ 0.555 \\ 0.0965 \\ 0.0965 \end{Bmatrix}=\begin{Bmatrix} 1.012 \\ 2.275 \\ 0.387 \\ 0.387 \end{Bmatrix}$$

$$\lambda_{\max}^{(0)}=\frac{1}{4}\left(\frac{1.054}{0.257}+\frac{2.254}{0.786}+\frac{0.257}{0.045}+\frac{0.457}{0.078}\right)=4.038$$

$$w^{(0)}=\begin{pmatrix} 0.278 \\ 0.56 \\ 0.045 \\ 0.098 \end{pmatrix}$$

Similarly, it can calculate judgment matrix

$$B_1=\begin{Bmatrix}1 & 1 & 1/3\\ 2 & 1 & 1/3\\ 3 & 6 & 1\end{Bmatrix}, B_2=\begin{Bmatrix}1 & 5 & 5\\ 1/5 & 1 & 2\\ 1/5 & 1/5 & 1\end{Bmatrix}, B_3=\begin{Bmatrix}1 & 6 & 8\\ 1/5 & 1 & 5\\ 1/8 & 1/5 & 1\end{Bmatrix}, B_4=\begin{Bmatrix}1 & 8 & 8\\ 1/5 & 1 & 5\\ 1/8 & 1/5 & 1\end{Bmatrix}$$

By above result, it is clear the paper uses small towns' main sports industry's maximum feature value and feature vector as weights to analyze, and establish weight hierarchical figure, as Figure 2 shows.

Analyze each factor maximum feature value and feature vector, it gets following results :

$$\lambda^{(1)}{}_{\max}=3.31, \omega^{(1)}{}_1=\begin{Bmatrix}0.252\\ 0.089\\ 0.66\end{Bmatrix}$$

$$\lambda^{(2)}{}_{\max}=3.12, \omega^{(1)}{}_2=\begin{Bmatrix}0.575\\ 0.286\\ 0.139\end{Bmatrix}$$

$$\lambda^{(3)}{}_{\max}=3.30, \omega^{(1)}{}_3=\begin{Bmatrix}0.624\\ 0.240\\ 0.136\end{Bmatrix}$$

$$\lambda^{(4)}{}_{\max}=4.05, \omega^{(1)}{}_4=\begin{Bmatrix}0.185\\ 0.240\\ 0.575\end{Bmatrix}$$

The paper uses consistency indicator to test:

$$CI=\frac{\lambda_{\max}-n}{n-1},\ CR=\frac{CI}{RI}$$

According to TABLE 8 showed RI value, it carries on testing.

**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 |

It gets judgment matrix $A$, $\lambda^{(0)}{}_{\max}=4.073, RI=0.9$

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

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

Due to result is less than 0.1, it shows A inconsistency test is valid and moves within permissible range, it can use A feature vector to replace weight vector.

Similarly, make consistency test on judgment matrix $B_1$, $B_2$, $B_3$, $B_4$, it gets weight vectors.

Utilize hierarchical chart drawing out computation results from target layer to scheme layer, as Figure 2 show.

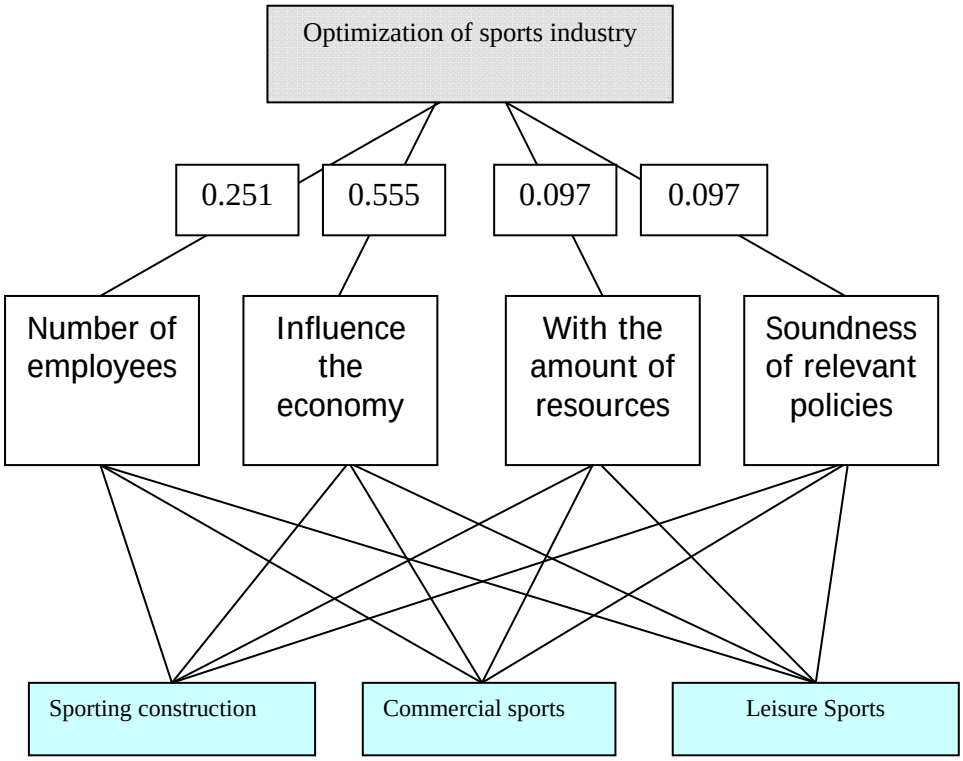


**Figure 2 : Hierarchical structure chart**

$$\begin{Bmatrix} 0.252 \\ 0.089 \\ 0.66 \end{Bmatrix}, \begin{Bmatrix} 0.575 \\ 0.286 \\ 0.139 \end{Bmatrix}, \begin{Bmatrix} 0.624 \\ 0.240 \\ 0.136 \end{Bmatrix}, \begin{Bmatrix} 0.185 \\ 0.240 \\ 0.575 \end{Bmatrix}$$

Computation structure as following:

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

$$w = w^{(1)}w^{(0)}$$

$$= \begin{Bmatrix} 0.252 & 0.575 & 0.624 & 0.185 \\ 0.089 & 0.286 & 0.240 & 0.240 \\ 0.66 & 0.139 & 0.136 & 0.575 \end{Bmatrix} \begin{Bmatrix} 0.567 \\ 0.056 \\ 0.104 \\ 0.273 \end{Bmatrix}$$

$$= \begin{Bmatrix} 0.290 \\ 0.157 \\ 0.553 \end{Bmatrix}$$

**According to analysis process, get measurement result**

According to obtained weights, sports goods and construction industry obtained weights are 0.29, commercial sports' is 0.157, leisure sports' is 0.553, therefore leisure sports have biggest contributions to sports industry, and to leisure sports, it includes sports lottery, sports tourism and so on.

## CONCLUSION

Sports industry structure change's influence factors include small towns' economic development level, small towns' natural resources conditions, urban and rural population structure and others. Numerous factors restrict sports industrial coordinated development. Therefore, we should fully recognize sports industry is a sunrise industry full of potentials; it has important contributions to national economic development.

According to result, the paper gets that sports goods and construction industry obtained weights are 0.29, commercial sports' is 0.157, leisure sports' is 0.553, and therefore leisure sports have biggest contributions to small towns' sports industry.

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