Chinese urban and rural sports fundamental public service system and mechanism evaluation system research

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ABSTRACT

The paper takes Chinese sports fundamental public service system and mechanism each indicator as research object and makes deeper research on it. Make analysis of public sports service influence system and mechanism factors, objectively defines its weights by applying analytic hierarchy process, and gets that largest influence is that participating sports population accounts for largest weight of total population, after that it applies fuzzy mathematics method to make comprehensive evaluation on constructed model, and finally defines the region final evaluation result belongs to good level.   © 2014 Trade Science Inc. - INDIA

INTRODUCTION

In the 18th CPC national congress, it put forward that it should transform government functions, establish service-oriented government, for the purpose of constructing a perfect, reasonable and scientific service-oriented government, it should increase investment on Chinese public service, improve Chinese public service level, from which sports public service as an indispensible part, it played an important roles in improving Chinese public service level, building a harmonious socialist society.

Formers have made lots of efforts on Chinese sports public service system and mechanism researches and got plentiful achievements, such as: Wang Bao-Wen in Chinese sports public service levels researching, he put forward that to meet public sports demand, and it should take sustainable development, public service theory, theories of value as premises, construct its evalu-ation system to analyze constructed factors and finally define best decision scheme; Tang Ji-Lan in Chinese fundamental public sports service equalization research, he applied analytic hierarchy process to quantize Chinese public sports service level equalization aspect input, output, and efficiency such three main aspect importance level with the form of weight, the system provided theoretical conditions for realizing Chinese sports public service equalization.

The paper just on the basis of previous researches, it carries out deep research on Chinese sports public service system and mechanism, uses analytic hierarchy process, fuzzy mathematics' comprehensive evaluation method to evaluate on it, and verifies it with examples, which provides theoretical preparation for improving Chinese sports public service system and mechanism level.

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FUNDAMENTAL PUBLIC SERVICE SYSTEM AND MECHANISM EVALUATION PRINCIPLE

To further perfect and develop Chinese urban and rural sports fundamental public service system and mechanism, establish a reasonable and scientific evaluation system is an important guarantee. But it should follow project operability, possessing flexible guidance quality, systematic ness, objectivity and scientific while constructing.

Research methods and objects screening

According to above principle, the paper selects national sports bureau, national statistic yearbook and others relative contents as the paper research objects,

TABLE 1 : Chinese sports fundamental public service system and mechanism indicator system

First grade indicator	Second grade indicator	Third grade indicator
U1 Security system	R11 scientific and technological information assurance	T111 Sports science lectures' times
		T112 Number of research projects
	R12 Regulatory framework construction	T121 Reward system
		T122 Evaluation system
		T123 Supervisory system
		T124 Emphasis
U2 Sports resources	R21 Sports fund	T211 Per capita sports undertakings expenditures
		T212 Fiscal appropriation growth ratio
	R22 Sports site facility	T221 Number of possessed stadiums per ten thousand people
		T222 Per capita sports facility active area
		T223 Per capita number of constitution monitoring sites
		T224 Per capita sports guidance
	R23 Sports organization	T231 Informal organization
		T232 Number of formal organizations
	R24 Sports human resource	T241 Athletes above provincial level
		T242 Number of possessed sports instructors per thousand people
		T243 Referee in or above national level
U3 Regional features	R31 Featured activities	T311 Number of traditional events
		T312 Number of featured activities
	R32 Special service	T321 Number of special service events
		T322 Special service development
U4 Social benefit	R41 Sports activities development	T411 Sports meeting organizing times per year
		T412 Number of sports competitions times above city level
	R42 Physical state	T421 Excellent rate occupies in total population
		T422 Standard rate occupies in total population
	R43 Sports population	T431 Sports population growth rate
		T432 Sports population rate occupies in total population

and combines with scholars and experts' investigation result, finally it preliminarily defines Chinese sports fundamental public service system and mechanism evaluation system, its indicators is as following TABLE 1 show:

Analytic hierarchy process

In order to define weight, the paper adopts analytic hierarchy process——AHP, the method feature is making complex problems hierarchical, clarifying primary and secondary, possessing stronger logistic and hierarchical structures, algorithm mainly is to calculation indicators' weights. It can apply to comprehensive evaluation system, is a powerful mathematical method that converts problems into quantitative researches. Nowadays, analytic hierarchy process has already widely applied into every field to solve practical problems. Chinese urban and rural sports fundamental public service system and mechanism evaluation system research involves multiple reference indicators; the kind of decision problem just applies to analytic hierarchy process. Correspond to above table, the constructed AHP model flow chart is as following Figure 1 show:

(1) Weight defining

For above criterion's three kinds of indicators, it makes careful comparison of the two relative importance's to construct judgment matrix. Such as: Take U_i, U_j to do importance comparison and structure is using U_{ij} to express, so all factors after comparing, it can get judgment matrix U . Its expression is as following.

$$U = \begin{pmatrix} U_{11} & U_{12} & \cdots & U_{1j} \\ U_{21} & U_{22} & \cdots & U_{2j} \\ \vdots & \vdots & \ddots & \vdots \\ U_{i1} & U_{i2} & \cdots & U_{ij} \end{pmatrix} \tag{1}$$

In formula, U_{ij} the two comparison importance is using quantized value to express. Use number 1—9 to describe judgment matrix, numbers represented definitions are as following TABLE 2 show:

Then the paper corresponding judgment matrix is as following TABLE 3 show:

(2) Weight vector and maximum feature calculation

According to first grade indicator's judgment matrix vector, do normalize processing with it, solve the sum by lines and make normalization, it can get weight vector. According to feature value and feature vector relations, it can solve feature value; its implementation method is as following:

At first do normalize processing with judgment matrix every column, its result is:

$$U_{ij} = U_{ij} / \sum_{k=1}^{n} U_{kj}(i, j = 1, 2, \cdots, n) \tag{2}$$

Then for judgment matrix that is normalized by column, solve sum by lines and can get:

$$\overline{W_i} = \sum_{j=1}^{n} U_{ij}(i = 1, 2, \cdots, n) \tag{3}$$

Above vector $\overline{w} = \left[\overline{W_1}, \overline{W_2}, \cdots, \overline{W_n}\right]^T$ to do normalize processing:
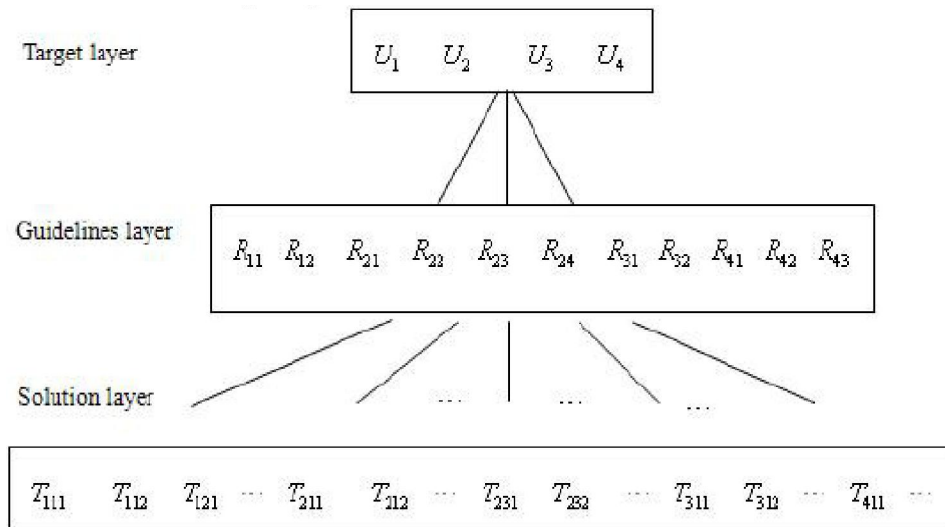
Figure 1 : Hierarchical model

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$$\overline{W}_i = \frac{\overline{W}_i}{\sum_{j=1}^{n} \overline{W}_j} \quad (i = 1, 2, \cdots, n) \tag{4}$$

Then:$W = [W_1, W_2, \ldots, W_n]^T$ is solved feature vector. In addition calculate maximum feature root, the process is:

$$\lambda_{max} = \sum_{i=1}^{n} \frac{(UW)_i}{nW_i} \tag{5}$$

In above formula, $(UW)_i$ represents vector UW's i component.

According to above formula, we can respectively solve Chinese urban and rural sports fundamental public service system and mechanism evaluation analysis's first grade indicator, second grade indicator to first grade indicator weight.

(3) Hierarchical arrangement

If in one layer, m pieces of factors weight calculation result is R_m, in next layer, n pieces of factors to U layer calculation weight is T_{nm}, then t layer factors total arrangement weight is:

$$w_i = \sum_{j=1}^{m} R_i T_{ij} \tag{6}$$

By above formula, calculate and get Chinese urban and rural sports fundamental public service system and mechanism weight size table is as following TABLE 4 show:

TABLE 2 : Judgment matrix proportional scale and definition

No.	Importance level	U_{ij} valuation
1	i, j two elements are equal important	2
2	i element is slightly important than j element	4
3	i element is obviously important than j element	6
4	i element is intensely important than j element	8
5	i element is extremely important than j element	10
6	i element is slightly unimportant than j element	1/2
7	i element is obviously unimportant than j element	1/4
8	i element is intensely unimportant than j element	1/6
9	i element is extremely unimportant than j element	1/8

TABLE 3 : Judgment matrix

U_{ij}	U_1	U_2	U_{ij}
U_1	1 / 3	1 / 3	3
U_2	1	2	4
U_{ij}	1 / 3	1 / 4	1 / 3

TABLE 4 : Layer T weight arrangement table

Layer T	Layer R			Layer T total arrangement
	R_1	R_2	R_3	
	0.2896	0.5412	0.1587	
T_{11}		0.3056		0.0924
T_{12}		0.2147		0.0598
T_{13}		0.4741		0.1524
T_{21}		0.3658		0.1987
T_{22}		0.1963		0.1123
T_{23}		0.2557		0.1326
T_{24}		0.1569		0.0855
T_{31}		0.6714		0.1124
T_{32}		0.3320		0.0523
$\sum W$	1.0000	1.0000	1.0000	1.0000

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By above, it is clear that two levels indicators weights, apply probability theory and mathematical sta-

tistics probability multiplication principle, it can get weight total arrangement, and finally get each indicator, as following TABLE 5 show:

In order to highlight three grades indicators relations, the paper draws out bar chart as following Figure 2 show:

By above Figure 2, we can see three indicators'

weight sizes.

CHINESE URBAN AND RURAL SPORTS FUNDAMENTAL PUBLIC SERVICE SYSTEM AND MECHANISM COMPREHENSIVE EVALUATION MODEL

Chinese urban and rural sports fundamental public service system and mechanism comprehensive evaluation model principle is using linear transformation method and combining it with maximum membership, making comprehensive consideration and research on the premise that considers multiple factors, realizing relative reasonable evaluation effects, so we can use fuzzy mathematics to carry out comprehensive evaluation, method and steps are as following:

(1) Define factor set:

$$U = (u_1, u_2, u_3, \cdots, u_n) \tag{7}$$

(2) Define judgment set:

$$Q = (q_1, q_2, q_3, \cdots, q_n) \tag{8}$$

(3) Single factor evaluation set:

$$f : U \to \phi(Q) \tag{9}$$

$$u_i \to f(u_i) \in \phi(U) \tag{10}$$

Corresponding fuzzy relation is :

$$R_f(u_i, q_i) = f(u_i)(q_i) = r_{ij} \tag{11}$$

Among them, above formula can be used to express R_f, that:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & & & \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \tag{12}$$

In above, by fuzzy relation R, it can derive from U to Q fuzzy change T_f, and call R single factor evaluation matrix, then comprehensive judgment model is
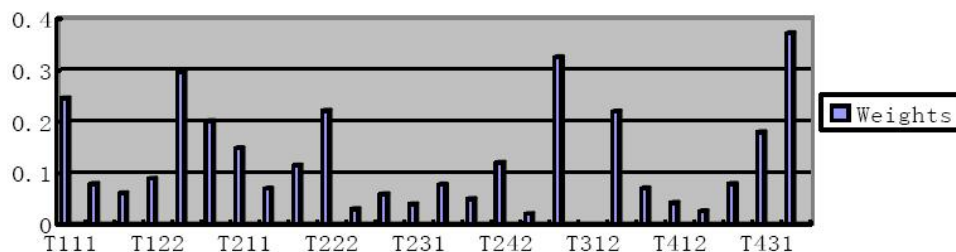
TABLE 5 : Chinese urban and rural sports fundamental public service system and mechanism indicator system weight

First grade indicator	Second grade indicator	Third grade indicator
	R11	T111(0.2456)
	0.0912	T112(0.0798)
U1		T121(0.0614)
0.2745	R12	T122(0.0896)
	0.1923	T123(0.2958)
		T124(0.2014)
	R21	T211(0.149)
	0.1124	T212(0.0703)
		T221 (0.1152)
	R22	T222 (0.2213)
	0.1789	T223 (0.0304)
U2		T224 (0.0596)
0.4526	R23	T231 (0.0397)
	0.0564	T232 (0.0784)
		T241 (0.0498)
	R24	T242 (0.1204)
	0.0836	T243 (0.0214)
	R31	T311 (0.3256)
U3	0.0697	T312 (0.3256)
0.2932	R32	T312 (0.1204)
	0.0356	T322 (0.2198)
	R41	T411 (0.0712)
	0.0560	T412 (0.0427)
U4	R42	T421 (0.0265)
0.1758	0.1124	T422 (0.0794)
	R43	T431 (0.1796)
	0.0917	T432 (0.3724)

Figure 2 : Three indicator system weight figure

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$U = (u_1, u_2, u_3, \cdots, u_n)$, it is for weight $A = (a_1, a_2, a_3, \cdots, a_n)$, let total evaluation result to be $B = (b_1, b_2, b_3, \cdots, b_n)$, then it can use formula $B = A \times R$ to calculate, from which b_j correspond to $b_{j\max}$ corresponding grade q_j is final evaluation result.

INTEGRATE THEORIES WITH PRACTICE

In order to more clearly present above stated theories rationality and validness, the paper selects one region sports public service system and mechanism to analyze, combines with above selected indicators, the paper selects partial indicators as following TABLE 6 show:

On the basis of above research, the paper sets five kinds of evaluation grades for the region that is very bad, bad, normal, good, excellent. By applying above fuzzy comprehensive evaluation process, it analyzes ontology, after that uses relative software and finally gets its second, third grade indicators result:

Second grade indicator:

T11=(0.0016 0.0035 0.0047 0.0016 0.0042)

T12=(0.0025 0.0035 0.0060 0.0044 0.0016)

T21=(0.0014 0.0037 0.0033 0.0054 0.0024)

T22=(0.0021 0.0036 0.0060 0.0041 0.0018)

T23=(0.0021 0.0041 0.0058 0.0047 0.0020)

T24=(0.0026 0.0031 0.0052 0.0054 0.0014)

T31=(0.0061 0.0091 0.0012 0.0016 0.0001)

T41=(0.0141 0.0066 0.0091 0.0021 0.0021)

TABLE 6 : Selected partial indicators

	R21 0.1124	T211(0.149)
		T212(0.0703)
	R22 0.1789	T221 (0.1152)
		T222 (0.2213)
U2 0.4526		T223 (0.0304)
		T224 (0.0596)
	R23 0.0564	T231 (0.0397)
		T232 (0.0784)
	R24 0.0836	T241 (0.0498)
		T242 (0.1204)
		T243 (0.0214)

T42=(0.0013 0.0031 0.0064 0.0066 0.0017)

T43=(0.0014 0.0035 0.0065 0.0003 0.0014)

Third grade indicator:

R221=(0.0085 0.0020 0.0399 0.0158 0.0046)

R222=(0.0239 0.0286 0.0380 0.0246 0.0010)

R223=(0.0154 0.0326 0.0358 0.0257 0.0010)

R224=(0.0673 0.0445 0.0295 0.0308 0.0066)

By above process, it can get final result, that:

$U_2 = (0.0025 \quad 0.0013 \quad 0.0131 \quad 0.0221 \quad 0.0134)$

According to above result and maximum membership principle, it can get the region sports fundamental public service system and mechanism final evaluation is good level.

CONCLUSIONS

The paper makes analysis of Chinese sports fundamental public service system and mechanism influence each indicator factor, with theories as guidance, it constructs Chinese sports fundamental public service system and mechanism indicator system, it is composed of three grades, meanwhile applies analytic hierarchy process method to define the event weight, and gets Chinese sports fundamental public service system and mechanism influence maximum factor, and then constructs comprehensive evaluation model, adopts examples to verify and gets that the region sports fundamental public service system and mechanism belongs to good level.

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