



Research on fuzzy comprehensive evaluation model and its application to the evaluation of the public services

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ABSTRACT

Firstly, this paper conducts the research to the fuzzy comprehensive evaluation model, identify the advantages and applicability of the evaluation model, and use this model to evaluate the construction of public service. Actuality comparison, this model can get higher accuracy and authenticity. In the application process of the model, By analyzing the current situation of China's public facilities, we can know, From 1993 to date, basic social services tend to formal, As such, yearly growth rate decreases. Thus the use of fuzzy comprehensive evaluation model to analyze value of comprehensive evaluation, The results from the weight $Z=(0.069 \ 0.25 \ 0.29 \ 0.35)$, we can get the value of public service evaluation class sports science , health classes , job security class , urban construction category in four areas, Description of the public service system gradually improved, gradually into the track.

Key words: Fuzzy Comprehensive Evaluation, Public Services, Membership

INTRODUCTION

Exact many cases are often included in a large number of uncertainties involved, Fuzzy comprehensive evaluation is a collection of some of the factors, then the performance of the human consciousness. Create a property of an object by scaling, Fuzzy mathematical analysis of an object, Firstly, the analysis of the object should have a vague or uncertain, and, the object to be studied with multiple factors restricting, therefore, this paper based on fuzzy comprehensive evaluation of our government to promote the development of public sports service business studies [1-5].

THE ASSUMPTION THAT THE MODEL

- (1) In this paper, the main research science and sports classes, health classes , job security class , urban construction class for our public services of key factors, assuming other factors do not affect [6-9].
- (2) Assuming our public has not reached saturation.
- (3) In this paper, only single -level fuzzy comprehensive evaluation.

MODEL BUILDING

Using fuzzy comprehensive evaluation, as follows:

(1) Establish the factors set U , $U=(U_1 \ U_2 \ \dots \ U_k)$

(2) The establishment of evaluation set V , $V=(V_1 \ V_2 \ \dots \ V_n)$

Under the general assessment system to determine selection level domain,

$V=\{V_1, V_2, V_3, V_4\}=\{\text{very good, good, general, bad}\}$

(3) The establishment of fuzzy evaluation matrix mapping from U to V , the fuzzy relation matrix obtained as follows, First of all, on any one u_i made an evaluation of the $f(u_i)(i=1,2,\dots,n)$, we can get from U to V

$$f : U \rightarrow F(U)$$

fuzzy relations, that is, $u_i \mapsto f(u_i) = (r_{i1}, r_{i2}, \dots, r_{im}) \in F(V)$

$$R = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

Get fuzzy relation from fuzzy mapping:

Each line of fuzzy relation R, reflects the degree of influence factors on the object of the line judge, at the same time Each column of R, row reflects the extent to which factors influence the judgment of the object [10-12].

$$\sum_{i=1}^n r_{ij} \quad j = 1, 2, 3, \dots, m$$

(4) Establish weight set, $A = (a_1, a_2, \dots, a_n) \in F(U)$, satisfy the conditions : $\sum_{i=1}^n a_i = 1 \quad a_i \geq 0$

$$B = A \cdot R$$

$$= (a_1, a_2, a_3, \dots, a_n) \cdot \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

$$= (b_1, b_2, b_3, \dots, b_n)$$

Fuzzy set of V is evaluation set b. In summary expression fact change model shown in Figure 1:

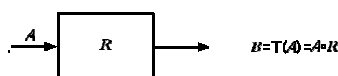


Figure 1: Change Model

THE FUZZY COMPREHENSIVE EVALUATION AND MODEL IN OUR PUBLIC SERVICES BUILDING EVALUATION

Situation Analysis of Public Services

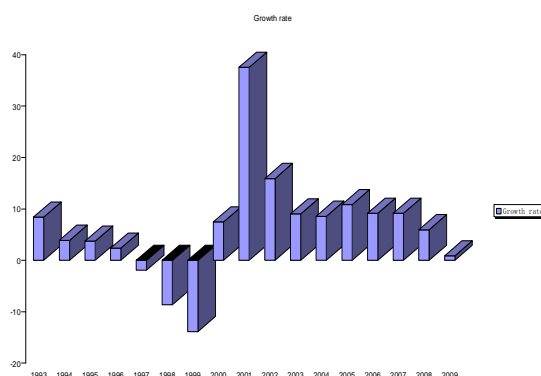


Figure 2. From 1993 to 2009 the growth rate of change in social service facilities

Figure 2 shows the, can be learned from 1993 to date, basic social services to meet the needs of the status quo, Basic social services tend to formal, description of the public service system gradually improved , and gradually into the right track , thus reducing the growth rate.

Fuzzy Comprehensive Evaluation of Public Services

Establish the factors set U , $U = (U_1 \ U_2 \ U_3 \ U_4)$. Among them, urban construction class U_1 , sports science

class U_2 , Employment security class U_3 , Health classes U_4 , get table 1.

Table 1: public service evaluation index system

Urban construction class U_1	Science and sports class U_2	Job security class U_3	Health class U_4
Environmental protection expenditure u_{11}	Technology spending u_{21}	Social security and employment expenditure u_{31}	The number of physicians u_{41}
Internet users u_{12}	Culture, sports and media spending u_{22}	Workers in the post staff u_{32}	People have health technicians u_{42}
Number of urban road lamps u_{13}	People have a number of teachers u_{23}	Hourly labor level u_{33}	Hospital coverage area u_{43}
Phone coverage u_{14}	Patents granted u_{24}	Corporate welfare u_{34}	
Heating level u_{15}			

There are factors enumerated in Table II to obtain evaluation set.

$$U_1 = \{u_{11}, u_{12}, u_{13}, u_{14}\}$$

$$U_2 = \{u_{21}, u_{22}, u_{23}, u_{24}, u_{25}\}$$

$$U_3 = \{u_{31}, u_{32}, u_{33}\}$$

$$U_4 = \{u_{41}, u_{42}, u_{43}, u_{44}\}$$

By collecting data, analyzing get, the importance of four factors sort of statistics, as shown in Table 2.

Table 2 ranking the importance of four factors statistics

Classification	Rank 1	Rank 2	Rank 3	Rank 4
Urban construction class U_1	16	12	5	2
Science and sports class U_2	5	15	13	2
Job security class U_3	3	13	10	9
Health class U_4	2	5	11	17

Table 2 is obtained by sorting, Science and sports class, health class, job security class, and urban construction class four areas ranked matrix.

$$U_2 = \{23, 7, 4, 0\}$$

$$U_2 = \{7, 18, 8, 0\}$$

$$U_3 = \{0, 9, 13, 12\}$$

$$U_4 = \{3, 0, 9, 21\}$$

From rank 1 to rank 2 the resulting weight vector

$$\beta = \{\beta_1, \beta_2, \beta_3, \beta_4\} = \{0.4, 0.3, 0.2, 0.1\}$$

$$U_i^* = U_i \cdot \beta^T$$

$$U_1^* = 11.2, U_2^* = 9.5, U_3^* = 8.0, U_4^* = 6.2$$

This paper will deal with its normalized

$$U_1^* = 0.32, U_2^* = 0.27, U_3^* = 0.23, U_4^* = 0.20$$

Get

$$\bar{A} = (0.31 \quad 0.27 \quad 0.22 \quad 0.18)$$

In this paper, the evaluation language to get the membership through public service performance, as shown in Table 3.

Table 3: evaluation of language membership

Evaluation methods	Set scores range			
	0-60	60-80	80-90	90-100
Very good	0	0	0.05	0.95
Good	0	0.05	0.9	0.05
General	0.05	0.9	0.05	0
Bad	0.95	0.05	0	0

Based on the public services of the indicators evaluated membership, Evaluation value obtained, Get Table 4.

Table 4: Evaluation of the value of public service indicators obtained

Layers indicators	Evaluation value	Layers indicators	Evaluation value
Environmental protection expenditure u_{11}	Very good	Social security and employment expenditure u_{31}	Very good
Internet users u_{12}	Very good	Workers in the post staff u_{32}	Good
Number of urban road lamps u_{13}	General	Hourly labor level u_{33}	Good
Phone coverage u_{14}	General	Corporate welfare u_{34}	General
Heating level u_{15}	General	The number of physicians u_{41}	Good
Technology spending u_{21}	Very good	People have health technicians u_{42}	Very good
Culture, sports and media spending u_{22}	Very good	Hospital coverage area u_{43}	General
People have a number of teachers u_{23}	Very good		
Patents granted u_{24}	Good		

Through the above model of single index weight factor is the fuzzy sets

$$U_1^* = \{u_{11}, u_{12}, u_{13}, u_{14}, u_{15}\} = \{0.25, 0.25, 0.2, 0.15, 0.15\}$$

$$U_2^* = \{u_{21}, u_{22}, u_{23}, u_{24}\} = \{0.54, 0.1, 0.24, 0.14\}$$

$$U_1^* = \{u_{31}, u_{32}, u_{33}, u_{34}\} = \{0.4, 0.3, 0.1, 0.2\}$$

$$U_1^* = \{u_{41}, u_{42}, u_{43}\} = \{0.3, 0.4, 0.3\}$$

In this paper, Table 5 and Table 3 evaluation of language membership, get sports science classes, health classes, job security class, urban construction category, evaluate all aspects of the collection.

$$U_1 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \\ 0 & 0.05 & 0.95 & 0.05 \end{pmatrix}$$

Urban construction category

$$U_2 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

Sports science classes

$$U_3 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0.05 & 0.9 & 0.05 & 0 \end{pmatrix}$$

Job security class

$$U_4 = \begin{pmatrix} 0 & 0 & 0.05 & 0.95 \\ 0 & 0.05 & 0.9 & 0.05 \\ 0 & 0.05 & 0.9 & 0.05 \end{pmatrix}$$

Health classes

Evaluation of the above collection as follows: $B_i = A_i \cdot R_i$

$$B = \begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix} = \begin{pmatrix} 0.07 & 0.27 & 0.13 & 0.53 \\ 0 & 0.1 & 0.4 & 0.5 \\ 0.08 & 0.46 & 0.38 & 0.08 \\ 0.14 & 0.2 & 0.3 & 0.36 \end{pmatrix}$$

Performed on the obtained normalized B, get fuzzy evaluation matrix:

Obtain the comprehensive evaluation value: $Z = U^* \cdot B = (0.069 \quad 0.25 \quad 0.29 \quad 0.35)$

In summary, Fuzzy comprehensive evaluation model to exclude the shortcomings of traditional evaluation models, Not only it is computationally simple and fully considered, although the study of systems with integrated features. Evaluation results obtained by the Z value in the range of 90-100 greater specific gravity, therefore, a better evaluation results.

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