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Research on Graduation Thesis Evaluation

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Abstract: This article mainly aims at the graduation thesis evaluation indexes to discussed, and the feasibility analysis of fuzzy evaluation. In order to improve the fairness of the evaluation of the rationality, ultimately providing help and advice for the evaluation of the graduation thesis. First, determine the evaluation index criteria, and selected 5 valid samples as the research object. Secondly, according to the sample data of existing indicators, establish the index weights to determine the index measure function. In the end, evaluate the comprehensive measure that calculated evaluation matrix, compares with the actual value, and determine the accuracy of the method.

Keywords: Thesis evaluation, Index measure function, Evaluation matrix

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1. INTRODUCTION

Evaluation of undergraduate teaching quality in the teaching quality management plays an important role, and college graduation thesis design for their own studies. It bring certain influence on the future development of the work. So the teaching quality evaluation system of undergraduate thesis should establish fair and reasonable.

Graduation thesis writing or test students on the professional master degree of theoretical knowledge, practical ability, innovation ability embodies. Ma Naiyi of Shihezi University for undergraduate graduation thesis quality management of [1]. Fuzzy comprehensive evaluation method of Shandong University of Science and Technology Liu Ranhui application of students' scientific and technological innovation ability was studied, but the comprehensive weight is obtained by expert scoring which is influenced by subjective factors [2].

2. INDEX WEIGHT DETERMINATION MODEL

2.1 Construction of quantitative model

We assume that $X=\{x_1,x_2,...,x_n\}$, $x_1,x_2,...,x_n$ is n numbers of evaluation objects. X is the object space.To quantitatively describe the properties of x_i ,we need to measure m indexes that is $I_1,I_2,...,I_m$. I is evaluation index space,which regards as $I=\{I_1,I_2,...,I_m\}$ .We assume that x_{ij} is i -th evaluation object x_i measure of j -th index I_j ,and x_i represent m dimensional vector.

$$x_i=(x_{i1},x_{i2},...,x_{im})$$

For every measures x_{ij} ,it always has p evaluation grade, $C=\{c_1,c_2,...,c_p\}$. C represent rank space.

We make $\mu_{ijk}=\mu(x_{ij}\in c_k)$ express the degree for x_{ij} belong to k -th grades c_k .At the same time

$$0\le\mu(x_{ij}\in c_k)\le 1 \tag{1}$$

$$\mu(x_{ij}\in U)=1 \tag{2}$$

$$\mu\left(x_{ij}\in\bigcup_{l=1}^{k}c_l\right)=\sum_{l=1}^{k}\mu(x_{ij}\in c_l) \tag{3}$$

When $i=1,2,...,n$; $j=1,2,...,m$; $k=1,2,...,\mathrm{p}$ .We call (2) satisfying normalization for rank space C ,and(3) satisfy addition for rank space C .The measurement results must satisfy these two results, and the three type is satisfied.We call matrix

$$(A_{ijk})_{m\times p}=\begin{bmatrix} a_{i11} & a_{i12} & \cdots & a_{i1p} \\ a_{i21} & a_{i22} & \cdots & a_{i2p} \\ \vdots & \vdots & \ddots & \vdots \\ a_{im1} & a_{im2} & \cdots & a_{imp} \end{bmatrix}, i=1,2,...,n \tag{4}$$

Is the single index evaluation matrix of x_i ,from which the j -th row vector is called the single index evaluation vector of x_{ij} .

2.2 Index weight

The w_j will be recorded as the weight of the j -th evaluation index I_j , w_j satisfy

$$0 \le w_j \le 1, \sum_{j=1}^{m} w_j = 1 \tag{5}$$

2.3 Level index measure

We make $A_{ik} = A(x_i \in c_k)$ recorded as the degree i -th specimen x_i subordinate k -th evaluation class c_k ,therefore:

$$A_{ik} = \sum_{j=1}^{m} w_j A_{ijk} \tag{6}$$

At this time, $0 \le A_{ik} \le 1$, and $\sum_{k=1}^{p} A_{ik} = \sum_{k=1}^{p}\sum_{j=1}^{m} w_j A_{ik} = \sum_{j=1}^{m}\left(\sum_{k=1}^{p} A_{ik}\right) w_j = \sum_{j=1}^{m} w_j = 1$. A_{ik} is degree.We call matrix

$$(A_{ik})_{n\times p} = \begin{pmatrix} a_{11} & a_{12} & \dots & a_{1p} \\ a_{21} & a_{22} & \dots & a_{2p} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{np} \end{pmatrix} \tag{7}$$

Is the evaluation matrix of the level index,from which the i -th row vector is called the degree comprehensive evaluation vector of x_i .

2.4 Similary

If the single index evaluation matrix (4) and the weight of the hierarchical index are known, the comprehensive evaluation matrix (7), which is solved by formula (6), can be used as the basis for identification.

We assume that $I_j\,(j = 1, 2, ..., m)$ is objective index,and all index weights can not be obtained by experience.Then assume that each index has the same importance, $w_j = 1/m$ .On this basis,the comprehensive evaluation matrix (7) can be obtained by formula (6).Each row vector in a matrix (7)is arithmetic mean which is based on single index measure evaluation matrix(4).

$$A_{ik} = \frac{1}{m}(a_{i1k} + a_{i2k} + ... + a_{imk}) \quad (8)$$

Therefore, the comprehensive evaluation vector (8) reflects the overall evaluation of x_i, that is to say, the single index evaluation vector and the comprehensive evaluation vector reflect the ability of I_j to reflect the overall situation.And the closer of two,the more can I_j reflect the overall situation, I_j 's weight is greater.Similarity coefficient method is used to describe the proximity of two vectors.

$$r_j = \frac{1}{n}\sum_{i=1}^{n}(a_{ij1}, a_{ij2}, ..., a_{ijp}) \cdot (a_{i1}, a_{i2}, ..., a_{ip})^T = \frac{1}{n}\sum_{i=1}^{n}\sum_{k=1}^{p} A_{ijk} \cdot A_{ik} \quad (9)$$

$$w_j = r_j \Big/ \sum_{j=1}^{m} r_j \quad (10)$$

We call r_j as similarity number,call w_j as similarity weight.

3. WEIGHT DETERMINATION MODEL BASED ON INDEX MESURE FUNCTION

First of all, to determine the level of graduation thesis indicators ,see Table.1.

Table.1 Standard of thesis evaluation

Grade / Evaluating indicator	Fail	Pass	Good	Excellent
Selected topic	<6	7	9	10
Research method	<6	7	9	10
Research results	<9	10	13	15
Analysis discussion	<9	10	13	15
Reference	<6	7	9	10
Paper report	<9	10	13	15
Defence	<9	10	13	15
Conclusion	<6	7	9	10

Secondly, the selected sample data,see Table 2:

Table.2 Sample data

	Selected topic	Research method	Research results	Analysis discussion	Reference	Paper report	Defence	Conclusion
x_1	9.2	8.2	11.1	10.1	7.2	12.1	13.1	8
x_2	8.7	9.3	12.4	13.9	8.3	10.1	14.2	9
x_3	9.4	9.6	13.2	13.9	9.1	13.4	13.1	8.4
x_4	6.3	7.4	10.2	10.9	7.1	9.4	11.1	6.4
x_5	6	7.1	8.3	10.2	5.5	6.4	10	5

The research object space is determined according to the known object:

$$X = \{x_1, x_2, x_3, x_4, x_5\}$$

Evaluation index space is:{Selected topic,Research method,Research results, Analysis discussion, Reference, Paper report, Defence, Conclusion};

Rating space is: $C = \{c_1, c_2, c_3, c_4\} = \{\text{Excellent}, \text{Good}, \text{Pass}, \text{Fail}\}$.

3.1 Estabilsh single index measure function

According to the evaluation criteria of Table 1, a single index function is established, because the index level is only presented in two points, so we can only show the two measurement functions, see Fig.1.

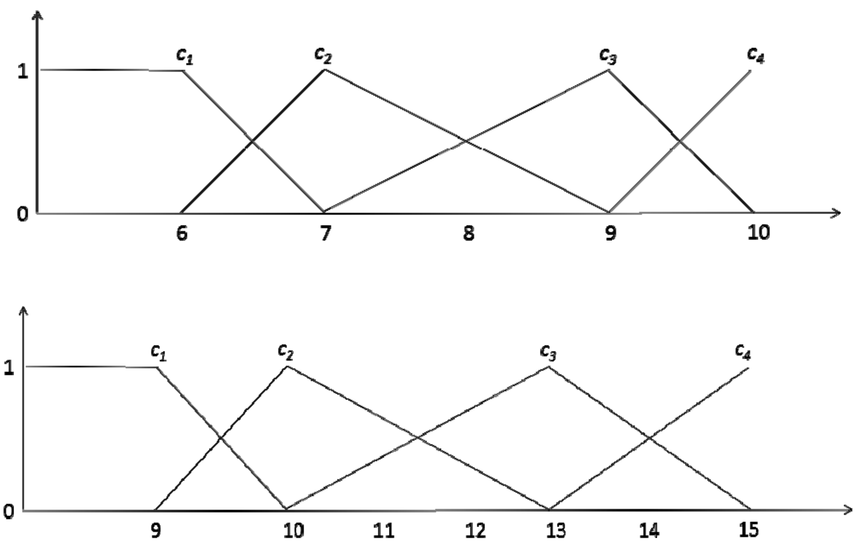

Fig.1 Schematic diagram of single index measure function

By comparing the actual data in Table 2 to the measure function in the graph, the single index measure is obtained[3,4].Such as $x_{11} = 9.2$,that is, the value of the first index of the first sample is 9.2.According to single index measure function,solved as *y*=0.5*x*-0.35.And get the equation $x_{111} = 0.2$.Similarly get that:

$$(x_{111}, x_{112}, x_{113}, x_{114}) = (0.2, 0.8, 0, 0)$$

Then we get the single index evaluation matrix of five samples.

3.2 Similarity

It is assumed that the existing eight evaluation indexes have the same weight [5].

$$(w_1, w_2, ..., w_8) = \left(\frac{1}{8}, \frac{1}{8}, ..., \frac{1}{8}\right)$$

Then use the formula (5) to find the comprehensive evaluation matrix:

$$\begin{array}{c} \\ A_{ik} = \end{array} \begin{array}{c} \begin{matrix} c_1 & c_2 & c_3 & c_4 \end{matrix} \\ \begin{pmatrix} 0.03 & 0.48 & 0.35 & 0.14 \\ 0.15 & 0.51 & 0.34 & 0 \\ 0.33 & 0.67 & 0 & 0 \\ 0 & 0.12 & 0.64 & 0.24 \\ 0 & 0.02 & 0.235 & 0.75 \end{pmatrix} \end{array} \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{array}$$

And solved according to (11):

$$(r_1, r_2, ..., r_8) = (0.456, 0.520, 0.551, 0.360, 0.557, 0.466, 0.356, 0.471)$$

Then $(w_1, w_2, ..., w_8) = (0.12, 0.14, 0.15, 0.1, 0.14, 0.12, 0.1, 0.13)$.

As the weight vector of the index, the new evaluation matrix is obtained:

$$\begin{array}{c} \\ A_{ik} = \end{array} \begin{array}{c} \begin{matrix} c_1 & c_2 & c_3 & c_4 \end{matrix} \\ \begin{pmatrix} 0.02 & 0.48 & 0.40 & 0.10 \\ 0.10 & 0.58 & 0.32 & 0 \\ 0.32 & 0.68 & 0 & 0 \\ 0 & 0.10 & 0.66 & 0.24 \\ 0 & 0.1 & 0.32 & 0.67 \end{pmatrix} \end{array} \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \end{array}$$

The evaluation results of the method are x_1, x_2, x_3 belong to the "good" level, x_4 belong to the "pass" level.But according to people's daily experience, if we simply divide the grade according to the score, the different from the index evaluation method is that x_2, x_3 belong to the "excellent" level,and x_1 belong to the "good" level.This is because in the score, the weights of different indicators and the scores are different.

4. CONCLUSION

This paper uses comprehensive evaluation index measurement method to determine the weight of undergraduate thesis, subjective experience is avoided for the weights of the influence, and the method is simple, wide scope, laying a good foundation for the study of undergraduate graduation thesis evaluation. But in view of different universities for different requirements, the weight is not uniform.

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