Fuzzy Comprehensive Evaluation of Quality for Accounting Major Graduates

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Abstract. With the global economic integration and the advent of the era of knowledge economy, China's accounting environment has undergone great changes, has a profound impact on accounting and accounting education, the development of new requirements are put forward. Scientific evaluation of the quality of accounting major graduates is an important means to improve the quality of students, optimize the training plan and guide the selection and appointment of employers, fuzzy comprehensive evaluation method is used in this paper. First of all, We build the weight set of first level indicators and two level indicators; then, establishes the evaluation mathematical model, including the single factor evaluation model and fuzzy comprehensive evaluation; finally, through concrete examples of evaluation and analysis the results. In practical application, it is possible to select the influencing factors flexibly, adopts the method of combining qualitative analysis with quantitative analysis, improves the applicability and accuracy of the evaluation results.

Introduction

Colleges and universities are the most important bases for training talents, should transport high quality and social needs of talent to talent market, which requires colleges and universities adhere to market-oriented in the professional structure, curriculum setting and teaching management, based on scientific talent demand forecasting, adjust and optimize the discipline and constantly improve and perfect the curriculum, adapt to the adjustment of economic structure and talent market demand changes [1]. In addition, we must also reform teaching methods and means, so as to impart knowledge and moral education; not only improve the ability, but also the development of intelligence, training with sound psychological quality, good moral quality and comprehensive ability of the new high quality talent.

Accounting is a discipline which is closely related to the development of social economy, with the deepening of global economic integration, the reform and opening up and the advent of the era of knowledge economy, great changes have taken place in the accounting environment in China, has a profound impact on the accounting work and education, puts forward new requirements. How to adapt to changing accounting environment, cultivate and train a large number of good occupation moral level, master the basic theory and professional knowledge, strong learning ability and professional skills of accounting personnel, is an urgent task facing to accounting education in current [2,3].

Fuzzy comprehensive evaluation method is a kind of method based on fuzzy mathematics. According to the theory of membership degree of fuzzy mathematics, the qualitative evaluation is transformed into quantitative evaluation, that is to say, make a general evaluation of things or objects which are restricted by many factors by fuzzy mathematics. Especially the multilevel fuzzy comprehensive evaluation, study the relationship between various factors, the system has the characteristics of clear, strong, can solve the fuzzy and difficult to quantify the problem, solve the problem of uncertainty for all. In this paper, the fuzzy comprehensive evaluation of accounting graduates, from the traditional single concerned performance evaluation to "Basic knowledge, Basic ability, Laws and regulations, Accounting knowledge, Information technology, Comprehensive

quality and other all-round, multi angle evaluation, play an important role in improving the quality of students, optimize the training program and guidance unit selection etc..

Establishment of Evaluation Index Weight Set

Different weights will get different evaluation results, the set of $W = \{w_1, w_2, \dots, w_n\}$ is called the weight set. The research [4], the evaluation index system composed of 6 first level indexes and 24 level indexes, the weight of the index is calculated, this paper based on the research, the weight set is as follows:

First level index (Basic knowledge B_1 , Basic ability B_2 , Laws and regulations B_3 , Accounting knowledge B_4 , Information technology B_5 , Comprehensive quality B_6) weight set is:

$$W = \{W_1, W_2, W_3, W_4, W_5, W_6\} = \{0.1077, 0.2773, 0.0897, 0.2311, 0.1401, 0.1541\}$$

"Basic knowledge B_1 " is the two indicators of first level index (Natural science c_{11} , Social science c_{12} , Economic management c_{13} , Information acquisition c_{14}) weight set is:

$$W_1 = \{w_{21}, w_{22}, w_{23}, w_{24}\} = \{0.1258, 0.2135, 0.4063, 0.2544\}$$

"Basic ability B_2 " is the two indicators of first level index (Accounting c_{21} , Business operation c_{22} , Financial analysis c_{23} , Literal expression c_{24}) weight set is:

$$W_2 = \{w_{21}, w_{22}, w_{23}, w_{24}\} = \{0.2516, 0.3441, 0.2164, 0.1879\}$$

"Laws and regulations B_3 " is the two indicators of first level index (Accounting regulations c_{31} , Accounting standard c_{32} , Rules and regulations c_{33} , International practice c_{34}) weight set is:

$$W_3 = \{w_{31}, w_{32}, w_{33}, w_{34}\} = \{0.2367, 0.2865, 0.2678, 0.2090\}$$

"Accounting knowledge B_4 " is the two indicators of first level index (Financial accounting c_{41} , Cost accounting c_{42} , Management accounting c_{43} , Stock accounting c_{44}) weight set is:

"Accounting knowledge B_4 " is the two indicators of first level index (Financial accounting c_{41} , Cost accounting c_{42} , Management accounting c_{43} , Stock accounting c_{44}) weight set is:

$$W_4 = \{w_{41}, w_{42}, w_{43}, w_{44}\} = \{0.3743, 0.2014, 0.2256, 0.1987\}$$

"Information technology B_5 " is the two indicators of first level index (Hardware knowledge c_{51} , Software knowledge c_{52} , Network knowledge c_{53} , Information safety c_{54}) weight set is:

$$W_5 = \{w_{51}, w_{52}, w_{53}, w_{54}\} = \{0.1474, 0.3554, 0.2121, 0.2851\}$$

"Comprehensive quality B_6 " is the two indicators of first level index (Political quality c_{61} , Professional ethics c_{62} , Psychological quality c_{63} , Innovation enterprising c_{64}) weight set is:

$$W_6 = \{w_{61}, w_{62}, w_{63}, w_{64}\} = \{0.2255, 0.2731, 0.2651, 0.2363\}$$

Mathematical Model of Fuzzy Evaluation

During fuzzy comprehensive evaluation, first carry out a single indicator of fuzzy evaluation, then make a fuzzy comprehensive evaluation, if the evaluation form is a multi-level hierarchical structure, conduct multi-level fuzzy comprehensive evaluation [5-7].

Single-Fuzzy Evaluation Index

From an indicator, determine the degree of membership about the evaluation of the object and evaluation indicators. From U to $F(V)$ to establish a fuzzy mapping:

$$f: U \rightarrow F(V), \forall u_i \in U, u_i \mapsto f(u_i) = \frac{r_{i1}}{v_1} + \frac{r_{i2}}{v_2} + \dots + \frac{r_{im}}{v_m} = \sum_{j=1}^m \frac{r_{ij}}{v_j} \quad (1)$$

In the formula r_{ij} , says u_i belong to v_j membership.

Membership, also known as membership function values or fuzzy relation coefficient, it is the key to describe the ambiguity of things. Membership function is subjective factors with objective measure of fuzzy objects, minimize the subjective factors, reflecting the ambiguity of the objective to maximize the features. Commonly used methods are fuzzy statistical method, binary comparison sorting method, the distribution law.

According to $f(u_i)$, obtain a single set of index evaluation $R_i = (r_{i1}, r_{i2}, \dots, r_{im})$. A single set of index evaluation composed of the matrix is called single-line index evaluation matrix. The matrix is a fuzzy matrix.

$$R = \begin{matrix} & v_1 & v_2 & \cdots & v_m \\ \begin{matrix} u_1 \\ u_2 \\ \vdots \\ u_n \end{matrix} & \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \cdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} \end{matrix} \quad (2)$$

Fuzzy Comprehensive Evaluation

From evaluation matrix which has a single indicator can be seen: Row i of R reflects the impact assessment of NO. i evaluation focused on the object to take the degree of each element; The j row of R reflects all index evaluation objects take the first j an evaluation the extent of the element. If the role of each indicator with the corresponding weights a_{ij} , it can reasonably reflect the combined effect of all indicators. Therefore, the fuzzy comprehensive evaluation can be expressed as [8,9]:

$$B = A \bullet R = (a_1, a_2, \dots, a_n) \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1m} \\ r_{21} & r_{22} & \cdots & r_{2m} \\ \vdots & \vdots & \cdots & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nm} \end{bmatrix} = (b_1, b_2, \dots, b_n) \quad (3)$$

In the formula, b_j is called fuzzy comprehensive evaluation index, referred to evaluation index. It means that, when consider the impact of all indicators, the evaluation focused on the evaluation of the object first j element of the membership. Weight matrix and evaluation of single indicators used in the synthesis $M(\bullet, \oplus)$ model. Namely:

$$b_j = \sum_{i=1}^n (a_i \bullet r_{ij}) \quad (4)$$

The model takes into account not only the impact of all indicators, but also retained the single indicators to evaluate all the information, it is applicable in the situation which needs to fully consider the impact of the various indicators and the full account of the results of single indicators to assess.

Treatment of evaluation indicators: when get evaluation indicators, decided the results according to principles. This article uses the principle of maximum membership, find the largest evaluation indicators $\max(b_j)$ and take corresponding elements v_j as the evaluation results.

Evaluation Example and Result Analysis

Fuzzy comprehensive evaluation method can evaluate all the students of a school or a class, and then sort according to the evaluation results, and can draw the advantages of school training students and training programs and training problems. Limited by the length of this article, only through a comprehensive evaluation of the quality of accounting graduates to illustrate the use of the process.

(1) Single factor fuzzy evaluation. Single factor evaluation use expert evaluation method. Hired 10 experts on the overall quality of the graduates according to the "Excellent, Good, Medium, Pass, Bad" five level are assessed, the percentage of statistical results as shown in table 1.

(2) First level fuzzy comprehensive evaluation. Take "Basic knowledge B1" under the two indicators to evaluate the first level index as an example:

$$B_1 = (0.1258, 0.2135, 0.4063, 0.2544) \begin{bmatrix} 1 & 3 & 5 & 0 & 1 \\ 1 & 1 & 3 & 3 & 2 \\ 0 & 0 & 2 & 5 & 3 \\ 5 & 2 & 1 & 1 & 1 \end{bmatrix}$$

$$= (1.6113, 1.0997, 2.3365, 2.9264, 2.0261)$$

Table 1 Single factor evaluation of quality for an accounting major graduate

Evaluation grade	Basic knowledge B_1				Basic ability B_2				Laws and regulations B_3			
	c_{11}	c_{12}	c_{13}	c_{14}	c_{21}	c_{22}	c_{23}	c_{24}	c_{31}	c_{32}	c_{33}	c_{34}
Excellent v_1	1	1	0	5	2	0	0	1	3	2	1	0
Good v_2	3	1	0	2	3	0	2	1	6	3	1	0
Medium v_3	5	3	2	1	3	5	7	4	1	4	1	0
Pass v_4	0	3	5	1	1	4	1	3	0	1	6	7
Bad v_5	1	2	3	1	0	1	0	1	0	0	1	3
Evaluation grade	Accounting knowledge B_4				Information technology B_5				Comprehensive quality B_6			
	c_{41}	c_{42}	c_{43}	c_{44}	c_{51}	c_{52}	c_{53}	c_{54}	c_{61}	c_{62}	c_{63}	c_{64}
Excellent v_1	2	0	1	0	0	1	0	0	6	2	0	0
Good v_2	4	1	2	0	0	4	0	2	4	4	1	1
Medium v_3	4	8	5	3	0	3	4	7	0	3	3	1
Pass v_4	0	0	2	6	2	2	6	0	0	1	5	5
Bad v_5	0	1	0	1	8	0	0	1	0	0	1	3

The results of all two levels of Table 1 are shown in Table 2.

Table 2 First level fuzzy comprehensive evaluation results of quality for an accounting major graduate

Basic knowledge B_1	Basic ability B_2	Laws and regulations B_3
(1.6113, 1.0997, 2.3365, 2.9264, 2.0261)	(0.6911, 1.3755, 4.7417, 2.4081, 0.5320)	(1.5509, 2.5475, 1.6505, 3.3563, 0.8948)
Accounting knowledge B_4	Information technology B_5	Comprehensive quality B_6
(0.9742, 2.1498, 4.8325, 1.8448, 0.1987)	(0.3554, 1.9918, 3.9103, 2.2782, 1.4643)	(1.8992, 2.4958, 1.8509, 2.7801, 0.9740)

(3) Two level fuzzy comprehensive evaluation. The calculation process and results are as follows:

$$B = \begin{bmatrix} 0.1077 \\ 0.2773 \\ 0.0897 \\ 0.2311 \\ 0.1401 \\ 0.1541 \end{bmatrix}^T \times \begin{bmatrix} 1.6113 & 1.0997 & 2.3365 & 2.9264 & 2.2061 \\ 0.6911 & 1.3755 & 4.7417 & 2.4081 & 0.5320 \\ 1.5509 & 2.5475 & 1.6505 & 3.3563 & 0.8948 \\ 0.9742 & 2.1498 & 4.8325 & 1.8448 & 0.1987 \\ 0.3554 & 1.9918 & 3.9103 & 2.2782 & 1.4643 \\ 1.8992 & 2.4958 & 1.8509 & 2.7801 & 0.9740 \end{bmatrix}$$

$$= (1.0719, 1.8889, 3.6644, 2.4579, 0.8472)$$

According to the evaluation criteria, the evaluation results of the comprehensive quality of accounting graduates are "Medium". The main reason is the results of the assessment are: influence on the evaluation results of the three most important indicators of "Basic ability, Accounting knowledge, Comprehensive quality evaluation" results are "Medium, Medium, Pass; influence on the evaluation results of the five most important two level index" Business operation, Accounting

Financial, accounting Professional, ethics, Economic management "evaluation results are " Medium, Good, Medium, Good, Pass ".

Conclusion

As well as the production of quality products, in addition to the strict management of all aspects of the training process, we must have a scientific monitoring, inspection and evaluation system. In order to have an objective understanding of the overall quality of students, timely feedback, find the problems in the training process, which can be adjusted and improved in time, and constantly improve the effectiveness of education. Such a set of evaluation system can help employers more accurately and quickly find the talent needed. With the change of times, the quality requirements of society for graduates will continue to put forward the new standard, therefore, the evaluation should actively adapt to the social economic development requirements, may be appropriate to adjust the weight of each evaluation index, achieve the purpose of evaluating the comprehensive quality of graduates is both practical and scientific.

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