Research of Vocational Specialty Evaluation System Based on Group Decision-making Technique

CHEN Liang[1], CHEN Li-fang[2], QI Shu-li[2]

[1]*TangShan Professional Technology College, TangShan,HeBei,China*,063004

[2]*Hebei Polytechnic University, Tangshan Hebei China*,063009

E-mail: ts_chenliang@126.com, hblg_clf@163.com, qishuli135@163.com

***Abstract*-Applying group decision-making technology, the professional setting evaluation system has been built for specialty characters in vocational institute. It is reliable and scientific. By the guidance of this system, a set of software with highly practical has been programmed. The system and software provide a scientific basis for decision-making in vocational institute professional setting.**

***Key words*-Group decision-making; Vocational Institute; professional setting; AHP]**

1. Introduction

Professional development is one of the core works of high vocational institute. In the professional building work, professional settings has become the most important. Scientific decision-making for the professional setting related to each college's future survival and development. Although each institution has a different choice of specialty evaluation methods, but mostly subjective decision based cooperation, lack of scientific basis for theory, operability poor, which leads to frequently error in specialty decision-making process. In the study, applying group decision-making technology, the professional setting evaluation system has been built for specialty characters in vocational institute. It is reliable and scientific. By the guidance of this system, a set of software with highly practical has been programmed. The system and software provide a scientific basis for decision-making in vocational institute professional setting.

2. Statistics of a Specialty Factors Research

Through full analysis of a specialized vocational college professional features, select the following six influential factors summary: the employment, situation of teachers, social influence, equipment and facilities the situation, school and enterprise cooperation, education and teaching reform of the professional setting, make a questionnaire. The investigations were to the College (including the Institute of leadership, teachers, students), government managers, education specialists and business experts, high school graduates, parents of high school students, high school teachers and social workers, has issued 300 ordinary, 242 questionnaires, and the valid papers 212, illustrated in table 1.

Table1 Factors Affecting Specialty Statistics Survey

time：10/20/2009

quotes	important / votes	Very important	Important	general	indifferent
1	employment	160	30	19	3
2	teachers	101	54	32	25
3	social influence	57	41	66	48
4	equipment and facilities	62	77	42	31
5	enterprise cooperation	35	83	45	49
6	teaching reform	15	37	71	89

978-1-935068-31-0

3. Determine Quota & Weight in Professional Setting Evaluation System

As a decision-making process, AHP provides a measure of decision-making factors (especially socio-economic factors) and the basic method. It makes good use of the experiences and judgments, take the form of relative scale, can be unified on the tangible and intangible, quantitative and non-quantitative factors in measurement.[1-2]

3.1 Applying AHP

Applying AHP analysis the relationship between the factors of system, established system hierarchical structure

According to Table 1, to establish the mathematic model shown in Figure 1.

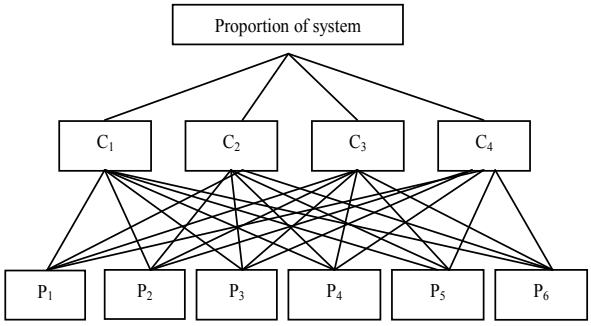

Figure1 Index system hierarchical structure diagram

3.2 Constructed comparison matrix

According to Fig1,compared on the same level elements under a hierarchy of criteria for the importance[3-4], constructed comparison matrix which are shown in table 2 to table 6.

Table 2. Overall comparison matrix

	C_1	C_2	C_3	C_4
C_1	1	3	7	9
C_2	1/3	1	3	7
C_3	1/7	1/3	1	3
C_4	1/9	1/7	1/3	1

Table 3 Comparison matrix of C

	C_1	P_1	P_2	P_3	P_4	P_5	P_6
B_1=	P_1	1	2	3	3	4	9
	P_2	1/2	1	2	2	3	7
	P_3	1/3	1/2	1	1	2	4
	P_4	1/3	1/2	1	1	2	4
	P_5	1/4	1/3	1/2	1/2	1	2
	P_6	1/9	1/7	1/4	1/4	1/2	1

Table 4 Comparison matrix of C2

	C_2	P_1	P_2	P_3	P_4	P_5	P_6
B_2=	P_1	1	1/2	1	1/2	1/3	1
	P_2	2	1	1	1/2	1/2	1
	P_3	1	1	1	1/2	1/2	1
	P_4	2	2	2	1	1	2
	P_5	3	2	2	1	1	2
	P_6	1	1	1	1/2	1/2	1

Table 5 Comparison matrix of C3

	C_3	P_1	P_2	P_3	P_4	P_5	P_6
B_3=	P_1	1	1/2	1/3	1/2	1/2	1/4
	P_2	2	1	1/2	1	1	1/2
	P_3	3	2	1	2	2	1
	P_4	2	1	1/2	1	1	1/2
	P_5	2	1	1/2	1	1	1/2
	P_6	4	2	1	2	2	1

Table 6 Comparison matrix of C4

	C_4	P_1	P_2	P_3	P_4	P_5	P_6
B_4=	P_1	1	1/8	1/9	1/9	1/9	1/9
	P_2	8	1	1/2	1	1/2	1/4
	P_3	9	2	1	2	1	1/2
	P_4	9	1	1/2	1	1/2	1/3
	P_5	9	2	1	2	1	1/2
	P_6	9	4	2	3	2	1

Definition1:[6-8]

Definition of a matrix $A=(a_{ij})_{m\times m}$, A > 0 if condition:

① $a_{ii}=1(i=1,2,\cdots,m)$,

② $a_{ij}=\frac{1}{a_{ji}}(i,j=1,2,\cdots,m)$,

Claimed that matrix A is a positive reciprocal matrix.

Definition2:

Set $A=(a_{ij})_{m\times m}$, A > 0, if meet the condition $a_{ij}=\frac{a_{ik}}{a_{jk}}(i,j,k=1,2,\cdots,m)$, claimed that matrix A is consistent matrix.

4. Calculating

Calculating the relative weights based on the comparison matrix[9-10], the results shown in Table 7.

Table 7 results

	C_1	C_2	C_3	C_4
P_1	0.378	0.105	0.071	0.022
P_2	0.239	0.140	0.134	0.113
P_3	0.135	0.123	0.257	0.199
P_4	0.135	0.246	0.134	0.120
P_5	0.076	0.263	0.134	0.199
P_6	0.036	0.123	0.269	0.346
λ_{max}	6.035	6.057	6.009	6.169
C.I	0.007	0.0114	0.0019	0.034

It can see from the Table 7, the five matrices were tested by consistency.

5. Calculate the Synthesis Weight

Calculate the synthesis weight of the different layer elements to the target system. [11-12]

978-1-935068-31-0 © 2010 SciRes.

$$W^{(3)} = \begin{bmatrix} 0.378 & 0.105 & 0.071 & 0.022 \\ 0.239 & 0.140 & 0.134 & 0.113 \\ 0.135 & 0.123 & 0.257 & 0.199 \\ 0.135 & 0.246 & 0.134 & 0.120 \\ 0.076 & 0.263 & 0.134 & 0.199 \\ 0.036 & 0.123 & 0.269 & 0.346 \end{bmatrix} \begin{bmatrix} 0.592 \\ 0.262 \\ 0.101 \\ 0.045 \end{bmatrix} = \begin{bmatrix} 0.2594 \\ 0.1968 \\ 0.1471 \\ 0.1633 \\ 0.1364 \\ 0.0963 \end{bmatrix}$$

From the calculated combination weight vector can be seen, the professional impact of specialty factor employment share of the weight is 25.94%; teacher case the weight is 19.68%; social influence of the weight of 14.71%; equipment and facilities condition weight of 16.33%; school and enterprise cooperation was 13.64%; education and teaching reform of the weight of 9.63%. Decision-making process in the next step, this calculation will be subject to the expert score assignment.

6. Expert Evaluation of Professional Setting

It can design a professional specialty expert evaluation table, shown in Table 8.

Table 8 Expert evaluation table

	score / grade / quotes	Weight score	grade			score
			Excellent	Qualify	Unqualify	
1	Employment	26	22-26	16-21	0-15	
2	Teachers	20	17-20	13-16	0-12	
3	Social influence	15	13-15	10-12	0-9	
4	Equipment & facilities	16	14-16	11-13	0-10	
5	Enterprise cooperation	14	12-14	9-11	0-8	
6	Teaching reform	9	8-9	6-7	0-5	
Total		100				

At least 10 experts were selected from area of educational, business and government, based on the full investigation of the evaluated profession, experts give their score in the rate table. Removing the highest point and the lowest point, calculate the final points for the evaluated profession. So, in the next step, we can make decisions in accordance with Table 9.

Table 9 Evaluation results

	Score range	Decision results	Notes
1	80~100	actively preparing for opening	
2	60~80	Careful treatment, further proof	
3	<60	No longer considered	

In this research, 12 experts have been selected to carry out the professional evaluation, the professional final score was 87 points. The result shows that we should be actively preparing for the opening of the profession.

7. Realizing the System

Because of the same profession in different regions and under different environmental conditions, teaching conditions and their acceptance of such profession would be different. In this study, Visual Basic.NET & MATLAB has been used to realize the whole process. The user can input his research information directly, through the process of computing the evaluated results will be output. By programming the system, the evaluation system has more strong operational and practical, it is facility to use for people.[13-14]

The application of this research provide the scientific basis of technical means and decision-making for all of the vocational institutes professional setting, saving a lot of manpower, material and financial resources, so as to create a certain social value and economic value.

References:

[1] Wang Guo-hua. Decision theory and methods. Hefei: Science and Technology University Press.2006
[2] Fang Zhi-geng. Decision theory and methods Beijing: Science

Press.2009
[3] Zhang Dong-po,Wang Yao-nan., Rough neural network and the basic intelligence information processing applications[j]. Control & Decision ,2005,2, P121-P126
[4] Chen Li-fang. AHP Fuzzy Incomplete Matrix Method[J]. Hebei polytechnic university Tecnology. 2006.2
[5] Chen Li-fang. AHP's iteration method and its implementation and application of computer,System Engineering, 2002
[6] R. Wille. Restructuring lattice theory: an approach based on hierarchies of concepts. In *Ordered Sets,* I. Rival, ed. pp. 445-470. Reidel, Dordrecht, Boston, 1982.
[7] Davey, B. A. & Priestley, H. A. (1992). Introduction to Lattices and Order. Cambridge: Cambridge University Press.
[8] Saaty T.L. The Analytic Hierarchy Process Mcgram-Hill. New York. 1980.
[9] CHEN Li-fang, ZHANG Chun-ying, LIU Bao-xiang. Deciding Weight coefficients of Group AHP by Concept Lattice. ASSA. 2005.2
[10] LIU Chun-feng, CHEN Li-fang. The Method and Application of Amend Positive Matrix in Mutually Apposed and Frequently Reappearing Consistent. Tangshan, Hebei: Hebei Institute of Technology Journal. 2001.11.
[11] CHEN Li-fang, ZHANG Chun-ying, LIU Bao-xiang.Deciding Weight coefficients of Group AHP by Concept Lattice. ASSA. 2005.2
[12] YOU De-kai, ZHAO Yu-qin, XU Li-hong.Completion of Uncomplete Judgement Information in Analytic Hierchay Process. Shenyang Institute of Chemical Technology Journal. 2000.3
[13] Sai Kui-chun. Visual Basic Engineering application & Project Practice. Beijing:: Machinery Industry Press. 2005
[14] Zhang Hong-li, Chen Hua. new methods of data exchange in VB & MATLAB. Computer application and Software. 2004, 12: 51-52.