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Application of improved analytic hierarchy process in network education evaluation

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ABSTRACT

Network education evaluation based on analytic hierarchy process is presented in this paper. The assessment factors of network education is analyzed, the assessment factors of network education have two first-class assessment factors and six second- class assessment factors. Each decision maker is expressed by the relative importance of two decision elements of the same level. Nine-point scales are used to measure the relative importance of two decision elements of the same level. In the analytic hierarchy process, the scores of pair-wise comparisons are used to form the pair-wise comparison matrices for each decision makers. The proposed network education evaluation method is applied to network education evaluation of Tianjin university. The experimental results indicate that evaluation results of network education of Tianjin university based on analytic hierarchy process is the same as the evaluation results of the evaluation experts.

KEYWORDS

Network education; Evaluation; Analytic hierarchy process; Decision-making.

INTRODUCTION

Analytic hierarchy process (AHP) is one of the most popular evaluation method[1-4], which have simple calculation and wide application[5,6]. Thus, network education evaluation based on analytic hierarchy process is presented in this paper. The assessment factors of network education is analyzed, the assessment factors of network education have two first-class assessment factors and six second- class assessment factors. The first-class assessment factors include teaching conditions and teaching achievements, and the second -class assessment factors include teaching facilities, teaching team, multimedia course, average grade, graduation rate, employment rate. Each decision maker is expressed by the relative importance of two decision elements of the same level. Nine-point scales are used to measure the relative importance of two decision elements of the same level. In the analytic hierarchy process, the scores of pair-wise comparisons are used to form the pair-wise comparison matrices for each decision makers.

The proposed network education evaluation method is applied to network education evaluation of Tianjin university. According to absolute weights of the second-assessment indexes and evaluation levels of the second-assessment indexes of network education of Tianjin university, the evaluation result of network education of Tianjin university can be obtained as ‘very good’. This evaluation result of network education of Tianjin university based on analytic hierarchy process is the same as the evaluation results of the evaluation experts. Thus,we can conclude that network education evaluation based on analytic hierarchy process is effective.

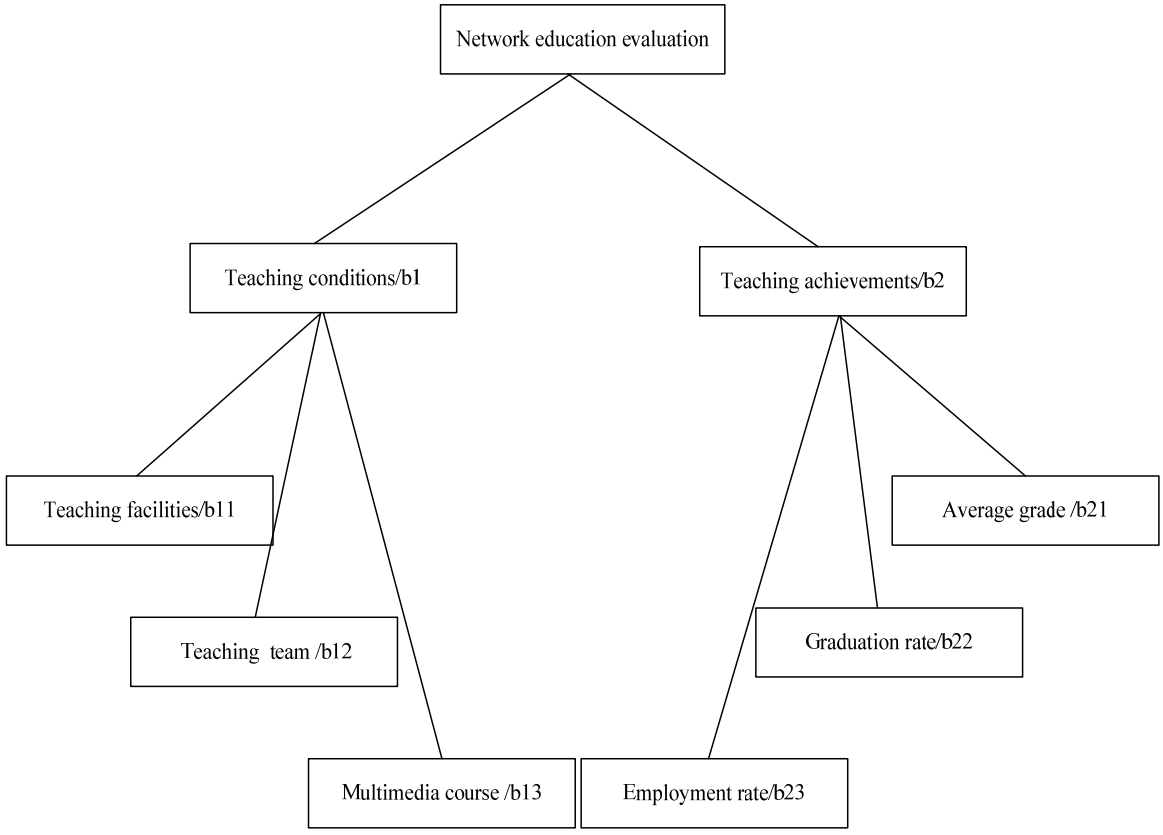

Figure 1: The assessment factors of network education

THE ASSESSMENT FACTORS OF NETWORK EDUCATION

The assessment factors of network education are described in Figure 1. The assessment factors of network education have two first-class assessment factors and six second- class assessment factors. The

first-class assessment factors include teaching conditions and teaching achievements, and the second - class assessment factors include teaching facilities, teaching team, multimedia course, average grade, graduation rate, employment rate. Among which teaching facilities, teaching team, multimedia course belong to teaching conditions; and average grade, graduation rate, employment rate belong to teaching achievements. We denote b1 and b2 as teaching conditions and teaching achievements respectively, and denote b11, b12, b13, b21, b22, b23 as teaching facilities, teaching team, multimedia course, average grade, graduation rate and employment rate respectively.

Each decision maker is expressed by the relative importance of two decision elements[7,8]. Nine-point scales are used to measure the relative importance of two decision elements of the same level[9-12]. Then, nine-point scales can be shown in TABLE 1.

TABLE 1 : Meaning of the scale

Scale	Meaning
1	Equal scale
3	Moderate scale
5	Strong scale
7	Extreme scale
9	Absolute scale
2,4,6,8	Intermediate levels of the above scale

NETWORK EDUCATION EVALUATION PROCESS BY ANALYTIC HIERARCHY PROCESS

In the analytic hierarchy process, the scores of pair-wise comparisons are used to form the pair-wise comparison matrices for each decision makers[13,14].

The first-class assessment matrix is obtained according to the scores of pair-wise comparisons of the first-class assessment indexes: teaching conditions and teaching achievements, which is shown in TABLE The first-class assessment matrix can be described as follows:

$$B=\begin{bmatrix} b1/b1 & b1/b2 \\ b2/b1 & b2/b2 \end{bmatrix}=\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix} \quad \textbf{(1)}$$

TABLE 2 : The scores of pair-wise comparisons of the first-class assessment indexes

b	*b*1	*b*2	weight
*b*1	1	1	0.5
*b*2	1	1	0.5

The weight of the decision elements are obtained, which is shown in TABLE 2. The matrix must be analyzed for consistency. The matrix is consistent by the consistency check.

The first second-class assessment matrix is obtained according to the scores of pair-wise comparisons of the second-class assessment indexes: teaching facilities, teaching team and multimedia course, which is shown in TABLE 3. This assessment matrix can be described as follows:

$$B=\begin{bmatrix} b11/b11 & b11/b12 & b11/b13 \\ b12/b11 & b12/b12 & b12/b13 \\ b13/b11 & b13/b12 & b13/b13 \end{bmatrix}=\begin{bmatrix} 1 & 1/2 & 2 \\ 2 & 1 & 3 \\ 1/2 & 1/3 & 1 \end{bmatrix} \quad \textbf{(2)}$$

The weight of the decision elements are obtained, which is shown in TABLE 3. The matrix must be analyzed for consistency. The matrix is consistent by the consistency check.

TABLE 3 : The scores of pair-wise comparisons of the second-class assessment indexes: teaching facilities, teaching team and multimedia course

***b*1**	***b*11**	***b*12**	***b*13**	**weight**
*b*11	1	1/2	2	0.2970
*b*12	2	1	3	0.5396
*b*13	1/2	1/3	1	0.1634

The other second-class assessment matrix is obtained according to the scores of pair-wise comparisons of the second -class assessment indexes: average grade, graduation rate and employment rate, which is shown in TABLE 3. This second-class assessment matrix can be described as follows:

$$B=\begin{bmatrix} b21/b21 & b21/b22 & b21/b23 \\ b22/b21 & b22/b22 & b22/b23 \\ b23/b21 & b23/b22 & b23/b23 \end{bmatrix}=\begin{bmatrix} 1 & 1 & 1/2 \\ 1 & 1 & 1/3 \\ 2 & 3 & 1 \end{bmatrix} \quad \textbf{(3)}$$

The weight of the decision elements are obtained, which is shown in TABLE 4. The matrix must be analyzed for consistency. The matrix is consistent by the consistency check.

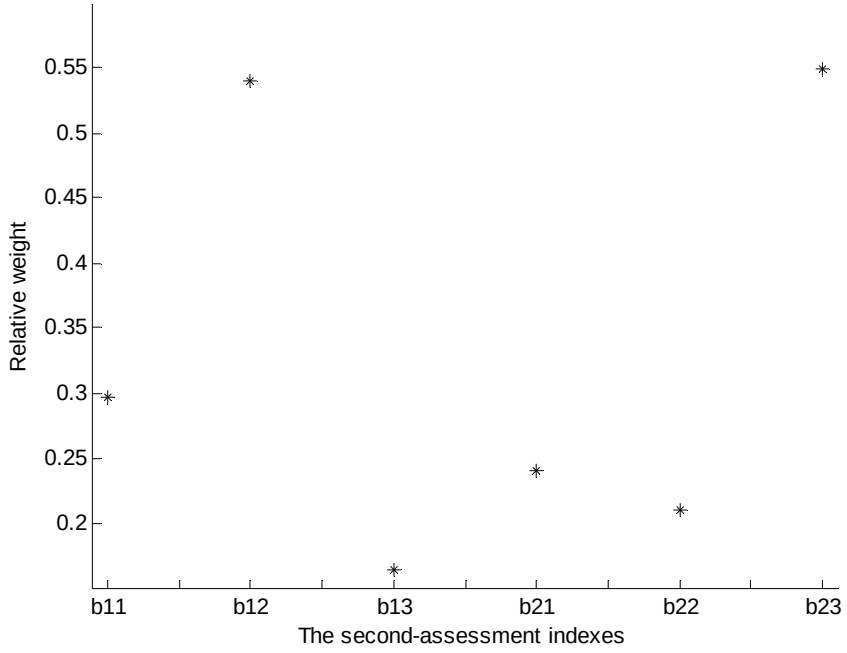

Figure 2 : Relative weights of the second-assessment indexes

TABLE 4 : The scores of pair-wise comparisons of the second-class assessment indexes: average grade, graduation rate and employment rate

***b*2**	***b*21**	***b*22**	***b*23**	**weight**
*b*21	1	1	1/2	0.2402
*b*22	1	1	1/3	0.2098
*b*23	2	3	1	0.5499

The weight of the decision elements are obtained, which is shown in TABLE 4. The matrix must be analyzed for consistency. The matrix is consistent by the consistency check.

Relative weights of the second-assessment indexes are shown in Figure 2. And absolute weights of the second-assessment indexes are shown in Figure 2.

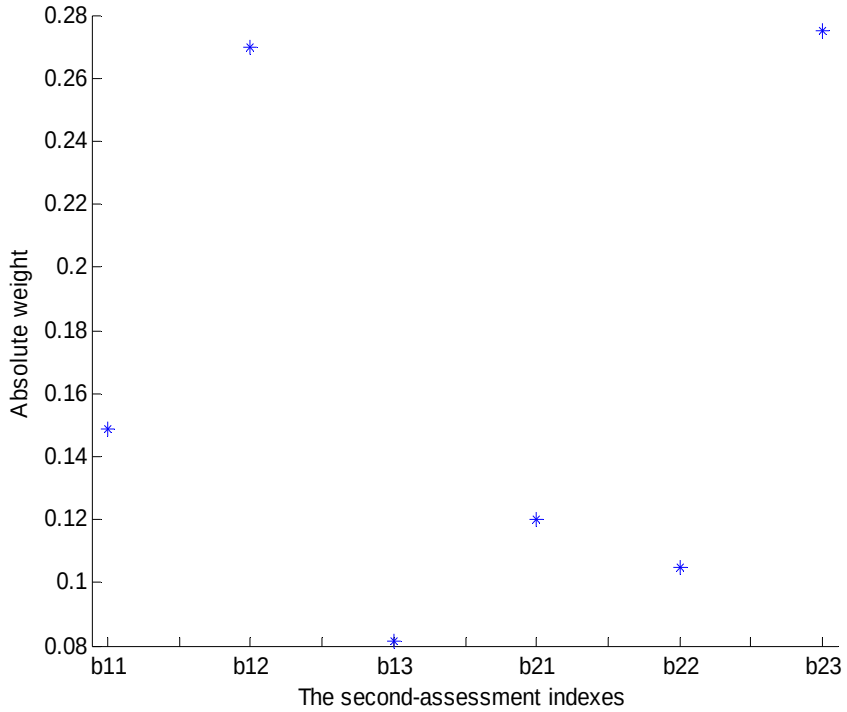

Figure 3 : Absolute weights of the second-assessment indexes

TABLE 5 : The evaluation level of the evaluation indexes of network education

Level	Meaning
1	very bad
2	bad
3	fair
4	good
5	very good

TABLE 6 : The description of the evaluation level of network education

Evaluation values	Level
0~1	very bad
1~2	bad
2~3	fair
3~4	good
4~5	very good

In this study, the evaluation level of the evaluation indexes of network education is divided into five degrees including ‘very bad’, ‘bad’, ‘fair’, ‘good’, ‘very good’, which is shown in TABLE 5. The evaluation level of network education is given in TABLE 6.

APPLICATION OF ANALYTIC HIERARCHY PROCESS IN NETWORK EDUCATION EVALUATION

The proposed network education evaluation method is applied to network education evaluation of Tianjin university. Evaluation levels of the second-assessment indexes of network education of Tianjin university are shown in Figure 4.

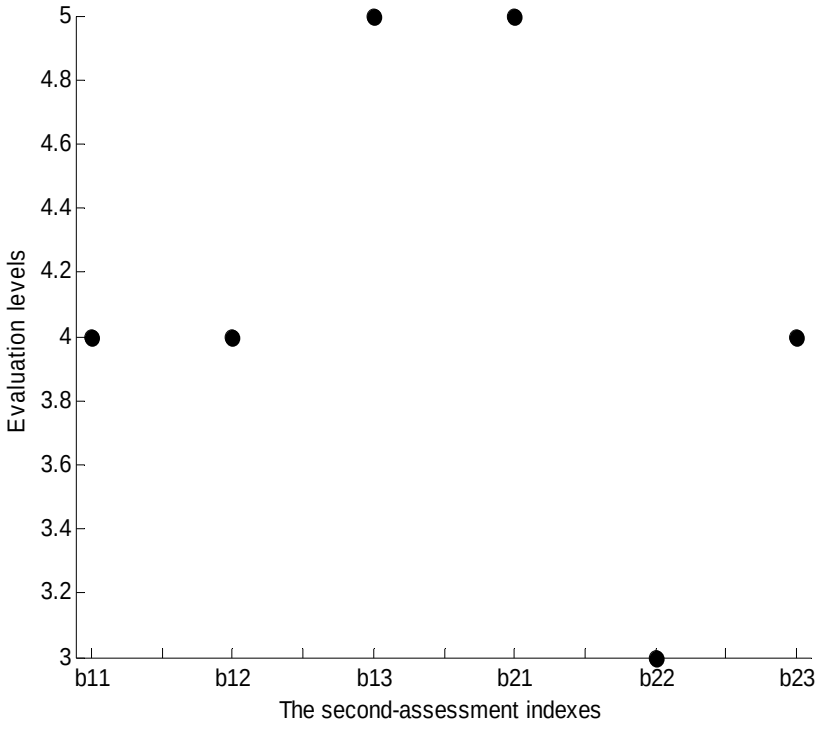

Figure 4 : Evaluation levels of the second-assessment indexes of network education of Tianjin university

According to absolute weights of the second-assessment indexes and evaluation levels of the second-assessment indexes of network education of Tianjin university, the evaluation value of network education of Tianjin university can be obtained, which is '4.0967'. According to the description of the evaluation level of network education of TABLE 6, the evaluation result of network education of Tianjin university can be obtained as 'very good'. This evaluation result of network education of Tianjin university based on analytic hierarchy process is the same as the evaluation results of the evaluation experts. Thus,we can conclude that network education evaluation based on analytic hierarchy process is effective.

CONCLUSION

Network education evaluation based on analytic hierarchy process is presented in this paper. The assessment factors of network education is analyzed, the assessment factors of network education have two first-class assessment factors and six second- class assessment factors. The proposed network education evaluation method is applied to network education evaluation of Tianjin university. This evaluation result of network education of Tianjin university based on analytic hierarchy process is the same as the evaluation results of the evaluation experts. Thus, we can conclude that network education evaluation based on analytic hierarchy process is effective.

REFERENCES

[1] Chih-Yao Lo; Evaluation Indicators for Decision-Making Model for Weddings, Advances in Information Sciences and Service Sciences, **3(7)**, 147-156 **(2011)**.

[2] Xueyan Cao, Fayun Deng, Liang Liu, Xiaolin Li, Shiming Li; Information Pretreatment and Multi-criteria Decision Making in Fast Disaster Assessment, International Journal of Digital Content Technology and its Applications, **5(10)**, 20-30 **(2011)**.

[3] Michael Henry, Yoshitaka Kato; An assessment framework based on social perspectives and Analytic Hierarchy Process: A case study on sustainability in the Japanese concrete industry, Journal of Engineering and Technology Management, **28(4)**, 300-316 **(2011)**.

[4] A.Azadeh, S.F.Ghaderi, M.Mirjalili, M.Moghaddam; Integration of analytic hierarchy process and data envelopment analysis for assessment and optimization of personnel productivity in a large industrial bank, Expert Systems with Applications, **38(5)**, 5212-5225 **(2011)**.

[5] Kun Xu, Wei Li, Dangfang Zhang; An AHP-Based Risk-Assessment Model of Expressway Network, International Journal of Digital Content Technology and its Applications, **6(21)**, 390-399 **(2012)**.

[6] Yu Ying; The Study on Logistics Supplier Management based on Analytic Hierarchy Process and Information Entropy, International Journal of Advancements in Computing Technology, **4(21)**, 254- 261 **(2012)**.

[7] I.Athanasios; Chatzimouratidis, Petros A. Pilavachi,Technological, economic and sustainability evaluation of power plants using the Analytic Hierarchy Process, Energy Policy, **37(3)**, 778-787 **(2009)**.

[8] I-Tung Yang, Wei-Chih Wang, Tzu-I Yang;Automatic repair of inconsistent pairwise weighting matrices in analytic hierarchy process, Automation in Construction,**22**, 290-297 **(2012)**.

[9] Shuo-Fang Liu, Yann-Long Lee, Jung-Chin Liang; Shape design of an optimal comfortable pillow based on the analytic hierarchy process method,Journal of Chiropractic Medicine, **10(4)**, 229-239 **(2011)**.

[10] Seong Kon Lee, Gento Mogi, Jong Wook Kim; Decision support for prioritizing energy technologies against high oil prices: A fuzzy analytic hierarchy process approach,Journal of Loss Prevention in the Process Industries, **22(6),** 915-920 **(2009)**.

[11] D.Cao, L.C.Leung, J.S.Law; Modifying inconsistent comparison matrix in analytic hierarchy process: A heuristic approach,Decision Support Systems, **44(4)**, 944-953 **(2008)**.

[12] Seong Kon Lee, Gento Mogi, Jong Wook Kim, Bong Jin Gim; A fuzzy analytic hierarchy process approach for assessing national competitiveness in the hydrogen technology sector,International Journal of Hydrogen Energy, **33(23)**, 6840-6848 **(2008)**.

[13] Fatma Tiryaki, Beyza Ahlatcioglu; Fuzzy portfolio selection using fuzzy analytic hierarchy process, Information Sciences, **179(1-2)**, 53-69 **(2009)**.

[14] A.Janine van Til, J.Gerbert Renzenbrink, G.James Dolan, J.Maarten IJzerman; The Use of the Analytic Hierarchy Process to Aid Decision Making in Acquired Equinovarus Deformity, Archives of Physical Medicine and Rehabilitation, **89(3)**, 457-462 **(2008)**.