Study on the Evaluation Model of Post Competency Based on Higher Vocational Project Management in Professional

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ABSTRACT

Make post competency evaluation model as the research object, based on the questionnaire survey and analytic hierarchy process (AHP) to construct higher vocational competency evaluation index system of students major in profession management in construction, based on AHP to calculate weight comprehensive evaluation index, evaluation method is put forward, building the appraisal model of post competence. The evaluation model can understand students the advantages and disadvantages of post competency force, adjusting to the professional training mode gives constructive suggestions, implement the professional training of students more in line with the demand of company which choose and employ the students, to improve the satisfaction of the company.

KEYWORDS
Evaluation model of post competency (EMPC), Professional Management in Construction (PMC), Analytic hierarchy process (AHP), Grey clustering theory.

INTRODUCTION

Competence refers to the deep features excellent performers at work, can be a motive, characteristics, self-image, attitudes or values, professional knowledge and cognitive or behavioral skills, and able to significantly distinguish between good performance and the performance of ordinary individual characteristics. Today, competency is often defined as the knowledge, skills, abilities and qualities of a high-achiever. Some research had studied, different researchers have constructed a variety of competency models and evaluation indexes from their respective perspectives. Due to different target positions, the construction of competency evaluation index system is not the same. How to improve the post competency of higher vocational students, and how to adjust the personal training mode to make the students meet the requirement of hire companies, educational circles the attention to these problems become more eager. Therefore, the competency evaluation model was constructed based on the higher vocational engineering management and the aim is to provides the theoretical basis for the reform of talent training mode.

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LITERATURE REVIEW

At present, there are some research achievements in the study of competency, which are mainly divided into two aspects:

On the one hand, it is the research of the competency model [1, 2, 3]. The paper [4] studies the system of building competency model. In the case of Beijing railway bureau, the relationship between the competency and career satisfaction was studied, and the relationship model of competency and career satisfaction was constructed. The results indicate that there is a significant positive correlation between job competence and career satisfaction, and the job competence has a positive effect on career satisfaction. Chinese scholar Shikan [5] studied the competency model of a corporate executive post, and verified that competency assessment can distinguish excellent management cadres and general managers.

On the other hand, it is based on the competency of personnel training mode reform [6, 7, 8]. The research of Wang Jin [9] takes a vocational college in Zhejiang province as an example to introduce the competency theory of the position into the training mode of high vocational customs declaration talents. In this study, he pointed out that education of higher vocational colleges should not only focus on the operation level of education, but also enhance the training of students' theoretical knowledge of education. In his research core professional competence in higher vocational colleges were analyzed, and summarize the declaration the core competence of professional post competency force, exploring teaching in the major of higher vocational customs organization and practice of the road of reform.

From what has been discussed above, we found in the actual process of teaching and research, while some school adopted a new teaching mode and quality education, the graduate’s employment rate and employment satisfaction degree is still low. At present, the outstanding problem is that the talent cultivation in colleges and universities is out of line with the actual demand of enterprises [10]. Traditional predominantly theory instilling teaching mode to ignore the cultivation of the students' employment ability, so it is necessary to study of construction project management professional post competency force, to cultivate technology applied talents that could satisfy the requirement of unit of choose and employ persons.

EVALUATION MODEL OF POST COMPETENCY (EMPC)

The goal of EMPC is to evaluate the competency level of the students. On the one hand, we can understand the advantages and disadvantages of the students' competence, and give specific suggestions for the weak points of individual differences. On the one hand, it can make recommendations for the adjustment and reform of professional training programs. In order to improve the students' job competence and meet the requirements of employers to improve their job satisfaction (Fig. 1).
Evaluate the students whom higher vocational project management in professional as the evaluation target. First, establish the evaluation index system. Secondly, weight is calculated based on the comprehensive evaluation index system. Finally, the author puts forward the method of EMPC. The following three aspects are summarized:

The establishment of evaluation index system

The analytic hierarchy process (AHP) is used to construct the evaluation index model. Through the questionnaire survey, the company of several professional graduates is investigated. The design of the questionnaire is the main content of the students' ability requirements and the actual performance of graduation. In combination with the characteristics of the position and the capabilities required, the relevant knowledge reserve, practical skills and personal qualities are analyzed. Based on the construction index, the three-level comprehensive evaluation index system is constructed by AHP.

The index system includes 3 first-level indexes, 6 second-level indexes and 30 third-level indexes. The first-level indexes of the competency model are knowledge reserve, practical skills and personal accomplishment. The knowledge reserve is divided into several second-level indexes: basic knowledge and professional knowledge. The professional knowledge is decomposed into a number of third-level indexes: construction organization design, construction technology and quality control, bidding and contract management, construction information management (Fig. 2).
Fig. 2. Index model and index weight of post competency evaluation.

**Calculation of evaluation index weight calculation**

By using group AHP subjective weighting method to calculate the comprehensive weight of evaluation indexes at all levels, the problem of inconsistency of group decision making is examined and adjusted by grey correlation analysis method. The index weight of the evaluation model is shown in Fig. 2.
TABLE 1. THE EVALUATION CRITERIA OF PROFESSIONAL MANAGEMENT IN CONSTRUCTION POST COMPETENCE.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Criteria Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>excellence</td>
<td>[90,100]</td>
<td>The knowledge, skills and quality performance are very satisfactory and can meet the requirements of construction engineering management.</td>
</tr>
<tr>
<td>good</td>
<td>[80,90)</td>
<td>The knowledge, skills and quality performance are satisfactory, and can better adapt to the requirements of construction engineering management.</td>
</tr>
<tr>
<td>Medium</td>
<td>[70,80)</td>
<td>The knowledge, skills and quality performance are satisfactory and can meet the requirements of construction engineering management.</td>
</tr>
<tr>
<td>pass</td>
<td>[60,70]</td>
<td>Knowledge, skills and quality performance can basically meet the requirements of construction engineering management.</td>
</tr>
<tr>
<td>fail</td>
<td>(60,0)</td>
<td>The performance of knowledge, skills and quality is not satisfactory, and it is not possible to meet the requirements of construction engineering management.</td>
</tr>
</tbody>
</table>

Evaluation criteria and comprehensive evaluation method

Evaluation criteria. The data of the evaluation criteria in this paper is derived from the construction standard of higher vocational professional management in construction, which is divided into excellent, good, medium, passing and failing grades from high to low. There are five levels of competency evaluation criteria for professional management in construction, and the standard values and grades of each grade are shown in table 1.

Evaluation method. In this paper, the grey clustering theory model is improved by the multi-level grey system and evaluation criteria. The optimal identification of students is carried out. As a result of the limitation of the actual problem to select indicators for evaluation index parameters cannot cover all the information and the grey clustering theory is to uncertainty system as the research object, to solve the deficiency of the samples of this model and poor information.

The albino function. The albino function of each level is associated with the standard values of each category, and the evaluation index value and each category have a membership degree. In this model, there are m grades in the evaluation level. The evaluation objects have n evaluation indexes. The comprehensive weight of each index is \( w_i, w_2, \ldots, w_n, \) \( 0 \leq w_k \leq 1, \sum_{k=1}^{n} w_k = 1 \) the standard value of rating classification is shown in table 2.

TABLE 2. THE CLASSIFICATION STANDARD VALUE OF THE EVALUATION INDEX.

<table>
<thead>
<tr>
<th>Grade 1</th>
<th>Grade 2</th>
<th>…</th>
<th>Grade m</th>
<th>Index value</th>
</tr>
</thead>
<tbody>
<tr>
<td>([y_{11}, y_{12}])</td>
<td>([y_{12}, y_{13}])</td>
<td>…</td>
<td>([y_{1m}, y_{1,m+1}])</td>
<td>(x_1)</td>
</tr>
<tr>
<td>([y_{21}, y_{22}])</td>
<td>([y_{22}, y_{23}])</td>
<td>…</td>
<td>([y_{2m}, y_{2,m+1}])</td>
<td>(x_2)</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>([y_{k1}, y_{k2}])</td>
<td>([y_{k2}, y_{k3}])</td>
<td>…</td>
<td>([y_{km}, y_{k,m+1}])</td>
<td>(x_k)</td>
</tr>
<tr>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>([y_{n1}, y_{n2}])</td>
<td>([y_{n2}, y_{n3}])</td>
<td>…</td>
<td>([y_{nm}, y_{n,m+1}])</td>
<td>(x_n)</td>
</tr>
</tbody>
</table>
\( y_{kh} , y_{k,h+1} \) represents the upper and lower limit of the criteria value of the \( k \) index within the grade \( h \), and \( x_k \) is the index value of the evaluation object, and \( y_{k1} < y_{k2} < y_{k3} < \cdots < y_{km} < y_{k,m+1} \). Then the value of the evaluation object of \( k \) belongs to grade \( h \), which the white function is \( f_{kh}(x_k) \), the calculation formula is as follows:

\[
\begin{align*}
f_{kh}(x) = & \begin{cases} 
1, & y_{k1} \leq x \leq y_{k2} \\
\frac{x-y_{k1}}{y_{k2}-y_{k1}}, & y_{k1} < x \leq y_{k2} \\
\frac{y_{k2}-x}{y_{k2}-y_{k1}}, & y_{k1} \leq x < y_{k2} 
\end{cases} \\
f_{kh}(x) = & \begin{cases} 
1, & y_{km} \leq x \leq y_{km+1} \\
\frac{y_{km} - x}{y_{km+1} - y_{km}}, & y_{km} < x \leq y_{km+1} \\
\frac{y_{km+1} - x}{y_{km+1} - y_{km}}, & y_{km} \leq x < y_{km+1} 
\end{cases}
\end{align*}
\]

**Calculate the grey relational degree.** The traditional grey clustering model calculates the correlation degree and only considers that the index value belongs to the condition of grade \( h \). In addition, this paper also takes into consideration the grey relational degree of the negative ideal solution sequence, and calculates the integrated grey relational degree and the optimal degree of the positive and negative ideal sequence. According to the formula (1) and (2), the value of the albino function of the evaluation index is calculated and the grey relational degree of the positive and negative ideal solution sequence is calculated.

\[
r_{h}^+ = \sum_{k=1}^{n} w_k \frac{\min \min_k [z_{kh}(k) - 1] + \xi \max_k [z_{kh}(k) - 1]}{z_{kh}(k) - 1 + \xi \max_k [z_{kh}(k) - 1]} \tag{1}
\]

\[
r_{h}^- = \sum_{k=1}^{n} w_k \frac{\min \min_k [z_{kh}(k) - 0] + \xi \max_k [z_{kh}(k) - 0]}{z_{kh}(k) - 0 + \xi \max_k [z_{kh}(k) - 0]} \tag{2}
\]

To determine that the evaluation object belongs to grade \( h \), it should satisfy \( r_{h}^+ \) Max and \( r_{h}^- \) minimum. Assume that the evaluation object belongs to the grade \( h \) with \( u_h \), and the value of \( 1 - u_h \) is not subordinate to the grade \( H \). The following objective function is established to determine the optimal degree:

\[
u_h = \frac{(r_{h}^+)^2}{(r_{h}^+)^2 + (r_{h}^-)^2} \tag{3}
\]

If \( \max_h u_h = u_{h_0} \), the evaluation object should belong to grade \( h \). Through the quantitative evaluation of the competency index of the students, the competency level of the post is evaluated, and the requirements of the post are determined.
CONCLUSION

The evaluation model of post competency was constructed based on higher vocational professional management in construction major. Firstly, through the questionnaire survey to establish evaluation index model; secondly, use inspection adjusting inconsistency group decision making based on grey correlation analysis of group AHP evaluation index weight is calculated and the final optimal based on grey clustering model calculate the post competency level students belong to. This model provides a theoretical basis for students' competency assessment, and provides suggestions for the reform of the training mode for later work.

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