A New Selection Model for the Adaptability Scheme of Graduate Employment Information System

Li-Li Dong
The department of Modern management,
Zhengzhou Technical College
Zhengzhou, China
E-mail: donglilibaihe@163.com

***Abstract*—In order to improve graduate employment information system (GEIS) adaptability, the Improvement Scheme of GEIS adaptability is studied. Firstly, an index system for GEIS adaptability is established. Secondly, the selection model for the adaptability scheme is built based on QFD method, and the selection algorithm is also given. Finally, the application of the model and algorithm is verified through an example.**

Keywords- *The graduate employment information system; Adaptability improvement; Selection model; Selection algorithm; QFD*

I. INTRODUCTION

With the number of graduates growing more and more, there are many problems coming forth, like information asymmetry, not orderly information flow, which affect graduate employment seriously. Fortunately, information construction provides a solution to this problem, i.e., solving the job problems of graduates through information construction. Meanwhile, graduate employment information systems (GEIS), as the major carrier of the information construction of university graduates employment, plays an important role in the success of information construction, and one of its properties is adaptability, which is an important factor for a university to adapt to the dynamic environment. Thus, there is significance to study GEIS from view of adaptability.

At present, the researches on information construction of graduate employment mainly focus on the following aspects: (1) study on the importance of information construction of graduate employment [1-4]. (2) countermeasures study on the information construction of graduate employment[5-9]. (3) study on the management information system of college graduate employment service [10-14]. In terms of the first area, Bi Xiaolong [1] analyzed the importance of information construction from three aspects, including the necessity of web information construction of graduate employment, that of the classification feature and the future development trend. In terms of the second area, Hu Qin [8] proposed specific programs and the related measures to ensure the successful implementation of those programs. As for the third area, Ruan Xuegang [13] established an employment service information system of college graduates in Zhejiang province based on Web science and XML. These researches have laid a foundation for the study on GEIS adaptability. Besides, as can be seen from above, there is little research on GEIS adaptability and most of them apply qualitative research, let alone the quantitative study on GEIS adaptability, such as how to choose a better method among many solutions for GEIS adaptability improvement, which is the main topic of this paper.

Thus, to improve GEIS adaptability, how to choose a better adaptability scheme is discussed. First, the index system of GEIS adaptability is established, then the selection model of adaptability scheme and the corresponding selection algorithm are proposed, and finally, the application of the above contents is verified though an example.

II. THE ESTABLISHMENT OF THE INDEX SYSTEM OF ADAPTABILITY

Definition: GEIS adaptability means the ability of GEIS adapting to the dynamic environment, bringing information construction into full play and realizing information flow in order.

To select the adaptability scheme quantitatively, the index system of GEIS adaptability is built, as shown in Fig.1.

As can be seen from Fig.1, five index sets are established, i.e., Cost, Reliability, Robustness, Scalability and Security. Each set contains the corresponding sub-indices, as shown definitely below: (1) Cost: here mainly denotes the adjustment costs, and in this paper two kinds are considered, including information adjustment cost and module adjustment cost. (2) Reliability: this index set contains two sub-indices including mean time between failures and effectiveness. (3) Robustness: this index set is mainly measured by two sub-indices including satisfactory degree and change impact rate. (4) Scalability: this index set mainly contains two sub-indices including modular layer degree and the interaction degree between modules. (4)Security: two kind of security are considered in this index set. One is the security of system and the other is the security of data.

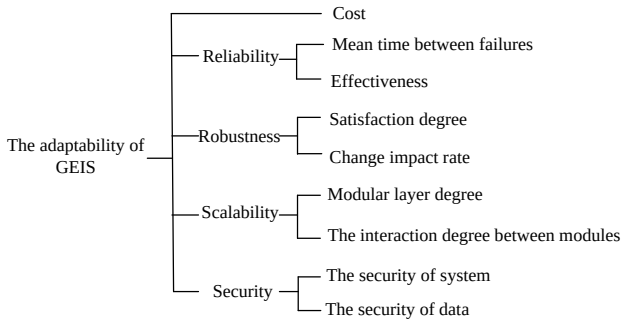


Fig.1 the index system of GEIS adaptability

III. THE SELECTION MODEL OF ADAPTABILITY SCHEME AND THE CORRESPONDING ALGORITHM

A. The selection model of adaptability scheme

In this paper, QFD is adopted to build the selection model of adaptability scheme, as shown in Fig.2.

As can be seen from Fig.2, (1) A represents customer demands, which can be obtained through questionnaire or market survey. (2) B represents the self-correlation matrix between adaptability indices. (3) C consists of adaptability indices, which is obtained the analysis of customer demands using certain analysis tool. (4) D represents the correlation matrix between customer demands and adaptability indices. (5) E means the importance of the adaptability indices of each scheme. (6) F represents the satisfactory degree of adaptability.

B. The selection algorithm

Based on the selection model established above, the corresponding selection algorithm is shown in Fig.3.

The concrete steps are shown in the following:

Algorithm 1: the selection algorithm

Step 1: analyze customer demands based on the data obtained through questionnaire or market survey, then obtain customer demand set $U_1 = \{u_1, u_2, \cdots, u_m\}$. Then based on customer demands, obtain the corresponding adaptability index set $U_2 = \{u_1', u_2', \cdots, u_m'\}$.

Step 2: compute the importance of each adaptability index $W_1 = \{w_1, w_2, \cdots, w_m\}$, and the method of obtaining the corresponding importance is explained in Algorithm 2.

Step 3: establish the correlation matrix between adaptability indices. Firstly, analyze the relation between customer demands and adaptability indices. Then establish the self-correlation matrix between adaptability indices. And finally, normalize the self-correlation matrix, and the standardized formula is shown in Eq.(1).

$$R_{ij}^{*} = \frac{\sum_{h=1}^{n} R_{ih} Y_{hj}}{\sum_{j=1}^{n}\sum_{h=1}^{n} R_{ih} Y_{hj}} \tag{1}$$

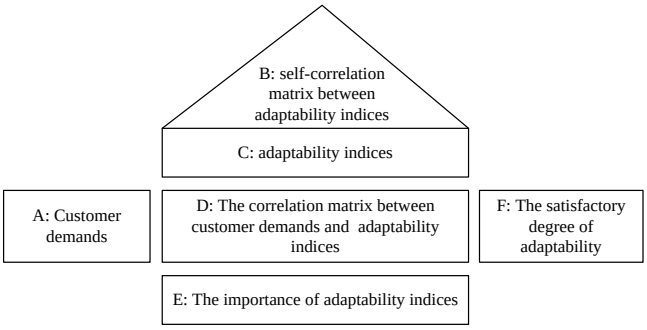


Fig.2 the selection model of adaptability scheme

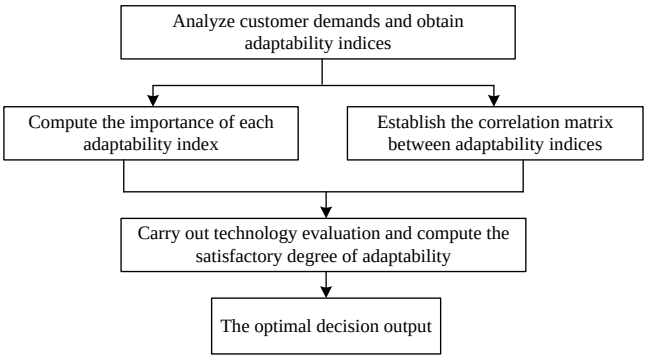


Fig.3 The selection algorithm

Where, $i = 1,2,\cdots,m;\ j,h = 1,2,\cdots,n;$ R_{ij} represents the correlation matrix between customer demands and adaptability indices. Y_{hj} represents the self-correlation matrix between adaptability indices.

Step 4: carry out technology evaluation, and compute the satisfactory degree of adaptability of each scheme. The specific computing method is shown in the following equations.

$$d_{i0} = \sum_{i} \frac{R_{ij}^{*}\left|x_k^{l} - x_k^{0}\right|}{x_k^{0}} \tag{2}$$

$$AM_i^{k} = I_m\left(1 \pm d_{i0}\right) \tag{3}$$

$$AM^{k} = \sum_{i=1}^{m} w_i AM_i^{k} \tag{4}$$

Where, x_k^0 represents the k^{th} satisfactory degree value at present. x_k^l represents the k^{th} satisfactory degree of the l^{th} scheme. d_{i0} represents the relative approach degree between the satisfactory degree of scheme and the benchmarking enterprise. R_{ij}^{*} is the correlation matrix after normalization. AM^{k} is the satisfactory value of the k^{th} scheme. I_m is the satisfactory index at present.

Step 5: make the optimal decision according to the satisfaction degree of each scheme. And the bigger AM^{k} is, the better the corresponding scheme is.

C. The selection algorithm

Assume there are S kinds of weight setter methods for multi-objectives. Each method corresponds to a weight factor, Given the weight vector of the p^{th} method is $W_p = (w_{1p}, w_{2p}, \cdots, w_{zp})^T$. Besides, each component of the weight vector is non-negative, that is, $w_{dp} \geq 0$, and $\sum_{d=1}^{z} w_{dp} = 1$. Then the weighted combination algorithm is shown below.

Algorithm 2: The weighted combination algorithm

Step1: establish the evaluation matrix according to questionnaire, and standardize the evaluation matrix. Then normalized evaluation matrix R is obtained.

Step2: obtain S weight vector according to different setter methods, and matrix A has S weight vector.

Step 3: compute the maximum eigenvalue $\lambda_{\max}$ of $(R^T A)^T (R^T A)$ and the corresponding eigenvector X^*.

Step 4: given $W^* = AX^*$, after normalization, the optimal combination weight vector is obtained, that is, $W^{**} = W^* / e^T W^*$, where $e^T = (1,1,\cdots,1)^T$.

IV. EXAMPLES

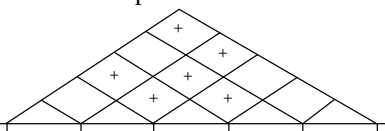
An example is used to show the feasibility and the effectiveness of the above contents in this paper. In a college, the current situation of GEIS cannot adapt to the environment, and now it's necessary to improve its adaptability. According to questionnaire and interview, customer demands mainly focus on the following aspects: 1)accelerate the information transfer between different departments or different modules. 2) the cost is low, or acceptable. 3) there are little dependence between modules. 4) it's easy for the scheme to transfer into actual system.5) there is little failure when running. The related data is shown in Fig.4. Then:

(1) Customer demand set is $U_1 = \{$little cost, few failure times, little influence on current modules when changing, little dependence between modules, safe and reliable data$\}$.

(2) According to the index system of GEIS adaptability and algorithm 2, the importance of the adaptability is $W = (0.17 \;\; 0.12 \;\; 0.11 \;\; 0.37 \;\; 0.23)$.

(3) The current adaptability value is $Y^0 = (35 \;\; 75\% \;\; 0.6 \;\; 0.5 \;\; 0.85)$. The adaptability values of the scheme 1 and the scheme 2 are $Y^1 = (40 \;\; 90\% \;\; 0.9 \;\; 0.85 \;\; 0.9)$ and $Y^2 = (50 \;\; 95\% \;\; 0.9 \;\; 0.78 \;\; 0.98)$ respectively. The satisfactory degree of the current information system is $X^0 = (64.8 \;\; 80.07 \;\; 62.02 \;\; 90 \;\; 85)$.

(4) Establish the correlation matrix and self-correlation matrix, where, the range of R_{ij} is $\{1,3,5\}$, and self-correlation matrix Y_{hj} includes positive correlation, negative correlation and no correlation. Then based on Eq.(1), the correlation matrix after normalization is



adaptability / Customer demands	The importance of customer demands	Cost	Reli-ability	Robust-ness	Scal-ability	Security	The current satisfactory degree of adaptability	The satisfactory degree of adaptability of scheme 1	The satisfactory degree of adaptability of scheme 2
Little cost	0.11	5		3		3	64.8	63.0115	31.6354
Not easy to failure when running	0.23		5	3	1	3	80.07	94.7068	99.6101
Little influence on current module when changing	0.12	1		5			62.02	104.6898	104.6898
Little dependence between modules	0.17		1	1	5		90	89.9047	97.7189
System data with security and reliability	0.37	1	3			5	85	101.6248	95.0132
The importance of adaptability		0.11	0.23	0.12	0.17	0.37			
The current adaptability value		35	75%	0.6	0.5	0.85			
the adaptability value of scheme 1		40	90%	0.9	0.85	0.9			
The adaptability value of scheme 2		50	95%	0.9	0.78	0.98			

Fig.4 The selection process of GEIS adaptability scheme

$$R_{ij}^{*}=\begin{bmatrix} 0.304 & 0.130 & 0.217 & 0 & 0.348 \\ 0.179 & 0.231 & 0.231 & 0.154 & 0.205 \\ 0.462 & 0 & 0.462 & 0 & 0.077 \\ 0.048 & 0.286 & 0.333 & 0.286 & 0.048 \\ 0.2 & 0.267 & 0.133 & 0.1 & 0.3 \end{bmatrix}$$

(5) According to Eq.(2)~(4), the adaptability value of the scheme 1 and the scheme 2 are

$$AM^{1}=101.6248, AM^{2}=95.0132$$

From AM^{1} and AM^{2}, the scheme 1 is the optimal result. And the cost is less but with higher reliability and robustness.

V. CONCLUSIONS

There are rich contents for employment information of college graduates. In this paper, how to select a GEIS scheme with better adaptability is studied. The index system for GEIS adaptability is established from five aspects: cost, reliability, robustness, scalability and security. Then the scheme selection model and selection algorithm are discussed on the basis of QFD, and the contents are verified though an example. In addition, for system design, the scheme selection is only a process in the early stage, but can affect time and cost in the later stage greatly. Thus, the scheme selection plays an important role in systems' life cycle. The study in this paper can enrich the adaptability theory and lay a foundation for the optimization of GEIS adaptability. How to evaluate and optimize GEIS adaptability is the topic of our future research.

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