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Study on talent training programs of applied IE based on QFD

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ABSTRACT

How to cultivate applied talents to adapt to the social needs, the first critical factor is to design scientific and reasonable programs of cultivating applied talents. QFD is applied to the evaluation and improvement of the talent training scheme in this paper.2013 industrial engineering personnel training programs of panzhihua University, Applied undergraduate university, is researched as a case. With social demands of the input point, the allocation of courses of personnel cultivating programs and social demands is evaluated and proposed some corresponding improvement suggestions.

Key words: QFD, industrial engineering, talent training programs

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INTRODUCTION

With the development of China economy and popularization of higher education , the demand of the society on the high quality talents with strong social adaptation and competition ability is increasingly strong . The research on applied talents training mode in our country is from the introduction of applied talent training experience abroad. Researchers generally define the connotation of the applied talents from the main distinction between applied talents and academic basis (or type) and skilled talents.It is considered that applied talents should be paied attention to the ability of applying theoretical knowledge to solve practical problems in the production or work practice[1]. Scholars Ren yu-shan stressed applied talents cultivation should be "application oriented", co-ordinatting the relevant elements of subject knowledge and professional practice elements into an organic whole[2]. Scholars Qian guoying and others emphasized "application" should be the mass-tone attune of the course layout, professional Settings, scientific research, teaching mode, quality evaluation and traditional education in the applied talents training oriented universities[3]. The research of applied talents training abroad mainly concentrated in the following respects. Scholars Hu Weizhong and Shi Ying describes the training system and training model applied talents of Australian higher education, putting forward four reference opinions: one is to adjust the relationship between teaching and learning, the second is to develop students' ability of applied theory, the third is to clear at the university of applied orientation, the last is to streamline the teaching content[4]. Scholars Liang Hong and others introduced a four-point method for American undergraduate cultivation: the implementation of individualized instruction, the implementation of research-type training, the implementation of open teaching and the implementation of diversity training[5]. Scholars Tang Xinhua and Chen Dejing made a detailed comparison of education foundation, curriculum system, faculty and humanistic environment from the perspective of the humanities cultivate engineering applied talents at home and abroad, providing a good reference for us to cultivate applied talents[6]. Scholars Ma Jingwei analyzed the similarities and differences of curriculums in the United States, Singapore, Hong Kong university , as well as their differences in the domestic university curriculum, providing a reference for domestic Applied Talents curriculum[7]. Deputy Director of the Higher Education Division Lin Huiqing defined talent training mode as knowledge, ability and quality structure, as well as the realization of this structure. It provides a fundamental characteristic of talent and focus on education ideas and education concept[8]. At present , the undergraduate course colleges with "application " school-running orientation accounted for nearly 30% in the whole national universities. However, a prominent problem to the cultivation of applied talents is that the

characteristics of the application is not prominent and the training applied talents can not meet the social demand . In order to solve this problem , designing a scientific and reasonable project of cultivating applied talents is the primary key. In this paper, based on the theory of QFD , combined with the project management techniques, the match degree of cultivating applied talents project and "customer requirements" is researched and high improvement Suggestions are put forward for the key link of poor suitability.

HOUSE OF QUALITY（HOQ）

THE PRINCIPLE OF QFD

QFD , the quality function deployment , is a kind of quality characteristic and a method of quality management , which means converting the customer needs into the requirements firstly , then the quality requirements pursuant to gradually expand to the method of product realization . QFD aims at focusing on customers , guaranteeing the system of production quality and design improvements systematically at the early stages of product development .

THE STRUCTURE OF HOQ

HOQ , the house of quality, is a basic tool for QFD implementation process. The core of quality house is the transformation and expansion of the demand. The house of quality structure will convert and spread "user needs" into "the talent training scheme "Figure 1:the industrial engineering talents training scheme of quality house model, composed of six parts (1) the left wall : the employing units' human needs and attention on the students; (2) the ceiling: training program module of Talent Cultivation; (3) the room: Relationship Matrix of "demand " and "training module"; (4) the right wall: Market competitiveness evaluation matrix and Quality improvement goals; (5) the roof: correlation matrix of Talent Cultivation module; (6) the floor: importance of " Talent Cultivation module " and competitiveness evaluation.

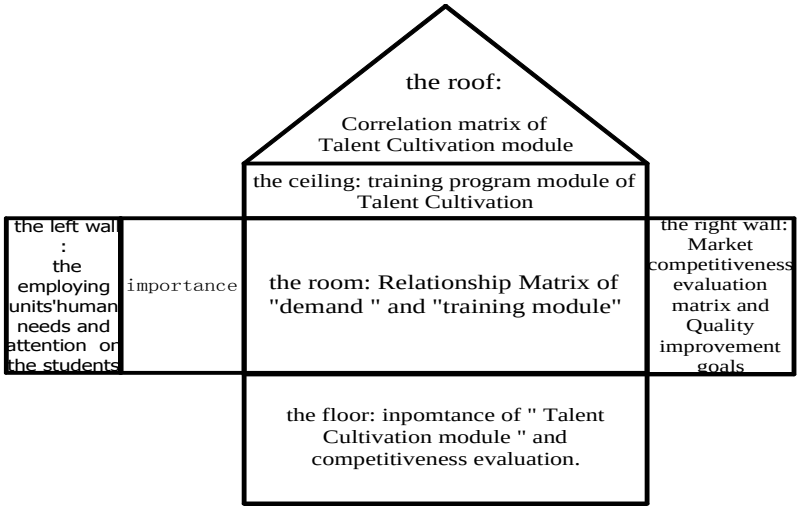


Fig.1: House of quality model of talent cultivation

STUDYING ON THE PLAN OF TRAINING APPLIED TALENTS

We selected the application-oriented university - grade 2013 of Panzhihua University's Industrial Engineering department for the study to assess matches of their personnel training programs and "employer demand".

"EMPLOYERS NEED" AND WEIGHTS

We selected dozens of employers , the workplaces of industrial engineering graduates of 2005 -2009 grades in Panzhihua University to get the community on the application of industrial engineering talent, "the employer needs" through questionnaires, telephone interviews and surveys and other methods, in combination with other information, such as information on the research literature to determine applied industrial Engineering graduates professional needs project "Knowledge (A1)", "Ability (A2)" and "Consciousness (A3)" aspects of statistical quality control using KJ method needs further sorting and classification, will project in accordance with the needs of the knowledge, skills and literacy classes were poly[2] for the 4, 5, 5, a total of 14 demands. As shown in Table 1.

Table 1 Expand table of demand for quality about applied Industrial Engineering professionals

A	TWO	
Knowledge(A1)	Breadth of expertise	A11
	Depth of expertise	A12
	Systematic expertise	A13
	Humanities and Social Sciences Knowledge	A14
Ability (A2)	The ability to observe the test	A21
	Research capacity	A22
	Comprehensive analysis / integration capabilities	A23
	Planning and design capability	A24
	Coordination / social skills	A25
Awareness(A3)	Cost and efficiency awareness	A31
	Awareness of the problem and reform	A32
	Work simplification and standardization of consciousness	A33
	Global and overall awareness	A34
	Human-centered consciousness	A35

We obtained Project-level demand weights ($W1_i$) and secondary demand project weights ($W2_i$) by using the AHP pair wise comparison method, the specific implementation process is as follows:(1) using the Delphi, we selected 15 experts to sort the importance of projects, and set Aij between projects according to the relative importance of the result, to get the judgment matrix A;2) calculating the matrix A needs to judge the importance of the project, that the weight $W_{i0} = \frac{W_i}{\sum_i W_i}$, $W_i = \left(\prod_{j=1}^{n} a_{ij} \right)^{\frac{1}{n}}$;(3) testing the consistency of the results, $CR = \frac{C.I.}{R.I.}$, $C.I. = \frac{\lambda_{\max} - n}{n-1}$, $\lambda_{\max} = \frac{1}{n} \sum_{j=1}^{n} \frac{\sum_{j=1}^{n} a_{ij} w_j}{W_i}$, RI based on n by looking up table , when n = 3, RI = 0.52, when n =4, RI = 0.89, when n = 5, RI = 1.12; When the consistency index CR ≤ 0.1, it is considered the consistency of judgment matrix is acceptable. Demand item matrix evaluation results shown in Table 2 - Table 5.

Table 2 applied industrial engineering talent "knowledge, ability and awareness," the importance of judgment matrix

	A1	A2	A3	W_{1i}	W_{1i}^0	λ_{1mi}	
A1	1	1/2	2	1	0.2970	3.009	λ_{max}=3.009 C.I.=0.0045 R.I.=0.52 C.R.=0.009<0.1
A2	2	1	3	1.8171	0.5396	3.009	
A3	1/2	1/3	1	0.5503	0.1634	3.009	
(3.3674)							

Table 3 applied industrial engineering talent "knowledge structures" Demand importance of the project to determine the matrix

	A11	A12	A13	A14	W_{2i}	W_{2i}^0	λ_{2mi}	
A11	1	4	2	1/2	1.4142	0.2854	4.033	λ_{max}=4.0511 C.I.=0.017 R.I.=0.89 C.R.=0.019<0.1
A12	1/4	1	1/3	1/5	0.3593	0.0725	4.0668	
A13	1/2	3	1	1/3	0.8409	0.1697	4.0504	
A14	2	5	3	1	2.3403	0.4723	4.0541	
(4.9547)								

Table 4 applied industrial engineering talent, "ability structure" the importance of the project to determine the demand matrix

	A21	A22	A23	A24	A25	W_{2i}	W_{2i}^0	λ_{2mi}	
A21	1	1/3	1/4	1/2	1/5	0.3839	0.0615	5.0884	λ_{max}=5.0681 C.I.=0.017 R.I.=1.12 C.R.=0.015<0.1
A22	3	1	1/2	2	1/3	1	0.1602	5.0588	
A23	4	2	1	3	1/2	1.6438	0.2634	5.0537	
A24	2	1/2	1/3	1	1/4	0.6084	0.0975	5.055	
A25	5	3	2	4	1	2.6052	0.4174	5.0844	
(6.2413)									

Table 5 applied industrial engineering talent, " consciousness structure" Demand importance of the project to determine the matrix

	A31	A32	A33	A34	A35	W_{2i}	W_{2i}^{0}	λ_{2mi}	λ_{max}=5.0681 C.I.=0.017 R.I.=1.12 C.R.=0.015<0.1
A31	1	3	2	1/2	1/3	1	0.1602	5.059	
A32	1/3	1	1/2	1/4	1/5	0.3839	0.0615	5.0883	
A33	1/2	2	1	1/3	1/4	0.6084	0.0975	5.085	
A34	2	4	3	1	1/2	1.6438	0.2634	5.0537	
A35	3	5	4	2	1	2.6052	0.4174	5.0844	
(6.2413)									

In Table 2 - Table 5, consistency index C.R. <0.1, said matrix consistency meets the requirements. Whereby "the employment needs" of importance, namely the weights K = W1i0 * W2i0. Getting "the employment needs of weight" matrix K = [0.0848,0.0216,0.0499,0.1403,0.0331,0.0864,0.142,0.0526,0.225,0.0262,0.01, 0.016, 0.0432, 0.0685]^{T} , filled in the House of Quality "left wall" As shown in Figure 4.

TRAINING PROGRAM MODULE SETTINGS

The "employment needs" into "training program." Training plan is the blueprint of personnel training, the main channel of implemented personnel training is courses. Industrial Engineering 2013 training plan of Panzhihua University, combined with domestic and international industrial engineering research personnel training programs, and its curriculum modules grouped into the following six categories: general education curriculum module (TR1), professional foundation course module (TR2), professional core course module (TR3), a professional outreach program module (TR4), practice compulsory course module (TR5), expanding education curriculum module (TR6), specific courses and Unit are shown in Table 6:

Table 6 Table Training Program Module Settings

Course modules and teaching purposes	Unit
General education curriculum module (TR1): promote students' moral, intellectual, physical and harmonious development, to enhance students outside of occupational and professional Humanities.	39
Professional foundation course module (TR2): cultivite students with basic theoretical foundation of basic disciplines of mechanical engineering technology and management, a solid foundation for the specialized courses of study.	51.5
Professional core curriculum module (TR3): cultivite Students to master the core theory and competencies in industrial engineering disciplines, analytical methods and management techniques to master systems management, industrial engineering students a solid foundation for the further study.	20
Professional epitaxial course module (TR4): limit enrollment form to broaden the industrial base and specialized knowledge of structural engineering.	16
Practice compulsory course module (TR5): train students to physical and moral, students master basic skills in industrial engineering, methods and awareness.	34
Expand education curriculum module (TR6): broaden the students 'knowledge of the structure and the ability to structure, enrich students' learning experience, encourage students to increase social experience.	24.5

THE CONFIRMATION OF "EMPLOYERS NEED" AND "TRAINING MODULES" RELATIONSHIP MATRIX

0-9 numerical scoring method indicates the degree of correlations between employment needs and personnel training modules, with the score of "0" indicates no correlation between the two, the score of "5" indicates moderate correlation between the two ,scores "9" indicates a fortissimo correlation between the two. Associating degrees scale is shown in Figure 2. Configured employment needs and the needs of personnel training module relationship matrix R = [r_{ij}] will be filled in the House of Quality, as shown in Figure 4.

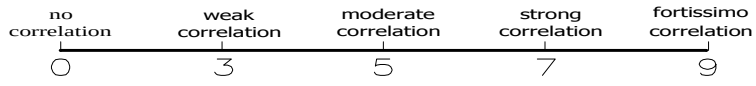


Fig. 2: criticality scale Figure

TALENTS COMPETITIVE ASSESSMENT AND QUALITY IMPROVEMENT

Talents competitive assessment, is used to evaluate the employer's satisfaction of students' knowledge, ability and awareness structure. We use the evaluation of similar colleges and universities to meet the needs of the employer, in order to reflect the current panzhihua university applied talents relative advantages and disadvantages. Selected several employers in the study to give a score to the industrial engineering students in our school (C0) and two similar applications Universities (C1, C2) as the ratings scale shown in Figure 3.The higher score indicates more employers satisfaction and the more competitiveness. Fill the house of quality assessment "right wall", as shown in Figure 4.

"TRAINING MODULE" TO DETERMINE THE CORRELATION RELATIONSHIP

Determining the relevance to "training modules" helps to understand mutual interaction or restrict between modules, providing a basis of making a decision on personnel training programs adjustments. The "training modules" correlation matrix fills House of Quality "roof", as shown in Figure 4. As can be seen from Figure 4, between "training modules" are positively correlated and has a strong positive correlation relationship (TR2 professional foundation module, TR3 professional core module); (TR3 professional core module, TR5 practice teaching module). The professional basic module is an important cornerstone of the professional core modules. The core module is an important cornerstone of professional practice teaching modules, playing a very important role in the link, should be considered deeply.

IMPORTANCE EVALUATION ABOUT "TRAINING MODULE"

Training Module" importance assessment matrix $H=R^TK$, the results H = [7.0136,7.6505,6.9736, 6.0961, 8.3344,4.6818]^T, filled in the House of Quality "floor" in Figure 4. The lager is the value, the more important is the module. The "training modules" importance evaluation results will be arranged according to their importance as shown in Table 7

Table 7 Importance of "training modules" sort table

number	Training Module	importance	Proportion
1	TR5 (Compulsory practical course module)	8.3344	20.5%
2	TR2 (Professional foundation course module)	7.6505	18.8%
3	TR1 (General education curriculum module)	7.0136	17.2%
3	TR3 (Professional core curriculum module)	6.9736	17%
5	TR4 (Professional epitaxial course module)	6.0961	15%
6	TR6 (Expand education curriculum module)	4.6818	11.5%
（43.7687） （100%）			

As can be seen from Table 7, the gap of importance between the "training modules" is not big. The first one is TR5 (compulsory practical course module), followed by TR2 (professional foundation course modules), TR1 (general education curriculum module) and TR3 (professional core course modules). The more importance is the module, the more resources should be invested, such as teachers, funding, teaching equipments, time etc., in personnel training programs designed primarily achieved through the class and credit arrangements.

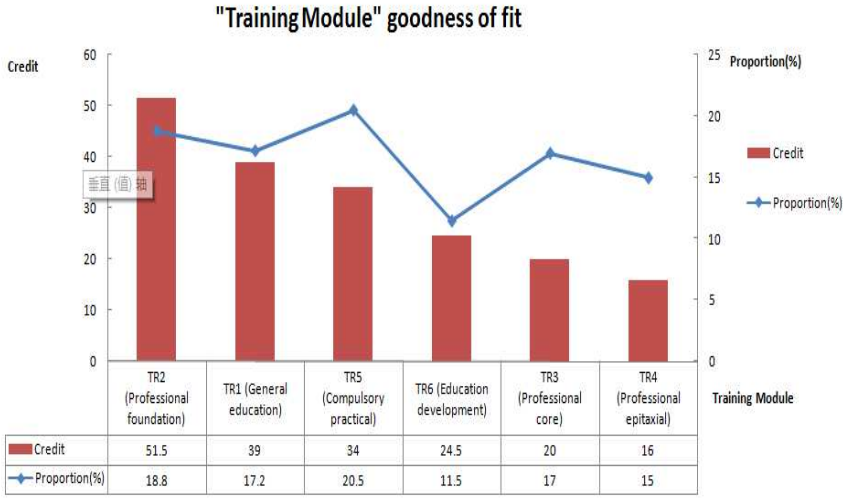
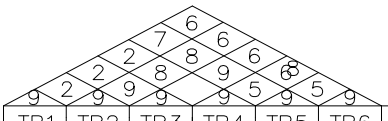


Fig.3: personnel training program "Training Module" goodness of fit analysis

"TRAINING MODULE" GOODNESS OF FIT ANALYSIS

Personnel training program in the credit arrangement with the importance exhibit "training module" inconsistency, as shown in Figure 3. An outstanding problem is that the application module "TR5 (practice required)" lies in third place and module "TR3 (professional core)",which plays an important connections role in the courses, lies in second to last place, and module "TR4 (professional extension)", which expands the application professional talent, lies in the penultimate one. The classes of "professional basis", "general education" and "educational outreach" should be appropriately reduced and the classes of "compulsory practice", "professional core" and "professional outreach." should be appropriately increased to meet more consistent employment needs of society. Meanwhile, the presence of

outstanding issues curriculum modules that can use two QFD Quality Function Deployment methods to optimize the design of its curriculum.



	Comprehensive importance K_i	TR1	TR2	TR3	TR4	TR5	TR6	C0	C1	C2	C3 (Improved value)	C4 (Quality improved rate)
A11	0.0848	8	9	7	9	7	3	7.3	7.8	7.2	8.0	1.09
A12	0.0216	6	7	9	4	8	1	7.5	8.2	7.7	8.2	1.09
A13	0.0499	7	8	8	6	8	1	7.1	8.1	7.3	8.1	1.14
A14	0.1403	9	8	5	7	6	8	7.9	7.9	7.8	8.0	1.01
A21	0.0331	5	7	7	5	9	6	7.2	7.6	7.2	7.6	1.05
A22	0.0864	5	7	7	5	9	6	7.3	8.1	7.4	8.1	1.11
A23	0.1420	5	7	7	5	9	6	6.5	8.1	7.3	8.3	1.28
A24	0.0526	5	7	7	5	9	6	7.6	7.6	7.0	7.6	1
A25	0.2250	8	8	7	7	9	7	6.8	7.2	7.1	8.4	1.24
A31	0.0262	5	7	8	5	9	3	7.8	8.2	7.8	8.2	1.05
A32	0.0100	5	7	8	5	9	3	7.7	7.8	7.3	7.8	1.01
A33	0.0160	5	7	8	5	9	3	7.4	8.1	7.9	8.4	1.14
A34	0.0432	8	7	8	5	9	3	7.2	8.0	7.8	8.0	1.11
A35	0.0658	9	8	8	5	9	6	7.0	8.1	7.9	8.2	1.17
	Importance	7.0136	7.6505	6.9736	6.0961	8.3344	4.6818					

Fig.4: 2013 Industrial Engineering personnel training programs HOQ

CONCLUSION

The application type undergraduate university, is the higher occupation education extension of the connotation, through the combination of high level knowledge and skills of occupation qualification and ability training [10], cultivating senior applied talents to serve the local economy. Application oriented university culture focuses on the needs of the society and composite occupation occupation accomplishment, this must be reflected in the talent training scheme design. In this paper, the application type undergraduate university 2013 Panzhihua University industrial engineering personnel training program as the research object, through the KJ method of the enterprise application type talents in industrial engineering requirement of the type "A1 (knowledge)", "A2 (ability)" and "A3 (Su Yang)" three kinds of a total of 14, the personnel training scheme of the curriculum is divided into "TR1 (general curriculum module)," TR2 "(professional basic courses)," TR3 "(professional core courses module)," TR4 "(professional extension module)," TR5 "(practice course module)", "TR6 (Education curriculum module)" a total of 6, based on the theory of QFD, study "module" and "configuration problem with human needs" talent cultivation, configuration results show, talent scheme, "professional", "general education" and "education" course distribution points too much, "practice," required "professional core" and "professional extension" course assignment credit too little, should strengthen the talent training scheme "professional" and "practical" culture characteristics; market competition analysis results show that, in the aspect of "ability" and "consciousness", also should Step up; "talent training module" correlation analysis results show, "professional" and "core" has a strong correlation, "has a strong correlation between the professional core" and "practice teaching", in the two level training program module settings can be used when the QFD expansion design. Due to limited space, I will continue to study the subject in a follow-up study.

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REFERENCES

[1] SHX Zhang,YP Li, *Higher Education Forum.*, **2010**, 10(10), 5-8.
[2] YSH Ren , *Modern Education Science*., **2009**, 5(3), 75-78.
[3] GY Qian guoying; G Wang Gang;LQ Xu liqing, *Chinese University Teaching.*, **2005**,9(9), 54-56.
[4] WZH Hu,Y Shi,LQ Xu, *Open Education Research*., **2006**,8(4), 92-95.
[5] H Liang,SM Yuan,GH Wu, *Heilongjiang Higher Education Research.*, **2001**, 3(2), 76-78.
[6] XH Tang,DJ Chen, *Jiangsu Institute of Education (Social Science Edition)* ., **2003**, 9(5), 30-32.
[7] JW Ma,T Ming, *Shandong Electric Power College Journals* ., **1999**, 2(1), 32-34.
[8]HQ Li, *Talent Medical Education.*, **1997**, 12(6), 1-7.
[9] FH Zeng,ZR LI, *Journal of Engineering Design.*, **2009**, 12(6), 415-420.
[10] CHY Jiang,Y Zhang,*Journal of Qiqihar Vocational College.*, **2010**, 9(3), 1-3.
[11] XJ Ma, *Value engineering.*, **2012**, 31(10), 245-246.

[12] ZHSH Zhang,J Guan, *Higher Education Forum.*, **2013**, 7(7), 37-41.
[13] YM Luo,ESH Qi,ZHF Mao, *Industrial Engineering.*, **2005**, 7(4),106-109.
[14] ESH Qi,YF Huo,L Liu, *Journal of Management.*, **2004**,(1),103-106.