THE COMPREHESIVE EVALUATION METHOD AT PROFESSOR'S LEVEL IN CHINESE UNIVERSITY

Wu Yuhua
(Tianjin University)
Zheng Zhongsan
(Nankai University)
Chen Zegan
(Transport Engineering College)

ABSTRACT

How to evaluate and assess the work done by a professor is very important in the management of university. This paper, first, set up an index system of evaluation at several levels, then uses the multilobjective decision making method (AHP) to quantify the evaluation criteria. Finally, from the view point of value engineering gives a new concept of value coefficient of a professor.

1. Introduction.

How to evaluate and assess the work done by a professor is very important in the management of a university. The development program of a university, promotion of personnel and distributing bonus are all needed to be based on such an evaluation or assessment. The motivation of individuals can be stimulated only when the evaluation in consistence with promotion and exprisal. Therefore, how to evaluate the work done by a professor objectively, and scientifically becomes an urgent problem to be solved.

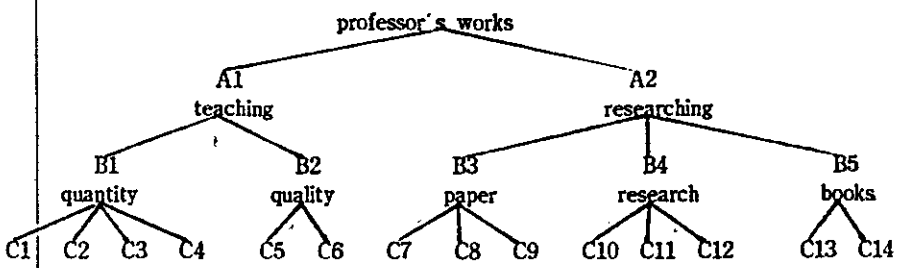
There are two aspects in the topic of evaluating the job of a professor. First, we need a suitable organization to do the job, this can be done by the academic committee headed by chairman of each of the departments. Second, we need a group of reasonable criteria, obtained by systematic analysis on the work by all teachers to assess quantitative indexes for each individual.

From the view point of value engineering, the problem of evaluating individual professor's job is to assess the functional coefficient for each of them — evaluation criteria. This paper, first, sets up a system of evaluation criteria at several levels, then uses the multi-goal decision making method incorporate with qualitative and quantitative analysis to quantify the evaluation criteria. Finally, the paper gives the concept of value coefficient, in evaluating we should not only focus on the criteria mentioned above but also consider magnitute of the coefficient, from the economic point of view to consider the ratio of quantified evaluation index to salary.

2. The Evaluation Criteria at Several Levels.

To set up such a criteria system we should follow the following three principles.
(1) the criteria should be consistent with national policies and regulations.
(2) The system should be comprehesive, reasonable and scientific.
(3) The system should be relatively simple and has the comparability and measurablity.

The university in our country involving both teaching and academic researches so the evaluation criteria should reflect the work of both. We can change the teaching and researching into more specific activities and for each of the activities we may stepwise further. For instance, for teaching, it could be divided into two parts: guality and quantity, for quantity of teaching, it can be further divided into four parts: average annual teaching hours, number of courses given to graduatestudents, number of courses given to undergratuated studens, number of graduate students advised. Same for the researching work, it can be expressed by papers and books published, and other research projects full filled. By this idea, we can set up an evaluation indexes system in three levels and which have 14 different indicators. This is shown in the following diagram.



C1——average annual teaching hours
C2——number of couses given to graduate students
C3——number of courses given to undergraduate students
C4——number of graduate students advised
C5——teaching results
C6——teaching content
C7——in advanced journal
C8——in middle—level journal
C9——presented in annual conference
C10——rewarded by province level
C11——accepted by province level
C12——other projects
C13——writing
C14——interpretations

The index system for evaluating work of a professor

In the above index system, among the 14 single indexes in the lowest level, C5 and C6 are qualitative indexes the others are quantitative.

The indexes system for evaluating work of a staff members only a demonstration, different universities or different departments in a university may add or remove some of the indexes which they think are suitable. But the basic idea is the same.

3. The Quantifying Process of the Indexes

According to the index system above to evaluate the work of a staff, one needs to assess the indexes. This process can be accomplished by the following three steps.

(1) From top to bottom to decide the relative importance of the factors in each level, in other

words to assess the weights (W1, W2, ... W14) for each of the factors, Ci (i=1, 2, .. 14).

(2) To decide the evaluating vector (P1, P2, ..., P14) where Pi is the evaluating value for factor Ci.

(3) Using formular $F=\sum Wi- Pi$ to determine evaluation index for each of the staff.

In step one, the AHP (analytical Hierarchy Process) method invented by Professor L. Saaty was used.

4. The following is an example of using the evaluating method. Using AHP to determine the weights of the 14 indexes, the bij value are from an academic group headed by department chairman.

Level A. to compare the relative importance between teaching and research. From the given bij to determin the weights and calculate the largest characteristic value and standardized characteristic vector.

G	A1	A2
A1	1	1
A2	1	1

λ max =2 C-I1 = 0
w = (0.5, 0.5)
The weights related to upper level (a1, a2) = (0.5, 0.5)

Level B. First determine the relative importance of B1 and B2 to A1. Accoding to the given b12 one can have the deciding matrix (A1–B)

A1	B1	B2
B1	1	1/3
B2	3	1

λmax = 2, C - I1 = 0
w = (0.25, 0.75)
The weights relative to A1 is $(b_1^1, b_2^1, \ldots, b_5^1)$ = (0.25, 0.75, 0, 0, 0,).

In the same way one can calculate the relative importance of Bi to A2,

A2	B3	B4	B5
B3	1	1	1
B4	1	1	2
B5	1/2	1/2	1

λmax = 3
W = (0.4, 0.4, 0.2), C - I2 = 0
R - I2 = 0.58, C - R2 = 0< 0.1
The wieghts related to A2 is $(b_1^2, b_2^2, \ldots, b_5^2)$ = (0, 0, 0.4, 0.4, 0.2)

Now we can calculate the weights of Bi related to level A

	A1 0.5	A2 0.5	weights related to level A
B1	0.25	0	b1 = 0.125
B2	0.75	0	b2 = 0.375
B3	0	0.4	b3 = 0.2
B4	0	0.4	b4 = 0.2
B5	0	0.2	b5 = 0.1

$C - I = \sum ai - C - Ii = 0$

$R - I = \sum ai - R - Ii = 0 - 0.5 + 0.5 - 0.58 = 0.29$

$C - R = C - I / R - I = 0 < 0.1$

Therefore we get the wieghts of the factors in level B related to level A. (b_1, b_2, ... , b_5) = (0.125, 0.375, 0.2, 1.2, 0.1).

Level C. First calculate the relative weihts of Ci to Bk (k = 1, 2, ... 5) represented by (b^1, b^2, ..., b^{14}). In other words one can set up the deciding matrix and then calculate their largest characteristic value and characteristic vectors.

B1	C1	C2	C3	C4
C1	1	1/5	1/3	1/5
C2	5	1	2	1
C3	3	1/2	1	1/2
C4	5	1	2	1

$\lambda max = 4.0042$
w = (0.00704, 0.3684, 0.1298, 0.3684)
C - R1 = 0.0014 / 0.9 = 0.0015 < 0.1
The weights of Ci Related to.
B1 are (C_1^1, C_2^1, C_3^1, ..., C_{14}^1)
=(0.0704, 0.3684, 0.1928, 0.3684, 0, ... 0)

B2	C5	C6
C5	1	3
C6	1/3	1

$\lambda max = 2$ w = (0.75, 0.25)
C - I2 = 0 C - R2 = 0
The weights of Ci related to
B2 are (0, 0, 0, 0, 0.75, 0.25, 0, ... , 0)

B3	C7	C8	C9
C7	1	7	9
C8	1/7	1	2
C9	1/9	1/2	1

$\lambda max = 3.0217$
C - R3 = 0.0109 / 0.58 = 0.032 < 0.1
w = (0.7928, 0.1312, 0.0760)
The weights of Ci related to B3 are
(c_1^3, c_2^3, ... , c_{14}^3) = (0, 0, 0, 0, 0, 0, 0.7604, 0.7928, 0.1312, 0.0760 0, ... 0)

B4	C10	C11	C12
C10	1	5	9
C11	1/7	1	2
C12	1/9	1/3	1

$\lambda max = 3.0012$
C - R4 = 0.0006 / 0.58 = 0.001 <1
w= (0.7608, 0.1576, 0.0816)
The weihts of Ci related to B4 are
(c_1^4, c_2^4, ... , c_{14}^4)=(0, ... 0, 0.7604, 0.1576, 0.0816, 0, 0)

B5	C13	C14
C13	1	1/5
C14	5	1

$\lambda max = 2$
w = (0.1667, 0.8233)
C - I2 = 0
the weihgts of Ci related to B5 are
(c_1^5, c_2^5, .. , c_{14}^5) = 0, .0, 0.1667, 0.8233).

Now we can use the following table to calculate the weights of Ci related to level B.

	B1 0.125	B2 0.375	B3 0.2	B4 0.2	B5 0.1	weights of Ci related to level B
C1	0.0704	0	0	0	0	0.0088
C2	0.3684	0	0	0	0	0.0461
C3	0.1928	0	0	0	0	0.0241
C4	0.3684	0	0	0	0	0.0461
C5	0	0.75	0	0	0	0.2813
C6	0	0.25	0	0	0	0.0938
C7	0	0	0.7928	0	0	0.1586
C8	0	0	0.1312	0	0	0.0262
C9	0	0	0.076	0	0	0.0152
C10	0	0	0	0.7608	0	0.1503
C11	0	0	0	0.1576	0	0.0356
C12	0	0	0	0.0816	0	0.0141
C13	0	0	0	0	0.1667	0.0167
C14	0	0	0	0	0.8333	0.0833

$C - I = \sum bi - C - Ii$

$= 0.125 - 0.0014 + 0.375 - 0 + 0.2 - 0.0107 + 0.2 - 0.0006 + 0.1 - 0 = 0.0025$

$R - I = \sum bi - R\ Ii = 0.3445$

$C - R = 0.0025 / 0.3445 = 0.007 < 0.1$

From the table we get the weights for the factors in the C level

C1 = 0.0088 C2 = 0.0461 C3 = 0.0241 C4 = 0.0461
C5 = 0.2813 C6 = 0.0738 C7 = 0.1586 C8 = 0.0212
C9 = 0.0152 C10= 0.1503 C11= 0.0356 C12= 0.0141
C13= 0.0167 C14= 0.0833

Now we get to step two. In determining Pi (i = 1, 2, ... 14) for each of the faculty staff, the inserting value techniques can be used.

For the indexes with data, called quantitative indexes, in determining the Pi values one can first give 100 to the highest one and 0 to the lowest one. The others can be assessed by Linear ratio inserting method, and calculated from following formular

$$P^k_i = (X^k_i - \min_j \{X^j_i\}) / (\max_j \{X^j_i\} - \min_j \{X^j_i\})$$

Where X_i^j represents the mark the jth teacher gets on index i.

For examle, a staff get the evaluation marks on the fourteen indexes given in the following table

The evaluation marks on indexes of the professor(k)

Ci	$\max_j X_i^j$	$\min_j X_i^j$	X_i^j	Pi
C1	2000	600	1500	(1500–600/2000–600) × 100=64
C2	10	0	3	(3–0/10–0) × 100=30
C3	8	0	6	(6–0/8–0) ×100=75
C4	7	0	0	(0–0/7–0) ×100=0
C7	4	0	2	(2–0/4–0) ×100=50
C9	10	0	3	(3–0/10–0) ×100=30
C10	4	0	1	(1–0/4–0) ×100=25
C11	3	0	1	(1–0/3–0) ×100=33
C12	4	0	1	(1–0/4–0) ×100=25
C13	30	0	0	(0–0/30–0) ×100=0
C14	25	0	2	(2–0/25–0) ×100=8

For the indexes without data, or called qualitative indexes, when determining Pi value. We can use four levels to discribe their works, namely very good, good, acceptable, unacceptable. The results may be got from students feed back and peer revision among the staff. The four levels can be quantified by 100, 66, 33, and 0. For instance the teacher K gets following in C5 and C6

Ci	Level	Pi
C5	Acceptable	33
C6	good	66

In this way, one can assess the P values for a staff in each of the evaluation factors. For the teacher K the P value are (64, 30, 75, 0, 33, 66, 50, 30, 25, 0, 33, 25, 0, 8)

Now using the formular $F = \sum Ci \times Pi$ we can give the staff s work an evaluation Where Ci is determined in step 1 and P is assessed in step 2

The evaluation value given in the these steps could be used in analysis, comparison, and reference in different aspects.

5. The determination of Value Coefficient

In evaluating a teacher, or awarding his works, one should not only look at the evaluation value calculated from above process, but also consider his or her value coefficient from the point of view of economics. According to value engineering point of view, in production sectors, both functional and value coeffecients of each part have to be considered There are also economic

relations in educationel area as well. Although the possibility of using economic accounting in educational field is limited, it is also useful to apply the economic lever in motivating people. Therefore, a similar value coeffeicient should be considered in evaluating the jobs of a staff. The formular V= F/C can be used to determine the value coefficient, where F is the value got from the evaluation above and C is the salary of the staff.

In other words, we should consider both work (function) and salary (cost) in analyzing and evaluating a staff, especially when raising salary and distributing bonus. The value coeffeicient is important in evaluating a teacher s job and it is even more important in considering staff at different levels.

Evaluating the jobs done by a faculty member is only at the begining. This paper gives a reference system, there may be some problems. In fact it is very difficult to find a system suitable for every university and every academic field if it is not impossible. The index system should be changed along with time going as well. This paper gives an applicable quantitative method. But it needs to be improved in practice. The purpose of introducting value coefficient is to explore the possibility of using economic lever in educational sector.

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