7. FACULTY EVALUATION SCHEME FOR ENGINEERING INSTITUTIONS BY FACTOR ANALYSIS APPROACH

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Abstract

Faculties are key persons for the growth of the institute and development of every student. Faculty have direct impact on teaching learning process and indirect impact on developing learning attitude among the students. They develop professional managers, industrialists and leaders from them. It is not possible to be done by an individual faculty but needs contribution by the whole team of faculty members. Therefore faculty enhancement is most important aspect for the development of engineering institutions in the era of global competitiveness. Faculty also needs to do self-evaluation to improve his own skills. Faculty promotion is also an important aspect from the management point of view. In this paper, a model is developed for the evaluation of a faculty member based on factor analysis approach. A framework of 25 criteria contributing faculty evaluation is developed based on expert's method approach. The Simple Additive Weighting (SAW) method is used for deciding relative importance of various parameters. Local and Global weights are decided by average method. Criteria ranking is done based on global weights of the same, which emphasizes importance of parameters. Classroom teaching and knowledge of the subject are two most important ones out of all criteria. For each criterion, scoring system is designed on the basis of qualitative and quantitative values of each. Then final model is prepared for the same and tested for one faculty of engineering institute and found effective. The proposed model can be used for evaluation of faculties of professional engineering colleges.

Key words: Engineering college faculty evaluation, Simple Additive Weighting method (SAW), model development, scoring system.

1. INTRODUCTION

For management of engineering institutions decision concerning tenure, salary and promotion are becoming increasingly more difficult. Institutions are now often forced to make fine distinctions between generally competent staff members. What information do departments use in making decision? How does the critical decision maker think an individual faculty member's performance ought to be evaluated? These questions were investigated in this study by surveying large number of senior academicians and also presently working unit heads of the institute and department.

Faculties are strength of the institution. In today's scenario of increased competitiveness, every engineering institution relies heavily on quality of faculties. Faculty retention is also becoming an alarming issue for engineering institutions. So, if a good faculty is encouraged on right time with right financial appreciation,

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their retention can be improved. Faculty promotion needs evaluation in a systematic manner. This evaluation may be done by student's feedback, colleagues, head of the department or head of the institutions, management or dean of the university. These all are known as decision maker of faculty performance. This paper has developed a model that will help in evaluating faculty performance and thus faculty improvement can be achieved which will bring overall enhancement of organization. Continuous faculty performance evaluation and enhancement, results in to improvement of institution.

Teaching, research and service are generally acknowledged as the major functions of most universities. Principal evaluation, systematic student ratings and colleague's opinion were generally the most influential indicators of teaching performance. Least used were videotapes of classroom teaching, the long-term follow-up of students, alumni ratings, colleagues rating based on classroom visit and student examination performance. (John A Centra, 1977)

As reported by Rob Kelly (2008), "Evaluation involves setting the culture and climate for faculty to develop, and it has to take on openness and respect for the individual to experiment and fail. One should encourage faculty members to self-assess. It doesn't involve a lot of bureaucracy. As said by Braskamp, it is more a relationship between the faculty member and his or her peers and with the department chair and dean." As Reported by the Governance Committee of the SUNY University Faculty Senate(2005) "Over at least the last decade, a movement towards greater accountability and transparency has occurred in higher education as elsewhere, and faculty evaluation of administrators is one response to this increased expectation. To state the obvious, evaluate student performance, faculty themselves generally invite student evaluations and are themselves subject to rigorous peer and institutional review for tenure promotion, and merit awards". Michael Theall (2002) reported in his paper regarding Meta-Professor stakeholder model which includes trustees, parents, organizations, students, employers, creditors' etc. student opinion continues to be a major factor in the evaluation of teacher effectiveness at institutions of higher education (Patricia A. Gordon). Institutions strive for the highest standards of fairness in individual tenure decisions. They evaluate each candidate with great care, conducting a time-consuming and elaborate review. The process places the candidate's achievements under intense scrutiny as his or her application proceeds through the various levels of review. The goal is a correct judgment based on the merits of the individual's qualifications. Sometimes, though, evaluators overlook the role of consistency. The fairness of the tenure process depends not just on the outcome of an individual decision, but also on the consistency of multiple decisions over time (The American Council on Education, 2000).

This study reports the importance that department head or head of institutions give to various criteria in evaluating individual faculty members. In addition to overall faculty performance the study discusses the institution head views of use and importance of specific criteria for assessing both teaching and research performance.

What is Evaluation?

1 Evaluation is the process of assessing a subject (subject may be a project report, answer paper, a student, a program, an institute, an employee etc.) and rating is based on some criteria/ingredients/ parameters for measuring its performance, improve its efficiency or improve its effectiveness.

2 We determine how much or how little we value something, arriving at our judgment, on the basis of predefined criteria.

Why faculty Evaluation is required?

1. To measure performance of faculty in terms of score/grade by evaluating how

well he/she performs his/her basic duties and additional duties such as overall growth of the institute, solving practical problem etc.

2. To encourage faculty for improvement of his performance in future.

3. To make the institute more competent and offer better quality education to students.

4. To make faculty promotion decisions.

2. CRITERIA FRAMEWORK DEVELOPMENT FOR FACULTY EVALUATION

After detailed discussion with heads of various departments, heads of various institutions and senior faculty members, criteria were listed that contribute for faculty evaluation. The frame work of criteria is as given below:

Criteria are categorized into 5 groups, to carryout the next process of weighting allocation:

A. Teaching towards Stake Holders

B. Behavioral Aspects

C. Ethical Aspects

D. Research & Self-development

E. Duty towards Institute development

The next process in model development is deciding relative importance of each criteria based weights allocation which is carried out in next session.

3. WEIGHTING METHODOLOGY

Framework of criteria was given to 11 selected experts of the different reputed engineering institutions having more than 5 years experience and based on their feedback final weights were derived for each level of criteria by average method. The weights and global weights of each parameter and final ranking of parameters are given in Table 1. (Next page)

Ranking of criteria based on their global weights:

Five most important parameters for faculty evaluation are:

1) Classroom teaching & Knowledge of the subject

2) Technical Activities

3) Result & Regularity in assessing answer books, assignment, and lab records etc

4. SIMPLE ADDITIVE WEIGHTING (SAW) METHOD

SAW method is well known and widely used for multiple attribute decision making. This method uses all 'n' attribute values of an alternative and uses the regular arithmetical operations of multiplication and addition. The attribute values must be both (numerical and comparable): quantitative and qualitative. The final score can be evaluated by using the formula as given below:

$$V_i = \sum_{j=1}^{n} W_j r_{ij}\ ,\ \text{i=1, 2,.....,\ n.}$$

Where W_j is weight of criteria and r_{ij} is score of that weight.

5. SCORING SYSTEM

Score for each criterion was decided based on 0 to 4 scores. Each level of performance for various criteria was decided with discussion along with experienced faculty members of the institute. The scoring system is described in Table 2.

In A1, A2, A3, B1, C1, and C2 the mandatory points are given. Faculty must achieve them. If in any one of them it is not achieved the total score will be zero.

Table 1 : Frame work development of criteria

Sr. No.	Parameter	Definition
GROUP A	Teaching towards stakeholders	
1	Classroom teaching	Making student to understand each and every topic by giving its applications to generate interest, timely covering syllabus, clears doubts of each student in simplest manner.
2	Knowledge of the subject	Clear understanding of each topic in depth
3	Presentation in class and control of class: 3a. Speech level 3b. Command on Language 3c. Board work	Normal Speed of speech, clear and audible voice, good board work and command on language, use of latest technology.
4	Result	Student examination performance
5	Regularity in assessing answer books, assignment, and lab records etc.	Regularity in giving and assessing assignment or lab records or answer books and display the result timely.
GROUP B	Behavioral Aspects	
1	Punctuality	The quality of doing work at arranged time or correct time; not late.
2	Student counseling	Counseling for student progress
3	Personality factors	Such as overall knowledge and inspirable good habits
4	Initiator/Self motivated	Starting any work himself or waiting for somebody's ignal
5	Manipulative	Influence or forces somebody to do what he/she wants, often in an unfair way; taking advantage of others
6	Cooperative	Ready to help to everybody in all circumstances
7	Dedication	Giving extra time for development of institution beyond college hours
GROUP C	Ethical Aspects	
1	Values	Having a clear understanding about morality; the belief about what is right and wrong and what is important in life e.g. moral values.
2	Honesty	Have a sense of justice or truthfulness

Sr. No.	Parameter	Definition
GROUP D	Research & Self-development	
1	Number of publications	Number of research papers written by the author in relevant field
2	Quality of publications	Number of research papers published in referred journals / conferences / seminars
3	Research and creative activity (independent of publications)	Arranging any programs for staff/student development such as workshops and conferences, quizzes and exhibitions etc.
4	Number of books or monograph published	Books or monograph written by author in the relevant field
5	Supervision of student's research	No. of students guided for dissertation work / project work
6	Activity in professional society	Contribution in ISTE, IEEE or IE etc. for student progress or faculty development or self development
7	Personal qualification	Ph.D., Masters or Bachelors degree or any extra certificate courses - achievement during his study span
8	Consultancy	Number of consultation projects completed / under progress handled by the faculuty
9	Professional honors/awards	Achievement of honors or awards during his professional career
GROUP E	Duty towards Institute development	
1	Technical Activities	Work assigned by the institute for any even in society, conference/workshop, STTP organizing or duty such as exam coordinatorship, time table preparation, Initiator of any program or working in any committee such as editor of Journal etc.
2	Social Activities	Duties such as in NSS/Red Cross/NCC etc.

Table 1A : Frame Work of Parameters

Goal	Criteria		parameters	Local Weight	Global Weight	Rank
Faculty Evaluation	Teaching towards stakeholders 50	A1	Classroom teaching	30	0.150	1
		A2	Knowledge of the subject	30	0.150	1
		A3	Presentation in class and control of class	10	0.050	4
		A4	Result	15	0.075	3
		A5	Regularity in assessing answer books, assignment, and lab records etc	15	0.075	3
		Total		100	0.500	
	Behavioral Aspects 10	B1	Punctuality	25	0.025	7
		B2	Student counseling	25	0.025	7
		B3	Personality factors	15	0.015	9
		B4	Initiator/Self motivated	10	0.005	11
		B5	Not Manipulative	10	0.005	11
		B6	Cooperative	10	0.010	10
		B7	Dedication	05	0.050	4
		Total		100	0.100	
	Ethical Aspects 10	C1	Values	50	0.050	4
		C2	Honesty	50	0.050	4
		Total		100	0.100	
	Research & Self-development 20	D1	Number of publications	20	0.040	5
		D2	Quality of publications	20	0.040	5
		D3	Research and creative activity (independent of publications)	15	0.030	6
		D4	Supervision of student's research	10	0.020	8
		D5	Number of books or monograph published	05	0.010	10
		D6	Activity in professional society	05	0.010	10
		D7	Personal qualification	10	0.020	8
		D8	Consultancy(Project)	10	0.020	8
		D9	Professional honors/awards	05	0.010	10
		Total		100	0.200	
	Duty towards Institute development 10	E1	Technical Activities	80	0.080	2
		E2	Social Activiteis	20	0.020	8
		Total		100	0.100	

Table 2: Scoring System

Sr. No	Parameter	Score					remark
		4	3	2	1	0	
A1	Classroom teaching	Excellent	Good	Average	-	-	2 points mandatory to achieve
A2	Knowledge of the subject	Superior	Good	Average	-	-	2 points mandatory to achieve
A3	Presentation in class and control of class	Superior	Good	Average	-	-	2 points mandatory to achieve
A4	Result	>80%	70-79%	65-69%	60-64%	<60%	
A5	Regularity in assessing answer books, assignment, and lab records etc.	Quick	Between quick and occasion-ally quick	Occasion -ally Quick	Needs Improvem ent	Slow	
B1	Punctuality	Always Punctual	-	Once in office, sincere	-	-	2 points mandatory to achieve
B2	Student counseling	Regular	Sometim es regular			nil	
B3	Personality factors	Very impressive	Good	Medium	Need improveme nt	nil	1 point mandatory to achieve
B4	Initiator/Self motivated	yes	-	-	-	no	
B5	Not Manipulative	yes	Takes his own decision to understan d the situation	Sometimes influence and sometimes takes his own decision	Influence by somebody then mani-pulative	manipulative	
B6	Cooperative	In all situations		Case to case	sometimes	not	
B7	Dedication	Fully dedicated		average		nil	

C1	Values	Ethical understand-ding	-	-	-	-	4 points mandatory to achieve
C2	Honesty	honest	-	--	-	-	4 points mandatory to achieve
D1	Number of publications	5 or more papers presented at National /Internation al level	4	3	1-2	nil	Within 5 years span of service (provided all kind of facilities provided by the institute))
D2	Quality of publications	International Journal	National Journal	State Journal	College Journal	nil	Within 5 years span of service no. of papers published in reputed Journals
D3	Research and creative activity (independent of publications)	Extra active	active	average	Below average	nil	
D4	Supervision of student's research	5 or more students	4	3	1-2	nil	Within 5 years span of service
D5	Number of books or monograph published	Independent	Combine with one author	Combine with two authors	Combine with more than two authors	nil	Maximum score should not be greater than 4
		OR Score=4* $\sum_{i=1}^{k} 1/n_i$ where k is total no. of books written by faculty and n is number of authors					
D6	Activity in professional society	Score=4*f where f∈ [0,1] depending upon coordinator ship/Expert lecture delivered etc.					
D7	Personal qualification	Ph.d	Masters with other	Only masters	Bachelors	nil	

D8	Consultation (project)	4	3	2	1	0	Within 5 years span of service
		OR N*1, N is Rs. in lacs					
D9	Professional honors/awards	Internatio nal level	National level	State level	College level/ Manage-ment level	nil	
E1	Technical Activities	4*I ,I=involvement factor , I∈[0,1] depending upon the comparative involvement of the faculty					
E2	Social Activities	4*I ,I=involvement factor , I∈[0,1] depending upon the comparative involvement of the faculty					

In A1, A2, A3, B1, C1, and C2 the mandatory points are given. Faculty must achieve them. If in any one of them it is not achieved the total score will be zero.

Grading levels of faculty:

Range of final Score gained by faculty	Level of Faculty
$3 \leq x < 4$	Excellent
$2 \leq x < 3$	Average
$1 \leq x < 2$	Below Average
$0 \leq x < 1$	Nil

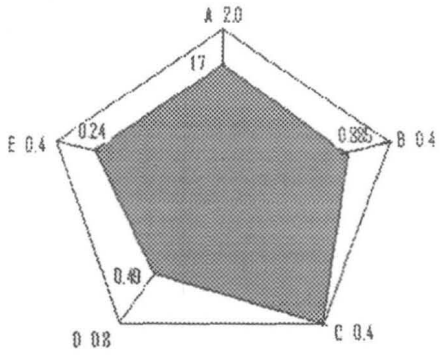
6. MODEL TESTING

For the testing of the described model we have considered a faculty X of the institute. The detailed histories about all criteria were provided to the head of the institute. Head of institute was told to evaluate the performance of the faculty based on above scoring system. The faculty score for each criterion is multiplied by global weight of that criteria and final score of faculty performance is arrived at in the following table. The data of his score is given in Table 3.

Table 3: Score of Faculty X

Criteria number	Parameter	Global Weight	Score by faculty X out of 4	Final score
A1	Classroom teaching	0.150	3	0.450
A2	Knowledge of the subject	0.150	3	0.450
A3	Presentation in class and control of class	0.050	4	0.200
A4	Result	0.075	4	0.300
A5	Regularity in assessing answer books, assignment, and lab records etc.	0.075	4	0.300
B1	Punctuality	0.025	4	0.100
B2	Student counseling	0.025	4	0.100
B3	Personality factors	0.015	3	0.045
B4	Initiator/Self motivated	0.005	4	0.020
B5	Not Manipulative	0.005	4	0.020
B6	Cooperative	0.010	4	0.040
B7	Dedication	0.015	4	0.060
C1	Values	0.050	4	0.200
C2	Honesty	0.050	4	0.200
D1	Number of publications	0.040	4	0.160
D2	Quality of publications	0.040	3	0.120
D3	Research and creative activity (independent of publications)	0.030	2	0.060
D4	Supervision of student's research	0.020	4	0.080
D5	Number of books or monograph published	0.010	0	0.000
D6	Activity in professional society	0.010	0	0.000
D7	Personal qualification	0.020	3	0.060
D8	Consultancy(Project)	0.020	0	0.000
D9	Professional honors/awards	0.010	1	0.010
E1	Technical Activities	0.080	3	0.240
E2	Social Activities	0.020	0	0.000
Total score				3.215

Faculty Performance Result Display



The final calculated score of faculty X is

X = (global weight) x (score by faculty x out of 4) = 3.215

7. CONCLUSION AND FUTURE SCOPE OF IMPROVEMENT

For the faculty X we have found final score x=3.215 by the SAW method, therefore he is excellent by the model testing. In reality also he is an excellent teacher. So the method is verified and found working satisfactorily. In present model only 0- 4 score (only positive score of parameters) is considered. That is the ideal score (Maximum) is 4. For further strengthening of the same model we can include negative aspect in the scoring system. The weight criteria is done with few selected experts, which can be done by selecting more experts in various ranges of their experiences. Such large number of expert's opinion can improve the weight criteria and thus enhancement of current model can be achieved. The simple scheme of faculty evaluation can be very useful to both: Management for deciding critical promotion decisions and for faculty to improve upon his/ her deficiencies. It is high time in the era of global competitiveness, to continuously evaluate the faculties and keep on enhancing the overall engineering institutional organization structure. Such, model can provide a very good tool in such conditions.

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