Research Paper

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Fuzzy Based Analysing Job Satisfaction of Engineering College Teachers at Puducherry

Education

KEYWORDS : Job Satisfaction, Fuzzy Logic

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ABSTRACT

This research paper discusses the fuzzy based analyzing job satisfaction of teachers in Engineering Colleges at Puducherry. Today, there is generally a widespread of engineering education has deteriorated because of mushroom growth of Engineering Colleges in India. A vast network of mediocre and substandard institutions has spring up due to unplanned and uncontrolled proliferation of ill equipped; ill provided and inadequately staffed colleges with less salary without concern for quality. At present, in spite of various plans and programmes to improve the conditions of teachers, serious attempts have not been made to identify the factors affecting the Job Satisfaction of teachers in Engineering Colleges for they have great impact on the youth to maximize the profession of Engineering. It becomes necessary to judge the Job Satisfaction of the Engineering College teachers, so as to develop the budding Engineers of the present scenario. To achieve the objectives of the present study, the normative survey method was used. In this study, "Job Satisfaction" is alone taken as the independent variable and type of institution, educational qualification and subject specialization are taken as three dependent variables. Job Satisfaction is analyzed in terms of the present satisfactory conditions of the Engineering College Teachers at Puducherry.

INTRODUCTION

Job satisfaction is pleasant and positive attitude possessed by an employee towards his job-life. Job satisfaction has been characterized as the feeling of effective responses of a person towards his job. Job satisfaction is the result of various attitudes possessed by the teachers. The teacher has a powerful and abiding influence in the formation of the character of every future citizen. He acts as a pivot for the transmission of intellectual and technical skills and cultural tradition from one generation to the other. The responsibility of the teacher is very important and great. If the plans of the nation are to be fulfilled, it is the teacher who can make the most substantial contribution towards the achievement of the desired goals. Over the years, beginning in the early 1930's, psychologists have endeavored to determine the components of job satisfaction. Though many studies were conducted on Job Satisfaction of teachers, yet these appear to be precious little that has been unequivocally established. The reasons for the difference in findings may be due to the fact that job satisfaction has many different points of variables.

Under the general studies, there were many research findings on Job Satisfaction. These research findings stressed stressed on the pleasant physical surroundings at work, freedom to do their work, job security and good pay, support and co-operation of the colleagues, job involvement, inter personal relationships, especially with the students and from their autonomy for their better Job Satisfaction. Dissatisfaction resulted mainly from the amount of paper work feeling of work overload and occupational stress. In general, college teachers are more satisfied with their jobs. There were many research findings regarding the type of Institution as a factor on Job Satisfaction. One of the findings concluded that the teachers of Government schools were more satisfied than those in privately managed schools. Another two findings revealed that the teachers working in private colleges were more satisfied than those working in Government Colleges. Four of the findings revealed that the level of Job Satisfaction depends on the type of institution, changes in the administrative control, environment in which the academics work, and management of schools. Two of the findings concluded that there was no relationship between the teacher's sense of satisfaction and the type of institution. A study on "Personality correlates of job satisfaction of higher secondary school teachers" and concluded that the teachers of Government schools were more satisfied than those in privately managed schools [1]. A study on "A study of job satisfaction, attitude towards teaching and job involvement of college teachers" reveals that teachers working in private colleges were more satisfied than those working in Government colleges [2]. A study on "A theoretical analysis of faculty job satisfaction / dissatisfaction" and concluded that job satisfaction of academic staff in universities and colleges is related to intrinsic factors (in particular, ministering to students and the work itself) and dissatisfaction is related to extrinsic factors and arises from factors external to the job [3]. A study on "job satisfaction of graduate teachers in Coimbatore" reveals that the level of satisfaction depends on the type of institution [4]. A study on "Job Satisfaction of Polytechnic Teachers in Tamil Nadu" and concluded that the private Polytechnic teachers have better job satisfaction than Government Polytechnic teachers [5]. A study on "A study of job satisfaction of secondary teachers in relation to some background variables" and the findings showed that the rural, urban settings of schools and management of schools were related to either total or one or more components of job satisfaction of teachers [6]. A study on "Job satisfaction among academic staff, 'An international perspective'" and indicated that factors related to the environment in which academics work, including University atmosphere [7]. To analyze the job satisfaction of teachers in respect of their sex, length of service, age, marital status, type of institution, [8] made a study on "School organizational climate with job satisfaction of teachers". The conclusion reveals that the type of institution causes no significant difference in their job satisfaction. A study on "Job Satisfaction of Working Lecturers Working in Private and Government Colleges" and found that job satisfaction is an act of satisfying, fulfillment or gratification. It may be the state of being satisfied; contentment or the cause or means of being satisfied or may be confident acceptance of something as satisfactory, dependable or true [9].

On the basis of Educational Qualification there were three findings. One of the findings reported that they do not put very much weight on extrinsic factors, such as income, but their decisions are influenced by intrinsic motives such as seeking opportunities for professional growth. Another finding revealed that satisfaction and in-service activities are not related. One more finding revealed that the educational qualifications appeared to be positively associated with Job Satisfaction. A study on "The American profession, a synthesis of social inquiry since world war – II" and reported that when faculty change jobs, they do not conform to the rational economic labour market model, that is they do not put very much weight on extrinsic factors, such as income, but their decisions are influenced by intrinsic motives such as seeking opportunities for professional growth [10]. A study on "A study of job satisfaction of secondary school teaches in Shillong and leadership characteristics of the heads / principals" and the result reveals that educational qualifications appeared to be positively associated with job satisfaction. Teachers tended to be more satisfied if they perceived the heads of schools as being concerned with achievements of goals and

achievements [11]. A study on "The relationship of staff development / in-service education and teachers' job satisfaction in selected middle schools" and found that satisfaction and in service activities are not related [12].. A study on "Job satisfaction of primary school teachers" and the result reveals that suitably qualified teachers were more satisfied with their job, young teaches were more satisfied with their job than middle aged and aged teachers, this is true for overall job satisfaction [13]. A study on "Job satisfaction of teaching assistants of the M.S. University of Baroda" and the results showed that most of the teaching assistants were satisfied with their job responsibility and the social conditions within the department. They did not differ in their level of job satisfaction in terms of favorable attitude towards the teaching profession and facilities for further study [14]. A study on "job satisfaction of secondary school teachers in relation to sex, experience, professional training & salary" and found that when the data was analyzed to see the difference between trained and untrained teachers it was found that untrained teachers were more satisfied than the trained teachers in job satisfaction [15].

Regarding the subject of specialization as a factor of Job Satisfaction, there were two research findings on Job Satisfaction. One of the findings revealed that there was no significant difference between Science and Arts teachers on Job Satisfaction. The other finding concluded that the subject they taught do not cause any significant differences in their Job Satisfaction. A study on "A study of the elements which affect the job satisfaction of teachers working in higher secondary schools of M.P." and the result reveals that there was no significant difference between male and female and sincere and arts teachers in the job satisfaction [16]. To analyze the job satisfaction of teachers in respect of their sex, length of service, age, marital status, type of institution, [8] made a study on "School organizational climate with job satisfaction of teachers". The result reveals that subject they taught do not cause any significant differences in their job satisfaction.

A study on "Design of Fuzzy Job Satisfaction Matrix with Dynamic Performance Criteria" and found that after defuzzifying the rules and computing the distance from ideal status, the gaps were determined and improvement strategies were suggested [17]. A study on "Hierarchical Fuzzy Competition algorithm for Complex Job Shops Scheduling Problem" and revealed that products with fuzzy logic monitor user defined settings and then automatically set the equipment to function at the user's preferred level for a given task [18]. A study on "Utilization of Artificial Intelligence Approach for Assessment of Job Satisfaction" and found that by determining the shifts that have more operators with fewer score and find the weakness each shift, we can begin to correct these shifts in order to achieve higher efficiency [19]. A study on "Application of Expert System with Fuzzy Logic in Teachers' Performance Evaluation" and found that The proposed model produced significant bases for performance assessment and adequate support in decision making, so the research on the issue can be continued. The qualitative variables are mapped into numeric results by implementing the fuzzy expert system's model through various input examples and provided a basis to use the system ranking for further decision making. Thus, the uncertain and qualitative knowledge of the problem domain have been handled absolutely through integration of expert system technology with fuzzy logic concept [20].

Hence in this paper an attempt has been made to analyze the job satisfaction of engineering college teachers in Puducherry using Fuzzy Logic method. The samples were taken for the present study from Central Government and Private Engineering colleges. And the results obtained from Fuzzy Logic and other conventional methods were compared and analyzed.

STATEMENT OF THE PROBLEM

Today there exists a general feeling that the professionals do not have satisfaction in their respective job at various levels of education. Hence there is a fall of standards in education as a whole. In order to identify, which factor favors the satisfaction in the Job and which components of Job Satisfaction influence the working environment are to be analyzed for the betterment of standards of education and simultaneously improve the working conditions. Hence the problem is identified as Job Satisfaction of Teachers in various educational Institutions. Particularly, Engineering Colleges have great impact on the youth to maximize the profession of Engineering. It becomes necessary to judge the Job Satisfaction of Engineering College Teachers, so as to develop the budding Engineers of the present scenario. Hence the problem is identified as "Job Satisfaction of Teachers in Engineering Colleges".

SAMPLING PROCEDURE

The population of the study is the Engineering College Teachers at Pondicherry. The population consists of nearly 250 teachers from Engineering College managed by Central Government and Colleges managed by the private bodies at Pondicherry. The stratified random sampling technique was used, to select the sample of Engineering College Teachers. Two strata, namely, Engineering College Teachers from Central Government College (Pondicherry Engineering College (PEC)) and Managed by private bodies (Sri Manakula Vinayagar Engineering College (SMVEC) & Rajiv Gandhi College of Engineering & Technology (RGCET)). From the population, 150 Engineering College Teachers from three different Engineering Colleges were selected. Table 1 shows the complete data collected for the present study. Table 2 shows the distribution of sub samples. It is easy to infer that the sample selected for the present study is almost stratified. The selected sample comprises nearly 60% of the population. Also the sample selected is further distributed on the sub sample based on Type of Institution, Educational Qualification and Subject Specialization.

TABLE – 1
SAMPLE SELECTED

Sl. No.	Strata	Name of the College	Sample selected	Total	Percentage of Sample
1	Central Government College	PEC	78	78	52%
2	Managed by private bodies	SMVEC	37	72	48%
		RGCET	35		
Total				150	100

TABLE – 2
DISTRIBUTION OF SUB SAMPLES

Sl.No.	Category	Type	Total
1	Type of Institution	Central Government College	78
		Managed by Private Bodies	72
2	Educational Qualification	B.E., B.Tech., M.A., M.Sc., M.B.A., M.C.A.	50
		M.E., M.Tech.	64
3	Subject Specialization	M.Phil., Ph.D.	36
		Engineering	111

TECHNIQUES USED

The statistical design adopted in the present study comprises the following techniques.

(i) Descriptive analysis
(ii) Differential analysis
(iii) Fuzzy Logic Method

DESCRIPTIVE ANALYSIS

The scores of "Job Satisfaction" (Present Satisfactory Conditions) are found to form a normal distribution with a mean of 66.73 and a standard deviation of 13.73. The median and mode of distribution are formed to be 66.00 and 59.00 respectively.

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The complete analysis is tabulated in Table 3.

TABLE – 3
DESCRIPTIVE ANALYSIS FOR PRESENT SATISFACTORY CONDITIONS ON JOB SATISFACTION

Sl. No.	Statistical Meaning	Present Satisfactory Conditions
1	Mean	66.73
2	Median	66.00
3	Mode	59.00
4	SD	13.73
5	QD	8.88
6	$SE_{\bar{x}}$	1.12
7	SE_{σ}	0.79
8	Skewness	0.12
9	Kurtosis	0.28
10	Fiduciary limits of Mean	63.84 & 69.62
11	Fiduciary limits of SD	11.69 & 15.77

DIFFERENTIAL ANALYSIS
Differential Analysis for the Present Satisfactory Conditions on Job Satisfaction is shown in Table 4.

TABLE – 4
DIFFERENTIAL ANALYSIS OF THE PRESENT SATISFACTORY CONDITIONS OF JOB SATISFACTION

Sl. No.	Variable	Sub sample	N	Mean	SD	MD	df	TS	Level of significance
1	Type of Institution	Government	78	65.93	11.49	0.55	148	0.6370	NS
		Private	72	67.28	15.85				
2	Educational Qualification	Bachelor of Engineering or Master of Arts & Science	50	64.18	14.96	4.40	112	1.7447	NS
		Master of Engineering or Master of Technology	64	68.58	10.98				
3	Educational Qualification	Master of Engineering or Master of Technology	64	68.58	10.98	2.44	98	0.8132	NS
		Master of Philosophy or Doctor of Philosophy	36	66.14	16.01				
4	Educational Qualification	Master of Philosophy or Doctor of Philosophy	36	66.14	16.01	1.96	84	0.5756	NS
		Bachelor of Engineering or Master of Arts & Science	50	64.18	14.96				
5	Subject Specialization	Engineering	111	66.80	12.81	1.06	148	0.3696	NS
		Arts & Science	39	65.74	16.22				

FUZZY LOGIC METHOD
Fuzzy logic is a mathematical theory, which encompasses the idea of vagueness when defining a concept or a meaning. For example, they're in uncertainly of fuzziness in expressions like large or small, since these expressions are imprecise and relative. Variables considered are termed 'Fuzzy' as opposed to 'crisp'. Fuzziness is simply one means of describing uncertainly. Such ideas are readily applicable to the job satisfaction problem.

In the formulation, the fuzzy variables associated with the Job Satisfaction problem are:

- Type of Institution (TI)
- Educational Qualification (EQ)
- Subject Specialization (SS)

A) Fuzzy Sets associated with Job Satisfaction
After identifying the fuzzy variables associated with job satisfaction, the fuzzy sets defining those variables are selected and normalized between 0 & 1. This normalized value can be multiplied by a selected scale factor to accommodate any desired variable. The sets are defined as follows:

The mean (M) is stated by following sets:
M = {Low, Medium, High}

The standard deviation (SD) is stated by following sets:
SD = {Very Low, Low, Medium, High, Very High}
The total score (TS) is chosen as the objective function, are given by:
TS = {Very Low, Low, Medium, High, Very High}

Based on the aforementioned fuzzy sets, the membership functions are chosen for each fuzzy input and output variables. For convenience, a triangular shape is used to illustrate the membership functions considered here. Once these sets are established, the input variables are then related to the output variables by If – Then rules as described below.

B) Fuzzy If – Then Rules
In a fuzzy logic based approach, decisions are made by forming a series of rules that relate the input variables to the output variable using If – Then statements. The If (condition) is an antecedent to the Then (consequence) of each rule. Each rule in general can be represented in the following manner:

If (antecedent) Then (consequence)

Mean, standard deviation is considered as input variables and total score is treated as output variables. This relation between the input and output variables are given as:

Total Score = {Mean} and
{Standard Deviation}

In fuzzy set notation this is written as:
TS = M ^ SD

Hence, the membership function of the production cost (μPRC) is computed as follows:
μTS = μmin. {μ M, μ SD}

Where, μ M and μ SD are membership of mean and standard deviation respectively. For example, rule 1 can be written as follows:

If Mean is low and
Standard Deviation is low
Then Total Score is low

After relating the input variables to the output variables, the fuzzy result must be defuzzified through what is called a defuzzification process, to achieve crisp numerical values. The analysis using Fuzzy Logic method is shown in Table 5.

C) Defuzzification Process
One of the most commonly used methods of defuzzification is the cancroids or center of gravity method. Using this method, production cost is as follows:

$$Total\,Score(\bar{S}) = \frac{\sum_{i=1}^{n} \mu\bar{S}_i * \bar{S}_i}{\sum_{i=1}^{n} \mu\bar{S}_i}$$

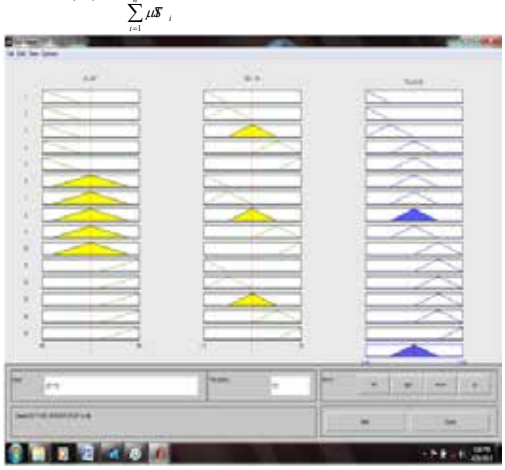

Fig. 1 Fuzzy Rule Base for Type of Institution

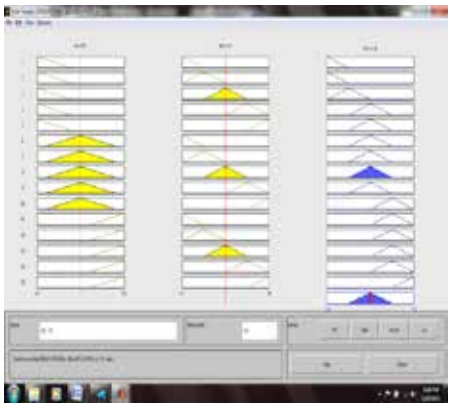

Fig. 2 Fuzzy Rule Base for Educational Qualification

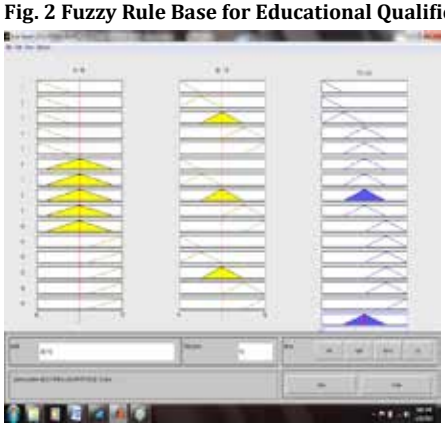

Fig. 3 Fuzzy Rule Base for Educational Qualification

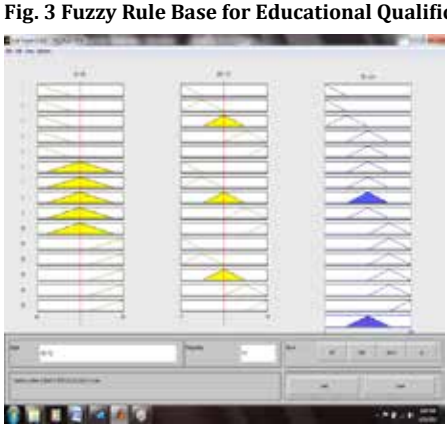

Fig. 4 Fuzzy Rule Base for Subject Specialization

TABLE – 5

FUZZY LOGIC METHOD OF THE PRESENT SATISFACTORY CONDITIONS OF JOB SATISFACTION

Sl. No.	Variable	Sub sample	N	Mean	SD	MD	df	TS	Level of significance
1	Type of Institution	Government	78	65.8	11.5	0.55	148	0.509	NS
		Private	72	67.3	15.9				
2	Educational Qualification	Bachelor of Engineering or Master of Arts & Science	50	64.2	15	4.40	112	1.6	NS
		Master of Engineering or Master of Technology	64	68.6	11				
3	Educational Qualification	Master of Engineering or Master of Technology	64	68.6	11	2.44	98	0.499	NS
		Master of Philosophy or Doctor of Philosophy	36	66.1	16				
4	Educational Qualification	Master of Philosophy or Doctor of Philosophy	36	66.1	16	1.96	84	0.4	NS
		Bachelor of Engineering or Master of Arts & Science	50	64.2	15				
5	Subject Specialization	Engineering	111	66.8	12.8	1.06	148	0.4	NS
		Arts & Science	39	65.7	16.2				

CONCLUSIONS

This research paper discussed the job satisfaction of teachers in Engineering Colleges at Puducherry using Fuzzy Logic. The scores of Job Satisfaction (present satisfactory conditions) form a positively skewed platykurtic distribution. It is concluded that there is no significant difference between the Government and Private Engineering College teachers in Job Satisfaction (present satisfactory conditions). It is concluded that there is no significance difference between the low and medium qualifications of teachers in Job Satisfaction (present satisfactory conditions). It is concluded that there is no significant difference between the medium and high in Job Satisfaction (present satisfactory conditions). It is concluded that there is no significant difference between the teachers who possess M.Phil., Ph.D., and the teachers with B.E., B.Tech., M.A., M.Sc., M.B.A., M.C.A., in Job Satisfaction (present satisfactory conditions). It is concluded that there is no significant difference between the Engineering teachers and the teachers of Arts and Science in Engineering Colleges in Job Satisfaction (present satisfactory conditions). It is concluded that there is no significant difference between the Engineering teachers and the teachers of Arts and Science in Engineering College s in Job Satisfaction (present satisfactory conditions). Based on the analysis using descriptive, differential and fuzzy logic method, it is seen that the present role of Job Satisfaction forms a positively skewed platykurtic distribution, which indicates that there is a greater satisfaction in the present job among the Teachers in Engineering Colleges. With the comparison of the results obtained by Fuzzy Logic method with conventional methods, it gives better results.

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