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Research Paper

Analysing Future Expectations on Job Satisfaction of Engineering College Teachers at Puducherry For a Few Factors Using Fuzzy Logic

Education

KEYWORDS :

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ABSTRACT

This research paper discusses the analysing future expectations on job satisfaction of teachers in Engineering Colleges at Puducherry for a few psychological factors using Fuzzy Logic. 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 Subject Specialization, Periods/Week, Salary/Month, Timely Promotion and Teaching Experience are taken as five dependent variables. Job Satisfaction is analyzed in terms of the future satisfactory conditions of the Engineering College Teachers at Puducherry using Fuzzy Logic Method.

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 on the pleasant physical surroundings at work, organizational climate, and relationship with colleagues, teaching experience, mental health, teacher's attitude towards students, job expectations and performance, morale, sense of community, job security, commitment towards organization and they have significant relationship with Job Satisfaction. Level of job involvement, administrative effectiveness, teaching competency and job satisfaction did not have any effect on Job Satisfaction. In general, college teachers are more satisfied with their jobs.

Regarding sex as a factor in Job Satisfaction, there were seven research findings on Job Satisfaction. Two findings revealed that women teachers have better Job Satisfaction than male teachers. Another two findings revealed that men teachers have better Job Satisfaction than female teachers. Three findings revealed no significant difference between men and women teachers regarding their job. A study on "Teachers job satisfaction in schools of different levels" and found out that there was no difference in job satisfaction between men and women teachers in respect of their jobs [1]. A study on "School teachers and job satisfaction" reveals that women teachers have better job satisfaction than men teachers [2]. A study on job satisfaction of selected parochial high school teachers in Kansas and found out that there was no significant difference between men and women teachers in their job satisfaction [3]. A study on "Job satisfaction and burn out among Minnesota Teachers" reveals that women teachers have better job satisfaction than men teachers [4]. A study on "A study of job satisfaction among school teachers" reveals that women teachers have better job satisfaction than men teachers [5]. A study on "Job satisfaction of primary school teachers" reveals that considering overall (job satisfaction), women teachers were more satisfied with their job than men teachers [6]. A study on "Job satisfaction of the Harijan welfare school teachers in Tamil Nadu" reveal that women teachers have better job satisfaction than men teachers [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". It reveals that female teachers have better satisfaction than their counter parts. A study of organization commitment, attitude towards work and job satisfaction of postgraduate teachers of Goa [9] reveal that there were differences with respect to gender. A study on "Job satisfaction of secondary school teachers in relation to sex, experience, professional training & salary" found that 70.41% of male teachers and 86.44% of female teachers were satisfied with their job satisfaction [10]. A study on "Attitude towards teaching profession and job satisfaction of women teachers in Coimbatore" 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 [11].

Regarding age as a factor in Job Satisfaction, there were two findings. One revealed that there was upward progression in Job Satisfaction with increasing age and the other over 55 years of age and less than 25 years were the most satisfied in their job. A study of job satisfaction of selected parochial high school teachers in Kansas and observed that there was upward progression in job satisfaction with increasing age [3]. A study on "Job satisfaction and burn out among Minnesota Teachers" and found out those teachers over 55 years of age and less than 25 years were the most satisfied [4]. A study on "Job Satisfaction Status of Primary School Teachers in Ota, Nigeria" and reveals that no significant difference existed on gender basis while there were significant differences on educational qualification and age groups. Consequent upon these findings it is imperative for proprietors of schools to ensure that teachers are not dissatisfied with their job through their inability to consistently provide enabling environment [12]. A study on "Socio – Personnel correlates of Job satisfaction" and concluded that age was positively correlated with job satisfaction. Also they found out that age is more effective correlates of job satisfaction [13]. A study on "Person-

ality correlates of job satisfaction of higher secondary school teachers" and concluded that age appeared to exert an adverse impact on job satisfaction [14]. A study on "Correlates of job satisfaction among different professionals" and concluded that age was positively correlated with job satisfaction [15]. A study on job satisfaction of graduate teachers in Coimbatore and concluded that the younger teachers were more satisfied with their jobs than their elders [16]. A study on "Job satisfaction of primary school teachers" and found that teachers younger in age had higher level of job satisfaction [6]. A study on "Job satisfaction of the Harijan welfare school teachers in Tamil Nadu" had reported that teachers who are above 40 years of age have better Job Satisfaction [7]. A study on "Job satisfaction of teaching assistants of the M.S. University of Baroda" 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 age group [17]. A study of organization commitment, attitude towards work and job satisfaction of postgraduate teachers of Goa [9] reveals that there were differences with respect to age. A study on "Occupational Stress and Job Satisfaction among Managers" and found that compared to the middle age that are more or less settled in their personals as well as work like young adults found their jobs much more satisfied [17]. A study on "Job satisfaction of faculty members of veterinary sciences: an analysis" and found that the younger faculty members are more satisfied as compared to those with a longer service period [18].

Regarding the marital status as a factor in Job Satisfaction, there was only one finding, which revealed that married teachers seem to be more satisfied with their teaching positions than unmarried teachers. A study on "Teachers voluntary absenteeism and perception of the professional environment, job satisfaction, and impact of collective bargaining" and revealed that married teachers seem to be more satisfied with their teaching positions than unmarried teachers [2]. A study on "A study of job satisfaction among school teachers" and noted that young unmarried teachers were more satisfied than married teachers [5]. A study on "Socio – Personnel correlates of Job satisfaction" has found that marital status is more effectively correlated to job satisfaction [13]. A study on "Personality correlates of job satisfaction of higher secondary school teachers" and concluded that the female unmarried teachers were more satisfied than the married teachers of both sexes [14]. To analyze the job satisfaction of teachers in respect of their sex, length of service, age, marital status, type of institution, A study on "School organizational climate with job satisfaction of teachers". It reveals that with reference to the marital status of teachers, the marital status has no influence on job satisfaction [8].

A study on "Job Satisfaction of Technology and Design Education Teachers in Turkey (Ankara Case)", and found that such variables as gender, age, educational level, experience do not affect all dimensions of satisfaction but they are influential in some aspects of job satisfaction [20]. A study on "Comparative Study of Job Satisfaction among Teachers in Public and Private Engineering Institutions" and found that the overall satisfaction which measured mean scores concluded that job satisfaction of the teachers of public Engineering Institutions is more than that of the teachers of private sector [21]. A study on "Role of Demographic Characteristics on Job Satisfaction" and found that age and job satisfaction was not positively correlated with each other's. The academic staffs from private sector universities were comparatively more satisfied with overall job satisfaction than that of public sector universities [22]. 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 [23]. 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 [24]. 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 [25]. 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 [26]. A study on "Job Satisfaction Status of Primary School Teachers in Ota, Nigeria" and reveals that no significant difference existed on gender basis while there were significant differences on educational qualification and age groups [27]. Consequent upon these findings it is imperative for proprietors of schools to ensure that teachers are not dissatisfied with their job through their inability to consistently provide enabling environment.

Today, there is generally a widespread feeling that teachers do not have satisfaction in their job across the spectrum of education. Teachers all over the country often manifest this in protests and strikes. The growing discontentment among teachers has resulted in the fall of standards in education as a whole. At present, in spite of various plans and programmes to improve the service conditions of teachers, serious attempts have not been made to identify the factors affecting their Job Satisfaction. It is therefore considered necessary to conduct an investigation concerning the factors associated with the Job Satisfaction of teachers in Engineering Colleges. Incidently, there is no study available exclusively on Job Satisfaction of teachers in Engineering Colleges in Puducherry. Hence the present study has earnestly been undertaken.

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. The sample selected is also diagrammed and is shown in Fig. 1. 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 subject specialization, periods/week, salary/month, timely promotion and teaching experience.

Table 1: Sample selected for the present study

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

Fig.1: Pie diagram showing the stratification of the sample

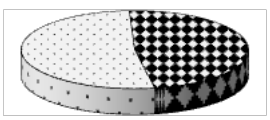

Table 2: Distribution of Sub Samples

Sl.No.	Category	Type	Total
1	Subject Specialization	Engineering	111
		Science	39
2	Periods / Week	Less than 17	72
		More than 17	78
3	Salary / Month	Below 25000	84
		Above 25000	66
4	Timely Promotion	Received	61
		Not Received	89
5	Teaching Experience	Less than 10	98
		More than 10	52

TOOLS USED

The tool used for the present study is Job Satisfaction Inventory. It is for finding the Job Satisfaction of Teachers. The investigator adopted Job Satisfaction inventory (JSI) developed by Jayalakshmi Indiresan (1973) of IIT, New Delhi. Also the investigator uses the 'Personnel data sheet' for finding out the effect of background variables subject specialization, periods/week, salary/month, timely promotion and teaching experience.

TECHNIQUES USED

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

- Descriptive analysis
- Differential analysis
- Fuzzy Logic Method

DESCRIPTIVE ANALYSIS

The scores of "Job Satisfaction" (future expectations) are found to form a normal distribution with a mean of 74.50 and a standard deviation of 19.27. The median and mode of distribution are formed to be 77.50 and 84.00 respectively. The complete analysis is tabulated in Table 3.

DIFFERENTIAL ANALYSIS

Differential Analysis for the Future Satisfactory Conditions on Job Satisfaction is shown in Table 4.

Table 3: Descriptive Analysis for Future Expectations on Job Satisfaction

Sl. No.	Statistical Meaning	Future Expectations
1	Mean	74.50
2	Median	77.50
3	Mode	84.00
4	SD	19.27
5	QD	11.50
6	SE_M	1.57
7	$SE\sigma$	1.12
8	Skewness	-0.47
9	Kurtosis	0.28
10	Fiduciary limits of Mean	70.45 & 78.55
11	Fiduciary limits of SD	16.38 & 22.16

Table 4: Differential Analysis of the Future Expectations on Job Satisfaction

Sl. No.	Variable	Sub sample	N	Mean	SD	MD	df	t	Level of significance
1	Subject Specialization	Engineering	111	66.80	12.81	1.06	148	0.3696	NS
		Arts & Science	39	65.74	16.22				
2	Periods / Week	Below 17	72	66.76	13.31	0.45	148	0.2005	NS
		Above 17	78	66.31	14.18				
3	Salary / Month	Below 25000	84	64.69	13.38	3.91	148	1.7377	NS
		Above 25000	66	68.60	13.91				
4	Timely Promotion	Received	61	67.36	14.93	1.40	148	0.5957	NS
		Not Received	89	65.96	12.90				
5	Teaching Experience	Below 10	98	66.81	13.76	0.81	148	0.3425	NS
		Above 10	52	66.00	13.80				

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:

- Subject Specialization (SS)
- Periods/Week (PW)
- Salary/Month (SM)
- Timely Promotion (TP)
- Teaching Experience (TE)

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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. The Figures 2 to 6 shows the rule viewers of fuzzy output corresponding to different variables.

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:

$$Total\,Score(TS) = \frac{\sum_{i=1}^{n} \mu TS_i * TS_i}{\sum_{i=1}^{n} \mu TS_i}$$

Table 5: Fuzzy Logic Method of the Future Expectations on Job Satisfaction

Sl. No.	Variable	Sub sample	N	Mean	SD	MD	df	T	Level of significance
1	Subject Specialization	Engineering	111	74.1	20.1	1.9	148	0.407	NS
		Arts & Science	39	76	16.8				
2	Periods / Week	Below 17	72	78	20	6.8	148	1.935	NS
		Above 17	78	71.2	18.1				
3	Salary / Month	Below 25000	84	73	21	3.7	148	1.635	NS
		Above 25000	66	76.7	16.7				
4	Timely Promotion	Received	61	73.4	20.2	2.7	148	0.7605	NS
		Not Received	89	76.1	17.4				
5	Teaching Experience	Below 10	98	76	18.6	2.5	148	1.062	NS
		Above 10	52	73.5	12.8				

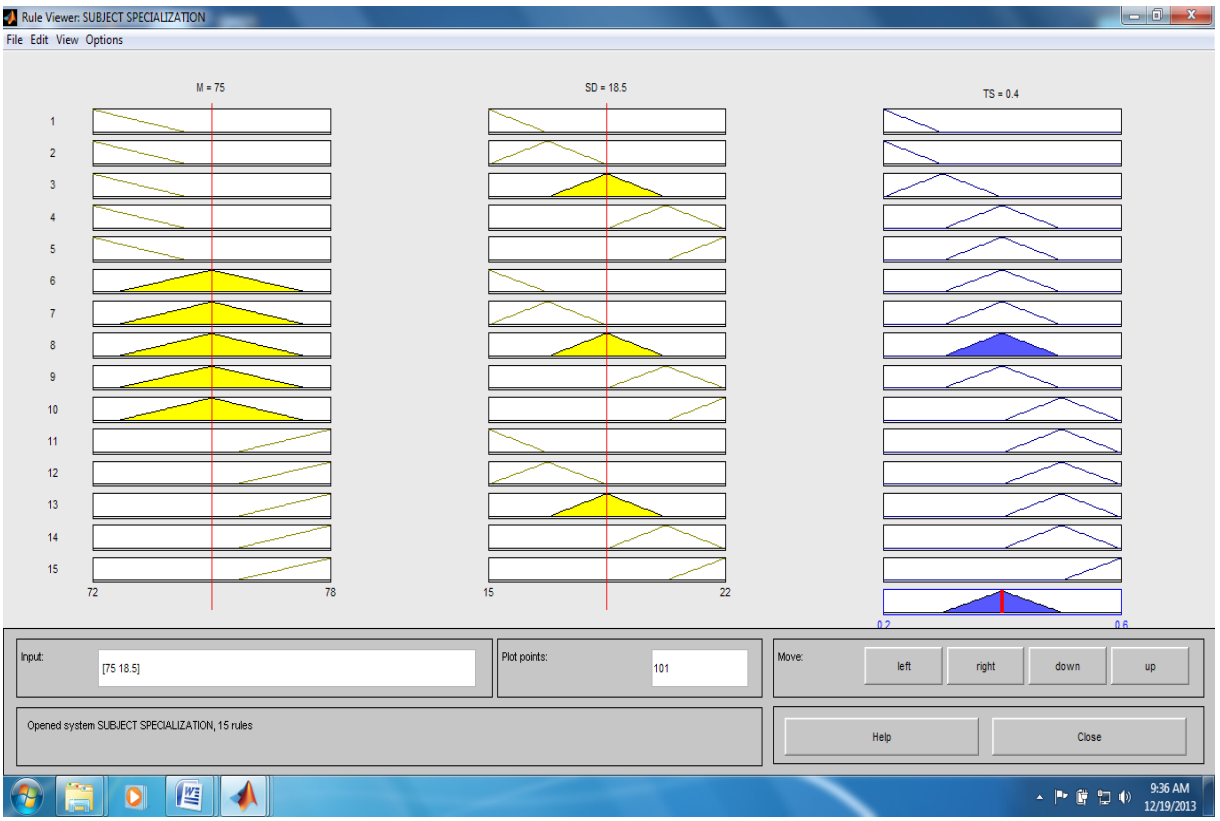

Fig. 2 Fuzzy Rule Base for Subject Specialization

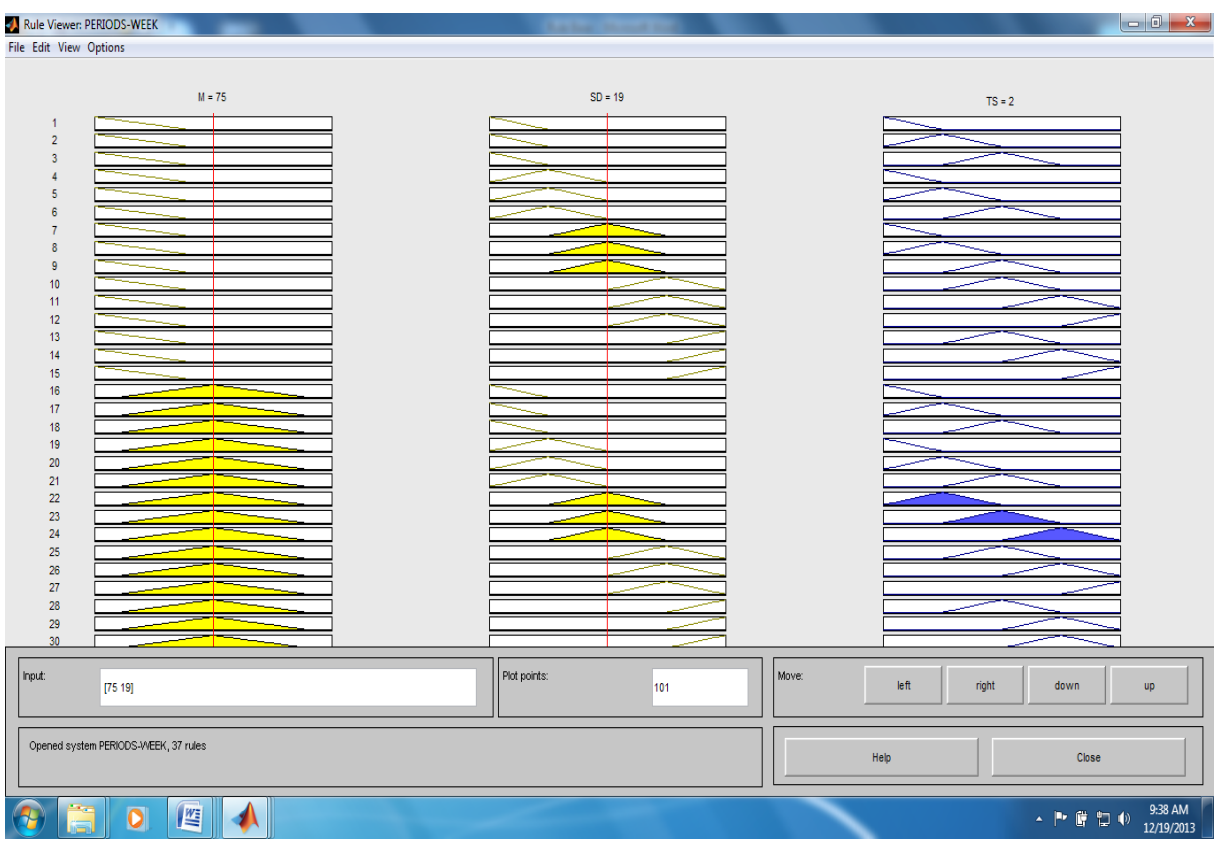

Fig. 3 Fuzzy Rule Base for Periods/Week

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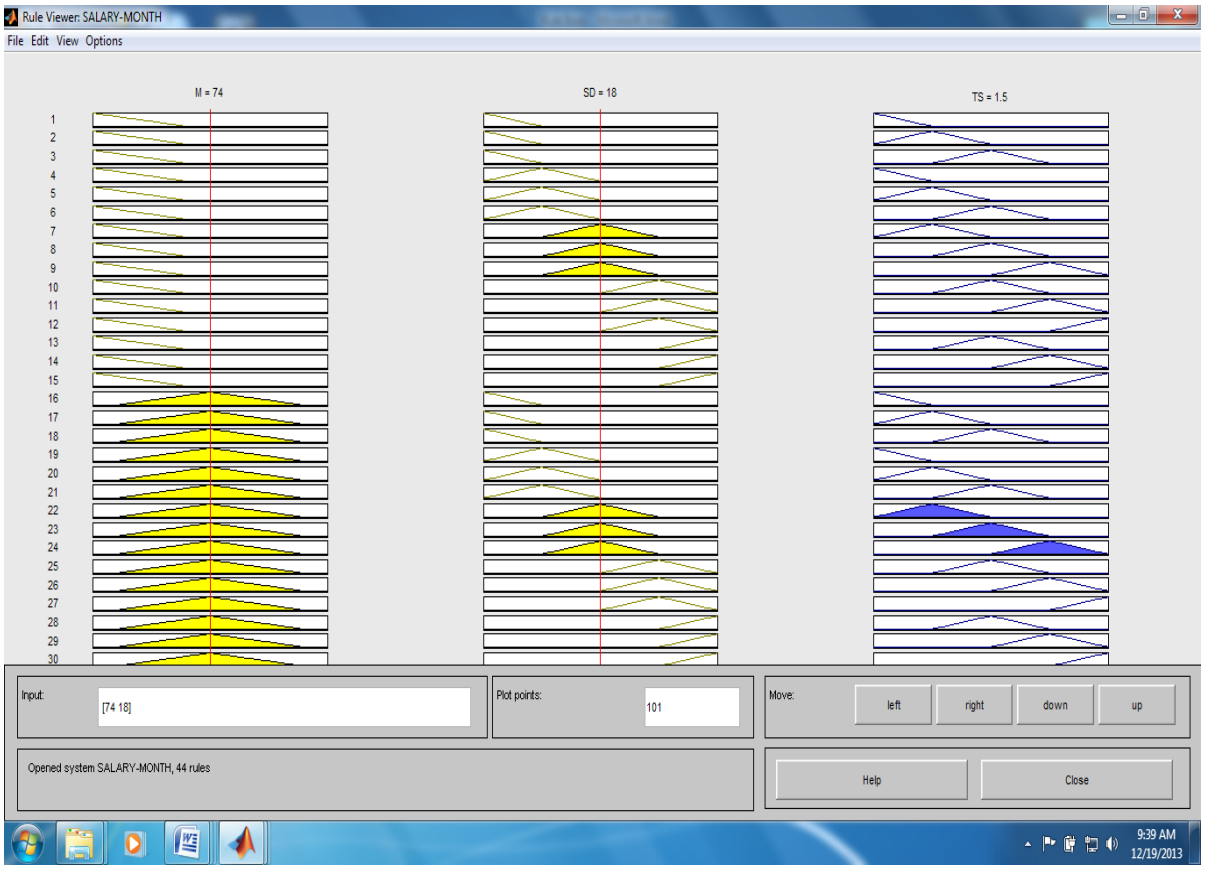

Fig. 4 Fuzzy Rule Base for Salary/Month

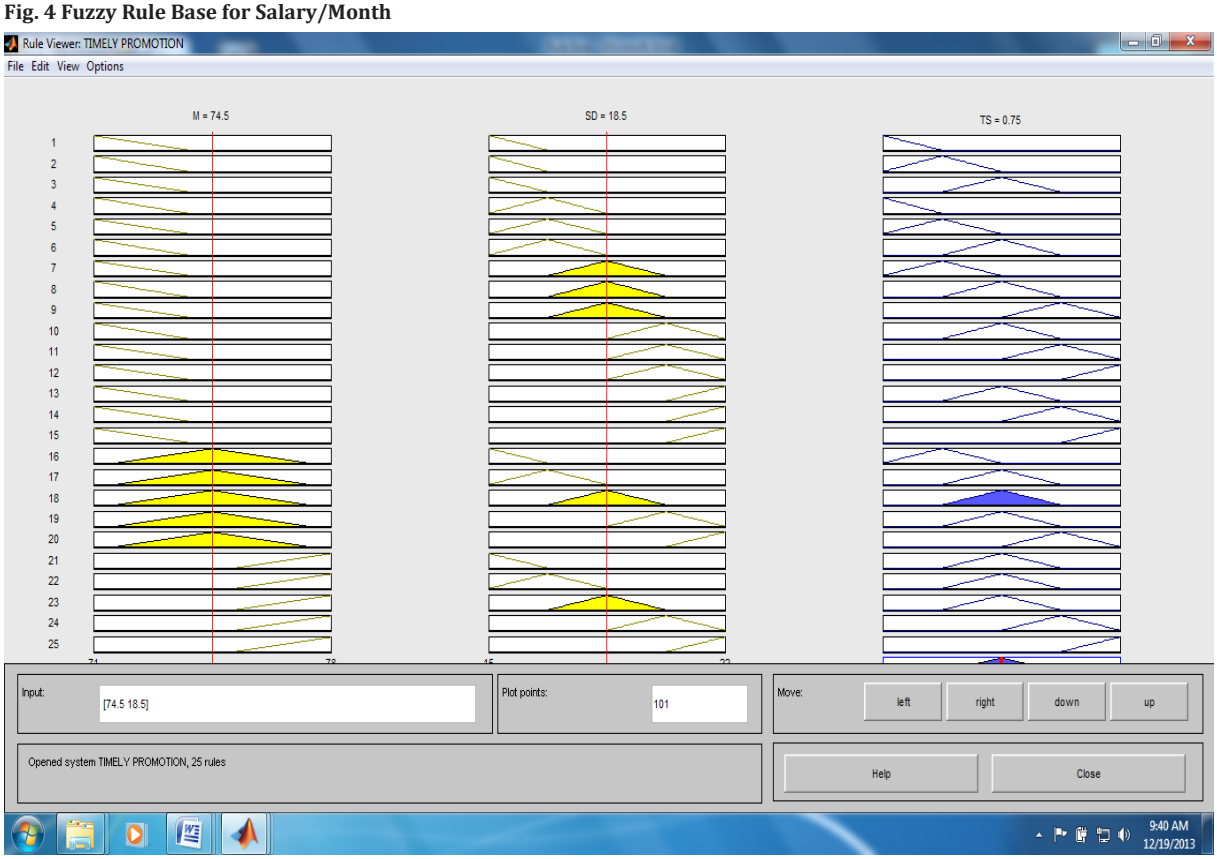

Fig. 5 Fuzzy Rule Base for Periods/Week

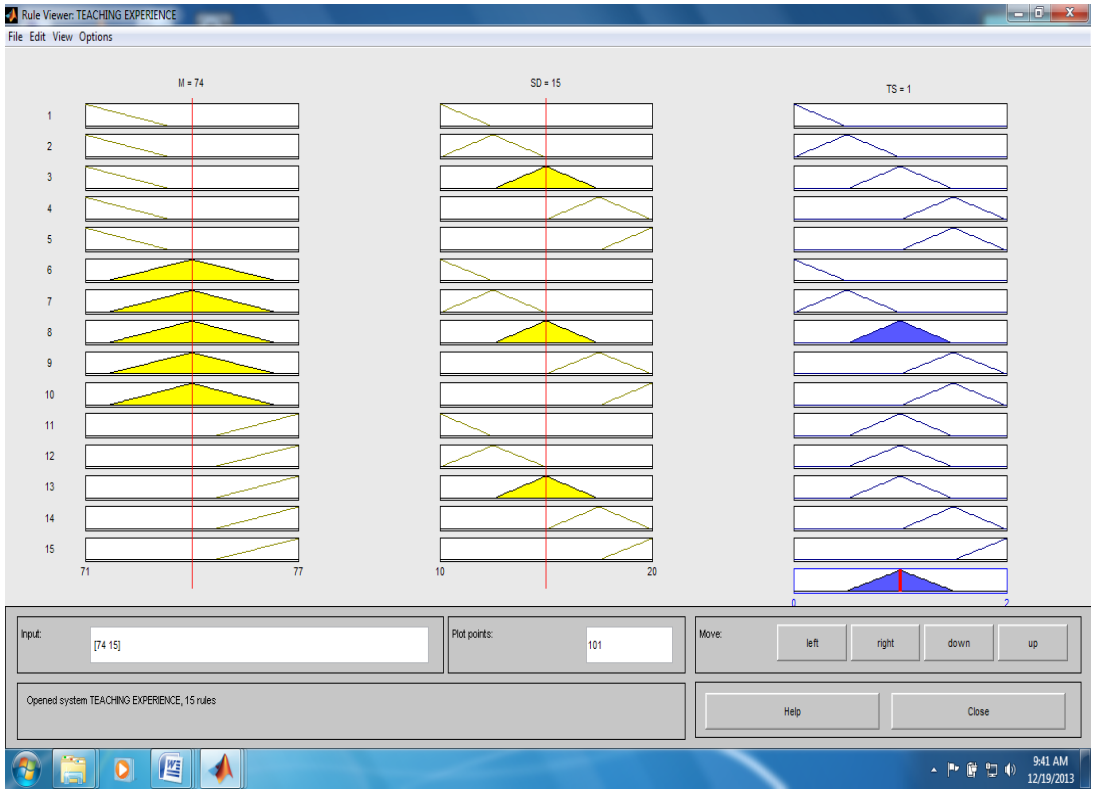

Fig. 6 Fuzzy Rule Base for Teaching Experience

CONCLUSIONS

This research paper discussed the analysing future expectations on job satisfaction of teachers in Engineering Colleges at Puducherry for a few psychological factors using Fuzzy Logic. The scores of Job Satisfaction (future expectations) form a positively skewed platykurtic distribution. 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 (future expectations). It is concluded that there is significant difference at 0.05 level between the teachers who handle less than 17 hours and more than 17 hours per week in Job Satisfaction (future expectations). It is concluded that there is no significant difference between the teachers who receive the salary below Rs 25000/- and above Rs 25000/-, in Job Satisfaction (future expectations). It is concluded that there is no significant difference between the teachers who have received timely promotion and who have not received timely promotion in Job Satisfaction (future expectations). It is concluded that there is no significant difference between the teachers who have teaching experience below 10 years and above 10 years in Job Satisfaction (future expectations). Based on the analysis using descriptive, differential and fuzzy logic method, It is easily inferred that the Future Expectations of Job Satisfaction forms a negatively skewed platykurtic distribution, which indicates that there is a greater expectation in Job Satisfaction 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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