Using a Fuzzy Logic-Based Emotional Intelligence Framework for Testing Satisfaction of Faculty in an Outcomes-Based Educational System

Pooja Pathak, Vijay Kumar Dwivedi,

Abstract: Workplace distress, a common manifestation in different professions, has been observed in all over the world. Occupational pressure among faculty has been documented to impact job satisfaction and job performance, thereby undermining student-faculty relationship leads to the future of student at risk. The purpose of this study to get satisfaction index of faculty in an outcome-based education system by using fuzzy based emotional intelligence (EI). Emotional expression is essential for survival. One can give his emotional expression in language (linguistic) only. As per literature the fuzzy logic is much more capable to handle linguistic variable in uncertain environment. Therefore, to analyze the satisfaction index of faculty fuzzy logic is used. Research findings indicate that emotional literacy plays an important role in thinking, learning, exhaustion, depersonalization and a sense of low personal adjustment that can occur among individuals who work with other people in some capacity in a University. In this study, 450 faculty satisfaction data are taken and analyzed, needing further investigation more data and more comparative analysis. Fuzzy based emotional intelligence was not as distinctive as previous literature has indicated.

Keywords: Emotional Intelligence, fuzzy logic, linguistic variable, satisfaction index

I. INTRODUCTION

Universities and institutions of higher education play a major role in the society advancement. Universities are the biggest source for the student teaching, which is the internal part of the economic, science and cultural progress. The biggest challenge facing by any Universities nowadays is to keep skilled staff exclusively in their faculties. The awareness of workplace emotion is growing in significance as they serve as an originator in evaluating the action of a person as well as attitude towards the workplace. Faculty member have many roles, tasks and obligations in terms of workload and research work. Longer hours of work under pressure which affect their level of job satisfaction and subsequent performance. Emotional intelligence plays a role in this matter by regulating their emotions and the emotion of other member in order to preserve a satisfactory output and improve the ability to cope with physiological pressure while carrying the research. This can result in higher performance at work and motivation. Job performance has become an important aspect for members of the faculty as a dissatisfaction affecting the teaching process and influencing other responsibilities perform by faculty. Job performance is the state of intrinsic fulfillment and satisfaction achieved while doing a specific job. Among the various critical concepts of recognizing emotional intelligence, Aristotle describes emotional intelligence as those who have the rare ability to be angry with the right person, to the right degree, at right time, for the right purposes and the right way in any field of life.

The purpose of this study is therefore to investigate the relationship between emotional intelligence and employee satisfaction within GLA University faculty UP India. This paper include four section, Section 2 represent the summary of the emotional intelligence study based on EI model for four area knowledge. Section 3 presents a fuzzy modeling approach proposed for EI and a fuzzy logic based performance and satisfaction framework for faculties. Section 4 is a conclusion and also present study guidelines for future work.

OVERVIEW OF EMOTIONAL INTELLIGENCE

For EI, there are various measuring tools available, with varying levels of complexity, skill and expense necessary for proper monitoring. The Emotional Quotient Inventory (EQ-i) developed by Reuven Bar-On, emotional and Social Competence Inventory (ESCI) and Mayer, Salovey, Carsuso Emotional Intelligence Test (MSCEIT) is the most well known and fairly difficult tests to conduct due to their excessive high cost [1]. A fuzzy-based model for the analysis of emotional intelligence is to be designed to recognize faculties which most require E.I interventions. [4].

II. OVERVIEW OF FUZZY LOGIC

Professor Lofali Asker Zadeh, University of California Berkley developed a Fuzzy logic concept in 1965. The fuzzy logic controller is considering a good methodology as it yields better outcomes to those obtained through conventional control algorithms. Fuzzy logic provides an alternative way to represent in processing the real world’s linguistic and subjective attributes. A basic fuzzy controller architecture is shown in Fig. 1.

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III. FUZZY BASED FRAMEWORK

The present study is revealing the impact of emotional intelligence and its components, their educational and research performance and fatigue on job satisfaction for the faculty members of university. Emotional intelligence, performance and fatigue level are the independent variables i.e. input to the system and job satisfaction as the dependent variable i.e. output to the system.

In this research, questionnaires were given to the faculty member from varied streams including English department, Mathematics, Engineering and Management. The sample size is of 300 from different department of the University for session 2018-19. Participants age between 30-60. The faculty designation ranged from Assistant Professor to Professor. The maximum 300 respondent’s samples were picked from the department on the random basis. After adjusting for the international variables such as employment, income, industry, length of work experience, operational area, department size and other such variables by randomization and elimination, the final sample of 243 respondents were selected. 32.57 % of the respondents were males in the final sample and 68.43% were females. The respondent’s average age in this sample was 36 years.

Fuzzy parameter emotional intelligence is a combination of the following:

- Self-Awareness: Getting to know yourself and identifying your current level of emotional intelligence
- Self-Management: Accepting your own emotions and feelings and their impact on yourself and others,
- Social Awareness: Use your own intelligence to strengthen your performance.
- Relationship management: Recognition and understanding of others’ cognitive behaviors.

Fuzzy input parameters for performance is a combination of the following:

1. Proficiency and Academic Ability:
   - Lectures, classes, seminars, practical, hours of contact to be taken as a proportion of allotted lectures.
   - Meetings or other teaching activities outside UGC guidelines.
   - Preparation and facilitation of expertise or knowledge according to curriculum.
   - Enrichment of Syllabus by producing additional resources to candidates.
   - Using participatory and creative teaching-learning methodologies, updating content of subjects, developing courses, etc.
   - Examination duties (Invigilation, Question Paper Setting, Answer Script Evaluation / Evaluation) as per allocation.
   - Percentage of taking extra lectures.
   - Use of advanced tools for teaching learning.
   - Updation of additional questions in question bank.
   - Continuous Assessment (Sessional / Home Assignment /Tutorial).
   - Percentage of syllabus covered.

2. Academic development:
   - Having Ph.D. degree.
   - Having degree of M. Tech./MCA/MBA/M.E./M.Phil. or equivalent.
   - Research Papers Presented in National Conference
   - Research Papers Presented in International Conference
   - Papers Published in National Journal.
   - Research Papers Published in International Journal
   - No. of Articles published in National or International Magazines/Periodicals
   - Text or Reference Books Published by International Publishers with an established peer review system.
   - Attended workshop or Faculty Development Program.

3. Professor personal and social characteristics:
   - An urge to express your love with subject to the students.
   - An ability to inspire and make the material taught interesting.
   - A facility to engage students at their level of intelligence.
   - A willingness to describe the content clearly.
   - A willingness to describe the content
   - A willingness to explain what needs to be understood at what point and why.

4. Showing concern and respect for students
   - Commitment to cultivate individuality.
   - Ability to improvise and adapt to new conditions.
   - Use of teaching methods and learning activities requiring students to learn actively, responsibly and cooperatively.
   - Use of valid methods of evaluation.
Instead of covering the ground, concentrate on key concepts and students’ misunderstandings.

Feedback on student work of the highest quality.

Instead of covering the ground, concentrate on key concepts and students’ misunderstandings.

### 5. Subject result of examination:

An essential component of the teaching and the learning process is the writing of effective and efficient exams. Exams are common approach to measure knowledge of student and the results are useful in a number of ways. The outcomes of the exams are most often used to provide student feedback on what they have learned and also measure a course learning effectiveness.

### 6. Feedback from students:

Having a record of faculty activities and observations from seeking reviews on teaching and units at the faculty is an important aid to reflection, particularly as memory eventually dims over time. These reports assist in the process of clarifying teaching objectives, defining strength and weakness in achieving these goals, narrowing down any areas for improvement, establishing courses of action for improvement, and reflecting on these improvements as they are implemented.

![Emotional Intelligence](image)

**Satisfaction Index**

**Performance**

- Proficiency and Academic Ability
- Academic development
- Professor personal and social characteristics
- Showing concern and respect for students
- Subject result of examination
- Feedback from students
- Other responsibilities

**Fig. 2. Proposed Model**

- **7. Other responsibilities:**
  
  Director / Institute Head shall describe accountability.

  The amount of work will be done on the basis of the hours devoted by a team member to the particular task out of available 42 hours. Based on the survey a fuzzy model is proposed (Figure 2) and input and output variable were taken as listed in Table 1 along with their linguistic variables. The author is taken triangular membership function for all input and output variables as shown in Figure 3 to Figure 13.

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**Table 1: Input/Output variable**

<table>
<thead>
<tr>
<th>Input/Output</th>
<th>Membership</th>
<th>Range</th>
<th>Linguistic Variable</th>
<th>Params</th>
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</thead>
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<tr>
<td>Self Awareness</td>
<td>Fig 3.</td>
<td>[0 40]</td>
<td>Low</td>
<td>[0 10 20]</td>
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<td>Average</td>
<td>[10 20 30]</td>
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<td></td>
<td>Self Aware</td>
<td>[20 30 40]</td>
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<tr>
<td>Self-Management</td>
<td>Fig 4.</td>
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<td>Low</td>
<td>[0 10 20]</td>
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<td>Average</td>
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<td></td>
<td>Self Managed</td>
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<td>Social awareness</td>
<td>Fig 6.</td>
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<td>[0 15 25]</td>
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<td></td>
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<td></td>
<td>Average</td>
<td>[10 15 35]</td>
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<td></td>
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<td></td>
<td>Socially aware</td>
<td>[25 35 50]</td>
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<td>Relationship Management</td>
<td>Fig 4.</td>
<td>[0 60]</td>
<td>Low</td>
<td>[0 15 25]</td>
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<td></td>
<td></td>
<td></td>
<td>Average</td>
<td>[15 25 45]</td>
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<td></td>
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<td></td>
<td>Skillful in Management</td>
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<td>[0 18]</td>
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<td>[0 8 12]</td>
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<td></td>
<td>Good</td>
<td>[8 12 15]</td>
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<td></td>
<td></td>
<td></td>
<td>very Good</td>
<td>[12 15 18]</td>
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<tr>
<td>Academic development</td>
<td>Fig 7.</td>
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<td>Poor</td>
<td>[0 8 12]</td>
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<td>Good</td>
<td>[8 12 15]</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>very Good</td>
<td>[12 15 18]</td>
</tr>
<tr>
<td>Professor personal and social characteristics</td>
<td>Fig 8.</td>
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<td>[0 30 40]</td>
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<td>[10 15 20]</td>
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<td>Excellent</td>
<td>[15 20 25]</td>
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<tr>
<td>Feedback from students</td>
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<td>Fair</td>
<td>[8 12 17]</td>
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<td>[12 17 20]</td>
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<td>Outstanding</td>
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<td>[0 20 28]</td>
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<td>Good</td>
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<td>Better</td>
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<td></td>
<td>Best</td>
<td>[35 40 45]</td>
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<tr>
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<td>Fig 13</td>
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<td>[0 20 28]</td>
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<td>Best</td>
<td>[35 40 45]</td>
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</table>
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Fig. 3. Self Awareness membership

Fig. 4. Self-Management membership

Fig. 5. Proficiency and Academic Ability membership

Fig. 6. Social- awareness membership

Fig. 7. Academic development membership

Fig. 8. Professor personal and social characteristics membership

Fig. 9. Showing concern and respect for students membership

Fig. 10. Subject result of examination membership
Fuzzy Rules and Defuzzification:
The method of inference in the fuzzy logic controller looks like the process of human reasoning. Artificial intelligence is associated with fuzzy logic.

We are developing module in the soft computing model for evaluating the overall satisfaction of teachers using fuzzy logic, namely overall satisfaction of teachers with emotional intelligence and performance.

The fuzzy laws are developed using experts’ knowledge and experience.

Degree of membership of the output fuzzy variable i.e., satisfaction is evaluated by calculating the input fuzzy sub variables in this case teaching feedback by students, teaching learning activity, subject result of university examination and the output fuzzy variable i.e., satisfaction is evaluated by these fuzzy subsets. In fuzzy model for evaluating teachers’ overall satisfaction fuzzy logic uses the max-min aggregation technique is used. The final output in terms of membership function for each rule is the fuzzy set assigned to that output by using the degree of the membership functions of the associated input fuzzy sub variables. Once the membership degree of each output fuzzy variable is determined all of the rules are fired are then after aggregating all the fuzzy output of each rule the actual crisp output is determined using defuzzification. Here centroid defuzzification method is used. The procedure of converting aggregated fuzzy output set into a single crisp value is called defuzzification.

Fig. 11. Feedback from students

Fig. 12. Other responsibilities

Fig. 13. Satisfaction Index membership

Fig. 14. Fuzzy rules for satisfaction index in MatLab

Fig. 15. Fuzzy inference system for satisfaction index
It is observed that a soft computing system for assessing the overall satisfaction of teachers using fuzzy logic provides better results than traditional model. A large number of factors have been identified and integrated into the process that affect the overall satisfaction of the teachers.

In this study, 450 faculty satisfaction data are taken and analyzed, needing further investigation more data and more comparative analysis. The proposed system can be further adapted and used to assess other staff's in the organization for identifying the satisfaction index. Some other methods of classification such as artificial neural networks (ANN), neuro-fuzzy systems and genetic algorithms (GA) may also be used to assess the overall performance of teachers effectively. From a managerial point of view, the results suggest that management should give priority to their employees’ emotions and emotional intelligence in order to increase job satisfaction apart from other parameters.

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REFERENCES


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Dr. Pooja Pathak, Associate Professor, IAH, GLA university, Mathura (India) has earn her PhD from BRA Agra University in Year 2010. She has published more than 20 paper and article in the area of soft computing (e.g. Fuzzy logic, ANN and Genetic Algorithm) She has 20 year of teaching experience.

Dr. Vijay Kumar Dwivedi, Associate Professor, GLA University, Mathura (India) has earn his Ph.D. from Motilal Nehru National Institute of Technology, Allahabad and masters in engineering from Indian Institute of Technology, (ISM) Dhanbad. He has very vast research and teaching experience of more than 18 years. He has guided 3 Ph.D. and 10 Masters in the field of Mechanical Engineering. He has published more than 100 papers in International journals and conferences proceedings. He has keen interest in investigating the soft computing, friction stir welding and thermal barriers coatings. in engineering and applications.