

Assessment of Technical Workshop Using Multi-criteria Evaluation and Fuzzy Logic

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Abstract- This paper presents a fuzzy logic reasoning based approach for assessment of technical workshops conducted for students in college. The attributes considered for assessment include technical and soft skills of the trainer, workshop venue, quality of content delivered and duration of theoretical and practical sessions. A step-by-step fuzzy approach has been used. We have proposed a Fuzzy Expert System for assessing the effectiveness of workshops based on fuzzy system in decision making. It describes the concept behind fuzzy logic and explains how these concepts could be applied to assess workshop's effectiveness. This model will help in providing the valuable feedback. The modeling and simulation can be performed in Matlab-Simulink with the help of fuzzy logic toolbox.

Keywords – Fuzzy, Expert System, Simulink, Decision making

I. INTRODUCTION

One of the important aspects in any assessment is to identify the criteria and their weights. A highly reliable and effective assessment method is must in decision making environments. There is increased need that high quality, and effective technical workshops are necessary to improve the technical knowledge of the trainees and there is increasing interest in determining various factors that impact student's learning. The evaluation of technical workshop can be defined as the step-wise evaluation of trainings' performance according to the defined parameters and contribution required to reach the objectives of the course taking into consideration the interest of the institution. Therefore, technical training implies the planning and management of workshop, deployment of training aids, teaching and learning methods, and finally the evaluation of the procedures carried out.

II. MULTIPLE-CRITERION FOR TECHNICAL WORKSHOP ASSESSMENT

A multi-criteria analysis in determining the quality of training using fuzzy rule is proposed. To put the existing workshops on quality parameters, it is very necessary to evaluate their performance, may be in semi-annually or annually that covers all parameters affecting directly or indirectly the quality of the institutes. Hence the fuzzy logic model is described to assess the workshop's overall output taking into consideration various parameters that include the assessment of workshop organization, assessment of technical and soft skills of trainers, training methodology, availability of study material, durations of lab and practical sessions, etc. All the assessment is done by taking feedback from students' who attend the workshop to determine if they are well satisfied and have got good learning experience and the faculty coordinator of the workshop who determine if the motive with which workshop is conducted is achieved .

Following factors are considered for quality evaluation of workshops:

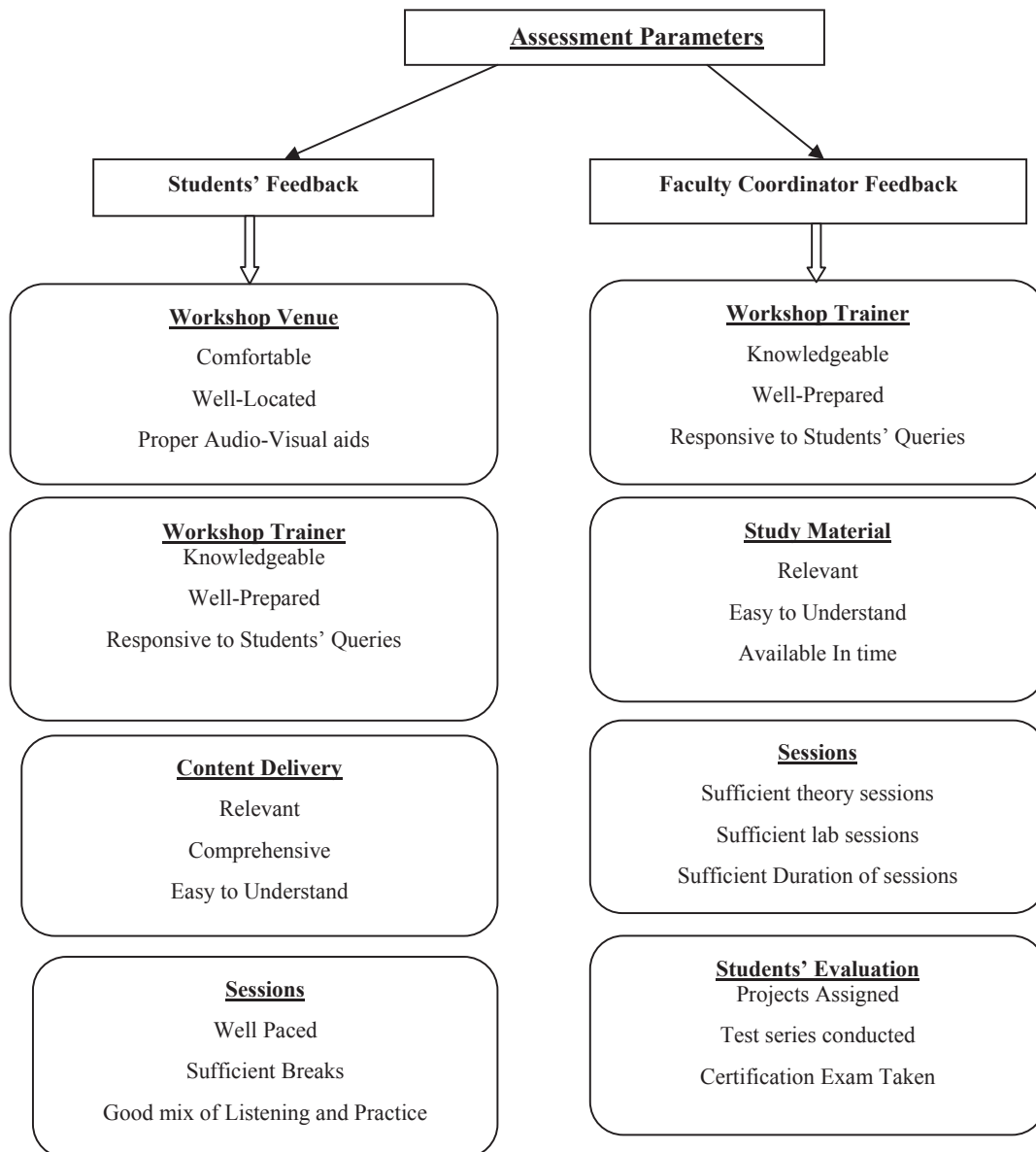


Figure 1: Basic Assessment Parameters

III. FUZZY LOGIC REASONING APPROACH

A. Introduction to fuzzy theory-

Fuzzy logic theory was introduced by L.A. Zadeh in 1965[1]. Fuzzy logic comes in when conventional logic fails. It is a computational paradigm which is based on human thinking. An important concept in fuzzy logic is the application of linguistic variables i.e. variables whose values are words or sentences in natural language [2]. The fuzzy reasoning approach has found a wide application in designing of certain complex industrial and management systems which cannot be modeled precisely under various assumptions and approximations [3].

A fuzzy expert system for evaluation of student academic performance was proposed by Yadav and Singh [4]. They proposed various approaches using fuzzy logic techniques that provide practical methodology for evaluation of students' performance and comparison with existing statistical methods. A fuzzy expert system for evaluating

teachers overall performance based on fuzzy logic techniques was proposed by Jyothi [5]. Team performance was evaluated using fuzzy logic reasoning approach by Nunes and Neill [6]. It showed that intelligent fuzzy controllers were able to perceive and evaluate the team's performance.

B. Fuzzy reasoning approach

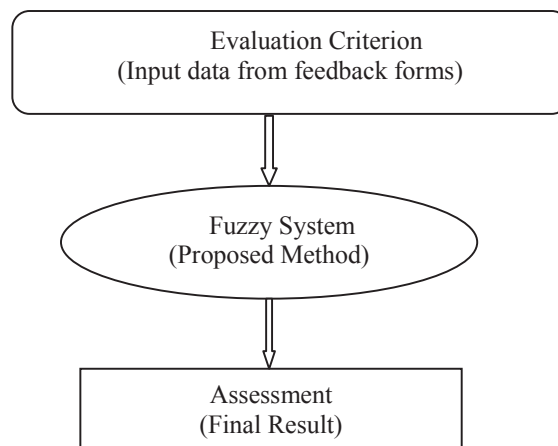


Figure 2: Assessment Model

The proposed method of fuzzy evaluation comprises of following steps [7]:

1. Identification of crisp value.
2. Fuzzification of input value.
3. Determination of application rules and inference method.
4. Fuzzy output overall performance value and Defuzzification of performance value.

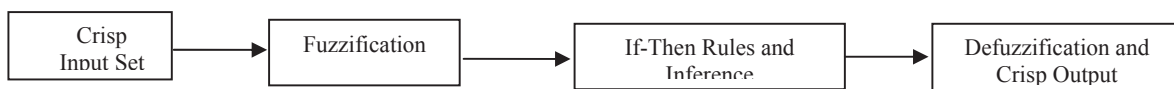


Figure 3: Step-wise fuzzy evaluation

1 Crisp Value (Data): Workshop Feedback forms are filled in students and faculty coordinator on the above mentioned criterion which is then evaluated by the Head of the Department and recommended to the head of the institution. The Crisp data is tabulated from these forms.

2 Fuzzification (Fuzzy Input Value): The input variables are then divided into linguistic variables

- 4- Strongly Disagree,
- 3-Disagree,
- 2-Agree and
- 1-Strongly Agree.

Appropriate membership functions (Trapezoidal or Triangular) are then formed assigning the proper range to respective linguistic variables [8].

3 Fuzzy Rule and Inference Mechanism The if-then rules determine input and output membership functions that may be used in inference process. These rules are linguistics and are entitled “IF-THEN” rules.

4 Fuzzy Output and Defuzzification The output variable is the overall assessment of workshop. After completing the fuzzy decision process, the fuzzy number obtained must be converted to a crisp value. This process is known as Defuzzification. An appropriate technique called Centroid technique, which is one of the most common methods may be employed for converting from fuzzy number to crisp value.

IV.CONCLUSION

Technical Workshop’s regular assessment is suggested to maintain quality. There is a vast potential of the applications of fuzzy expert system in workshops’ assessment. Expert system technology using Fuzzy Logic is very interesting for quantitative and qualitative facts evaluation. In this paper a model of Fuzzy Expert System is proposed to evaluate workshop’s overall effectiveness on the basis of various related parameters. In this way the workshop coordinator is encouraged to reflect on quality, adequacy, satisfaction and efficiency in training in the technical academic institutions.

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