



A Linguistic Fuzzy Approach for Employee Evaluation

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Abstract— Employee being knowledge asset for an organization, employee evaluation is carried out by the organizations for performance appraisal and rewards to be given to the employees. Employee evaluation represents a critically important decision that often involves subjective information. An impartial assessment of this subjective information is difficult. Thus employee evaluation is vague, uncertain and imprecise which may not result into fair decision. The paper proposes a linguistic fuzzy approach for employee evaluation that removes any psychological elements that may have a negative bearing on unbiased evaluation. Fuzzy logic provides a simple way to draw definite conclusions from vague, ambiguous or imprecise information. It resembles human decision making with its ability to work from approximate data and find precise solutions. The paper discusses parameters that effect the performance evaluation and gives design of employee evaluation interface. The evaluations are expressed using fuzzy scales. Weight matrices are designed for each evaluation parameter and final evaluation is computed as weighted average of fuzzy evaluations.

Keywords— Evaluation Parameters, Employee Evaluation, Fuzzy Logic, Weight Matrix

I. EMPLOYEE EVALUATION

Employee evaluation is used to identify industrious employees and encourage meritocracy by promoting a system of compensation that is commensurate with performance [1]. Human resources with knowledge and competencies are the key assets in assisting firms and/or countries to sustain their competitive advantage. Globally competitive organizations will depend on the uniqueness of their human resources and the systems for managing human resources effectively to gain competitive advantages [2]. Generally employee evaluation includes measuring the things that make the most difference. The problem is that many of the things that make the most difference are not easily quantifiable. The sort of parameters that can be considered includes attendance and punctuality, initiative, dependability, attitude, communication, productivity, interpersonal relationships, organisational & time management, knowledge sharing, safety, etc [3]. Employee evaluation should be fair and unbiased, since employee compensation is based on the results of performance appraisal.

II. WHY FUZZY LOGIC FOR EMPLOYEE EVALUATION?

Employee evaluation represents a critically important decision that often involves subjective information. Models and heuristic techniques that focus on the use of different types of information are available; however, with few exceptions, the models are not robust enough to be applied in a practical, managerially useful manner. Fuzzy logic models provide a reasonable solution to this common decision situation [4].

It is common to use discreet scales with sharp real values in the evaluation process. The theory of fuzzy sets allows for the use of such linguistic fuzzy scales, where the various scale values are expressed linguistically and modeled by fuzzy numbers. The purpose of using the instruments of linguistic fuzzy modelling is, on the one hand, an exact mathematic data processing that excludes unwanted subjective influence, and, on the other hand, the natural expression of the expertly defined vague evaluations using natural language [5].

III. EXISTING FUZZY LOGIC SOLUTIONS FOR EMPLOYEE EVALUATION

C.C. Yee and Y.Y. Chen proposed a performance appraisal system using multi-factorial evaluation model in dealing with appraisal grades which are often expressed vaguely in linguistic terms [6]. The project was carried out in collaboration with one of the Information and Communication Technology Company in Malaysia with reference to its performance appraisal process. Ming-Shin Kuo and Gin-Shuh Liang presented a performance evaluation method for tackling fuzzy multi-criteria decision-making (MCDM) problems based on combining VIKOR and interval-valued fuzzy sets [7]. To illustrate the effectiveness of the method, a case study for evaluating the performances of three major intercity bus companies from an intercity public transport system is conducted. G Meenakshi proposed a Multi source feedback or 360-degree feedback based performance appraisal system using Fuzzy logic and implemented it in academics especially engineering colleges [8]. The 360 degree appraisal system includes self-appraisal, superior's appraisal, subordinate's appraisal student's appraisal and peer's appraisal. Adam Golec and Esra Kahya presented a comprehensive hierarchical structure for selecting and evaluating a right employee [9]. The process of matching an employee with a certain job is performed through a competency-based fuzzy model.

IV. THE EVALUATION METHODOLOGY

The evaluation methodology is based on multiple evaluation parameters. The evaluation parameters can be objective or subjective. After reviewing evaluation criteria of various multinational companies and performance appraisal reports of different organizations evaluation parameters shown in Table 1 have been considered:

TABLE I: EMPLOYEE EVALUATION PARAMETERS

Personality	Communication skills
Attendance	Cooperative
Punctuality	Qualifications
Initiative	Work Experience
Self control	Job Knowledge
Responsibility	Leadership
Quality of Interpersonal Relationships	Innovativeness
Quality of work	Accomplishments
Attitude	Effectiveness
Commitment	Result-Oriented

Each evaluation parameter is expressed using linguistic fuzzy scales. The evaluator gets an opportunity to consider evaluation parameters in form of intervals. In this case objectiveness can be associated with fuzzy scales of evaluation parameters by defining weights for each evaluation parameter [10].

Moreover, the evaluation methodology considers different organizational levels i.e. Strategic, Tactical and Operational. It is obvious that not all the parameters are equally important for the employees at different organizational levels hence weight matrix is defined for each evaluation parameter against the management level in the organization. Weight Matrix indicates the significance of particular parameter for an employee at a particular organizational level.

A. Weight Matrices for evaluation parameters

Personality	Very Good	Good	Quite Good	Not Good
Management Level				
Strategic	√	√		
Tactical		√	√	
Operational			√	√
Self Control	Very Good	Good	Quite Good	Not Good
Management Level				
Strategic	√			
Tactical	√			
Operational	√			
Interpersonal Relationships	Very Good	Good	Quite Good	Not Good
Management Level				
Strategic	√			
Tactical	√			
Operational	√	√		
Result-Oriented	Achieves Maximum Results	Achieves Average Results	Achieves Less Results	
Management Level				
Strategic	√			
Tactical	√			
Operational	√			

Attendance	Very Regular	Regular	Quite Regular	Not Regular
Management Level				
Strategic	√	√		
Tactical	√	√		
Operational	√	√		

Qualifications	Highly Qualified	Qualified	Less Qualified	Least Qualified
Management Level				
Strategic	√			
Tactical	√	√		
Operational			√	√

Commitment	Very Committed	Committed	Less Committed	Least Committed
Management Level				
Strategic	√	√		
Tactical	√	√		
Operational	√	√		

Leadership	Great Leadership	Very Good Leadership	Good Leadership	No Leadership
Management Level				
Strategic	√			
Tactical	√			
Operational			√	√

Experience	Well Experienced	Experienced	Less Experienced	Least Experienced
Management Level				
Strategic	√			
Tactical		√		
Operational			√	√

Attitude	Very Positive	Positive	Quite Positive	Negative	Very Negative
Management Level					
Strategic	√				
Tactical	√				
Operational	√	√			

Initiative	Most Initiative	More Initiative	Quite Initiative	Less Initiative	Least Initiative
Management Level					
Strategic	√				
Tactical		√			
Operational			√	√	√

Punctuality	Always on time	Almost on time	Quite on time	Rarely on time	Not on time
Management Level					
Strategic	√	√			
Tactical	√				
Operational	√				

Communication skills	Excellent	Outstanding	Very Good	Good	Quite Good	Not Good
Management Level						
Strategic	√	√				
Tactical		√	√			
Operational				√	√	√

Accomplishments	Highly Accomplished	Accomplished	Quite Accomplished	Less Accomplished
Management Level				
Strategic	√			
Tactical		√		
Operational			√	√

Cooperative	Very Cooperative	Cooperative	Quite Cooperative	Rarely Cooperative	Not Cooperative
Management Level					
Strategic	√	√			
Tactical	√	√			
Operational	√	√	√		

Innovativeness	Very Innovative	Innovative	Quite Innovative	Less Innovative	Least Innovative
Management Level					
Strategic	√	√			
Tactical	√	√			
Operational				√	√

Effectiveness	Very Effective	Effective	Quite Effective	Less Effective	Least Effective	Not Effective
Management Level						
Strategic	√	√				
Tactical	√	√				
Operational	√	√				

Quality of work	Excellent	Outstanding	Very Good	Good	Quite Good	Rarely Good	Not Good
Management Level							
Strategic	√	√					
Tactical	√	√					
Operational	√	√					

Job Knowledge	Vastly Knowledgeble	Knowledgeble	Quite Knowledgeble	Less Knowledgeble	Least Knowledgeble
Management Level					
Strategic	√				
Tactical	√	√			
Operational			√	√	√

Responsibility	Very Highly Responsible	Highly Responsible	Responsible	Quite Responsible	Rarely Responsible	Not Responsible
Management Level						
Strategic	√	√				
Tactical	√	√				
Operational				√	√	√

The weight matrix indicates linguistic fuzzy scales for each evaluation parameters. Considering these weight matrices weights are assigned to each fuzzy scale for each parameter for different organizational levels. Also the expected weight for each parameter for an employee at a particular organizational level is assigned.

Employee Evaluation using Fuzzy Logic

[Log out](#)

Employee ratings on the basis of General qualities

Employee Code
(Select the code of the Employee to be evaluated)

Employee Name

Evaluation Parameters
(Check the Parameters that are valid for given employee)

	paramcode	paramdesc
Select	ATT	Attitude
Select	ATTND	Attendance
Select	COMM	Commitment
Select	COOP	Cooperative
Select	CS	Communication Skills
Select	IN	Initiative
Select	IR	Interrelationships
Select	PER	Personality
Select	PUNC	Punctuality
Select	QW	Quality of Work

1 2

Negative
 Positive
 Quite Positive
 Very Negative
 Very Positive

[Home](#)

Fig.1 Employee Evaluation Interface

Fig. 1 shows the interface to evaluate an employee whereby when the evaluation is done as per the employee's performance and attitude appropriate fuzzy scale for each parameter is selected. Accordingly corresponding actual weight for each parameter is obtained and organizational level wise expected weight is also obtained.

The weighted average method is used to calculate aggregate value for evaluation parameters, which is as follows:

$$AV_{EP} = \frac{\sum_{i=1}^m W_{exp}(i) * W(i)}{\sum_{i=1}^m W_{exp}} \quad (1)$$

$W_{exp}(i)$ is expected weight for i th evaluation parameter

$W(i)$ is actual weight for i th evaluation parameter.

AV_{EP} is Aggregate value for evaluation parameters

The result obtained using weighted average method is passed through the fuzzy rule set that defines threshold values for three possible outcomes i.e. Retain, Neutral or Layoff Employee. The result is compared against these threshold values and relevant fuzzy rule is fired and final decision is obtained.

V. FUTURE IMPLICATIONS

The proposed linguistic fuzzy approach considers evaluation parameters that are more or less applicable to any company in general hence it is generic. The proposed approach can be used for different other domains like student evaluation, production evaluation or software quality assurance, etc with minor modifications. Moreover, the fuzzy approach can be extended to neuro-fuzzy approach with rule extraction where fuzzy rules for employee evaluation can be extracted.

VI. CONCLUSION

The research paper demonstrates the application of fuzzy logic in employee evaluation process. Employee evaluation represents a critically important decision that often involves subjective information. Employee evaluation is based on many parameters like Commitment, Attitude, Communication Skills, Leadership qualities, Innovativeness, Responsibility, etc. While evaluating an employee for such parameters the scores given by reviewers merely imprecise approximations as they are based on judgment making ability of the reviewer. The use of fuzzy logic allows reviewers to express themselves linguistically and to make assessments that are subjective in nature. Fuzzy logic help represent higher level of abstraction originating from our knowledge and experience. Fuzzy logic provides a simple way to draw definite conclusions from vague, ambiguous or imprecise information.

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