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ScienceDirect

Procedia Computer Science 102 (2016) 190 – 197

Procedia Computer Science

12th International Conference on Application of Fuzzy Systems and Soft Computing, ICAFS 2016, 29-30 August 2016, Vienna, Austria

Application of fuzzy logic in job satisfaction performance problem

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Abstract

Job satisfaction has been a popular topic of research for many decades. The interest in this topic has attracted psychologists, management scholars and, more recently, economists. Most of the studies conducted in the area of job satisfaction have been based on statistical methods. However these methods cannot account for the fact that basic facets of job satisfaction, such as Activity, Independence, Variety, Social status, and Supervision-human relations, to name but a few, are evaluated based on perceptions which do not provide precise numeric information. Information supported by perceptions can be processed more adequately by using fuzzy logic. In this paper we suggest fuzzy if-then rules based expert system to describe relations between job factors and overall job satisfaction.

Peer-review under responsibility of the Organizing Committee of ICAFS 2016

Keywords:job satisfaction, fuzzy logic, possibility measure, expert system, fuzzy inference, Minnesota Satisfaction Questionnaire, quality measure-degree of truth, fuzzy arithmetic mean

1. Introduction

Job satisfaction is one of the most important issues of organizational psychology[1]. The key definitions and main research studies of job satisfaction are given in the literature[2,3]. In job satisfaction is described as “the level of contentment a person feels regarding his or her job”. This feeling is mainly based on an individual's perception of satisfaction. Job satisfaction can be influenced by a person's ability to complete required tasks, the level of

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Peer-review under responsibility of the Organizing Committee of ICAFS 2016
doi:10.1016/j.procs.2016.09.388

communication in an organization, and the way management treats employees. Job satisfaction falls into two levels: affective job satisfaction and cognitive job satisfaction. Affective job satisfaction is a person's emotional feeling about the job as a whole. Cognitive job satisfaction is how satisfied employees feel concerning some aspect of their job, such as pay, hours, or benefits.

Though various researchers and practitioners have provided their own definitions of what job satisfaction is , the two most common definitions describe job satisfaction as "the pleasurable emotional state resulting from the appraisal of one's job as achieving or facilitating the achievement of one's job values"[4]; and "the extent to which people like (satisfaction) or dislike (dissatisfaction) their jobs"[2] .

Organizations should be highly concerned with the job satisfaction of their employees[5] due to the essential role of human resources in organization performance. When employees are satisfied with their work, they are more creative and innovative. On the other hand, a lack of job satisfaction results in the low performance of an employee. Authors[6] conclude that high job satisfaction reduces absenteeism, work related accidents, and employee stress, as well as improving employee life satisfaction. Employee job satisfaction in organizations has attracted research since the middle of the 20th century with the emergence of Maslow's Theory of Needs Hierarchy in 1943. The literature devoted to this issue includes various analytical studies[7,8].

Paper[9] provides the evaluation of employees' job satisfaction and the role of gender difference in the airline industry in Iran. A descriptive analysis was used to determine the level of the employees' job satisfaction. In addition, independent sample t-test was utilized to empirically test relationship between employees' job satisfaction and their gender.

Job satisfaction is an attitude very sensitive to the features of the context in which it is studied[10]. There is no model of job satisfaction[10] applicable to all work settings as there are no general truths regarding the factors and the mechanisms accounting for such an elusive and subjective concept.

Pool's paper[11] is one of the first studies aiming at exploring the level of overall job satisfaction of the faculty members who are employed in the Greek universities. Results showed that Greek academics were moderately satisfied with their job. It is interesting to note that a comparable study of faculty members in Northern Cyprus reports the same levels of job satisfaction[12]. Similar results were also found in a previous study that examined aspects of academics' satisfaction with their job across eight nations (Australia, Germany, Hong Kong, Israel, Mexico, Sweden, UK, USA)[13]. These consistent findings imply that, as professionals, faculty members are generally content with their job in the university.

Basically job satisfaction can be measured using two different approaches. One approach is an overall measure of job satisfaction with the second approach being one that emphasizes several aspects/facets of the job. One of the most widely used measures of job satisfaction is the Minnesota Satisfaction Questionnaire (MSQ). Long and short forms of the instrument are available. The short-form MSQ measures job satisfaction by considering twenty factors/facets of the job and measures the extent to which an individual is satisfied with the twenty factors of the job that determines the overall degree of job satisfaction by adopting a facet-sum approach. The twenty item short-form MSQ rates items on a 5-point Likert scale ranging from 1 (very dissatisfied) to 5 (very satisfied).

In paper[14], it is argued that the use of ordinal values in a Likert scale does not offer the best way in representing the linguistic terms. This paper proposes the use of fuzzy sets to represent linguistic terms in a Likert-type scale and employs the technique using fuzzy conjoint method in job satisfaction evaluation.

The authors[15] propose a fuzzy rule-based algorithm to evaluate the job satisfaction in an organization. First, they collect the effective factors of job satisfaction through interviews. After analyzing the interview results, they propose questionnaires with respect to categories obtained from interviews. Due to qualitative aspect of satisfaction, they use linguistic choices in the questionnaires. While it is hard to disseminate questionnaires to all being interviewed, sampling is performed based on STRATA technique. The results are used to compose fuzzy rules. After defuzzification of the rules output and computing the distance from ideal status, the gaps are determined. The gaps are fulfilled using improvement strategies. Next, they give a brief description of STRATA sampling technique and fuzzy logic. Fuzzy logic is capable of treating this dynamic performance criterion in the uncertain and qualitative environment. In paper[16]the author examines how individuals "determine" their job satisfaction based on changes in situational factors. A simulation model, using Fuzzy Set Theory and System Dynamics, is used. As Piegat[17] state "information obtained from people is usually of less precision (large granularity), while information delivered by measuring devices is of higher precision (small granularity)". For this model, the information is obtained from people. It measures subjective features of work, consequently making fuzzy set theory a highly

applicable technique to evaluate the features. The estimation of the individual's input-output ratio and the effects of input-output ratio changes on the individual's satisfaction are evaluated using fuzzy set theory.

In paper[18] , the authors analyze the relationship between the psychological contract and facets of job satisfaction among non-profit sector employees, using the nascent non-hierarchical evidential c-means (ECM) clustering technique. To date, this technique has been theoretically discussed but not widely applied. Based on the Dempster–Shafer theory of evidence, ECM is novel in facilitating the assignment of objects, not only to single clusters, but to sets of clusters, and no clusters (outliers). The paper compares the theoretical underpinnings and findings from ECM with those of three other well-known clustering techniques, namely (1) the hierarchical Ward's method, (2) the non-hierarchical crisp k-means and (3) the non-hierarchical fuzzy c-means approaches. The authors present and interpret the cluster solutions from each clustering technique. They establish three clusters differentiated by the content of the employees' psychological contracts. These clusters are validated by considering their relationship with facets of job satisfaction, to ensure the clusters are theoretically meaningful.

In study[19] it is proposed a fuzzy approach to measure the degree of satisfaction of graduates on the suitability of university education for working purposes. The designed fuzzy system is based on the Mamdani fuzzy inference. From the literature it is known, that the advantages of the MamdaniMethod are: 1) It is intuitive; 2) It has widespread acceptance; 3) It is simple.However, it isn't a very effective method. The reasons are the need in precise input information and also a loss of information in defuzzification process. From this viewpoint possibility measure based Aliev's fuzzy inference method is more effective[20,21]. This method underlies information processing in the kernel of expert system shell ESPLAN operation. We can describe advantage of this method as follows: 1) It is intuitive; 2)It has widespread acceptance; 3) It is well suited to human-like linguistic input information; 4) It allows modeling under second-order uncertainty using the possibility-probability measure; 5) Can be used as a basis of computing with words.

In this study we use the expert system shell ESPLAN to determine a level of employees' job satisfaction given information obtained by using the short form Minnesota Satisfaction Questionnaire (MSQ).

The paper is organized as follows. Section 2 provides the necessary definitions. The statement of a job satisfaction modeling problem is presented in section 3. The experimental results are described in Section 4 and Section 5 concludes the study.

2. Preliminaries

Definition 1.Fuzzy number[22].A fuzzy set A, defined on the universal set of real numbers R, is said to be a fuzzy number if its membership function has the following characteristics:

1) $\tilde{A}$ is convex i.e. $\mu_{\tilde{A}}(\lambda x_1 + (1-\lambda)x_2) \geq \min(\mu_{\tilde{A}}(x_1), \mu_{\tilde{A}}(x_2)),\ x_1, x_2 \in \mathrm{R}, \forall \lambda \in [0,1]$

2) $\tilde{A}$ is normal i.e. $\exists x_0 \in R$ such that $\mu_{\tilde{A}}(x_0) = 1$

3) $\mu_{\tilde{A}}$ is piecewise continuous.

Definition 2.Trapezoidal fuzzy number[22]. A fuzzy number $\tilde{A} = (a,b,c,d)$ is said to be a trapezoidal fuzzy number if its membership function is given by

$$\mu_{\tilde{A}}(x) = \begin{cases} \dfrac{x-a}{b-a}, a \leq x \leq b \\ 1, b < x < c \\ \dfrac{d-x}{d-c}, c \leq x \leq d \end{cases}$$ where $a < b \leq c < d$

Definition 3.The fuzzy arithmetic meanbasedaggregation operation[23,24]. The arithmetic mean aggregation operator defined on a set of *n* trapezoidal fuzzy numbers (TrFNs)

$< a_1, b_1, c_1, d_1 >, < a_2, b_2, c_2, d_2 >, ..., < a_n, b_n, c_n, d_n >$, produces the result $< \bar{a}, \bar{b}, \bar{c}, \bar{d} >$, where

$$\bar{a} = \frac{1}{n}\sum_i^n a_i, \quad \bar{b} = \frac{1}{n}\sum_i^n b_i, \quad \bar{c} = \frac{1}{n}\sum_i^n c_i, \quad \bar{d} = \frac{1}{n}\sum_i^n d_i$$

Definition 4. The Minnesota Satisfaction Questionnaire (MSQ)[25,26]. This approach is designed to measure an employee's satisfaction with his or her job. Three forms are available: two long forms (1977 version and 1967 version) and a short form. The MSQ provides more specific information on the important aspects/facets of a job than the existing more general measures of job satisfaction do. The MSQ is useful in exploring client vocational needs, in counseling follow-up studies, and in generating information about the reinforcement in jobs.

Definition 5. ESPLAN[20,21]**.** The ESPLAN expert system shell ensures the development of expert systems for various applications; building module-oriented structures and segmentation of knowledge bases; representation of fuzzy values; compositional inference with possibility measure; arithmetic operations with fuzzy numbers; realization of a simple user-machine query dialogue by using special functions; assigning a confidence degree for any rule (in per cent); call of external programs; data interchange using a file system. All the above mentioned abilities are supported by ESPLAN knowledge representation language based on if-then rules.

The inference engine of ESPLAN allows: forward-chaining width-first inference with truth degree calculation on the continuous scale [0,100]; set of a truth threshold during run-time in order to ignore rules with current truth degrees less than the given threshold; tracing inference to the screen; - tracing inference to disk for further generation of the explanation.

The ESPLAN shell has WORDSTAR compatible text editor which is represented in a user friendly multi-window interface. Fuzzy inference algorithm of the ESPLAN shell is given below:

1. Representation of linguistic information by using fuzzy trapezoid numbers
2. Calculation of the truth degree of the rules by using possibility measure
3. Calculation of the individual outputs by using truth degree of the rules
4. Calculation of resulting output value by using the weighted fuzzy average.

3. The Statement Of The Problem And Its Solution

The main purpose of this work is to model job satisfaction. Assume that group of *n* experts evaluates *m* facets/aspects of job satisfaction, such as Activity, Independence, Variety, Social status, Supervision-human relations, etc. Each expert must estimate satisfaction of the facets by using linguistic terms given in a designed questionnaire. In this study, the linguistic terms are “very satisfied”, “satisfied”, “quite satisfied”, “less satisfied”, “and unsatisfied”.

By using the interview-based approach, n experts evaluate m facets. For example, anexpertassessmentcouldbe as follows(Table 1):

Table 1. Job facets and linguistic labels .

Item	Job facet	Linguistic value
1	Activity	Satisfied
2	Independence	Very satisfied
3	Variety	Quite satisfied
4	Social status	Less satisfied
5	Supervision-human relations	Very satisfied
6	Supervision-technical	Quite satisfied
7	Moral values	Satisfied
8	Security	Very satisfied
…	……..	…..
m	Achievement	Satisfied

To construct a linguistic model of job satisfaction we need facet estimations and the corresponding overall job satisfaction degree from n experts. For calculation of an overall job satisfaction performance(Y), the weighted fuzzy average aggregation operation is used.For all experts, an aggregated overall job satisfaction is estimated as a Trapesoidal Fuzzy Number as follows[23].

$$y_1 = (\bar{a}_1 = \frac{1}{m}\sum_{i}^{m} a_{i_1},\ \bar{b}_1 = \frac{1}{m}\sum_{i}^{m} b_{i_1},\ \bar{c}_1 = \frac{1}{m}\sum_{i}^{m} c_{i_1},\quad \bar{d}_1 = \frac{1}{m}\sum_{i}^{m} d_{i_1})$$

…, …, …

$$y_n = (\bar{a}_n = \frac{1}{m}\sum_i^m a_{i_n},\ \bar{b}_n = \frac{1}{m}\sum_i^m b_{i_n},\ \bar{c}_n = \frac{1}{m}\sum_i^m c_{i_n},\ \bar{d}_n = \frac{1}{m}\sum_i^m d_{i_n})$$

Then we construct a linguistic model with n fuzzy if-then rules. The antecedents of the rules are fuzzy estimations of the facets and the consequent is an aggregated overall job satisfaction as their fuzzy average mean. Using the above mentioned m facets, the job satisfaction model can be expressed as:

R1: IF x_1 is A_{11} and x_2 is A_{12} … and … x_m is A_{1m} THEN y is B_1 *and* $CF_1 \in]0;100]$
R2: IF x_1 is A_{21} and x_2 is A_{22} … and … x_m is A_{2m} THEN y is B_2 *and* $CF_2 \in]0;100]$
…
Rn: IF x_1 is A_{n1} and x_2 is A_{n2} … and … x_m is A_{nm} THEN y is B_n *and* $CFn \in]0;100]$

Here CF_i – is the confidence degree of the rule and is defined by expert. It expresses the belief degree of the expert to an adequacy of a rule. $x_i, i = 1,...,m$ isi-th criterion, A_{ij} is a fuzzy value of i-th criterion in j-th rule, y is the output variable. The problem is to compute an overall job satisfaction y by aggregating outputs of all fired rules.

4. Experimental investigation of overall job satisfaction.

Our aim is to define the job satisfaction degree using given current information represented by linguistic terms. In our case m=20, n=15. For determining overall job satisfaction of respondents, linguistic terms in Table 2 are used[12] . These surveys have been taken from the Minnesota Satisfaction Questionnaire (short form)[25].

The answers were received from 15 respondents(see Table 3)[12] and are operated on the basis of weighted fuzzy average aggregation method[23]. An overall job satisfaction y_j for j-thexpert is defined as:

$$Y_j = (B_j = a_j, b_j, c_j, d_j) = (\frac{1}{20}\sum_i^{20} a_{ij}, \frac{1}{20}\sum_i^{20} b_{ij}, \frac{1}{20}\sum_i^{20} c_{ij}, \frac{1}{20}\sum_i^{20} d_{ij}),\ j = \overline{1,5}$$

$\bar{a}$ $\bar{b}$ $\bar{c}$ $\bar{d}$	$\bar{a}$ $\bar{b}$ $\bar{c}$ $\bar{d}$	$\bar{a}$ $\bar{b}$ $\bar{c}$ $\bar{d}$
$B_1 = (2,4\ \ 3,2\ \ 3,59\ \ 3,875)$	$B_6 = (2,6\ \ 3,4\ \ 3,8\ \ 4,1)$	$B_{11} = (2,35\ \ 2,99\ \ 3,54\ \ 3,825)$
$B_2 = (2,4\ \ 3,12\ \ 3,55\ \ 3,775)$	$B_7 = (2,7\ \ 3,5\ \ 3,89\ \ 4,175)$	$B_{12} = (2,55\ \ 3,23\ \ 3,72\ \ 3,975)$
$B_3 = (2,45\ \ 3,17\ \ 3,63\ \ 3,9)$	$B_8 = (3,05\ \ 3,85\ \ 4,24\ \ 4,525)$	$B_{13} = (3,05\ \ 3,77\ \ 4,15\ \ 4,3)$
$B_4 = (2,15\ \ 2,75\ \ 3,31\ \ 3,55)$	$B_9 = (3,15\ \ 3,95\ \ 4,32\ \ 4,575)$	$B_{14} = (1,9\ \ 2,58\ \ 3,08\ \ 3,35)$
$B_5 = (3,4\ \ 4,2\ \ 4,52\ \ 4,7)$	$B_{10} = (2,95\ \ 3,71\ \ 4,06\ \ 4,225$	$B_{15} = (2,85\ \ 3,61\ \ 4,02\ \ 4,275)$

By using the responses from the respondents and the aggregation operation we obtain the following outputs for all 15 experts (overall job satisfaction values) is given Table 2.

By using the possibility measure based approximation to the used linguistic terms, we obtain the following linguistic labels for the respondents job satisfaction:

B_1 = quite satisfied, B_2 = quite satisfied, B_3 = quite satisfied, B_4 = quite satisfied, B_5 = satisfied, B_6 = satisfied, B_7 = satisfied, B_8 = satisfied, B_9 = satisfied, B_{10} = satisfied, B_{11} = quite satisfied, B_{12} = quite satisfied, B_{13} = satisfied, B_{14} = quite satisfied, B_{15} = satisfied.

By using the respondents' fuzzy estimation of the facets and the related fuzzy values of job satisfaction we construct the fuzzy if-then rules based model. In the model, the following notations are used: x_1 -Activity, x_6 -Independence, x_7 -Variety, x_8 -Social status, x_9 -Supervision-human relations, x_{10} -Supervision–technical, x_{11} -Moral values, x_{12} -Security, x_{13} -Social service, x_{14} - Authority, x_{16} -Ability, x_{17} -Company policies and practices,

x_{18} -Compensation, x_{19} -Advancement, x_{20} - Responsibility, y_1 -Creativity, x_{17} -Working conditions, x_{18} -Co-workers, x_{19} -Recognition, x_{20} -Achievement.

A sample of the knowledge base composed of the obtained fuzzy if-then is shown below:

Table 2.Linguistic terms

Job Facets	Linguistic label
Activity	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Independence	Satisfied, Quite satisfied, Less satisfied
Variety	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Social Status	Very satisfied, Satisfied, Quite satisfied, Less satisfied
Supervision-human relations	Very satisfied, Satisfied, Quite satisfied, Unsatisfied
Supervision-technical	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Moral Values	Very satisfied, Satisfied, Quite satisfied
Security	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Social Service	Very satisfied, Satisfied, Less satisfied
Authority	Very satisfied, Satisfied, Quite satisfied
Ability	Very satisfied, Satisfied, Quite satisfied
Company Policies and Practices	Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Compensation	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Advancement	Very satisfied, Satisfied, Quite satisfied, Less satisfied, Unsatisfied
Responsibility	Very satisfied, Satisfied, Quite satisfied, Less satisfied
Creativity	Very satisfied, Satisfied
Working conditions	Satisfied, Quite satisfied, Less satisfied
Co-workers	Very satisfied, Satisfied, Quite satisfied
Recognition	Very satisfied, Satisfied, Less satisfied, Unsatisfied
Achievement	Very satisfied, Satisfied, Quite satisfied

IF x_1*="satisfied" AND* x_2*="satisfied" AND* x_3*="less satisfied" AND* x_4 *="satisfied" AND* x_5*="satisfied" AND* x_6*="satisfied" AND* x_7*="satisfied" AND* x_8*="less satisfied" AND* x_9*= "less satisfied" AND* x_{10} *="quite satisfied" AND* x_{11}*="satisfied" AND* x_{12}*="less satisfied" AND* x_{13}*="less satisfied" AND* x_{14}*="less satisfied"* x_{15}*="satisfied" AND* x_{16}*="satisfied" AND* x_{17} *= "satisfied" AND* x_{18}*="very satisfied" AND* x_{19}*="satisfied" AND* x_{20}*="satisfied" THEN y="quite satisfied";*

… … …

IF x_1 *="satisfied" AND* x_2*="satisfied" AND* x_3*="satisfied" AND* x_4*="very satisfied" AND* x_5*="satisfied" AND* x_6*="satisfied" AND* x_7*="satisfied" AND* x_8*="satisfied" AND* x_9*= "satisfied" AND* x_{10}*="quite satisfied" AND* x_{11}*="very satisfied" AND* x_{12}*="unsatisfied" AND* x_{13}*="quite satisfied" AND* x_{14}*="satisfied" AND* x_{15}*="satisfied" AND* x_{16}*="satisfied" AND* x_{17}*= "satisfied" AND* x_{18}*="quite satisfied" AND* x_{19} *="satisfied" AND* x_{20}*="very satisfied" THEN y="satisfied".*

Let us determine the overall job satisfaction the aggregated output of the fuzzy rules by using the following test linguistic input information:

Test 1: x_1 is very satisfied AND x_2 is very satisfied AND x_3 is satisfied AND x_4 is very satisfied AND x_5 is satisfied AND x_6 is satisfied AND x_7 is very satisfied AND x_8 is quite satisfied AND x_9 is very satisfied AND x_{10} is satisfied AND x_{11} is satisfied AND x_{12} is quite satisfied AND x_{13} is quite satisfied AND x_{14} is satisfied AND x_{15} is very satisfied AND x_{16} -is satisfied AND x_{17} is very satisfied AND x_{18} is very satisfied AND x_{19} is satisfied AND x_{20} is satisfied.

The result obtained in the ESPLAN shell is the overall job satisfaction as “satisfied”.Let us consider another test given below.

Test 2: x_1 is very satisfied AND x_2 is satisfied AND x_3 is quite satisfied AND x_4 is satisfied AND x_5 is very

satisfied AND x_6 is satisfied AND x_7 is satisfied AND x_8 is quite satisfied AND x_9 is quite satisfied AND x_{10} is satisfied AND x_{11} is quite satisfied AND x_{17} is quite satisfied AND x_{13} is quite satisfied AND x_{14} is quite satisfied AND x_{15} is satisfied AND x_{16} is satisfied AND x_{17} is satisfied AND x_{18} is satisfied AND x_{19} is very

Table 3.The answers of respondents

	JOB ASPECT/FACET	Activity	Independence	Variety	Social Status	Supervision-Humanrelations	Supervision-technical	Moralvalues	Security	Socialservice	Authority	Ability	Companypolicies andpractices	Compensation	Advancement	Responsibility	Creativity	Workingconditions	Co-workers	Recognition	Achievement
	1	S	S	LS	S	Sz	S	S	LS	LS	QS	S	LS	LS	LS	S	S	S	VS	S	S
	2	LS	S	VS	VS	QS	QS	S	US	S	QS	VS	LS	QS	US	QS	S	LS	VS	S	VS
	3	QS	S	S	VS	QS	S	S	US	S	QS	S	US	LS	QS	S	S	QS	S	VS	VS
	4	US	S	US	QS	QS	QS	VS	US	S	S	VS	US	US	S	QS	QS	VS	QS	QS	S
	5	S	S	VS	VS	S	S	VS	VS	S	VS	S	S	VS	S	VS	VS	S	S	S	S
	6	S	LS	S	LS	S	S	S	LS	S	S	S	QS	S	S	QS	S	S	S	S	S
	7	S	S	S	S	S	S	S	LS	VS	S	S	QS	LS	S	LS	S	S	S	S	S
	8	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	VS	S	S
Fuzzy number	**9**	S	S	S	S	S	S	S	S	S	S	S	S	S	S	VS	VS	S	VS	S	S
	10	S	LS	VS	VS	S	S	VS	VS	VS	VS	QS	QS	S	VS	VS	VS	LS	S	US	QS
	11	S	S	US	S	US	US	S	S	S	S	VS	US	LS	S	S	S	S	S	S	S
	12	S	S	QS	S	VS	VS	S	US	S	S	S	US	US	LS	S	S	S	VS	S	S
	13	VS	QS	VS	VS	VS	S	VS	QS	VS	VS	S	US	US	QS	VS	VS	S	S	S	VS
	14	QS	LS	S	S	US	LS	QS	S	VS	QS	VS	US	LS	US	LS	S	LS	S	LS	S
	15	S	S	S	VS	S	S	S	S	S	QS	VS	US	QS	S	S	S	S	QS	S	VS

satisfied AND x_{20} is satisfied.

For this test information, the ESPLAN shell's decision is the overall job satisfaction as "quite satisfied".

5. Conclusion

In this paper an evaluation of an overall job satisfaction method by using fuzzy aggragation procedure and fuzzy if-then rules based model is proposed. By using the Minnesota Satisfaction Questionnaire, the basic facets/aspects of job satisfaction were determined. The constructed fuzzy if-then rules based model is implemented in the ESPLAN expert system shell. Different tests are performed to compute job satisfaction with real data. The obtained results of job satisfaction evaluation show validity and efficiency of the suggested approach.

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