Employee Quality of Life in Office Automation Through Service Innovation: A Fuzzy Approach

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Abstract. Managers have to make different decisions about using different types of information at the same time. Managing the performance of employees and quality of life in printing industries and Information Technology Parks, individually or collectively is an important aspect of decision making. Effectively managing an organization's human resources and evaluating employees to support personal development, improved organizational performance, and input into the organization's strategy depend on performance appraisals. This is due to the absence of quantitative and systematic techniques. The problems include improper data, qualitative and quantitative measurements, and the performance evaluation is the main task for the industrial sectors. Fuzzy control is used to calculate the overall achievement index by aggregating the performance results for some selected parameters and presenting them as numerical values, which will certainly facilitate the evaluation of the appraisal calculation of the human resources staff. Consequently, the current research utilizes the characteristics of data technologies and provides a method to quantitatively and automatically assess employee performance in office automation. The results show that an independent aspect of workplace performance appraisal is the automated employee performance appraisal system.

1 Introduction

Human resources are one of the most important organizational functional systems in order to assist various departments and sustain their competitive advantages [1]. Evaluation of performance appraisal is generally considered as one of the most important tools of regulation of human resource management [2-3].Therefore, supervisors appreciate the use of effective instruments with excellent precision in the method of evaluating worker efficiency. The performance measures are major issues in human resources management. Management must decide where the performance appraisal (PA) platform will be used before developing and implementing it as well. The process used to execute the process must then be established. Therefore, an organization effectively controls its performance, it depends on the techniques chosen and the tools used to implement those strategies. These appraisal procedures are based on statistical techniques that provide accurate results indicating employee performance.The uniqueness of the performance evaluation system encountered different issues, as observed by different researchers in the field of evaluation employee effectiveness [4]. As the review process struggles with issues such as subjectivity, imprecise data, and quantitative measurements, users are reluctant to embrace these methods [5].

Generally, managers must make different judgments about the use of different types of information simultaneously for the decision making process. The value of employee performance reviews and its relationship to an organization's success has been extensively reported in research [6]. The performance appraisal of employees, whether they are working alone or as a team, is a crucial area of decision-making for administratorsReviews of achievement necessitate and frequently incorporate several sorts of ambiguous, insufficient, unbiased, and subjective data.When developing and implementing a system for performance evaluation After deciding what it will be used for, management must choose when to implement the system.Effective monitoring of business performance depends on the approaches chosen and the tools used to implement those strategies.

These evaluation procedures have their foundation in quantitative methods that provide an accurate result of characterizing the work ethics of employees. However, many of the data used to assess achievement are not limited by precise, quantitative or obvious limitations. Instead, this knowledge is presented in general terms or formulas that lack precision.Due to the development of technological innovations in the past few decades, E-HRM [7] has attracted the attention of many researchers. The technology used to conduct the assessment are brand-new in this respect.However, the

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relationship between information systems and measuring performance systems has received high attention [8-9].Generally, assessment systems simply collect data; They don't take a holistic, insightful view of the data. Whereas, in online communication office automation systems, important data about an employee's work routine is continuously recorded, which can be used to assess operational performance.

Wua et al [10] utilized the FUZZY approach for evaluating the performance of employees in office automation by the Multiple Criteria Decision-Making approach. As a result, 23 performance indexes fitted for performance evaluation were selected by questionnaires.In addition, FAHP determined the relative strength of the selected evaluation indices. Then, using three financial institutions as a real example, the MCDM empirical methods of VIKOR, TOPSIS, and SAWwere used to find out their financial performance and close discrepancies.For the assessment of manufacturers' sustainability accomplishments, Tuzkaya et al. [11] created a combination of the fuzzy analytical networking approach and fuzzy preferences rankings organization approach. They also gave a numerical illustration with sensitivity assessments for improved knowledge.In a fuzzy setting, Sahu et al. [12] suggested an effective supplier evaluation system that takes into account green standards of performance. A fuzzy rating index has been developed to measure the level of environmental sustainability of suppliers.A holistic method for decision makers to assess and rank environmentally relevant metrics using TOPSIS is described by Yarahmati et al. [13].Zemkova (2011) employed fuzzy sets to evaluate worker effectiveness in a business that uses many standards for assessment [14-15].A growing fuzzy heterogeneous network of neurons was developed by Cheng et al. (2011) to improve the ability to assess the performance of subcontractors across the construction sector. Yadav and Singh (2011) proposed a fuzzy expert system for assessing student academic achievement, Using fuzzy logic approaches.

The following section uses aspects of information technology to quantitatively and automatically assess employee performance in web-based automated office systems.To handle the complexity of dynamic work systems, many approaches and frameworks have been published and evaluated. Most empirical investigations of the impact of appraisals on work outcomes rely on quantitative, factual data collected systematically as part of the employee performance review process in an organization.This brief flow demonstrates the entire process, simultaneously, from the blurring of linguistic variables, through the appearance of the defuzzification of the overall result.

2 Fuzzy sets and designs

The approach suggested in this study uses the Fuzzy Inference System (FIS), an optimization method that takes into account multiple variables and connects those data points to outputs using a set of rules. The fuzzy sets enhance the relationship between the input and output variables.The combined optimized outcome of every separate rule produces the final outcome.The concept of fuzzy sets later resulted in the development of fuzzy logic, which was used to express understanding and reasoning with uncertain and ambiguous data. The technique of using fuzzy logic to map a given input to an output is called fuzzy interpretation.The mapping subsequently serves as a foundation for selections or the identification of connections.Mamdani-type and Sugeno-type FIS are two types of FIS that can be used in the fuzzy reasoning toolbox. The methods used to identify outcomes in these two types of inference methods differ significantly.

The basic form of a fuzzy set A universe X is:

$$A = \{x, \mu_A(x) | x \varepsilon X\} \quad (1)$$

Where, A (x) represents the degree of conformity or participation of member x of a fuzzy collection X. An element x shows the dependent variable for full membership (μA(x)=1), partial membership (0<μ_A (x)|<1, or non-membership (μ_A (x)=0). For instance, the adjectives very strong, robust, medium, weak, poor, and extremely poor can be used to describe linguistically ambiguous attribute management.In the above instance, each linguistic modifier is associated with an arbitrary number that represents the level of leadership in the range of 1 to 7. Consequently, a fuzzy set can be used to describe the official set A and its permutations as follows:
A={1.0|0,2.0|0.10,3.0|0.30,4.0|0.40,5.0|0.60,6.0|0.80,7.0|1.0}

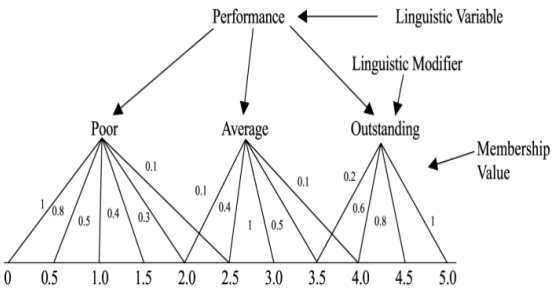

Fig.1. Fuzzy operations

Table 1. Variation of linguistic variables for input parameters.

I/P	Notation	Low	Medium	High
Versatility	B1	0-0.4	0.4-0.8	0.7-1
Planning capability	B2	0-0.4	0.4-0.8	0.7-1
language skills	B3	0-4	4-7	7-10
Maintainability and flexibility	B4	0-4	4-7	7-10
Time management skills	B5	0-0.4	0.4-0.8	0.7-1
Teamwork	B6	0-4	4-7	7-10
Ethics and integrity	B7	0-4	4-7	7-10
Innovative and start-up skills	B8	0-4	4-7	7-10
Grooming and appearance	B9	0-4	4-7	7-10
Punctuality	B10	0-0.4	0.4-0.7	0.7-1
Confidence level	B11	0-0.4	0.4-0.7	0.7-1
Dependability	B12	0-0.4	0.4-0.7	0.7-1
Job skills	B13	0-4	4-7	7-10
Absent status	B14	0-1	1-3	3-5
Leadership skills	B15	0-4	4-7	7-10
Decision making and problem-solving Ideas	B16	0-4	4-7	7-10
Quantity of work	B17	300-400	400-500	500-600
Quality of service	B18	0-4	4-7	7-10
under high stress level	B19	0-4	4-7	7-10
Professional attitude	B20	0-4	4-7	7-10

2.1 Fuzzy set operations

Addition, intersection, complement, and effect procedures are four common fuzzy set manipulations that are used to manage fuzzy sets. The fuzzy sets A and B are as a function of $\mu_A(x)$= {0, 3, 5, 7, 8} along with unit interval x→ [0, 10], $\mu_B(x)$= {1, 2, 4, 6, 9}, y→ [0, 10], The union of A and B is a fuzzy set C=A Ụ B where

$$\mu_A V_B(z) = \mu_A(x) v\, \mu_B(y) \quad (2)$$

A fuzzy set union is accomplished by applying the maximum function to the elements of two sets, which involves choosing the highest value of the first, second, elements in each set to form the combination of two separate sets. Accordingly:

$$\mu_A V_B(z) = \{1,3,5,7,9\} \quad (3)$$

D = A Ո B another fuzzy set

$$\mu_A V_B(w) = \mu_A(x) v\, \mu_B(y) \quad (4)$$

Applying the 'min' function based on the fuzzy set interactions

$$\mu_A V_B(z) = \{0,2,4,6,8\} \quad (5)$$

The complements of a collection are calculated by subtracting each of its elements from the maximum attainable value, which in this case is 10.

$$\mu_A(x) = 10 - \mu_A(x) = \{10,7,5,3,2\} \quad (6)$$

$$\mu_B(x) = 10 - \mu_B(y) = \{9,8,6,4,1\} \quad (7)$$

One uses the effect value to determine the degree to which B is implied by A. As a result, the A B or Klein-Dienness estimate, the inference procedure is performed.

$$\mu_A V_B(u) = \mu_A x \mu_B \quad (8)$$

$$\mu_A V_B(u) = \{10,5,6,7,9\} \quad (9)$$

It should be emphasized that there are additional fuzzy procedures besides those used above in fuzzy set procedures.

Table 2. Variation of output linguistic variables.

Output variable	Notation	Very low	Low	Medium	High
Performance index	U	0-0.2	0.2-0.4	0.4-0.6	0.6-0.8

3 Result and Discussions

The collected descriptive data from the printing industries and IT sectors by five different strategies such as Technology innovation (A1), Artificial Intelligence (A2), service quality (A3), non-financial office automation (A4), and service

innovation (A5)(It was one of the individuals who went there to choose the criteria and whose results are used to separate the linguistic variables), has been taken into main considerations and analyzed based on the google form and manually collective data's. The input information for these five individuals is shown in Table 3, and Table 4 shows the output of fuzzy modeling. The staff member with the highest indicators of achievement is ranked 1st overall.Figure 5 shows the rule analyzer for employee A5. Employee A5 inputs are presented in the aforementioned rule viewer, and a performance index is instantly calculated using the input parameters and the information provided by the generated rules.

Table 3. Data collected from five significant strategies in office automation.

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16	B17	B18	B19	B20
A1	2	5	500	5	6	9	4	3	9	0.2	0.7	6	8	3	0.7	0.3	7	2	0.5	0.4
A2	8	4	600	6	9	8	2	0	7	0.8	0.4	8	7	5	0.8	0.5	4	3	0.3	0.1
A3	5	9	700	6	7	6	1	8	6	0.3	0.8	9	6	2	0.5	0.4	5	7	0.5	0.8
A4	4	7	500	5	4	8	2	4	8	0.4	0.7	4	8	5	0.8	0.8	8	5	0.2	0.7
A5	5	8	400	6	8	4	1	2	9	0.7	0.2	9	7	8	0.4	0.7	7	2	0.7	0.9

Technology innovation(A1), Artificial Intelligence (A2), Service quality(A3), non-financial office automation(A4), service innovation(A5)

The input and quality of employees connection with job is versatility (0.1), planning capability (0.3), language skills (6), maintainability and flexibility (0.4), time management skills (0.3), teamwork(7), ethics and integrity(2), innovative and start-up skills (8), grooming and appearance (4), punctuality (2), confidence level under high stress level (4), dependability (0.7), time management (0.3), job skills (6), absent status (1) leadership skills (3), decision making and problem solving Ideas (5), quantity of work (400) and quality of service (8).

Table 4. Fuzzy model results.

Office automation	Performance indices	Performance ranking
A1	0.485	5
A2	0.505	4
A3	0.625	1
A4	0.520	3
A5	0.585	2

The surface analysis of FUZZY toolbox results as obtained from MATLAB have been shown in Figure 2.The results of the outputs of the final product using the provided rules are depicted in these graphs. Figure 6a demonstrates the relationship between performance index and variables in terms of quality and quantity of work.Although initially the index of efficiency (for small inputs) and very high values of input exhibits a downward trend, in general it shows a clear upward trajectory with high-quality jobs.In the case of volume of work, the output shows a rising trend for the given values, which is typical, while the output shows a constant pattern for the highest and lowest values. Therefore, when these two inputs—quality and quantity of work—are high, the result unequivocally indicates a higher value. Similarly, the performance index in variation based on the late comers and absenteeism. At first, (for extremely tiny values of data) and very substantial amounts of input, the outcome in this scenario exhibits a growing inclination, but in general, it clearly illustrates a falling trend regardless of the rate of attendance and rate of lateness, with the exception of a few inconsistencies.Therefore, the performance of the results code when each of these inputs is used is obviously different from the previous case situation. In this instance, higher values for both inputs result in a lower performance index value than in the alternative scenario.

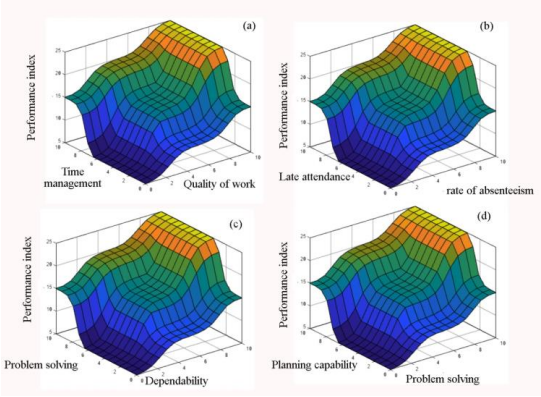

Fig.2. Surface analysis between two input parameters with output

Similarly, Figure 2(C) shows the Fuzzy contour for the effect of office automation through different service sectors of employee's performance index based on the dependability and innovation skills. This case slightly changed rather than previous outputs due to unsymmetric behavior has been observed from the both inputs. Based on the graph, initiative and innovation skills increase while reliability decreases and result increases. However, when each of the inputs is present, output is high when reliability is low, and creativity and imagination are high, whereas it is low when suggestions are the opposite.

The problem-solving skills and decision-making skill and planning capability on the performance index are shown in Figure 2(d). Except for very low and high input values, these two inputs show a growing pattern with the productivity index. Hence, as in the first situation, the output in this case also shows a high value when both the inputs are very high, and it shows a small value in the reverse situation.Therefore, some abnormalities at very high and low input values are not observed, and it can be said that these estimates represent our conventional hypothesis about the relationship between input and output. The prescriptive rules discussed earlier determine this fluctuation of the performance index with respect to the input variables.

4 Conclusion

Comparing the proposed technique with others currently in use, such as the analytical hierarchy process and the weighted average method, both involve significant computation if a large number of performance criteria are simultaneously taken into account as the basis for evaluation. The recommended one is easy to use for performance evaluation. It is more adoptable and has high accuracy compared with other methods as an easy access decision maker to implement the subjectivity, uncertainty, and vagueness into the performance index evaluation system. A company's human resources management is responsible for maintaining this performance appraisal or evaluation on a regular schedule. The best person is selected based on the worker's performance index, which, according to the inquiry, is calculated using historical company data. A fuzzy approach to performance evaluation is also presented.

In this case, the result is determined after calculating 20 input parameters for five strategies. The nature of the objective of the company's valuation system will determine whether or not certain additional input factors are taken into account while determining the outcome. Triangular relationships are taken into account for each input and output parameter while designing the mathematical framework.The design of the model can take into account additional functions related to membership. According to the performance index, sampling and selection of candidates for promotions, training, incentive payments and performance-based pay rewards can be done in a straightforward manner; Naturally, this makes the model a great management resource.Complex intermediate calculation of fuzzy logic is completely carried out by MATLAB software. The Fuzzy Toolkit in MATLAB gives input and output values that can be readily manipulated by interested HR officers who typically deal with evaluating employee performance and calculating a productivity score.

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