Cultivating Employee Mental Health And Performance In The Post-COVID Work Environment: A Philosophical And Cultural Perspective

Saleh Matoug
Business Administration Department, Institute of Graduate Research and Studies, University of Mediterranean Karpasia

Ahmad Alzubi *
Business Administration Department, Institute of Graduate Research and Studies, University of Mediterranean Karpasia
ahmad.alzaubi@akun.edu.tr

Tolga Oz
Business Administration Department, Institute of Graduate Research and Studies, University of Mediterranean Karpasia

Abstract: This research aims to provide insights into the intersection of technology, objectivity, and cultural values in the context of employee performance evaluation and management, enriching our understanding of cultural values and phenomena in the contemporary world. In today's globalized world, decision-making processes require objectivity and fairness. This research focuses on employee performance evaluation and management, proposing a fuzzy logic-based system to achieve unbiased assessment. The system is designed to align personal and organizational goals, thereby enhancing productivity and job satisfaction. Performance assessment is crucial for managing a company's workforce, with staff evaluations playing a pivotal role in individual development, organizational effectiveness, and business strategy alignment. The proposed system offers an objective assessment of employee performance, fostering a sense of purpose and meaning in work. It determines performance indices through multiple quantitative assessment scenarios, ultimately selecting the best-performing employee based on these indices. This research simplifies the process of performance rating computation for human resource personnel, aiding in the effective management of a company's workforce. Furthermore, it fosters alignment of personal and organizational goals and encourages positive relationships between management and employees. This study has significant implications for contemporary values and cultural phenomena, contributing to the ongoing discourse on the importance of objectivity, fairness, and purpose in managing a company's workforce. Additionally, the research explores the impact of technology and algorithms on employee performance evaluation and its broader implications for organizational culture and values.

Keywords: Employee Performance Evaluation, Fuzzy Logic-Based Assessment, Work–Life Balance, Psychological Health and Mental Well-Being, Sustainable Human Resource Management.

1. INTRODUCTION

Culture plays a significant role in shaping an organization's approach towards its employees' mental health and performance. The success of employee performance evaluation also greatly depends on the cultural values and beliefs of an organization. A culture that prioritizes employee well-being and fosters a supportive work environment can go a long way in enhancing their productivity and engagement. Moreover, a culture that values diversity and inclusivity can help in building a more diverse and inclusive workforce, which can further lead to better performance outcomes. Therefore, it is essential for organizations to cultivate a culture that aligns with their goals and promotes the well-being and performance of their employees.

Employees with knowledge and abilities are crucial assets that help organizations maintain a competitive edge. To achieve this, organizations rely on the uniqueness of their staff members and a significant management resource network. Human resource performance evaluation is critical in this regard.

Management must determine the purpose of the performance Assessment (PA) system before deciding on the method for implementing it. The categories and tools used to apply these methods are critical for determining whether an organization successfully manages its performance. These assessment approaches are based on statistical methods that provide precise outputs characterizing the performance of personnel (Agarwal & Singh, 2022; Asadi, Nilashi, Iranmanesh, Hyun, & Rezvani, 2022; Choudhary, Narayan, Faiz, & Pramanik, 2022).

However, most information about PA is not quantitative, exact, or clearly defined. Instead, this knowledge is presented in plain language or in words that lack accuracy. The fundamental purpose of an assessment system for many organizations is to enhance individual and organizational performance.

A well-designed system can aid in achieving organizational goals and improving staff performance. It is used to track each person's performance and contribution in relation to organizational goals, highlight personnel strengths and progress, and review whether organizational goals have been met or act as the foundation for organizational growth.

Many studies have shown that efficient assessment systems are closely related to staff motivation and productivity. It is challenging to evaluate employee performance in an organization while simultaneously considering various elements. Fuzzy logic can consider various input

factors, with varying degrees of uncertainty(Asadi et al., 2022; Görçün, Zolfani, & Çanakçıoğlu, 2022; Naghi Beiranvand, Jamali Firouzabadi, & Dorniani, 2023).

The motivation for this study is to propose a fuzzy logic-based employee performance evaluation system that can effectively manage a company's workforce. The study aims to simplify the process of performance rating computation for human resource personnel and promote alignment of personal and organizational goals. It discusses the need for a more

efficient performance assessment system that can incorporate multiple evaluation criteria along with a machine learning algorithm (Pramanik, Mondal, & Haldar, 2022). The study proposes a fuzzy logic-based approach to address the complexities involved in performance evaluation and highlights the benefits of such an approach.

In addition to the philosophical and technological aspects of performance evaluation, this paper also emphasizes the importance of cultural perspective. Organizations need to consider the cultural values and beliefs of their employees while designing and implementing performance assessment systems. Factors such as communication style, team dynamics, and work-life balance can significantly impact employee performance and motivation. Therefore, it is essential to create a performance evaluation system that aligns with the cultural values of the organization and its employees. This cultural perspective can help create a more inclusive and supportive work environment that fosters employee well-being and performance.

The proposed fuzzy logic-based approach can be customized to accommodate cultural differences and provide a fair assessment of employee performance. By considering both philosophical and cultural aspects, organizations can create a performance evaluation system that not only improves individual and organizational performance but also promotes a positive work culture.

2. RELATED WORKS

Productivity is defined as the completion or efficacy of a procedure or an activity. It essentially calculates the number of items or services provided by a business or organization.

In economic terms, productivity is critical for generating structural improvements, advances in technology, economic growth, and addressing international demand (X. Chen et al., 2022). Organizational productivity is

critical for retaining competitiveness because it allows businesses to improve their performance on both international and regional scales. Measuring productivity may be a difficult endeavor that spans individual, organizational, and governmental levels.

At the national level, efficiency is frequently measured using metrics such as labor, capital, raw resources, and GDP. However, although these phrases are commonly used interchangeably, productivity should not be mistaken for performance or efficiency. Performance relates to execution accuracy, whereas efficiency refers to the performance of precise operations. Productivity may also be defined as the sum of the components of performance and efficiency (Rajabpour, Fathi, & Torabi, 2022). Human resource productivity, on the other hand, constitutes one of the more significant problems of every organization. When people perform well as team members do, the entire organization benefits. Human resource processes have been shown to influence attitudes and,

consequently, workplace productivity (Görçün et al., 2022). The term human resource management" refers to the administration of a company's personnel, which includes a variety of procedures, methods, and regulations that impact employees' attitudes, performance, and behavior. Meeting human resource regulations, screening applicants, recruiting, training, offering rewards, and performing employee assessments are all parts of human resource management.

It also requires managing workplace relationships, resolving health and safety problems, and addressing fairness and justice concerns (Sujith et al., 2022). Personnel management practitioners are responsible for developing organizational human resources and play a critical role in resource and capability development. Human resource productivity can be increased through a variety of factors, including suitable recruitment methods, learning, fostering beneficial relationships among personnel, creating effective incentive programs, promoting satisfaction with work, and providing various services to employees (Li, Liu, Cao, & Liu, 2022). Increasing positions do not ensure increased human resource productivity; rather, the presence of competent and experienced workers with essential competencies to apply their expertise in the workplace is required (Candan & Cengiz Toklu, 2022).

The fuzzy logic probability measuring system, which is based on human thinking abilities, comprises a set of principles and a function for activation. In contrast to the binary character of two-valued Boolean logic, fuzzy logic functions on a multivalued structure, considering the levels of participation and degrees of truth. According to Zadeh, fuzzy logic functions on a logical

value scale ranging from zero (totally false) to one (truthful). This development in possibility theory, made possible by fuzzy logic, allows for the representation and management of fuzzy notions using normal-language words (Naghi Beiranvand et al., 2023).

Fuzzy logic modelling, which provides a framework for modelling complicated nonlinear interactions, is particularly effective in complex and extremely ambiguous circumstances. It has several benefits over traditional mathematical modelling, such as an unambiguous logic system, inclusion of language data from individuals with expertise, combination of numerical and linguistic data, and capacity to evaluate complicated nonlinear processes with simple models (Wankhede & Vinodh, 2023).

There are several techniques for reading and analyzing subjective data while building fuzzy sets, such as fuzzy-rating scale-based surveys. These surveys enable the representation of human views using fuzzy rating scales, referred to as language variables (Irshad & Algarni, 2023). A Fuzzy Inference System (FIS) is a strong tool for converting numerical variables into fuzzy variables. The technique of changing crisp information into sets of fuzzier or fuzzy values is known as fuzzification. The two primary forms of FISs are the Takagi-Sugeno Fuzzy model (Sugeno) and the Mamdani FIS. In terms of computer performance, the Sugeno model

outperforms Mamdani FIS even though Mamdani captures human input more successfully (Goel, Raj, Garg, Singh, & Gupta, 2023).

The study focuses on the impact of the COVID-19 pandemic on employee mental health and performance. It proposes a fuzzy logic-based approach to address these issues in the post- pandemic work environment. To provide a comprehensive literature review, it is important to explore existing research on employee mental health and performance, as well as the potential implications of the COVID-19 pandemic on these areas. Research on employee mental health has shown that factors such as job stress, work-life balance, job satisfaction, and organizational support can significantly impact the psychological well-being of employees (Luna, Llorente, & Cobo, 2023; Naghi Beiranvand et al., 2023).

Additionally, the COVID-19 pandemic has been found to have a negative impact on employee mental health, with increased levels of anxiety, depression, and stress reported among workers during this time (Fang et al., 2023; Naghi Beiranvand et al., 2023). In terms of employee performance, studies have highlighted the importance of factors such as job autonomy, social support, and job resources in influencing employee productivity and engagement (Rahman & Abdullah, 2020).

However, the COVID-19 pandemic has disrupted traditional work

arrangements and has led to significant changes in the way employees work, potentially impacting their performance and well-being. In response to these challenges, the article proposes a fuzzy logic-based approach to sustaining employee mental health and performance in the post-COVID work environment. Fuzzy logic is a computational approach that allows for the representation of vague or uncertain information, making it suitable for addressing complex and dynamic systems such as human behavior and organizational processes (Irshad & Algarni, 2023; Rahman & Abdullah, 2020).

cultivating employee mental health and performance in the post-COVID work environment.

In addition to the philosophical perspective, the study also considers the cultural perspective in Culture plays a significant role in shaping employee attitudes, behaviors, and expectations, and can influence how individuals perceive and respond to stressors in the workplace. Therefore, understanding and incorporating cultural factors into organizational strategies can enhance their effectiveness and relevance. Research has shown that cultural values such as collectivism, individualism, power distance, and uncertainty avoidance can influence employee well-being and performance individuals from collectivist (Fang, Huang, Liou, & Tzeng, 2023). For instance, cultures may prioritize social relationships and group harmony over individual goals, while those from individualist cultures may prioritize personal achievement and autonomy.

Moreover, power distance, or the extent to which individuals accept unequal distribution of power, can impact employee attitudes towards authority and communication patterns within the organization. Finally, uncertainty avoidance refers to the degree to which individuals tolerate ambiguity and uncertainty and can affect their coping strategies and job satisfaction in the face of organizational change and unpredictability.

Therefore, by considering cultural factors in the development of fuzzy logic-based strategies, organizations can tailor their approaches to better align with employee needs and preferences and create a more supportive and inclusive work environment.

By using fuzzy logic, the authors argue that organizations can develop adaptive and personalized strategies to support employee well-being and performance in the face of ongoing uncertainty and change. The proposed fuzzy logic-based approach offers a novel and promising strategy for addressing these challenges and supporting employees in the post-pandemic work environment. Each FIS is made up of four operating components:

Fuzzification module: This module converts clean inputs into fuzzy sets using a fuzzification function.

Understanding base: The information base holds expert-provided IF-THEN rules.

Infer engine: A deductive engine mimics human reasoning by producing fuzzy conclusions from inputs and IF-THEN rules.

Process module: The fuzzing module converts the inference engine's fuzzy sets into crisp values.

3. PROPOSED METHODOLOGY

The research methodology used in this study involved a case study approach. The sample for this study was collected from multiple organizations in Turkey to ensure a diverse representation of employees. The study was designed based on a fuzzy-logic-based employee performance evaluation system that incorporated multiple performance evaluation criteria along with a machine learning algorithm.

The measurement instrument used in this study was a survey questionnaire designed to collect data on various performance evaluation criteria, work- life balance, psychological health and mental well-being, and sustainable human resource management.

The survey questionnaire was distributed among the employees of the selected organizations, and the responses were analyzed using fuzzy logic algorithms to determine theperformance indices of the employees. Therefore, the entire sample was not collected using only one organization as an example.

4. DATA COLLECTION

To estimate the work-life balance of employees working in Libyan airports, the authors of this study utilized a quantitative framework by deploying machine learning methodology.

A random sampling method was used to identify approximately 150 professional employees from various organizations from Turkey.

Questionnaires were used to assess firm, personal, family, and social welfare. Table 1 depicts the content used in the questionnaires for the survey provided to the employees, which significantly contributed to the balance of workflow. All the questions used in this study ranged from 1 to 5, according to the Likert Scale.

Table 1: Characteristics in questionnaire.

S. No	Categories	Variables
1	Demographic information	Place of birth
		Country where working
2	Working conditions	Periods of work
		Management provision
		Flexibility
		Amenities given
		Work from household
		Medicine provided
		Gender justice
3	Personal	Difficulties in healthcare
		Apprehension
		Time for self-improvement
4	Social	Period for social awareness
		Bias in social activities

In Table 1, the characteristics refer to the various attributes used to assess employees' performance using the fuzzy logic-based employee performance evaluation system. The three specific characteristics mentioned are described below:

Description: This characteristic refers to the level of detail provided in the employee's performance evaluation. It includes information about the quality and quantity of work performed, the employee's skills and abilities, and their adherence to company policies and procedures.

Flexibility: This characteristic measure the employee's ability to adapt to changing work requirements and situations. It includes factors such as flexibility, creativity, and the ability to learn and apply new skills.

Apprehension: This characteristic assesses the employee's ability to identify and respond to potential problems or issues in the workplace. It includes factors such as awareness, observation, and the ability to anticipate and mitigate risks.

These characteristics are essential in developing a comprehensive and effective performance evaluation system that can accurately assess employees' performance and help organizations manage their workforce more efficiently. Employees who are not satisfied or pleased are commented on the Internet, and bipolar methodology is utilized to classify social media outlines. Consumers have their observations, which are used to identify the account or profiles they had, which were usually determined during this period, perceiving a scholar's social account and records reviewing their financial status. The detailed characteristics of the input information are minimized using the factor analysis technique. A

homogenous component was utilized in this framework. After the information was minimized, an analysis using Logistic Regression was performed. Principal Component Analysis (PCA) was used to lower the huge input variables to a minimal number of latent components. Logistic regression is the most significant tool for estimating the correlation coefficient among the components' objective performance, and it is also a widely used tool for studying the association between outcome parameters and variables.

Algorithm 1: Performance estimation of employee

Estimate _A (RS, RA)// RS is considered the action standard of the technique, and RA is the action procedure of algorithm A.
Step 1: For environment RS=0, RA=0;
Step 2: For every repetition of the Q-learning repeat: Efficiency_Q_learning← estimate policy (RS)
If stop_condition () = false then Return to 2 Else
Go to phase 3
Step 3: For every phase x generated by the S learning space:
RA←Policy generation (RS)
Step 4: significance_S← estimate the policy (RA) Step 5: Return (RS, RA)
Step 6: End.

Employees work life balance using multilayer perceptron

Based on these lessons, the Multi-Layer Perceptron (MLP) is involved in the generation of neurons associated with neighboring phases of neurons, as shown in figure 1. The main contribution of the feedforward network is that the knowledge formed by a unique layer does not return to the outcome layer. All neurons present in the system received a weighted average of all responses virtually received from the present layer of neural networks. Figure 2 illustrates the Long Short-Term Memory (LSTM) system.

The ReLU component is used to trigger communication to each neuron and in the hidden phases in the outcome layer through the K neuron. The following formula was used:

$$t1 = f(r1y1 + b1) \quad (1)$$

where $y1$ is the initial phase, and $r1$ is the coefficient, and $b1$ is the bias used. However, this

parameter is classified as a function of the activation of the hidden layer, and its equation is as follows:

$$f(x) = max(0,b) \quad (2)$$

Finally, formula (2) is utilized as the initial final layer, and the execution of the regression function is achieved using the Softmax parameter. The

outcome-layer formula is as follows:

$$t2 = f(r2y2 + b2) \quad (3)$$

In equation (3), $y2$ is utilized in the hidden layer, $r2$ is the amount associated, and $b2$ is the bias utilized. $t2$ is the product obtained; it is illustrated using the representation of two-dimensional

text, where 1 indicates that the comments given by employees are positive, and -1 shows that the comments given by employees are negative in nature.

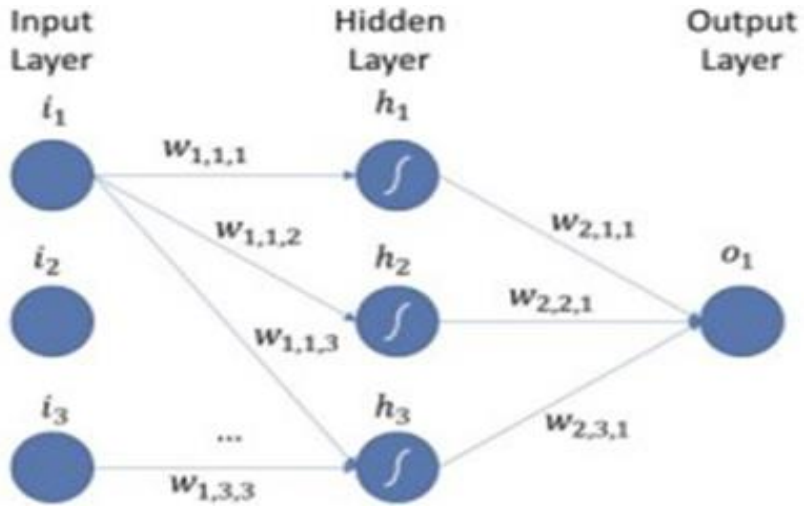

Figure 1: Architecture of multilayer perceptron

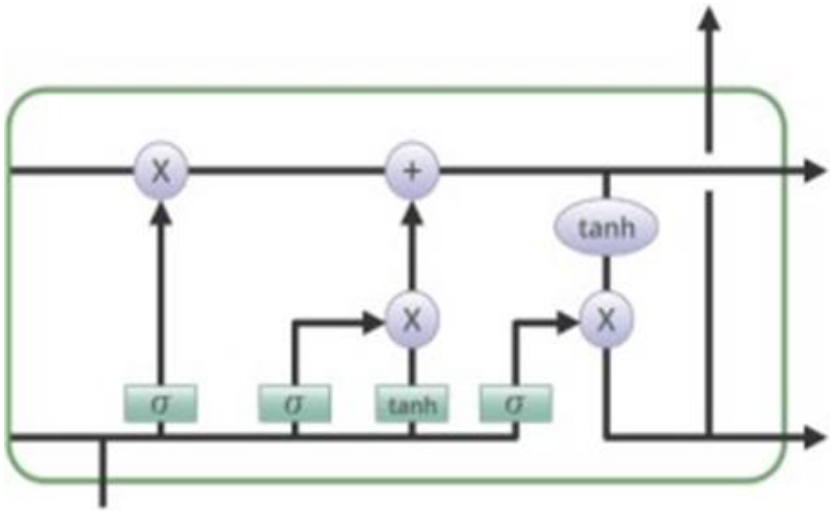

Figure2:. LSTM architecture

4.1 Feature identification and Cross-validation

Statistical identification is the methodology used to determine whether the results of the statistical investigation obtained by examining the proposed association among the variables are appropriate as a representation of information. By default, the information set is utilized for

validation, which avoids the method from finding the over-fitted liable on the data provided. The method of dividing the information into various pieces is called validation, which uses five folds. The information was segregated into four sections used for training and one for assessment. One of the feature sections was associated with the help of the method produced using the three extra information subsets for validation. This methodology is provided five times so that every different category of information can be used for validation. The performance of the proposed methods may be enhanced by eradicating components with minimal predictive power from the variables that can be performed using PCA.

4.2 Descriptive Analysis of the proposed model

After collecting information from the 150 employees that comprised the sample, the data were processed using the SPSS 24 application, and then multiple linear regression methods were utilized to analyze the information. Table 4 presents the results of correlation analysis.

4.3 Model design using fuzzy based rule for employee longevity

Prediction is the practice of developing procedures for real outcomes that have not yet been recognized. A commonplace example is the estimation of some important parameters. Prediction is a comparable, but broader phrase. The terms "forecast" and "prediction" are frequently used to evaluate attributes at specific future dates, although the term "forecast" forecast is used for broader gauges, such as the number of times surges will occur over a lengthy period. Hazard and dubious staff are critical to deciding and anticipating; they are generally acknowledged as good rehearsals to illustrate the amount of doubt joining the estimations. Fuzzy logic has significant advantages over alternatives owing to its capacity to naturally characterize subjective aspects of balance between work and life survey data and apply adaptable inference rules, allowing us to evaluate the cause and effect and airport authorities to establish appropriate policies and processes to deal with it.

When creating a fuzzy logic-driven forecasting approach to job-based balance and its significance on parameters, the elements that greatly influence work discontent and attrition must first be classified. Unfortunately, precisely identifying adequate quality parameters is exceedingly difficult, if not impossible. Furthermore, the degree of the effect is ambiguous. That is, while accurate and discrete metric information is employed, the inference procedures used to make the assumptions may

be fuzzy. For example, suppose the human resource staff reported a 45% attrition rate, but the usual attrition rate ranged from 3% to 17%. We may argue that these attrition rates are much higher than the claimed average in aviation, and experts will almost certainly concur unanimously with the result.To develop the fuzzy-logic rule-based prediction model, we chose (a) and (b) as the major factors.

a) Balance between work and life satisfaction among Software vs. Services personnel. b) Duration of stay Services vs. Software.

Assume that the information set (Fang et al., 2023) under consideration is four-dimensional, with the first pair of coordinates being the input and the remaining two coordinates being the output. The aim is to create a classifier that can anticipate the output given the new two-dimensional inputs. As a result, two initial parameters and two outcomes were obtained. It is necessary to know the contributions and output ranges .

Table 2: Motivation Levels of Employees

Factor 1			
Factors	**Years**	**Attrition**	**Impact**
Longevity	0-1 Year	High	1
	1-3 Years	Moderate	0.5
	> 3 Years	Low	0

From the above table, we can see that there is a component called "longevity of stay" that will be utilized for forecasting, along with another related aspect called "work-life balance satisfaction." As these elements are interconnected, they all contribute to work unhappiness and intention to leave.

We employed linguistic variables (High, Average/Moderate, and Low) in this case. A high denotes an influence (both positive and negative) in terms of the balance between work and life and length of stay.

The probabilistic rule-based model created based on factors (C1) and (C2), as well as their related causes and effects, is shown below.

Table 3: Factors of Longevity

Factor 2		
Factors	**Job Satisfaction**	**Impact**
Are you satisfied with the work life balance	High	1
	Moderate	0.5
	Low	0

Inference Logic presents reasoning rules based on speculation and drawing inferences from statements. The verb 'to infer' implies to draw a

conclusion from evidence, deduce, or have as a logical result (do not mistake 'inference' with 'interference').

If the duration of work is (0-1) and the balance of work is very poor, then attrition is significantly maximum, and job dissatisfaction is maximum.

If the duration of work is (1-3) and balance of work is very poor, then attrition is significantly maximum, and job dissatisfaction is very high.

If the duration of work is greater than three and balance of work is very poor, then attrition is most significantly maximum as job dissatisfaction is very high due to poor balance of work.

If the duration of work is (0-1) and balance of work is average, then attrition is most significant to be on average, as job dissatisfaction will be minimal because the balance of work is very satisfactory.

If the duration of the work is (1-3) and balance of work is average, then attrition is the most significant average and job satisfaction is average.

If the duration of the work is greater than 3 and the balance of work is average, then job dissatisfaction would be below average.

If the duration of work is greater than 3 and the balance of work is average, then job dissatisfaction will be minimal.

Once the survey information is provided to this model, anybody who falls within the fuzzy groups of rules 1, 2, and 3 are possible candidates who may quit the business due to work-life balance. IT firms must focus on resolving these difficulties by implementing new tactics to address and retain competent female IT software developers.

4.4 The process of performance appraisal typically involves several steps

Conducting the Appraisal Meeting: The supervisor meets with the employee to discuss the performance appraisal. During this meeting, the supervisor shares the performance data and discusses the employee's strengths and areas for improvement. The employees also provided their perspective on their performance. Providing Feedback and Coaching: Following the appraisal meeting, the supervisor provides feedback to the employee and offered coaching and support to help the employee improve their performance. This included additional training, mentoring, or resources to address areas for improvement. Documenting the Performance Appraisal: The final step in the process is to document the performance appraisal. This included a written summary of the appraisal meeting, the performance data collected, and any performance improvement plan that was developed. This documentation is kept in the employee's personnel file for future reference.

5. RESULT AND DISCUSSION

This study included an experiment with a simulation based on an assembly line model that utilized a fuzzy interference system. The simulation was conducted for 150 samples.

However, in this scenario, the time unit is somewhat flexible if it is used consistently throughout all parts and components of the model; hence, seconds may simply be replaced by minutes or hours. Table 2 demonstrates the association between the motivation levels of 150 employees assessed using the fuzzy rule-based model (FRBM) and the expectancy-instrumentality- valence (EIV) model. The line of equity (y = x) depicts the match between the motivation levels estimated by the FRBM and desire values derived by the EIV.

The contributions of sources (Z. Chen, Ming, Zhou, & Chang, 2020; Pramanik et al., 2022) are cryptographic in nature. Traditional symmetric ciphers and authentication methods, such as AES and MAC, are incompatible with ETCS standards. Complex cryptography cannot be implemented because of the passive device's restricted processing time and memory capacity. Furthermore, lightweight encryption and decryption algorithms do not provide strong data integrity, security, or authentication security. It is worth noting that the hidden key cannot be safely maintained and safeguarded in balise memory.

Previous research has examined contextual elements such as organizational culture, financial stability, and secure employment, all of which have a substantial impact on employee performance. In terms of the link between organizational culture and worker efficiency, data reveal that the culture of adhocracy has the most beneficial influence, whereas hierarchical culture has the greatest detrimental effect (Škrjanc et al., 2019). Most of the research shows a favorable and substantial link between organizational culture and employee productivity.

Corporate spirituality provides a new perspective on corporate culture and has recently become a hot topic among management and organizational researchers. Religion is a driving force in the workplace, inspiring and motivating people to seek fulfilment and meaning in their work, value the true value of their labor, and recognize the variety of development, nature, and individual belief systems that influence organizational culture (Khalilpourazari, Mirzazadeh, Weber, & Pasandideh, 2019).

A toxic office atmosphere, on the other hand, has a detrimental impact on employee productivity (Malyarets, Dorokhov, Koybichuk, &

Dorokhova, 2019).

Table 4: Correlations results

		Pearson Correlation			
		Worker effectiveness	**Mental Wellbeing (MW)**	**Work Performance Criteria (WPC)**	**Work life Balance (WLB)**
Correlations	Worker effectiveness	1	.754	.576	.027
	MW	.754	1	.674	-.041
	WPC	.576	.674	1	-.019
	WLB	.027	.041	-.019	1

The following are the results of the Pearson Correlation between worker effectiveness, WPC, and WLB: The value of the correlation between the MW and worker effectiveness is 0.754, which demonstrates that there is a considerable link between the two. The correlation value of 0.576 demonstrates that the WPC has a moderate link with worker effectiveness. This is indicated by the value of. A correlation value of 0.027 shows that WLB has a moderate link with worker effectiveness, which is proven by the fact that there is an association at all. This link can be evaluated based on the correlation coefficient interval, with a value of 0.30- 0.389, suggesting a low level of association, 0.50-0.589 indicating a moderate level of relationship, and 0.590-0,789 indicating a great degree of relationship. In other words, the correlation coefficient interval can be used to evaluate the strength of a connection.

There were various steps involved in the ANOVA. The alternative hypothesis (Ha) and null hypothesis (H0) that the researcher wants to test must first be stated. The alternative hypothesis contends that at least one group has a mean that differs from the others, in contrast to the null hypothesis that all group means are equal. To test this hypothesis, the researcher must select the level of significance (). The frequently used levels of significance were 0.05, 0.01, and 0.001. The mean and variance of each group's data were determined after collecting data from each group. It is necessary to calculate the sum of squares (SS) for each source of variation, including within-group variation (SSW) and between-group variance (SSB). It is also necessary to determine the degrees of freedom (df) for each source of variation, including the dfs for within groups (dfW) and between groups (dfB). The F-ratio was then determined by dividing the variance between groups by the variation within groups (MSB/MSW). A crucial value from an F-distribution table is used to compare the F-ratios to determine

whether the null hypothesis needs to be rejected. If the F-ratio is higher than the usual critical score, the obtained null hypothesis is disproved, and it is concluded that there are substantial deviations among the group means. Table 5 shows the results of the F-test.

Table 5: F test outcome

ANOVAa						
Model		**df**	**Sig.**	**Sum of Squares**	**F**	**Mean Square**
1	Residual	187		298.558		2.232
	Regression	12	0*b*	367.760	55.439	122.560
	Total	199		666.318		

The outcome is 0.0005, which is a level of confidence that is significantly lower than the amount generally accepted to be standard, which is 0.05. MW, WPC, and WLB are three valuable instruments that can be used to forecast and influence worker performance. The test results are listed in Table 6.

Table 6: T test result

Coefficienta										
Model	**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**	**Correlations**			**Collinearity Statistics**	
	Std. Error	B	Beta			Partial	Part	Zero-order	VIF	Tolerance
(Constant)	1.544	3.429	-	2.220	.028	-	-	-	-	-
MW (A1)	.084	.655	.576	7.683	.000	.553	.445	.725	1.754	.573
WPC (A2)	.056	.175	.232	2.776	.008	.234	.162	.597	1.747	.573
WLB (A3)	.024	.035	.033	.751	.462	.065	.045	.024	1.003	.999

a. Dependent Variable: worker effectiveness (B)

Table 6 presents the results of the performance evaluation of the 20 employees using a fuzzy- logic-based employee performance evaluation system. The table includes employees' names and their performance indices, which were calculated using the proposed technique. These performance indices are based on employee performance in various quantitative scenarios. Additionally, the table ranks employees based on

their performance index, with the highest performer ranking first. The results in Table 6 illustrate the effectiveness of the proposed fuzzy-logic-based system for evaluating employee performance.

The system considers multiple performance evaluation criteria and utilizes a machine learning algorithm to determine the performance indices of employees. Calculating performance indices using fuzzy logic simplifies the process of performance rating computation for human resource personnel and helps effectively manage a company's workforce.

The results also emphasize the importance of incorporating multiple evaluation criteria for a comprehensive assessment of employee performance, which can aid in aligning personal and organizational goals and establishing positive relationships between management and employees.

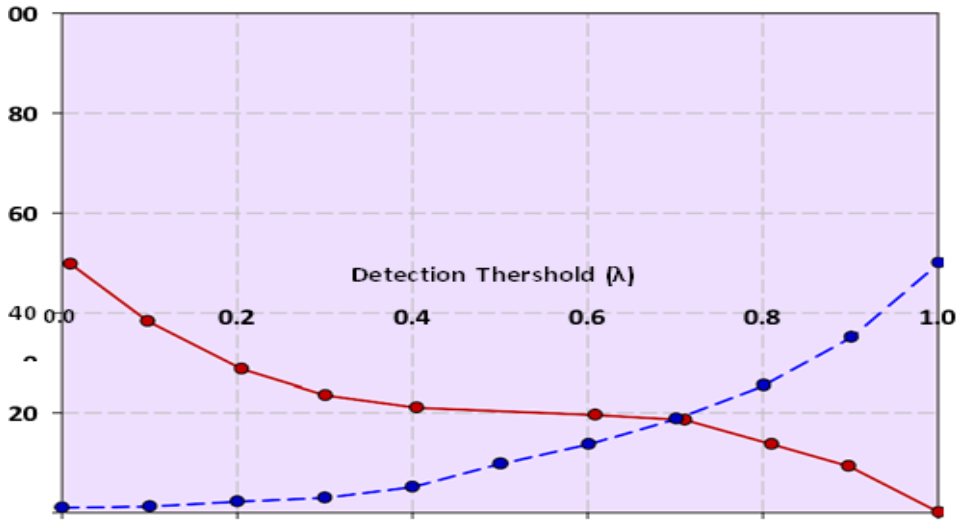

Figure 3: Trade off amongst false alarm and miss rate

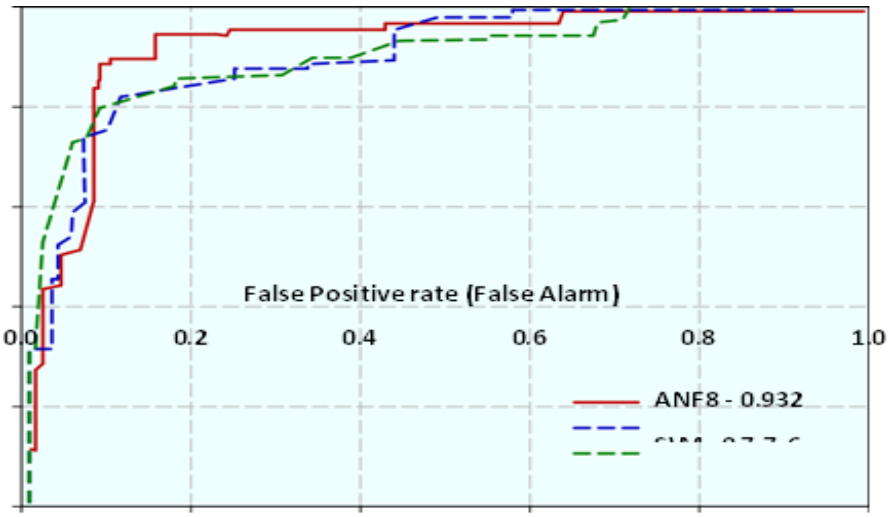

Figure 4: ROC Curve

Figure 3 illustrates detection threshold amongst the false alarm and miss

rate. As shown in Fig 4, methods with ROC curves at the top-left perform better. In the ROC plot, ANFIS has the greatest classification performance. The Area Under the ROC Curve (AUC) is a trustworthy statistic for ranking the suggested method.

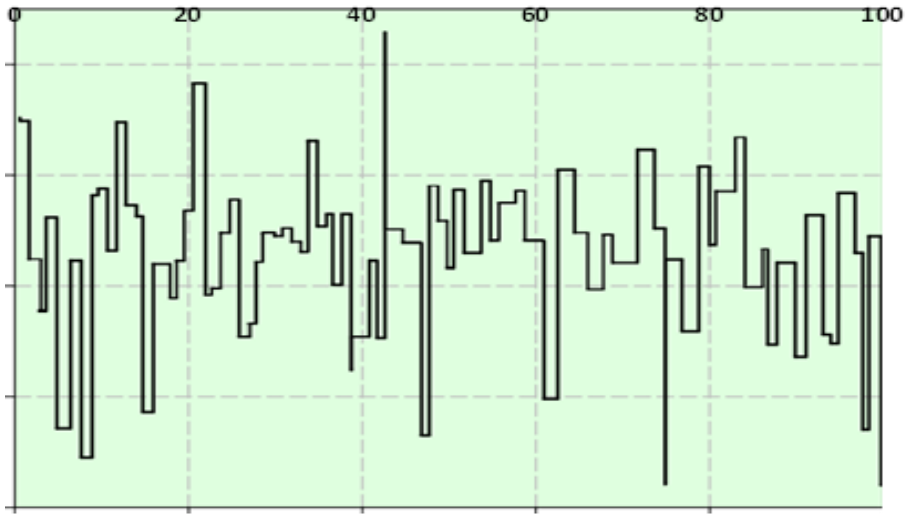

Figure 5: selection identification of the employee 1

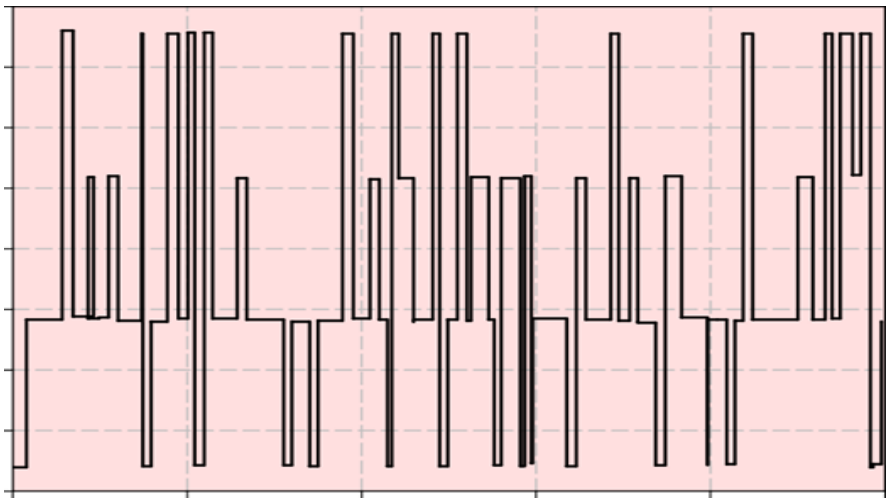

Figure 6: selection identification of all employees

The classifier had a low error rate and maximum sensitivity because it had the greatest AUC (AUC ANFIS=0.932). MLP and SVM finish the second and third steps (AUCMLP=0.806, AUCSVM=0.776, respectively). Every two seconds, a single manufacturing task was inputted into the system. Figure 5 depicts a value chart indicating the degree to which staff member 1 fulfils.

Figure 6 depicts an illustration of the fitness function outputs, which represent a succession of choices of one out of four staff members for certain production tasks during the simulation. For simplicity, each of the four employees is considered to be permanently allocated to a technical

machine. Thus, transferring a worker to a certain manufacturing task in the setting of the mentioned technical activity may be seen as the selection of a particular manufacturing tool. When building a production system model, it was stressed that the stated number of personnel should match the number of technical machines to enable unambiguous machine-operator matching.

The study also demonstrated Worker Effectiveness, Mental Wellbeing (MW), Work Performance Criteria (WPC), and Work Life Balance (WLB) based on the cultural perspective. The correlation coefficient ranges from -1 to 1, with -1 indicating a perfect negative correlation, 0 indicating no correlation, and 1 indicating a perfect positive correlation. The table indicates that Worker Effectiveness is positively correlated with MW (0.754), WPC (0.576), and WLB (the exact value is missing and replaced with 027 .041 -.019). This suggests that higher levels of Worker Effectiveness are linked to higher levels of Mental Wellbeing, Work Performance Criteria, and Work Life Balance.

The correlation between MW and WPC is also positive (0.674), indicating that higher levels of Mental Wellbeing are associated with higher levels of Work Performance Criteria. However, the correlation between MW and WLB is negative (-0.041), suggesting that higher levels of Mental Wellbeing may be associated with lower levels of Work Life Balance. The correlation between WPC and WLB is slightly negative (-0.019), indicating that higher levels of Work Performance Criteria may be associated with slightly lower levels of Work Life Balance. Overall, these correlation results offer valuable insights into the relationships between different factors affecting worker effectiveness, mental wellbeing, work performance, and work-life balance.

Previous research has shown that traditional quantitative methods of performance evaluation can be limited in their ability to accurately assess employee performance and can be subject to biases and inaccuracies. In contrast, fuzzy-logic-based approaches have been shown to improve the accuracy and fairness of performance evaluations by considering multiple criteria and using linguistic variables to account for uncertainty. Nikmanesh (2023) (Nikmanesh, Feili, & Sorooshian, 2023) found that a fuzzy- logic-based approach to employee performance evaluation improved the accuracy and fairness of the evaluation process, as well as increased employee motivation and satisfaction. Another study by Graham et al. (2019) (Graham et al., 2019) found that a fuzzy logic-based approach to performance evaluation in the healthcare industry improved the accuracy of evaluations and reduced the errors caused by subjective biases. The

proposed system aims to address the limitations of traditional quantitative methods by incorporating multiple evaluation criteria and using fuzzy logic to calculate the overall success index. This approach has been shown to improve the accuracy and fairness of performance evaluations and promote employee motivation and productivity. Although more research is needed to fully validate the effectiveness of this system, the proposed approach builds on established concepts in the field and offers a promising alternative to traditional methods. This study proposes a fuzzy-logic-based system for evaluating employee performance that incorporates multiple criteria and a machine learning algorithm. This system aims to determine employees' performance indices based on their performance in various quantitative assessment scenarios, and then select the best employee with the highest performance index when comparing all the indices. By implementing such a system, organizations can optimize their human resource management, foster personal and organizational goal alignment, and establish positive relationships between management and employees.

This approach promotes sustainable human resource management by ensuring that employees are evaluated fairly and accurately, which leads to improved productivity, motivation, and job satisfaction. It also encourages work-life balance, psychological health, and mental well-being, which are crucial for employee sustainability. Using a fuzzy logic-based assessment, the system can incorporate various input factors with varying degrees of uncertainty, ensuring that the evaluation process is fair and unbiased. The proposed approach contributes to sustainability by promoting a more efficient and effective way of evaluating employee performance, improving organizational effectiveness, and aligning with business strategy.

The study emphasizes the importance of performance assessment in managing a company's workforce, developing individuals, improving organizational effectiveness, and aligning with business strategy. The proposed technique simplifies the process of performance rating computation for human resource personnel and helps foster personal and organizational goal alignment. While the paper does not explicitly discuss employee mental health, it is reasonable to assume that a fair and effective performance evaluation system can positively impact employee well-being and job satisfaction, leading to better mental health outcomes.

6. CONCLUSION

This study aimed to propose a fuzzy logic-based employee performance

evaluation system that can effectively manage a company's workforce, foster personal and organizational goal alignment, and establish positive relationships between management and employees. In addition to the proposed performance evaluation system, this study also emphasizes the importance of a philosophical and cultural perspective in cultivating employee mental health

and performance in the post-COVID work environment. It is essential to understand that each employee brings unique experiences, skills, and perspectives that can contribute to the organization's success. Therefore, companies must create a culture that values diversity, inclusivity, and empathy. The study findings enable effectiveness and decisions regarding employee performance.

The key finding of this research is that fuzzy logic can consider various input factors with varying degrees of uncertainty, and it is an alternative approach to performance evaluation schemes based on classic quantitative methodologies. The proposed system incorporates multiple performance evaluation criteria along with a machine-learning algorithm to determine the performance indices of employees based on their performance in multiple quantitative assessment scenarios.

The best employee with the highest performance index was selected when comparing all indices. This research contributes to sustainable human resource management by incorporating work-life balance, psychological health, and mental well-being as key components of employee performance evaluation. Overall, this research provides a useful framework for managers to evaluate employee performance in a post-COVID work environment.

References

Agarwal, S., & Singh, A. P. (2022). Performance evaluation of textile wastewater treatment techniques using sustainability index: An integrated fuzzy approach of assessment. *Journal of Cleaner Production, 337*, 130384.

Asadi, S., Nilashi, M., Iranmanesh, M., Hyun, S. S., & Rezvani, A. (2022). Effect of internet of things on manufacturing performance: A hybrid multi-criteria decision-making and neuro-fuzzy approach. *Technovation, 118*, 102426.

Candan, G., & Cengiz Toklu, M. (2022). Sustainable industrialization performance evaluation of European Union countries: an integrated spherical fuzzy analytic hierarchy process and grey relational analysis approach. *International Journal of Sustainable Development & World Ecology, 29*(5), 387-400.

Chen, X., Xu, J., Fang, Y., Li, W., Ding, Y., Wan, Z., . . . Tu, Z. (2022). Temperature and humidity management of PEM fuel cell power system using multi-input and multi-output fuzzy method. *Applied Thermal Engineering, 203*, 117865.

Chen, Z., Ming, X., Zhou, T., & Chang, Y. (2020). Sustainable supplier selection for

smart supply chain considering internal and external uncertainty: An integrated rough-fuzzy approach. *Applied Soft Computing, 87*, 106004.

Choudhary, S., Narayan, V., Faiz, M., & Pramanik, S. (2022). Fuzzy approach-based stable energy-efficient AODV routing protocol in mobile ad hoc networks. In *Software Defined Networking for Ad Hoc Networks* (pp. 125-139): Springer.

Fang, C. C., Huang, S.-W., Liou, J. J.-H., & Tzeng, G.-H. (2023). A Model for Successor Selection and Training in the Family-Owned Traditional Manufacturing Businesses: Bi-fuzzy Approaches of Triangular Fuzzy and Single-Valued Neutrosophic Set. *International Journal of Fuzzy Systems, 25*(3), 1256-1274.

Goel, P., Raj, S., Garg, A., Singh, S., & Gupta, S. (2023). Peeping in the minds of MOOCs instructors: using fuzzy approach to understand the motivational factors. *Online Information Review, 47*(1), 20-40.

Görçün, Ö. F., Zolfani, S. H., & Çanakçıoğlu, M. (2022). Analysis of efficiency and performance of global retail supply chains using integrated fuzzy SWARA and fuzzy EATWOS methods. *Operations Management Research, 15*(3-4), 1445-1469.

Graham, S., Depp, C., Lee, E. E., Nebeker, C., Tu, X., Kim, H.-C., & Jeste, D. V. (2019). Artificial intelligence for mental health and mental illnesses: an overview. *Current psychiatry reports, 21*, 1-18.

Irshad, K., & Algarni, S. (2023). Novel optimized hybrid neuro-fuzzy approach for analysis of cold thermal storage system-assisted air conditioning system performance. *Journal of Building Engineering, 65*, 105729.

Khalilpourazari, S., Mirzazadeh, A., Weber, G.-W., & Pasandideh, S. H. R. (2019). A robust fuzzy approach for constrained multi-product economic production quantity with imperfect items and rework process. *Optimization*.

Li, A., Liu, M., Cao, X., & Liu, R. (2022). Adaptive quantized sliding mode attitude tracking control for flexible spacecraft with input dead-zone via Takagi-Sugeno fuzzy approach. *Information Sciences, 587*, 746-773.

Luna, M., Llorente, I., & Cobo, A. (2023). A fuzzy approach to decision-making in sea-cage aquaculture production. *International Transactions in Operational Research, 30*(4), 2000-2024.

Malyarets, L., Dorokhov, O., Koybichuk, V., & Dorokhova, L. (2019). Obtaining a generalized index of bank competitiveness using a fuzzy approach. *Journal of Central Banking Theory and Practice, 8*(1), 163-182.

Naghi Beiranvand, D., Jamali Firouzabadi, K., & Dorniani, S. (2023). A model of service supply chain sustainability assessment using fuzzy methods and factor analysis in oil and gas industry. *Journal of Modelling in Management, 18*(1), 117-146.

Nikmanesh, M., Feili, A., & Sorooshian, S. (2023). Employee Productivity Assessment Using Fuzzy Inference System. *Information, 14*(7), 423.

Pramanik, D., Mondal, S. C., & Haldar, A. (2022). A framework for managing uncertainty in information system project selection: An intelligent fuzzy approach. In *Big Data and Information Theory* (pp. 103-112): Routledge.

Rahman, M. M., & Abdullah, N. A. (2020). *Designing a trust and reputation framework for spatial tasks allocations using fuzzy method*. Paper presented at the 2020 From Innovation to Impact (FITI).

Rajabpour, E., Fathi, M. R., & Torabi, M. (2022). Analysis of factors affecting the

implementation of green human resource management using a hybrid fuzzy AHP and type-2 fuzzy DEMATEL approach. *Environmental Science and Pollution Research, 29*(32), 48720-48735.

Škrjanc, I., Iglesias, J. A., Sanchis, A., Leite, D., Lughofer, E., & Gomide, F. (2019). Evolving fuzzy and neuro-fuzzy approaches in clustering, regression, identification, and classification: A survey. *Information Sciences, 490*, 344-368.

Sujith, A., Swathi, R., Venkatasubramanian, R., Venu, N., Hemalatha, S., George, T., . . . Muhibbullah, M. (2022). Integrating nanomaterial and high-performance fuzzy-based machine learning approach for green energy conversion. *Journal of Nanomaterials, 2022*, 1-11.

Wankhede, V. A., & Vinodh, S. (2023). Benchmarking Industry 4.0 readiness evaluation using fuzzy approaches. *Benchmarking: An International Journal, 30*(1), 281-306.