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A Fuzzy-Based Modeling for Manager Candidate Selection and Performance Assessment Combined With Multi-Criteria Approach

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Abstract

This study develop a civil service evaluation model to identify employee with significant ability and performance. The fuzzy logic and the multi-criteria are proposed as our research model. To evaluate employee capabilities, fuzzy logic is used for analyzing data in mathematical equations. The conceptual model is applied on the case study of managers' performance capabilities. This multi-criteria approach will determine the coefficient weights of each criteria and the ranking of employee performance. These two methods combine weighting to select the most suitable employee for the manager's post. This study applied the ratings of these criteria to compare the strength of these criteria. This experimental test was also conducted using a real-world civil servant evaluation dataset to identify potential employees with high capabilities and performance for recommendation as manager candidates. Finally, the model can be used to assess an employee's ability and performance to be the next manager.

***Keywords:* fuzzy logic, problem solving capability, multi-criteria approach**

I. INTRODUCTION

Technology has developed in the fields of business and engineering, but there is still no research on the use of technology to evaluate employee abilities and performance in selecting future managers [1]. To achieve this goal and promote the use of technology in HRM practices, many companies are using Human Resource Information Systems (HRIS) [2]. HRIS software has been widely introduced to support employee data collection, but there are only a few concepts and methods that support employee development, especially in terms of competence and efficiency so that they become leaders who are able to solve problems in the company.

The use of technology to select future leaders is a difficult problem that requires careful analysis and a combination of methods. At the company level, many companies only follow HR standards and ignore their negative impact on employee morale [3]. The selection of the best employees for project management must pay attention to the conflict between ability and performance, equipped with the necessary tools to support the achievement, while taking into account the abilities and skills of the workers [4]. This situation drives HR practitioners to resolve the challenges, namely, they have to utilize technology to create technology that is suitable for the interests of employees and the company while minimizing risk. In order to achieve this, it is important to create a model that links the two interests to evaluate different processes based on employee potential, social structure and territory.

Through this paper, a new model for identifying the best candidates for managerial position is proposed. it takes into account psychographic-based criteria for selecting suitable employees. Compared with traditional HRIS, which often use fuzzy logic techniques, this study will use the weight criteria. The weight of this criteria is adopted as the output value, which is used to make the final decision regarding the most suitable employee for the management position. After compiling the list of employees, fuzzy logic is used to select the most suitable employees based on the results of psychological tests. The application of this model will help HR practitioner in the evaluation of psychological data studies using data on civil servants in Indonesia.

In recent years, much research has focused on problem solving and leadership skills. However, many studies show that problem solving skills are not effective to improve employee communication skills, but also with other factors such as leadership, planning and planning (PO), and operations. It brings urgency to seek proper evaluation of employees to improve their work and reduce employee emotions and work [5]. In response, researchers have begun to apply cognitive and problem-solving skills to the area of leadership assessment, particularly in interpersonal skills such as communication and organizational performance. As main example, there are key elements of communication are planning and organizing (PO), leadership skills (L), effective communication skills (ECS) and problem solving (PSC) in social work jobs [6].

The author chooses fuzzy logic because it has many advantages: (1) the model framework remains the same regardless of the number of choices and models; (2) there are many other methods and techniques that can be used; (3) following the changes in detail and presenting them in a mathematical form so that the results are easier to understand; (4) applies to both qualitative and quantitative samples, and (5) provides a stable solution regardless of changes in sample size [7].

This article is divided into three parts. In the introductory chapter, it explains the importance of employee selection as future managers. The second part of this paper introduces and explains the fuzzy-based modeling process. an evaluation of the model through empirical research is presented in the third and final section. and finally, the recommendations for future research in the research area are provided.

II. LITERATURE REVIEW

A. Fuzzy Sets and Membership Functions

The meaning of a fuzzy set only provides a limit on its membership function, which must lie in the interval [0; 1]. This definition provides an unlimited number of membership forms [8]. It is important to have a way to represent the functional results. For the discrete world X domain, the degree of membership in the fuzzy set A is usually expressed as:

$$A = \sum_{i=1}^n \frac{\mu_i}{x_i} = \sum_{i=1}^n \frac{\mu_a(x)}{x} \dots \dots \dots (1)$$

where $\mu_i = \mu(x_i)$ with the employee population size is a discrete variable. A discrete fuzzy concept, say small, can be represented as a continuous fuzzy set A:

where $\mu_i = \mu(x_i)$ and the number of workers is the variable. It is a discrete, small, and fuzzy concept that must be expressed as a continuous fuzzy set A:

$$A = \int_i^n \frac{\mu_i}{x_i} = \frac{\int \mu_A(x)}{x} \dots \dots \dots (2)$$

Since many types of membership, several employees are used frequently, especially for permanent situations. In the memberships form, the trapezoidal membership has become main point which can be represented by five elements (A; B; C; D; E), and the fuzzy membership is the standing body of (a; b; c; d; e) which provides:



$$\mu(x) = \begin{cases} \frac{(x-a)e}{b-a} & \text{when } a \leq x < b \\ e, & \text{when } b \leq x < c \\ \frac{(d-x)e}{d-c} & \text{when } b \leq x < d \\ 0, & \text{otherwise} \end{cases} \dots\dots\dots (3)$$

where:

A = leadership skills with membership $(a_1, a_2, a_3, \dots, a_n)$;

B = planning and organizing with membership $(b_1, b_2, b_3, \dots, b_n)$;

C = communication skills with membership $(c_1, c_2, c_3, \dots, c_n)$;

D = problem-solving capability with membership $(d_1, d_2, d_3, \dots, d_n)$;

E = performance with membership $(e_1, e_2, e_3, \dots, e_n)$;

with condition that $a \leq b \leq c \leq d$ and $0 < e \leq 1$ stands for the maximum membership. The parameter is frequently assumed to be one. A trapezoidal membership function occurs when $b=c$, resulting in perfect membership functions. An employee is accepted as manager candidate if $b-a=d-c=\delta$. The trapezoidal membership is deemed symmetric and can be represented by only four parameters (a, b, c, d) whereas e represent the employee performance, otherwise, the employee is failed in the assessment another important shape for continuous fuzzy sets is the bell-shaped (Gaussian membership function, specified by three parameters (a, b, e, d) and defined as

Assume $a \leq b \leq c \leq d$ and $0 < e \leq 1$ represent the highest degree of membership. This parameter is usually considered as a parameter representing trapezoidal membership if $b = c$ so that it is a perfect membership. If $b - a = d - c = \delta$ then the employee is accepted as a candidate for manager. The trapezoidal level of ownership is assumed to be symmetrical and can only be represented by four factors (a, b, c, d) , whereas e represents the work of workers, otherwise employees cannot evaluate other important process forms. continuous fuzzy alarm (Gaussian membership, defined by three parameters (a, b, e, d) , defined as:

$$\mu(x) = e \times \exp\left\{-\frac{(x-a)^2}{d-b} \times c\right\}, \dots\dots\dots (4)$$

where $a \in \mathbb{R}$, $b > 0$ and $e \in [0,1]$.

B. Characteristics of Membership Functions

Based on theory of performance, employees with good planning and communication will be more cooperative to reach higher levels [9]. When effective problem solving skills (PSC) are combined with effective communication skills (ECS), these factors can improve employee performance [10]. Previous literature has shown that ECS-based interventions result in better performance, and PSC has also been shown to be related to employee performance. So, it can be assumed that PSC functions to link PO and employee performance.

In addition, this leadership style shows that leaders who have the best problem-solving abilities will be more helpful, especially when working hard. Given that effective communication is important in PSC, and PSC can be considered important, we think that effective communication (ECS) influences PSC and representing the effect of PSC and employees performance [11]. Therefore, this paper aims to find out the mediation model, namely PSC, PO, ECS, and which employees work. This research advances PSC theory and ECS research to a higher level.

For the definition given in this section, he considers a fuzzy set A whose member function μ_A of is defined in the expression X of, for example $\mu_A: X \rightarrow [0,1]$. Based on the results of employee evaluations, the fuzzy set in this study has three characteristics or groups of employees, namely the first group, employees with high performance (P), employees with high problem solving abilities (PSC). Each worker group must support a fuzzy set that applies to all elements of X with a non-zero membership value, so that the work of workers is affected by Effective Communication (ECS), which is modeled as follows:

$$P(x) = \{x \in X: \mu_{A(x)} > 0\}, \dots\dots\dots (5)$$

$$PSC(x) = \{x \in X: \mu_a(x) = 1\}, \dots \dots \dots (6)$$

$$ECS(x) = \{P_{x \in X} \times \mu_A(x)\}, \dots \dots \dots (7)$$

where $P_{x \in X}$ denotes the previous performance results of the employees. If $P(x) = 1$, it exists at least one element $x \in X$ such that that $\mu_A(X) = 1$, then the fuzzy set A is said to be normal; otherwise the data is corrupted no complete.

In subnormal cases, it is very common to normalize the membership function to guarantee that the employee has normal performance equal to 1 lastly, the core of a fuzzy set is the crisp set of all elements that have a membership degree of 1.

Another important characteristic of fuzzy sets is the α -cut representation, which provides a connection between classical set theory and fuzzy set theory. An α -cut, defined at a membership grade α of a fuzzy set A, denoted by a , is a crisp set that contains all elements of the universe of discourse whose membership degrees are greater than or equal to the specified value of LS. In other words,

$$LS(x) = \{x \in X: \mu_A(x) = \alpha\}, \alpha \in [0,1], \dots \dots \dots (7)$$

Note that each fuzzy set can be represented entirely by its components, where for each element $x \in X$, we can choose an operator to become a potential manager according to its performance (P), namely the worker's problem-solving ability (PSC) skill.

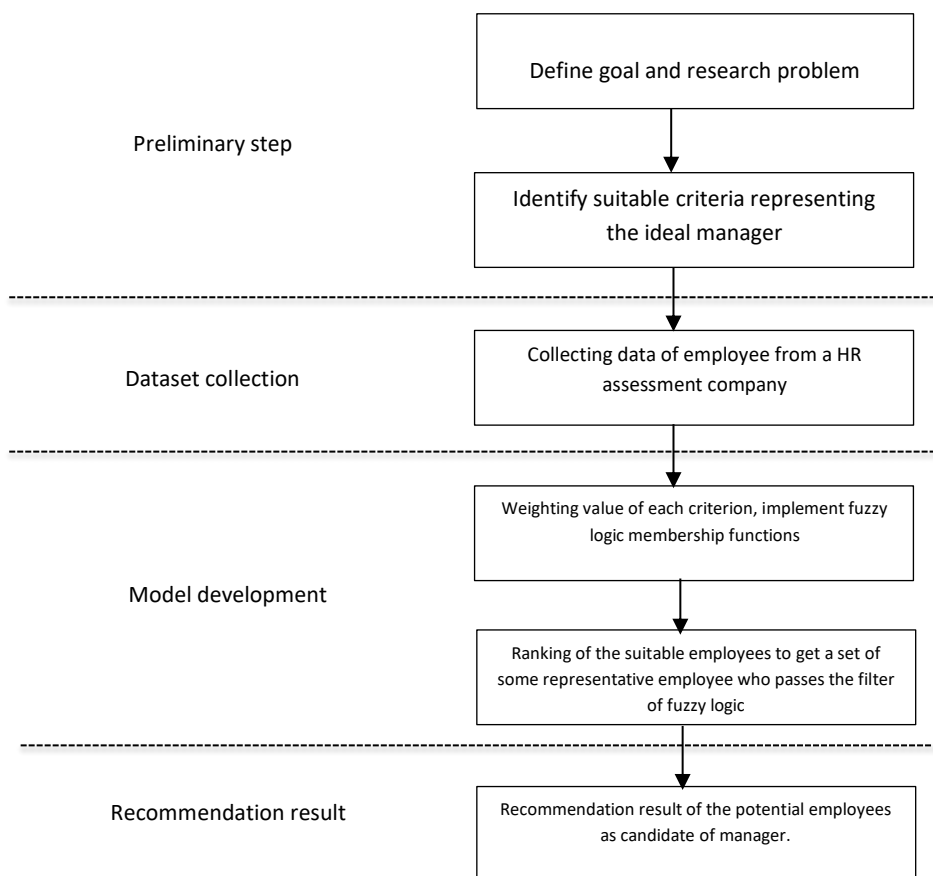


Fig 1. Step of model development process

C. Model development process

Model development in this study is as follows (Figure 1). In the first step, we define the research objectives and questions. In the second step, we identify a suitable model that represents the process of selecting good managers. In the third step, we

collect primary data from companies participating in the HR evaluation. Fuzzy logic functions are then created from the selection process and data for each parameter, which is determined by evaluating the value of each parameter using fuzzy logic membership [12]. In the sixth step, we sort the necessary workers to get a representative worker that passes the fuzzy logic filter. After the seven steps have been taken, we will get recommendations to identify prospective employees who will become future employees.

After defining the problem and creating the model, we define boundaries and evaluate the evaluation criteria. This restriction is based on a process that limits (rejects) the possible choices and identifies them. To do so, we use criteria that limit (reject) the possible choices and are based on a Boolean relationship (true/false), whereas evaluation criteria can be calculated as a Boolean relationship (true/false) evaluation can be calculated as a Boolean relationship (true/false) because all options which may be evaluated according to the degree of use [13].

As can be seen from Figure 1, the proposed model can handle the uncertainties that occur during process evaluation by experts. In this paper, we hope to close a gap in humanities research by using a new method of selecting workers as future leaders. To do so, the fuzzy logic algorithm is proposed below, the process of which includes the following steps:

Step 1. It defines the evaluation process. This step uses the assumption that the decision-making process involves these experts. To do so, the expert decides on the evaluation process and chooses the final run where n represents all samples.

Step 2. This step determines the most important (most affected) and the worst (most important). The expert decides the best and worst of the sets $C = \{c_1, c_2, \dots, c_n\}$. If the expert decides which two or more sizes are the best, which is the worst or the worst, then he decides which model is the best and which is the worst.

Step 3. We also determine the most important (most relevant) process preference (B) in set C relative to other processes for a given process. Suppose there are experts and n processes, where each expert must determine the size of the consensus process B on process ($j = 1, 2, \dots, n$). This is how we compare the best of the best and the rest. System preference B is compared with the j th model determined by expert e which is expressed by E ($e = 1, 2, \dots, n; 1 < e < m$). The value of each pair of E is given through initial measurements with intervals $e \in [0,1]$ so that the weight vector is obtained:

$$E = (e_1, e_2, e_3, \dots, e_n); 1 \leq e < m, \dots \dots \dots (8)$$

where E represents a group of employees who perform well, and m represents employee evaluation based on the impact of process j on W 's evaluation.

Step 4. In this step, we provides a suitable model by assigning C to the worst (W) for a given process. In this case, each expert must determine the effect of procedure j ($j = 1, 2, \dots, n$) on procedure W. The preference of procedure j over model W determined by expert e which defined by W ($j = 1, 2, \dots, n; 1 < e < m$). The values for each pair of W take the values of the predefined parameters in the interval $w \in W: [1,0]$ which provides:

$$D(x) = [E_x]_W^C = \sum_{x \in X}^i [A][B][C][D][E], \dots \dots \dots (9)$$

where:

A = leadership skills with membership ($a_1, a_2, a_3, \dots, a_n$);

B = planning and organizing with membership ($b_1, b_2, b_3, \dots, b_n$);

C = communication skills with membership ($c_1, c_2, c_3, \dots, c_n$);

D = problem-solving capability with membership ($d_1, d_2, d_3, \dots, d_n$);

E = performance with membership ($e_1, e_2, e_3, \dots, e_n$);

Step 5 Gather result recommendations from potential employees as future managers. To obtain these promising results, we have tested the consistency of the fuzzy matrix comparative model. However, when comparing models, there may be some situations that do not follow standard j . Therefore, the next section defines the Correlation (CR), which gives us information



about the comparison between the C and W matrices [14]. To explain how CR is determined, we start with a minimum similarity measure when comparing samples, which is explained in the next section.

As before, sample comparisons were made based on a predetermined scale, with the highest score being 9 or the highest score on the scale determined by the jury. The comparison is said to be inconsistent if there is a maximum difference indicating that the employee has the highest score, and the highest score affects the total score, as well as the correct correlation below:

$$RR = \left[\frac{\sum_{x \in X}^i A}{w_{Aij}} \right] \times \left[\frac{\sum_{x \in X}^i B}{w_{Bij}} \right] \times \left[\frac{\sum_{x \in X}^i C}{w_{Cij}} \right] \times \left[\frac{\sum_{x \in X}^i D}{w_{Dij}} \right] \times \left[\frac{\sum_{x \in X}^i E}{w_{Eij}} \right], \dots \dots \dots (10)$$

in simple form

$$RR = \zeta_A \times \zeta_B \times \zeta_C \times \zeta_D \times \zeta_E \dots \dots \dots (11)$$

When RR is implemented, the largest inequality occurs when $\zeta_A; \zeta_B; \zeta_C; \zeta_D; \zeta_E$ have their maximum values, then we get the final recommendation results of the manager candidate based on their main criteria of A, B, C, D, and E.

D. Aggregation of the Criteria

In the determining the category/process weight, it is necessary to write down the criteria. This weight is used in the process of writing the method. the method balances each sample map (ie each cell in each map) based on its weight and then calculates the results [15]. According to the WLC method, the following mathematical expressions are used to combine the parameters elements :

$$S = \sum w_i x_i \dots \dots (11)$$

where S is suitability, w_i is the normalized value of the weight of factor i , and x_i is the criterion score of factor i .

the memberships provide a simple tool for measuring relationships among the component of the matrices. It means that a low score on one measure can be compensated for by a high score on another measure, which is desirable to take this particular into account [16]. Then the proposed method was chosen as a collective method. As the final result of applying fuzzy logic to our model, we have obtained the integration of this model.

E. Dataset for Identification of Criteria

This information is collected by a human evaluation company that evaluates the selection of managers in these public organizations. It has 120 datasets in it. The size of this data is determined using the sampling objective, with the aim of testing the proposed concepts.

Determining the personnel selection process is an important step in the planning process [17]. Based on the psychological characteristics of the officers, this study analyzes the characteristics and skills of the officers such as A, B, C, D, E. from the latest information, it considers the opinions of experts to assess human resources. To solve a similar problem, it uses the following formula (Table 2):

TABLE 1 MAIN CRITERIA AND SUB-CRITERIA OF MANAGER CANDIDATE SELECTION

Main criteria	Sub-criteria	Definition
Effective Communication Skills (ECS)	C1. Attention	The organization monitors the selection of new employees based on the characteristics of the audience.
	C2. ECS	Effective communication skills reflect the interpersonal relationships created through the process of interpreting, engaging and managing these concepts.
Problem solving capability	C3. PSC1	Employees with high PSC are able to manage time, manage emotions and take advantage of the workplace.
	C4. PSC2	PSC in employee represent their problem solving capability in routine tasks. Employee with high PSC has capability in time management, emotional settings and office resources usages.
Planning and Organizing	C5. PO1	It is the ability to collect information to identify important tasks that need to be carried out and achieve goals.

(PO)	C6. PO2	It is represents how they provide feedback on performance to employees by managing PO strategies, to provide self-support and facilitate the use of resources in work to be successful.
Workload	C7. Workload1	This subscale evaluates employees' ability to cope with job demands, and their duties and responsibilities are the measure of this scale.
	C8. Workload2	This manager can open migration and direct workers to do well in high jobs. The manager also can stimulate key driving force to bring their subordinates and handle a good teamwork in the middle of high workload burden.
Leadership	C9. Leadership1	It represents people ability to help others through sharing information and teamwork. This parameter can be measured from the behavior, beliefs, and solutions of employees in solving problems at work and at work.
	C10. Leadership2	In this parameter, the employees demonstrate their ability to collaborate, communicate and achieve results. These standards also demonstrate their ability to empower teams to adopt new technologies that monitor and solve operational problems across teams and organizations.
Goals and initiatives	C11. Goal	Goals Achievement represents the level of productivity and efficiency.
	C12. Initiative	Proactive initiative refers to the ability of employees to respond to certain situations in the workplace. Employees who are effective at starting jobs can often solve problems through writing and speaking.
Self-appraisal & negativity (SAN)	C13. SAN	SAN is a standard that represents the ability of employees to create their own information through self-assessment. the employees has ability to focus on identifying, implementing, and improving themselves and their partners by using self-assessment techniques to improve work performance.
	C14. Negativity	Negativity is the employee tendency to prohibit and slow down job performance through labor organizations, such as trade unions, and participate in these strikes. It also measure the employee ability to focus on work and organizational interests rather than participating in other organizations. Unhappy employees with high negativity will feel unhappy and create staggering situations lead to conflict in the entire organization.

III. EXPERIMENTAL RESULTS

F. Selection result of the manager candidate based of the leadership skills

Given that standard data are collected in different ways and formats, it is necessary to standardize the data set and turn it into units that can be compared. There are many ways to compare standard procedures. In this case, it is a process whose main elements are categorical values (cultural intelligence), using discrete classifications in which experts assign direct values to fuzzy set elements. In all other groups (values vary gradually from place to place), process elements are normalized using fuzzy concepts based on [13] linear or sigmoid membership functions. For the blur index, a range of 0 to 1 byte is used, with the value closest to 0 being the smallest and closest to 1 being the setting that best suits the feasibility of the wind farm location. The value 0 was removed from the analysis. The results of employee evaluation using fuzzy membership are shown in Figure 2.

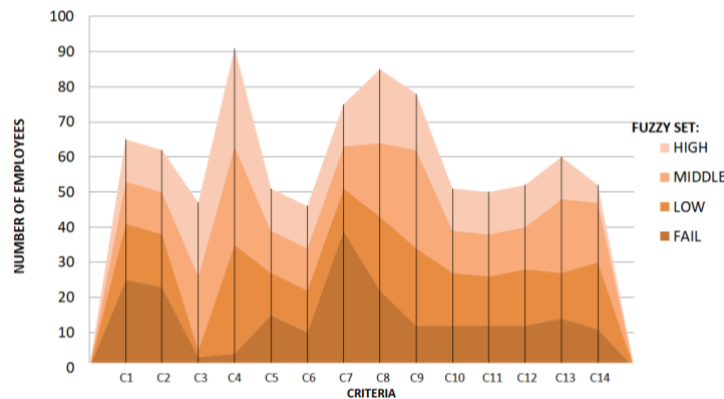


Fig 2. Fuzzy membership for manager candidate selection based of leadership skills

In the Figure 2,, the weighing scale is used to determine the sample weight. After determining the standard, the experts also identify the appropriate standard. It is on this basis that fuzzy logic partitions the employee data set as options to determine the matrix with high, middle, low and fail category. Then the fuzzification weighting is applied to the dataset. from the 120 employees, only 90 employees were complete, while the rest were omitted due to incompleteness or errors. from the 90 records, there are four matrix groups (high, middle, low, failure) that we try to determine the level of leadership of each employee so that a score is created as shown in Figure 2.

From 120 employees, 90 employees has passed the fuzzy filter and having leadership abilities in this study. Figure 2 shows the score result which we consider only high and moderate. It is at this high level that the top two candidates are considered qualified for the Director and Project Manager positions. Then at the MIDDLE level, if a candidate at the HIGH level refuses or resigns for any reason, two candidates with the best results are also chosen as replacements.

We found that the adopted model is not final and can be extended to various target situations, including areas of application. In this study, in determining the weight of the criteria, 14 criteria were given with reference to general knowledge, skills and employee performance. This study selects two managerial abilities because the employee's score is higher than 75 compared to other employees.

G. Manager candidate selection based of the planning and organizing

Similarly, from 120 dataset, it turned out that only 100 were complete, while the rest were deleted because they were incomplete or contained errors. From the 100 data, there were four groups (HIGH, MIDDLE, LOW, and FAIL) that we tested to determine the performance level of each employee who produced a score as shown in figure 3 Since this study has purpose for selecting the highest score, we only consider the HIGH and MIDDLE levels into our analysis.

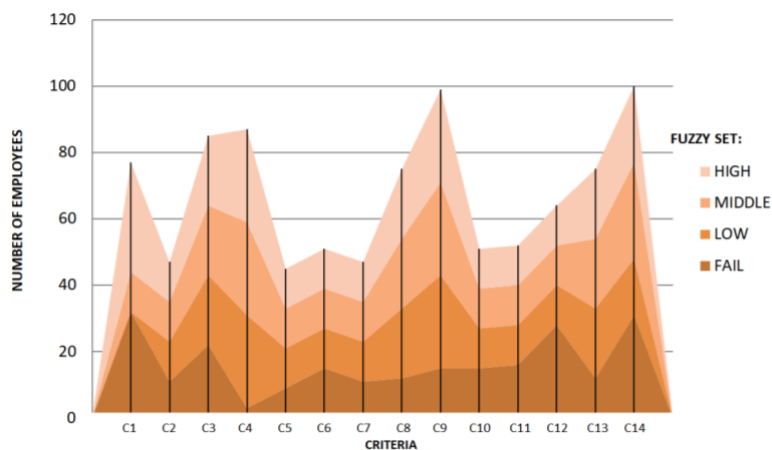


Fig 3. Fuzzy membership for manager candidate selection based of their planning and organizing abilities

Difference from above result, from 120 dataset, only 69 completed dataset to be included in this experimental testing. The completed dataset was tested with our model at the HIGH level obtained four candidates who had the highest performance so that they were considered worthy to fill positions as managers and deputy managers. Then at the MIDDLE level, three candidates who have the highest performance are also obtained so that they can be reserved as an alternative reserve in case the candidate at the HIGH level refuses or withdrawn their selves from the candidacy.

Again, only 100 of 120 employees are selected and the rest were deleted due to incompleteness or errors. From 100 records, we tested four groups (high, middle, low and fail) to find out the activity level of each employee, resulting in a score which shown in Figure 3. Because the purpose of this study was to select the one with the highest score, we only consider high and middle in the analysis.

H. Manager candidate selection based of the effective communication skills

After 120 datasets is fuzzificated, only 69 were completed, and the rest were deleted due to incompleteness or errors. This information will be used to obtain fuzzy membership to select future managers based on effective communication. Once the

model was ready to complete the data set with effective communication as the main theme, we wrote four groups (high, middle, low, it, and did not work), creating an extraordinary nia band as shown in figure 4.

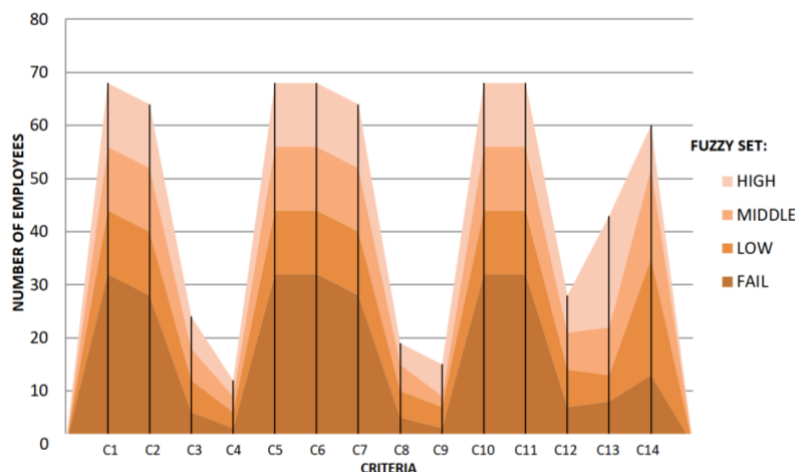


Fig 4. Fuzzy membership for manager candidate selection based of effective communication skills

After processing, the fuzzy membership is written as a set of effective communication capabilities. The test results of 100 employees provide two main groups namely. This senior employees has the four most successful candidates deemed worthy of the presidential and presidential positions. Then at the middle level, if there are candidates at the high level who refuse or resign for any reason, then the top four candidates can be kept as replacement candidates.

H. Manager candidate selection based of the problem-solving capability

From 120 data, it turned out that only 69 were complete, while the rest were deleted because they were incomplete or contained errors. From the completed dataset, there are four groups (HIGH, MIDDLE, LOW, and FAIL) that we tested to determine the level of problem-solving capability of each employee who produced a score as shown in figure 5.

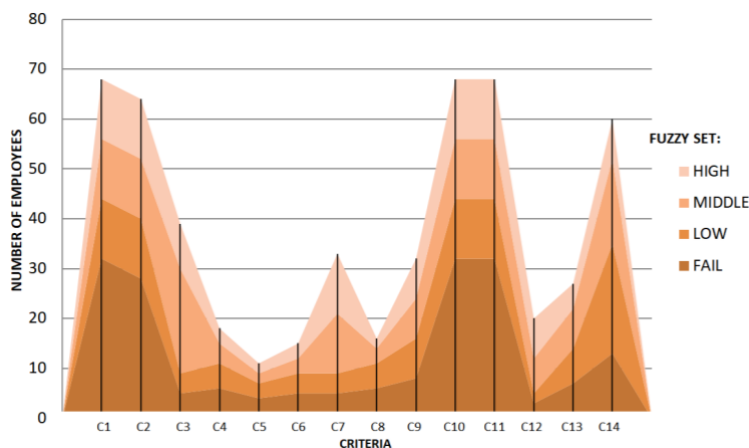


Fig 5. Fuzzy membership for manager candidate selection based of their problem-solving capability

After the processing, the fuzzy membership is collected from the criteria of effective communication skills. From the HIGH level category, three candidates who had the highest performance were obtained so that they were considered worthy to fill positions as managers and deputy managers. Then at the MIDDLE level, three candidates who have the highest performance are also obtained so that they can be reserved as an alternative reserve in case the candidate at the HIGH level refuses or withdraws because of a basis.

After processing, the fuzzy membership is written as a set of effective communication capabilities. From the top ranking, three candidates with the best performance were selected so that they were considered suitable for the positions of Director and

Director. Then at the MIDDLE level we also get the three best candidates, so that if a high level candidate refuses or resigns for any reason, they can be kept as a backup.

I. Manager candidate selection based of the performance

From the 120 dataset, it turned out that only 100 were complete, while the rest were deleted because they were incomplete or contained errors. From the 100 dataset, there were four groups (HIGH, MIDDLE, LOW, and FAIL) that we used to determine the performance level of each employee who produced a score as shown in figure 6.

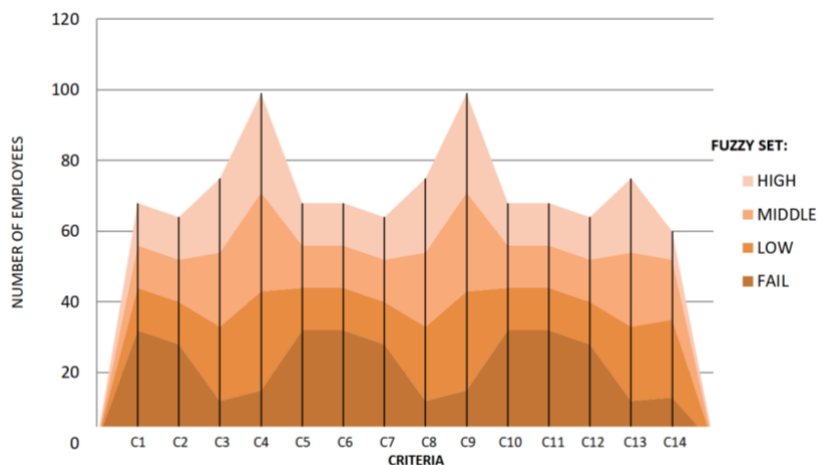


Fig 6. Fuzzy membership for manager candidate selection based of their performance

After processing, the fuzzy membership is collected by the processing system. This model selects high-ranking employees out of 100 employees, so the two best employees are deemed suitable for the manager and deputy positions. The two best candidates are then also accepted at the MIDDLE level to serve as replacements if the candidate at a higher level refuses or resigns for any reason.

Finally, we want to find out which candidates meet all of these criteria. From the test results above, it is known that the manager and deputy candidates has fulfill all the criteria as shown in Table 4.

TABLE 4. SUMMARY OF SELECTED CANDIDATE AND SELECTED RESERVE BY THE PROPOSED MODEL

Main criteria	Selected candidate	Selected for reserve
Leadership skills	2	2
Planning and organizing	4	3
Effective communication skills	4	4
Problem solving capability	3	3
Performance	2	2

J. Manager candidate selection based of all combined criteria

After processing, fuzzy membership is collected from all criteria and sub-criteria. From Figure 6 it can be seen that the selected candidate has the strongest C7 criteria, meaning that he has the ability to work well in workplace with high responsibility. This figure also represents the operator's simulated situation and may differ from the actual situation. The second results shown in the figure is the C5 and C10.

For sub-criteria C5 (Planning and Organization (PO)), the selected candidates have high documentation skills and are motivated to build their team and organization. This candidate is also highly effective at keeping promises to improve the job performance.

The selected candidates also scored highly on C10 (Leadership), which represents their abilities and skills in collaboration, communication and achievement. The results demonstrate their ability to support team adaptation and problem solving across multiple teams and organizations.

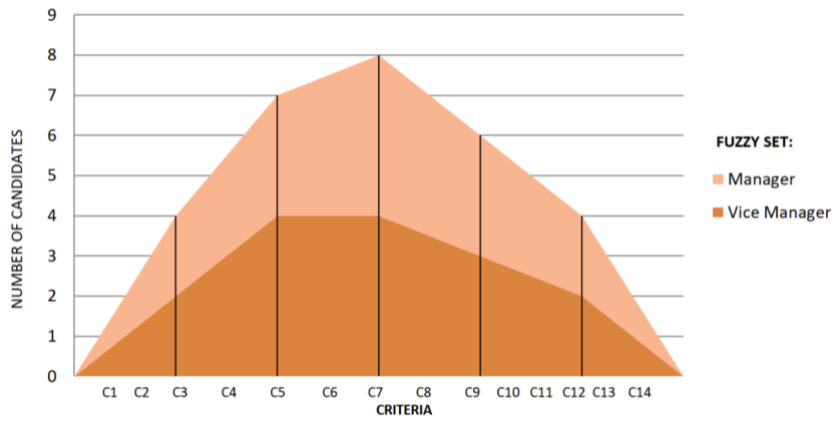


Fig 6. Result of candidate selection based of all criteria combination

Among all the shortlisted candidates which are fuzzified and ranked, all shortlisted candidates are ranked according to the highest score of the process. The most recommended candidate is position C7, followed by C5 and C9. C9 staff can occupy key positions, while C5 and C9 to occupy manager positions. If for some reason an employee for position C7 refuses, then he can be replaced by hiring an employee for position C5 or C9, and so on. While employees who are included in positions C3 and C12 need to be studied further through training or human development.

IV. DISCUSSION

This paper establishes a model for selecting leaders to become future managers. It uses several equations and fuzzy membership to select workers with good criteria. The experimental results show that the proposed model can be used on experimental data using the experimental model [18]. In addition, this study shows that the model can provide recommendations regarding the purpose of selecting employees based on ECS and their performance.

Other researchers believe that leadership is at a level of communication similar to schools of thought [19; 20]. However, investment in the development and use of PSCs remains unclear. These results prove that managers with PSC will devote more energy and resources to identifying, developing and implementing the basic structure that defines the roles of employees in a work standard system [21].

Candidates are ranked based on the difference in total costs, and the solution with the lowest cost is selected from the best solutions closest to the best candidate. The worst candidate is the candidate with the highest margin, who is at or farthest from the next best candidate. Candidate must get the highest score in the whole process. Based on the ranking of jobs that require the use of the proposed model, it can be concluded that the best job candidates are workers who have C5, namely C7 and C10.

V. CONCLUSION

This paper introduces a combination of fuzzy logic and several methods to identify suitable candidates. The criteria presented in this study are used to determine the weight or importance of each measure. This model is used with real population test data to identify the final employees who are fit to become future leaders.

There are many standards in appointing employees as managers. The final selection is obtained by identifying the eight most suitable candidates for management positions. In the test results using the proposed model, the candidate with the highest score is C7. The candidate has the most skill and ability to cross out all of the options.

For measuring the employee rank, the result of this study will provide the candidate's strengths/weaknesses. These assessors can provide appropriate training to other candidates who still score low on other criteria in order to strengthen the skills and performance of employees who have not yet screened prospective candidates.

It should be noted that this process allows for the inclusion of other processes not included in this study. This model expands the theoretical framework of knowledge in candidate selection. Using new methods to solve current problems, it lays the foundation for theoretical and practical application in the general application of HR technology research.

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