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Decision Support Model to Determine the Best Employees (Mechanic) using Fuzzy Logic and Profile Matching

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Abstract: In a company, verifying the best employees is practically very essential. Knowing the best employees or understanding each employee's performance can be an advantage for the company to evaluate the whole company's performance and improve the lack. Determining the best employees is also necessary for giving appreciation to employees and is expected to be able to expand the performance and morale of employees. This study aims to build a Decision Support Model (DSM) to determine the best employee using a combination of fuzzy logic and profile matching methods. In developing the model, there are twelve selected parameters considered; i.e., performance problem diagnosis, problem-solving, preventive action, concept, time management, disciplinary, work management, efficiency, education, support skills, and business workflow. Finally, the model has been methodologically constructed. It is operated in determining the best employee (especially for mechanic staff in workshop) thru evaluating all employees' performance.

Keywords: Decision Support Model, Fuzzy Logic, Profile Matching, Best Employee, Mechanic

Introduction

Employees are one of the most important assets owned by the company in its efforts to maintain survival, develop ability to compete and earn profits (Firdaus *et al*., 2016). Each employee has different skills in carrying out his role as a company asset, one of the employees is a mechanic. Mechanics are experts in repairing and maintaining machines (KBBI, 1983).

The increasingly fierce competition in the business world makes companies strive harder to improve the quality of their companies, one of which is increasing the professionalism of employees. However, having professional employees is certainly not easy for companies, because not many employees are able to realize professionalism at work (Ranggadara and Sahara, 2017). An incompetence in work causes employees to be unproductive, have no integrity, and are irresponsible and the result is that employees leave the company.

If this happens, the company's quality can decline (Suryanto *et al*., 2018), as employees have a key role in maintaining various economic activities in the company. The main reason why people leave the organization is due to lack of recognition, rewards, and career development (Elsdon, 2013). To overcome this problem, various ways are carried out by companies to solve this problem, one of which is to provide compensation or awards to employees with the best performance (Suwati, 2013). Program rewards to employees can positively affect employee performance and thus improve company performance (Gubler *et al*., 2013).

Based on research conducted by (Kosfeld and Neckermann, 2011), individuals who work with promised rewards for best performance have 12% higher performance compared to those who do not. This indicates that the award program for the best performance can improve the performance of individuals. However, the assessment process which is still subjective to employees is a major problem for every company because many factors cause inaccuracies and errors in decision making (Jasri and Rahim, 2017).

Determination of the assessment criteria is also one of the problems in determining the best employees because often the determination of the best employees is constrained by only assessing attendance without paying attention to the ability of employee performance whether the employee is able to complete each job well or not. Or assessing performance without looking at employee absenteeism and other factors (Hertyana, 2018). In addition, the determination of the best employees, which is still done manually, takes a long time (Saputra and Wardoyo, 2017) and tends to cause dissatisfaction and suspicion among employees (Gunawan *et al*., 2016).

Therefore, in this study, a Decision Support Model (DSM) was scientifically made for selecting the best

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employees that was devoted to the best mechanics. The research done aims to help companies that are engaged in the process of determining the best mechanics which is so far done subjectively without operating the clear decision parameters and standard measurement. Then, the mechanic who gets the best predicate actually is going to get the future opportunity (e.g., promotion or getting a bonus). The DSM constructed by using Fuzzy Logic (FL) and Profile Matching (PM) combined methods and considering twelve selected decision parameters.

Literature Review

Decision Support Model

According to (Eom *et al*., 1998), DSM is defined as a computer-based interactive system that: Supports the decision-making process of an organization or company, assists decision-making instead of replacing it, utilizes data and models, solves problems with various levels of structure; unstructured (unstructured or unstructured); semi-structured; semi-structured and unstructured tasks; and structured, semi-structured and unstructured and focuses on the effectiveness rather than the efficiency of the decision process (facilitating the decision process). DSM allows the decision-making process not based on unreasonable things, but DSS (with its concept) allows decision-makers to make decisions in a very logical and correct way (Utama, 2017).

According to (Utama, 2017), DSM has several important components in it. Parameters and values are important components or can be said to be mandatory in the DSM whether they have been processed or not (data and or information) all of them must be involved as optimally as possible in the decision-making process, the parameters and values that will be utilized must also have been processed based on certain rules that Usually it is optimization and statistics to then become a model domain to allow it to be stored and in the future can be used, manipulated and even enriched for decision development needs. Another DSM component is communication media or interfaces, the interface is a very important component used for decision-makers so that decision-makers can take advantage of DSM properly according to their needs. Pictures of DSM components can be seen in Fig. 1.

There are many studies to measure human performance by making decisions using decision support models as a tool for making decisions such as research by (Utama and Oktafiani, 2020), in their research raised a research topic using DSM with fuzzy logic and Profile-Matching (PM) methods to determine the best marketers Seventeen parameters were used in this study, the seventeen parameters selected were inputs from fuzzy rules and ratings were output from fuzzy rules. The membership function used in the model is a Triangular Membership Function (TMF) with specific linguistic variables and boundary values. The model that has been made is applied in medical device marketing companies and is able to measure and present the best ratings from marketers which can make it easier for companies to make important decisions.

Utama *et al*. (2019) in their research raised a research topic using DSM with the fuzzy logic method and designed an Android-based application to evaluate urban forest governance in Indonesia. All data used in the study are secondary data and obtained from online or other documents. There are five parameters used: Namely the area, type of land, number of trees, number of tree species, and quantity of maintenance per year. The model built is able to measure the quality of urban forest governance in five forests in Indonesia as the research sample and shows that the Sensing urban forest has the highest assessment value for urban forest qualifications. Empirically it has become a good urban forest.

Saputra and Wardoyo (2017) in their research raised a research topic using a decision support system with the Simple Additive Weighting method and based on 5 assessment criteria, namely loyalty, responsibility, behavior/ethics, cooperation, and attendance criteria to assist the selection of the best employees. The TOPSIS method is used for decision-making in each appraiser, while the Borda method is used to combine the results of the decisions of each appraiser to obtain the final result in the form of the best employees at the Lombok Garden hotel. Based on the final result of the system of determining the best employees in the form of ranking of the final value of each employee. The highest score will be used as a recommendation as to the best employee at the Lombok Garden hotel.

Pami (2017) in their research raised a research topic using a decision support system with the Promothee method and based on six criteria, namely honesty, appearance, personality, presence, loyalty, and responsibility to assist in making decisions on selecting the best employees. Promothee calculation process is carried out with three criteria, namely leaving flow, entering flow, and net flow. Later, the net flow value will be used as a reference to determine the rank of employees from high to low, judging from the net flow value from large to small. The system created can assist decision making in selecting the best employees by providing a list of employee rankings that have been inputted.

Safii and Zulhamsyah (2018) in their research raised a research topic using a decision support system with the Multi Objective Optimization on The Basis of Ratio Analysis (MOORA) method and based on several criteria, namely efforts to overcome problems, years of service, education and discipline to assist in making selection decisions. the best mechanic. The approach taken by MOORA is defined as a concurrent process to optimize two or more conflicting ones on several constraints. The steps for solving the problem use the Multi Objective Optimization based on Ratio Analysis (MOORA) method, namely making a decision matrix, normalizing the x matrix, and optimizing attributes. The research was

conducted by finding the weight value for each attribute, then a ranking process was carried out which would determine the optimal alternative, namely a Yamaha Alfascorfii motorcycle mechanic.

Fuzzy Logic (FL)

According to (Zadeh, 2008), fuzzy logic or fuzzy logic is the precision logic of impressions and reasoning estimates which basically fuzzy logic is widely seen as an effort to formalize two human abilities, namely: The ability to speak, reason, and make decisions in an imperfect environment that contains uncertainty and limited information. and the ability to perform physical tasks without any calculations or measurements. The fuzzy logic algorithm has several stages in the process, the image of the fuzzy logic process algorithm can be seen in Fig. 2.

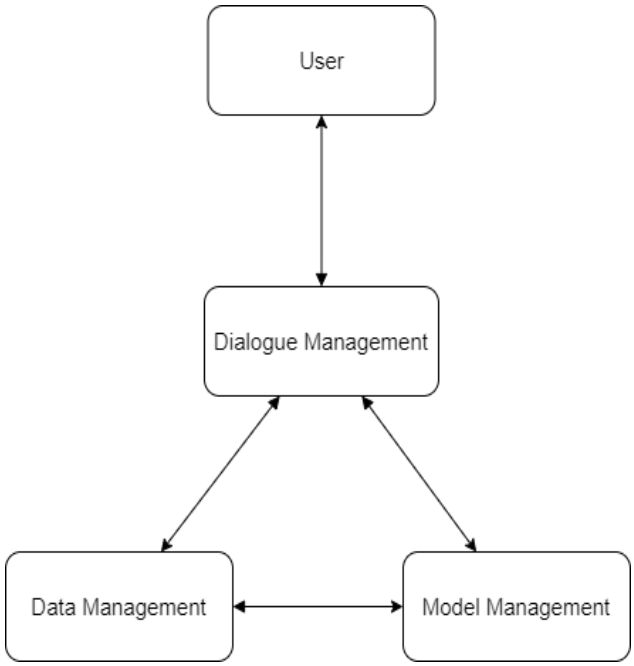

Fig. 1: DSM components (Turban *et al*., 2005)

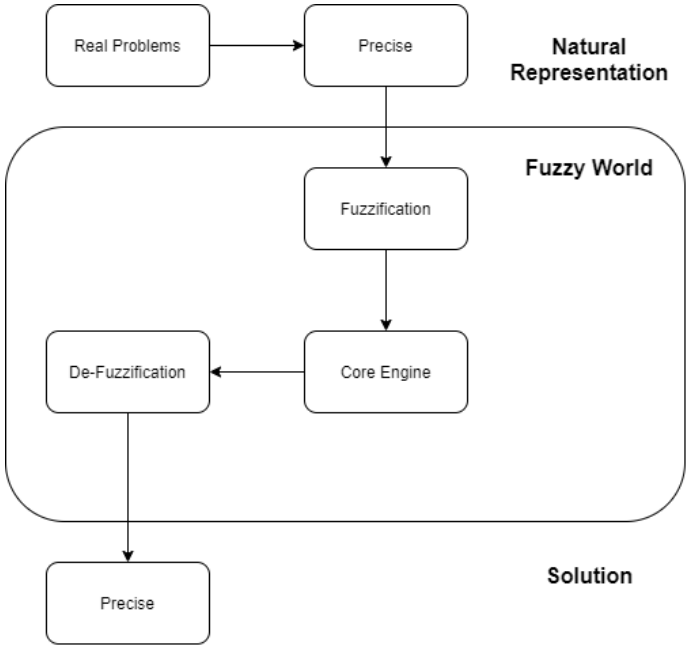

Fig. 2: Fuzzy logic process stage algorithm (Utama, 2017)

The process of starting fuzzy logic begins with a problem that exists form nature. The value obtained from the problem is called the exact value or also called the crisp input. The existing precise value or crisp input will be converted into a fuzzy value where previously the results of traditional logic representations or simple ways of thinking were only 1 and 0 or called true and false. Whereas in fuzzy logic the true or false value is not always represented as 1 and 0 (absolute value) but has a degree of truth or a degree of truth, for example in the example 0.8 (read 0.8 true) and 0, 2 (read 0.2 wrong) (Utama, 2017).

Profile Matching

Profile matching is a decision or decision-making mechanism commonly used in decision support systems that aim to assist decision-making by determining that the subject that must be met must meet the ideal predictor target variable set, the minimum level that must be met or passed (Kusrini, 2007). In solving problems using profile matching, there are several stages.

Gap Mapping

The first stage is gap mapping, which is calculating the gap by calculating the difference between the employee profile and the expected standard profile, or can be shown in the equation below:

$$Gap = Employee\ Profile - Standard\ Profile \tag{1}$$

Gap value ranges may vary according to the subject being measured or the standard profiling performed.

Gap Mapping Analysis

At this stage, the weight value will be determined by each attribute by using a predetermined weight value for each attribute itself. As for input from This weighting process is different from the profile individual and job profiles. That difference obtained can be given the appropriate weight benchmark values in Table 1. A comparison of weights with the Gap value can be seen in Table 1.

Calculation of Core and Secondary Factor Values

After the weight of each attribute is determined, each attribute is grouped into two groups: The core factor and the secondary factor.

Core Factor

Core Factor is the most preferred or most prominent attribute of a position. The core aspect factor is estimated for optimal performance. The calculation of the core factor can be formulated by Eq. 2. Variable NCF means the Average Value of the Core Factors, NC is the Total Core Factor and IC is the Number of Aspects of the Core Factors:

$$NCF = \frac{\sum NC}{\sum IC} \tag{2}$$

Secondary Factors

Secondary factors are aspects other than the core aspect factor. The calculation of the secondary factor can be seen in Eq. 3. Variable NCF means the Average

Value of the Core Factors, NC is the Total Core Factor and IC is the Number of Aspects of the Core Factors:

$$NCF = \frac{\sum NS}{\sum IS} \tag{3}$$

Calculation of Total Value

Calculation of total value. The total score is from the percentage of core and secondary driver factors that are likely to affect the results of each profile. The calculation of the total value is done using the Eq. 4. Variable N means the total score of the criteria, NFS means the average value of the secondary factors, NFC means the average of the core factors and (x) % Entered the percent value:

$$Total\ value = (x)\%\ NFC + (x)\%\ NSF \tag{4}$$

Final Result Determination

Calculation of total value. The total score is from the percentage of core and secondary driver factors that are likely to affect the results of each profile. The calculation to determine the final rank can be done by the Eq. 5. NMA Key Aspect criteria variable is the total score, NSA means the Total score for the Supporting Aspect criteria, and (x) % means the percent value entered:

$$Ranking = (x)\%\ NMA + (x)\%\ NSA \tag{5}$$

Table 1: Gap value weight

Gap	Weight	Description
0	5.0	No difference (competence as required)
1	4.5	Individual competence excess 1 level
-1	4.0	Competence of individuals lacking 1 level
2	3.5	Individual competence excess 2 levels
-2	3.0	Competence of individuals lacking 2 levels
3	2.5	Individual competence excess 3 levels
-3	2.0	Competence of individuals lacking 3 levels
4	1.5	Individual competence excess 4 levels
-4	1.0	Competence of individuals lacking 4 levels

Research Methodology

Figure 3 shows the stages of research used in this study. which will be explained below in detail.

The first thing to do before designing a model or solution, of course, is to conduct a preliminary study. In conducting a preliminary study there are two important things that the author does, namely identifying the problem and conducting a literature study. In identifying a problem. The problem raised in this research is how to determine the best employee or the best mechanic with real parameters and data in the field. This problem is certainly quite worthy of research because of the great influence in giving awards to employees in improving the quality of the employees themselves. Another problem is how to optimize the model made to be more accurate in terms of accuracy and speed. In identifying this problem in addition to conducting a literature study, researchers also identified problems directly in the field against the company PT. BM Motor to learn more about the problems faced by conducting interviews and direct discussions with the owner of PT. BM Motors. After conducting interviews and direct discussions with the owner of the company, it was concluded that the determination of the right parameters in the process of determining the best mechanics, accuracy problems, and time problems became problems in the company in the process of determining the best mechanics.

After identifying the problem, the writer conducted a literature study. Literature study is one of the most important stages in this research. Literature study gives the writer an idea and broad view of the research problem the writer is facing. By conducting a Literature Study the author can find out about the research that has been done to solve this problem so that the author can compare the methods that have been used in previous papers and the knowledge gained will be used to make a better and more optimal DSM by using Fuzzy Logic method to justify the fuzzy value of the parameters and Profile Matching Calculation method to adjust the value of each parameter by calculating the gap of each parameter and multiply by the percentage factor. In addition to comparing the best methods to be used, the author also conducted a literature study for parameter determination. Literature studies conducted for parameter determination play an important role in obtaining the best parameter list in determining the best mechanics by combining several relevant parameters that have been used in previous studies. Some of the best and relevant parameters based on literature study are as follows: Concept, Problem Diagnosis, Problem Solving, Business Workflow, Disciplinary, Communication with others.

Parameter Stages Determining or determining the right parameters or suitable for use in making DSM is one of the most important stages. This is because the parameter is a reference that will be used as a consideration for making decisions. There are several methods that can be used in determining the parameters to be used, including interviews, literature studies, and surveys. In this study, the author chose to use the interview method and literature study in determining the parameters to be used, interviews were conducted with the head of the workshop and senior mechanics, while there were more than 10 papers which were also used as references in determining the parameters of Communication with others.

Data Collecting or Generating is an important step in making a model because in making a decision, data is needed to be tested by the model that has been built. In collecting data, sometimes this activity has its own problems. This is because the data used in making DSM tend to be in the form of Real Data or original data, but it is possible that the data can be obtained through literature studies. In this study, data collection was carried out by conducting interviews with every mechanic in the company based on predetermined parameters, employee attendance data, and the assessment of each team head on the performance of mechanics in carrying out their duties. From these activities obtained a number of 11 mechanical data company PT. BM Motor that will be used as a dataset to be assessed.

At the Model Analyzing and Designing stage, the design and analysis of the model to be made will be carried out. Designing and analyzing the model is very important because it relates to the ability of the model that we will build in executing the research object under study. In doing this step the writer decided to use the Fuzzy Logic method combined with Profile Matching to calculate the suitability between the value of each mechanic and the ideal value. Analysis and design of the model is made using class diagrams, activity diagrams, and other diagrams. The class diagram will explain several classes consisting of research objects, namely mechanics, methods to be used, and parameters or criteria that have been determined. The result of this model is the determination of the best mechanics accompanied by a rating for each mechanic based on their respective values.

The next stage is Model Constructing. Model Construction or model construction is the stage where the DSM is built. DSM has a unique characteristic that one DSM is only intended for one case so that the DSM is made from scratch starting from determining mathematical formulas and programming. In accordance with the method that has been determined in the previous stage, namely Fuzzy Logic and Profile Matching, and the parameters that have been determined, the DSM is ready to be built. In building a DSM, several stages are carried out such as the process of reading data, fuzzification, defuzzification, and calculating the distance suitability, and multiply by the percentage factor using the PM method.

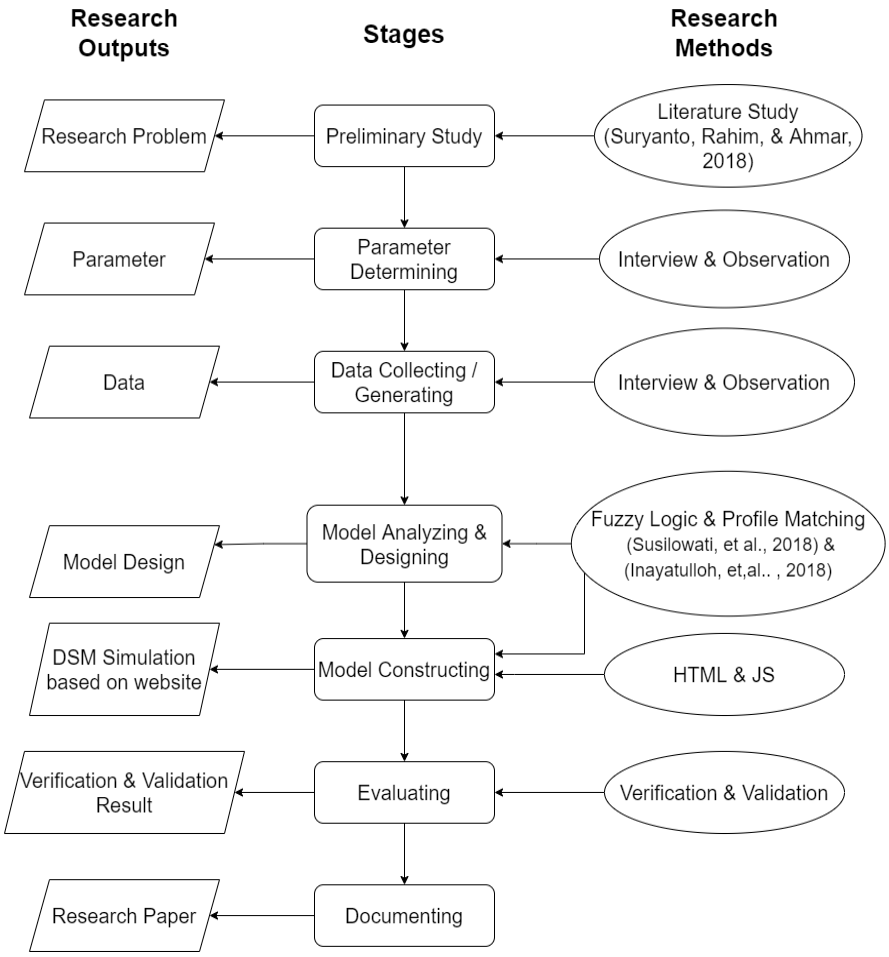

Fig. 3: Structure of Research Stages Using Activity Diagrams

Results

High-Level Configuration of Constructed Model

The built model. This is clearly shown in Fig. 1 via the class diagram. It mainly consists of three central classes: Mechanic, Fuzzy Logic, and Profile Matching. Class criteria describe the parameters considered in the model. This section describes the connections between the parameters. They worked to measure the quality and ranking of each mechanic. The 12 selected parameters are all fuzzy rule inputs and the ranking is fuzzy rule output. The Profile Matching class is divided into three sub-classes, namely core factors, secondary factors, and third factors, all of which affect the input calculation. classes, the membership function used in the model is a Triangular Membership Function (TMF) with specific language variables and restrictions.

Influence Diagram

In this study twelve parameters will be used which are divided into three aspects or factors, namely core factors consisting of parameters: Performance, problem diagnosis, problem-solving and preventive measures, secondary factors consisting of parameters: Concept, time management, discipline, work management and efficiency, the third factor consists of parameters: Education, supporting skills and business workflow. Furthermore, these three factors will be used to determine the best employees using the Fuzzy Logic and Profile Matching methods.

Fuzzy logic is used to avoid confusion of parameter values and consider parameter values based on human linguistics, while profile matching is used to calculate gaps and determine output values by calculating them with predetermined aspects, which will then get results in the form of rankings from employees (mechanics) which are intended to give appreciation or bonuses to mechanics who have worked well. and is expected to increase employee morale. mechanics to provide the best quality and improve mechanical performance. The influence chart can be seen at Fig. 5.

Fuzzy Logic Process

The first step in the fuzzy logic process is to convert the precision value into a fuzzy value (fuzzification). The first stage in the fuzzification process is to create linguistic variables for each parameter. An example that can be seen is that the P10 parameter is categorized into three categories of bad, moderate, and good, which can be seen in Fig. 4. Then the second stage in the fuzzification process is to create a cleaning function for each parameter. A membership function is a representation of a language variable that is mapped to a Degree of Truth (DoT) value.

To determine the DoT value of each parameter (Table 2), a fuzzy triangle membership function with certain linguistic variable limits is used to determine the limits of each parameter. One example that can be seen is Parameter Education (P10) which is divided into three linguistic categories, namely Bad (B), Medium (A), and Good (G), With triangular boundaries (0, 0, 1, 2.5), (1.5, 2.5, 3.5) and (2.5, 4, 5.1, 5.1) which can be seen in Fig. 6. Parameter P10 has one sub-parameter, namely Degree (DEG) which is divided into three linguistic categories, namely Under SMK, SMK, and SMK and Certified. With triangular boundaries (0, 0, 10, 15), (7,5, 15, 22,5), and (15, 20, 31, 31) and can be seen in Fig. 13, the fuzzy rules for the criteria of Degrees VS Education are then made as in Algorithm 1.

Algorithm 1: Fuzzy rules for degree VS education

```
Result: Education Value
if (Degree is Below SMK) then
|           Education is Bad;
else if (Degree is SMK) then
|           Education is Average;
else if (Degree is SMK And Certificated) then
|           Education is Good;
end
```

Core Factor (CF), Parameter Performance (P01), Problem Diagnosis (P02), Problem Solving (P03), Preventive Action (P04) are divided into two linguistic categories, namely Bad (B) and Good (G). With triangular boundaries (0, 0, 1, 4) and (1, 4, 5.1, 5.1) Fig. 10. For parameter, P01 has one sub parameter, namely Completed Work Performance (CP) which are divided into three linguistic categories, namely Bad (B), Medium (A), and Good (G). With triangular borders (0, 0, 7.5, 15), (7.5, 15, 22,5) and (15, 22.5, 31, 31). Parameters P02, P03, and P04 each have three sub-parameters, namely Mechanical (MC), Electrical (EC), and Others (OT). Each sub-parameter is divided into two linguistic categories namely Bad (B) and Good (G), With triangular bounds of (0, 0, 5, 25) and (5, 25, 31, 31) Fig. 8. Mechanical sub-parameters have four sub-parameters namely Engine (E), Transmission (T), Legs (K), Brake System (BS), and Service System Reset (SSR), Electrical sub-parameters have four sub-parameters parameters, namely Service System Reset (SSR), Engine Control Unit (ECU), Air Conditioner (AC), Body Electrical (BC) and the Others sub-parameter has three sub-parameters namely Hybrid Engine (HE), Tools Handling (TH), Diagnostic Tools Handling (DTH). Each sub-parameter of MC, EC, and OT is divided into three linguistic categories, namely Bad (B), Average (A), and Good (G). With triangular bounds of (0, 0, 7.5, 15), (7.5, 15, 22.5) and (15, 22.5, 31, 31) Fig. 12.

For Secondary Factor (SF), the parameters Concept (P05), Time Management (P06), Disciplinary (P07), Work Management (P08), and Efficiency (P09) are divided into two linguistic categories, namely Bad (B) and Good (G). With triangular bounds of (0, 0, 1, 4) and (1, 4, 5.1, 5.1) Fig. 11. Parameter P05 has three sub-parameters, namely MC, EC, and OT. Each sub-parameter is divided into two linguistic categories, namely Bad (B) and Good (G). With triangular bounds of (0, 0, 5, 25) and (5, 25, 31, 31) Fig. 9. The Mechanical sub-parameter has four sub-parameters namely ET, K, BS, and SSR, the Electrical sub-parameter has four sub-parameters namely SSR, ECU, AC, BC, and the Others sub-parameter has three sub-parameters namely HE, TH, DTH. Each sub-parameter of MC, EC, and OT are divided into three linguistic categories, namely Bad (B), Average (A), and Good (G). With triangular bounds of (0, 0, 7.5, 15), (7.5, 15, 22.5) and (15, 22.5, 31, 31).

For parameters P06, P07, P08 there are four sub-parameters, namely: Concept (CO), Explaining Base on Role or Position (EBR), Action (ACT), and Ability to

Improve (ATI) which are divided into three linguistic categories, namely Poor (B), Medium (A), and Good (G). With triangular boundaries (0, 0, 10, 15), (7,5, 15, 22,5) and (15, 20, 31, 31) Fig. 14. Parameter P09 has one sub-parameter, namely Completed Work Efficiency (CE) which is divided into three linguistic categories, namely Bad (B), Medium (A), and Good (G). With triangular borders (0, 0, 10, 15), (7.5, 15, 22,5) and (15, 20, 31, 31).

The Third Factor (SF) consists of three parameters, namely: Education (P10), Support Skills (P11), and Business Workflow (P12). Parameters P11 and P12 are divided into two linguistic categories, namely Bad (B) and Good (G). With triangular bounds of (0, 0, 1, 4) and (1, 4, 5.1, 5.1). Parameter P11 has three sub-parameters, namely Internet and Computer (IAC), English (ENG), and Communication with Others (CWO) that are divided into three linguistic categories, namely Bad (B), Average (A), and Good (G). With triangular bounds of (0, 0, 10, 15), (7.5, 15, 22.5) and (15, 20, 31, 31) Fig. 7. Parameter P12 has four sub-parameters, namely: Concept, Explaining Base on Role or Position, Action, and Ability to Improve that divided into three linguistic categories, namely Bad (B), Average (A), and Good (G). With triangular bounds of (0, 0, 10, 15), (7.5, 15, 22.5) and (15, 20, 31, 31).

Furthermore, calculations are carried out on samples of 15 mechanical data that have been collected and will be used as input into the Fuzzy Logic method to go through the process of fuzzification and defuzzification to get fuzzy values or Crisp Output

(Table 3). The data that will be used as input is the value from the evaluation of the mechanics which is measured based on the performance of each mechanic. Then the fuzzy value will be calculated again using the profile matching method to get the total value or final value that will be used for ranking each mechanic and to provide recommendations for the best employees.

After going through the Fuzzy Logic process by using raw data for each parameter which can be seen in Table 4 to 10, the Crisp Output value can be seen in Table 11. This value (Crisp Output) will be continued to the Profile Matching process which aims to calculate the total value for each mechanic and determine the ranking based on the three predetermined aspects, namely Core Factor, Secondary Factor, and Third Factor. The first thing to do is to divide the parameters into three aspects (Table 2), namely Core Factor, Secondary Factor, and Third Factor The distribution of the parameters into 3 aspects is due to the difference in the weights possessed by each aspect.

Furthermore, the process of mapping the Gap value for each parameter will be carried out. The process of mapping the Gap value using the Crisp Output that has been obtained previously and the gap will be mapped with the target value using the gap calculation formula which can be seen in Eq. 1. Because each parameter has the same target value of 5, each Crisp Output value for each parameter will be deducted by 5 and the Gap value will be obtained. Gap value mapping for each parameter can be seen in Table 12.

The gap values that have been mapped will be weighted based on the provisions of the gap values and weights that have been made in Table 1. The results of the calculation of the weighting of the Gap value and the weight value can be seen in Table 13. The next step will be to calculate the total value of each parameter which is divided into three aspects namely Core Factor, Secondary Factor, and Third Factor. The process of calculating the total value for each aspect is done by first adding each parameter in the same aspect and dividing by the number of parameters in that aspect. The total value for the Core Factor aspect can be seen in Table 14, the total value for the Secondary Factor aspect can be seen in Table 15 and the total value for the Third Factor aspect can be seen in Table 16.

Table 2: Parameter decision support model

Factor	Code	Parameter	Weight
Core factor	P 01	Performance	45%
	P 02	Problem diagnosis	
	P 03	Problem solving	
	P 04	Preventive action	
Secondary factor	P 05	Concept	35%
	P 06	Time management	
	P 07	Disciplinary	
	P 08	Work management	
	P 09	Efficiency	
Third factor	P 10	Education	20%
	P 11	Support skills	
	P 12	Business workflow	

Table 3: Raw data input concept sub-parameter

	Concept								
	Mechanical			Electrical			Others		
	E	…	BS	SR	…	BE	HE	TH	ET
M 01	10	…	15	11	…	24	25	18	25
M 02	30	…	27	11	…	22	14	18	21
…	…	…	…	…	…	…	…	…	…
M 14	20	…	10	20	…	40	13	20	12
M 15	40	…	18	30	…	23	90	15	22

Table 4: Raw data input problem diagnosis sub-parameter

	Problem diagnosis								
	Mechanical			Electrical			Others		
	E	…	BS	SR	…	BE	HE	TH	ET
M 01	12	…	29	20	…	18	13	24	28
M 02	23	…	29	18	…	30	12	30	20
…	…	…	…	…	…	…	…	…	…
M 14	12	…	50	19	…	15	15	30	23
M 15	10	…	24	90	…	60	18	30	50

Table 5: Raw data input problem-solving sub-parameter

	Problem-solving								
	Mechanical			Electrical			Others		
	E	…	BS	SR	…	BE	HE	TH	ET
M 01	28	…	19	29	…	30	30	27	12
M 02	23	…	13	30	…	80	70	10	50
…	…	…	…	…	…	…	…	…	…
M 14	12	…	19	30	…	12	50	26	18
M 15	18	…	19	23	…	30	20	27	20

Table 6: Raw data input preventive action sub-parameter

	Preventive action								
	Mechanical			Electrical			Others		
	E	…	BS	SR	…	BE	HE	TH	ET
M 01	27	…	29	11	…	15	18	20	30
M 02	10	…	90	24	…	10	50	17	80
…	…	…	…	…	…	…	…	…	…
M 14	24	…	10	28	…	28	60	16	16
M 15	15	…	10	21	…	60	30	15	11

Table 7: Raw data input business workflow and time management sub-parameter

	Business workflow				Time management			
	CO	EBR	ACT	ATI	CO	EBR	ACT	ATI
M 01	27	15	11	30	27	16	10	26
M 02	60	13	30	20	80	80	28	25
…	…	…	…	…	…	…	…	…
M 14	19	25	24	11	15	16	22	30
M 15	15	22	10	21	18	60	27	24

Table 8: Raw data input disciplinary and work management sub-parameter

	Disciplinary				Work management			
	CO	…	ACT	ATI	CO	…	ACT	ATI
M0 1	24	…	11	23	14	…	11	14
M0 2	12	…	10	30	17	…	50	12
…	…	…	…	…	…	…	…	…
M1 4	50	…	20	60	17	…	10	25
M1 5	40	…	21	22	27	…	25	90

Table 9: Raw data input efficiency and performance sub-parameter

	Efficiency CE	Performance CP
M 01	10.8	30.0
M 02	12.0	10.0
…	…	…
M 14	3.0	8.5
M 15	24.0	24.0

Table 10: Raw data input support skills and education sub-parameter

	Support skills			
	IAC	ENG	CWO	Education Degree
M 01	22	27	30	SMK
M 02	22	27	30	Below SMK
…	…	…	…	…
M 14	12	10	80	SMK and certificated
M 15	20	14	60	SMK

Table 11: Crisp output of mechanic

	P 01	P 02	…	P 11	P 12
M 01	4	3	…	4	3
M 02	2	3	…	2	2
…	…	…	…	…	…
M 14	4	3	…	1	3
M 15	4	3	…	2	3

Table 12: Gap mapping of each parameter

	P 01	P 02	…	P 11	P 12
M 01	4	3	…	4	3
M 02	2	3	…	2	2
…	…	…	…	…	…
M 14	4	3	…	1	3
M 15	4	3	…	2	3
GAP	5	5	…	5	5
	P 01	P 02	…	P 11	P 12
M 01	-1	-2	…	-1	-2
M 02	-3	-2	…	-3	-3
…	…	…	…	…	…
M 14	-1	-2	…	-4	-2
M 15	-1	-2	…	-3	-2

Table 13: Calculation of the weight of each parameter

Mechanic	P0 1	P0 2	…	P 11	P 12
M 01	4	3	…	4	3
M 02	2	3	…	2	2
…	…	…	…	…	…
M 14	4	3	…	1	3
M 15	4	3	…	2	3

Table 14: Core Factor Value

Mechanic	P0 1	P0 2	P0 3	P0 4	CF
M 01	4	3	3	3	3.25
M 02	2	3	2	3	2.50
…	…	…	…	…	…
M 14	4	3	3	3	3.25
M 15	4	3	3	4	3.50

Table 15: Secondary factor value

Mechanic	P0 5	P0 6	P0 7	P0 8	P0 9	SF
M 01	4	3	…	4	…	3.00
M 02	2	3	…	2	…	2.25
…	…	…	…	…	…	…
M 14	4	3	…	1	…	2.00
M 15	5	3	…	2	…	2.75

Table 16: Third-factor value

Mechanic	P 10	P 11	P 12	TF
M 01	4	3	…	3.33
M 02	2	3	…	2.00
…	…	…	…	…
M 14	4	3	…	1.66
M 15	5	3	…	2.66

Table 17: Total value calculation for each mechanic

Mechanic	CF	SF	TF	Total	Rank
M 01	3.25	3.00	3.33	3.18	60
M 02	2.50	2.25	2.00	2.28	12
…	…	…	…	…	…
M 09	3.25	4.00	4.00	3.70	10
…	…	…	…	…	…
M 14	3.25	2.00	1.66	2.41	11
M 15	3.50	2.75	2.66	3.02	

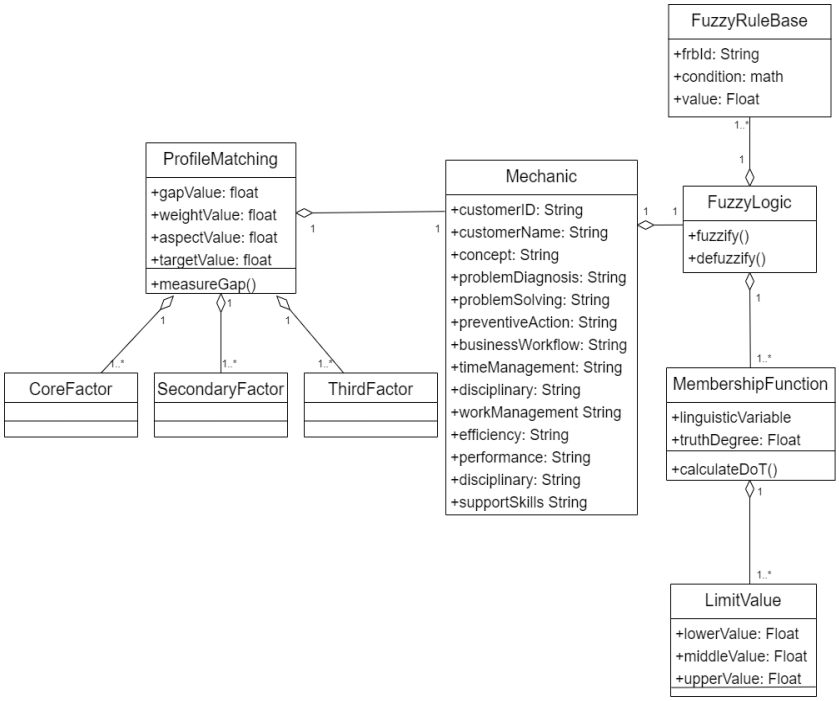

Fig. 4: Class diagram

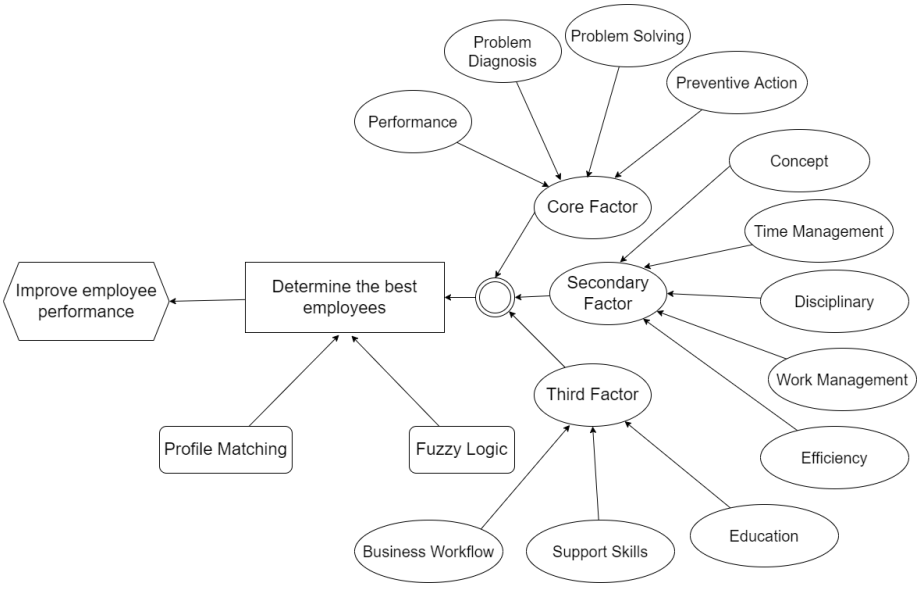

Fig. 5: Influence diagram

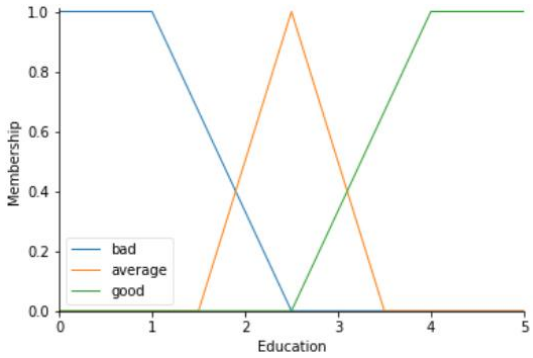

Fig. 6: The graph of fuzzy triangular membership function parameter education

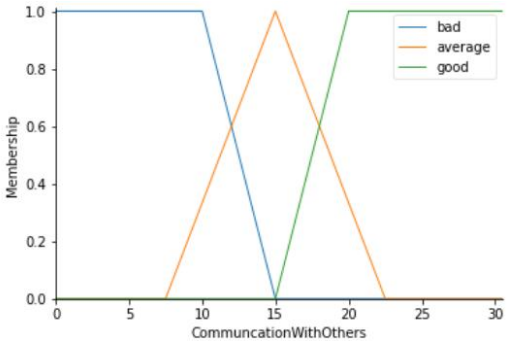

Fig. 7: The graph of fuzzy triangular membership function for sub-parameter communication with others

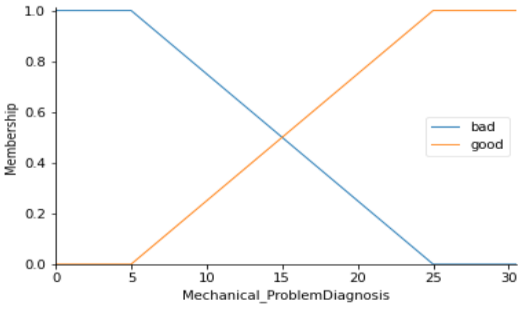

Fig. 8: The graph of fuzzy triangular membership function for mechanical problem diagnosis

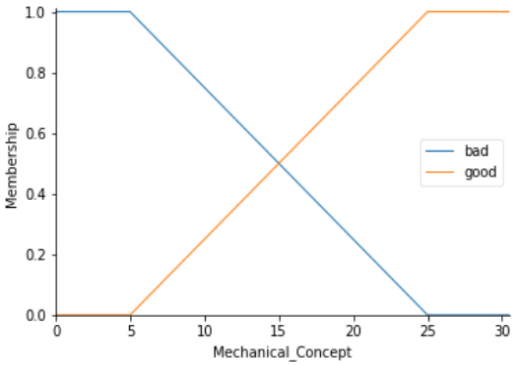

Fig. 9: The graph of fuzzy triangular membership function for the sub-parameter mechanical concept

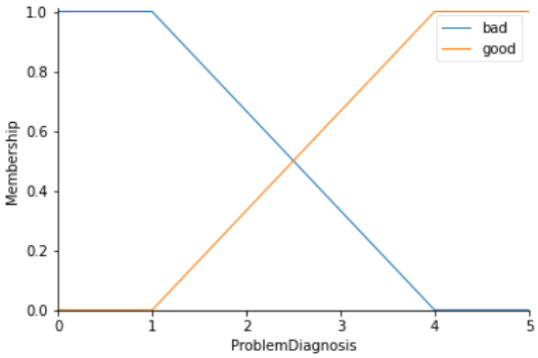

Fig. 10: The graph of fuzzy triangular membership function for parameter problem diagnosis

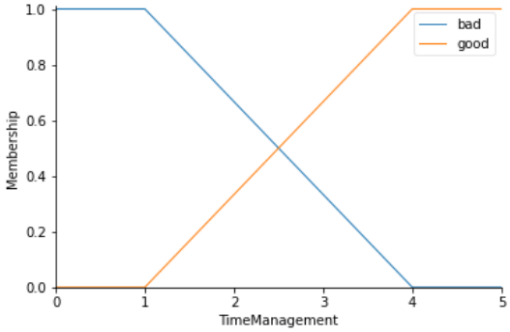

Fig. 11: The graph of fuzzy triangular membership function for parameter time management

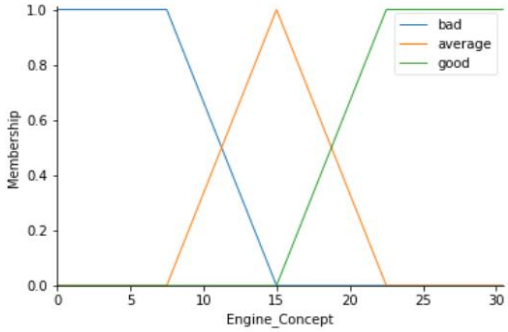

Fig. 12: The graph of fuzzy triangular membership function for sub-parameter engine concept

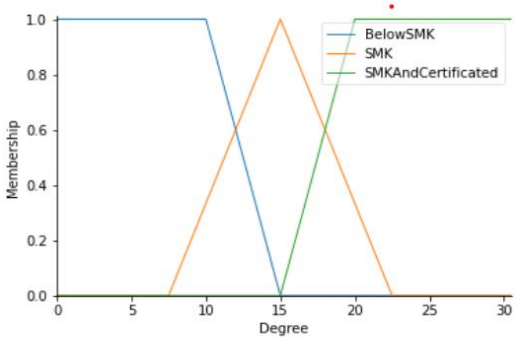

Fig. 13: The graph of fuzzy triangular membership function for sub-parameter degree

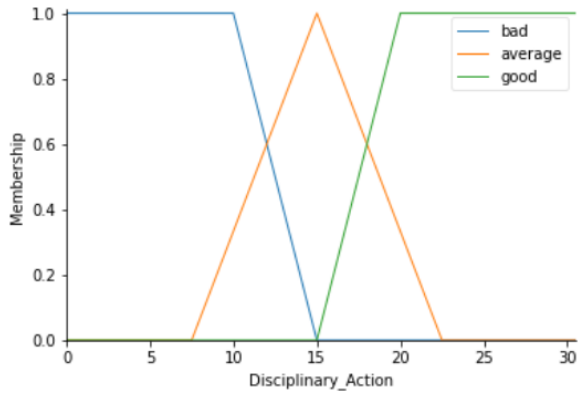

Fig. 14: The graph of fuzzy triangular membership function for sub-parameter degree

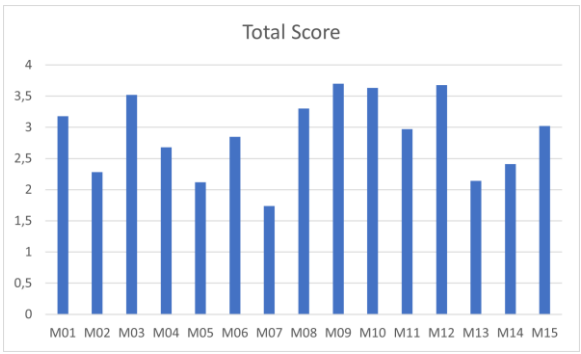

Fig. 15: Total score for each mechanic

Then after obtaining the total value for each aspect, each aspect will be multiplied by the percentage or weight of each aspect where the Core Factor has a weight of 45%. Secondary Factor has a weight of 35% and Third Factor weights 20%. Furthermore, the total value that has been calculated for each aspect will be added up and a final value will be produced where the highest value can be recommended as the best mechanic in the company. The results of the calculation of the total value can be seen in Table 17 and a graph is also made that aims to compare the total value for each mechanic which can be seen in Fig. 15 and you can see a comparison of the performance of each mechanic. From Table 17 it can be concluded that Mechanic M 09 obtained a value of 3.7 and is the highest value compared to other mechanics so that Mechanic M 09 is recommended as the best mechanic at this time.

Discussion

Previously, in measuring mechanical performance and determining the best mechanic, it was only determined based on a direct assessment from the supervisor without clear criteria or reasons, and caused several problems. The assessment process which is still subjective to employees is a major problem for every company because many factors cause inaccuracies and errors in decision making (Jasri and Rahim, 2017). Determining the assessment criteria is also one of the problems in determining the best employees because often the determination of the best employees is constrained by only assessing attendance without paying attention to the ability of the employee's performance and whether the employee is able to complete each job well or not. Or assessing performance without looking at employee absenteeism and other factors (Hertyana, 2018). In addition, the determination of the best employees, which is still done manually, takes a long time (Saputra and Wardoyo, 2017) and tends to cause dissatisfaction and suspicion among employees (Gunawan *et al*., 2016) Therefore, in this study a decision support model (MPK) was made for the selection of the best employees which was devoted to the best mechanics.

Many studies related to DSM use the main concept of FL to assess the performance of human resources: Yaqin *et al*. (2014) who conduct research in determining the right supervisor for students based on several assessment factors, namely lecturer competence, student GPA, lecturer guidance load and student thesis scores. This research was conducted at one of the universities in Yogyakarta, namely STMIK AMIKOM using test data selected randomly from 2163 student data. After testing, the decision support system made in this study has an accuracy rate of 87% and is able to provide optimal suggestions and solutions in the appointment of supervisors.

Sari and Mochammad (2020) conducted research in providing recommendations for determining the best employees by creating a decision support model using the Simple Multi-Attribute Rating Technique (SMART) method which was determined based on six criteria, namely performance, productivity, absenteeism, commitment, discipline, and cooperation. This research was conducted at a banking company, namely PT. Panin Bank by using employee data in the company. The final result of this research is the ranking of employees from the worst to the best.

However, (Astari and Umar, 2020) who conducted research to compare two methods, namely SMART and Profile Matching in the selection of laboratory assistants in universities using 12 criteria divided into four aspects using 7 participant data taken in 2019. It was found that the accuracy generated using the Profile Matching method is 100% while using the SMART method is only 42.8%. Also according to (Verdian and Wantoro, 2019) who compared two methods, namely profile matching and the combination of fuzzy logic and profile matching in the selection of vice principals, the combination of fuzzy logic and profile matching resulted in better accuracy than using the fuzzy logic method alone.

Therefore, a combination of fuzzy logic and profile matching methods will be used in the development of decision support models.

Conclusion

In this study, a Decision Support Model is made to determine the best mechanic based on twelve core parameters, namely Performance, Problem Diagnosis, Problem Solving, Preventive Action, Concept, Time Management, Disciplinary, Work Management, Efficiency, Education, Support Skills and Business Workflow which have their respective sub-parameters. Fuzzy Logic and Profile Matching methods are used in making the Decision Support Model due to differences in weight for aspects which are divided into three parts, namely Core Factor, Secondary Factor, and Third Factor.

In addition, the Fuzzy Logic and Profile Matching methods are very helpful in determining mechanic ranking values. Based on the object-oriented method, the model is described in a class diagram and the results of these calculations and results are displayed in the form of a table and chart. This diagram clearly shows the relationships between the entities or classes in each model. The level of accuracy of the FL method can minimize the value of ambiguity, so the expected end result is more accurate and rational.

This model is very useful for high-level decision-making. This is where emotions and assumptions need to be set aside when making decisions and the top-level needs to be more specialized. The findings provide the top companies conducting the survey to more quickly and effectively determine who has the right to become the company's top mechanic. In this way, suspicion can be minimized and psychological stress and errors that are likely to be dominated by emotions can be reduced.

For further developments, additional parameters or criteria can be used. The addition of parameters or criteria can improve the performance and accuracy of the model in providing the best mechanical recommendations. Other methods can also be used for different conditions.

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Author's Contributions

Hiromi Jorge Akbar Aljofarinski: Analyzing all data, design the model, and finalizing the manuscript.

Ditdit Nugeraha Utama: Reviewing and finalizing the model and manuscript.

Ethics

This manuscript substance is the authors' own original work and has not been previously published somewhere else. Authors already read and approved the manuscript and no potential ethical issues immersed.

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