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Design of a Decision Support System for Performance Appraisal of Civil Servants with a Fuzzy Multi Attribute Decision Making Model

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A R T I C L E I N F O

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ABSTRACT (9 PT)

In accordance with the regulations that have been determined by the office to obtain a promotion, criteria are needed to determine who will be elected to receive a promotion. Promotions are carried out with the aim of providing feedback on the performance produced by a civil servant during a certain period. To help determine the application of someone who deserves to be promoted to a Decision Support System, the Fuzzy Multi Attribute Decision Making (FMADM) model is used. In this study, a case was raised, namely looking for the best alternative based on predetermined criteria using the Simple Additive Weighting (SAW) method to calculate the FMADM model in this case. The fuzzy used uses a fuzzy system rule, namely fuzzification, inference and defuzzification. The FMADM model was chosen because it is able to select the best alternative from a number of alternatives, namely those who have the right to choose employees to be promoted to their positions according to the specified criteria. 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 the best civil servant.

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1. INTRODUCTION

Employees are human resources who carry out their duties. As teachers at the Tanjung Harapan State Islamic Madrasah, with the aim of being able to manage an office of the Tanjung Harapan State Islamic Madrasah and serve students. Madrasah Ibtidaiyah Negeri Tanjung Harapan makes an employee who has good performance with an assessment called employee performance appraisal, as well as Madrasah Ibtidaiyah Negeri Tanjung Harapan. In work activities, the Tanjung Harapan State Islamic School, various ways and efforts are carried out to evaluate employees periodically.

The implementation of employee performance appraisal needs to be carried out in every organization or agency by involving the management. Performance appraisal is an important part of the entire process of employee activities concerned. Performance appraisal in general aims to

provide feedback to employees in an effort to improve the appearance of work, increase the productivity of an organization, and is specifically carried out with regard to various policies towards employees, such as for the purpose of promotion, salary increases, education, training, and others (Lina, 2014) (Fatimah, 2017). Performance appraisal can be the basis for knowing the extent to which human resource management activities, such as recruitment, selection, placement, and training are carried out properly and effectively.

From the process of evaluating the performance of Civil Servants, namely the list of job performance appraisals (DP3), the role of the decision support system is needed to improve the efficiency of decision making (Nomor, 10AD). The role of the decision support system will assist management in achieving the objectives of employee performance appraisals, such as promotions, without overriding the parameters that have been determined by the Tanjung Harapan State Islamic School. The process of evaluating employee performance if done manually, especially in calculating the final value of each Civil Servant, takes a long time because of the large number of civil servants. Therefore, to increase the effectiveness and efficiency of decision making, need to be supported by a computerized system that can assist the management in making a decision. The model used in the promotion decision support system is Fuzzy Multi Attribute Decision Making (FMADM).

In general, Fuzzy Multi Attribute Decision Making has a specific goal (criteria) with the best characteristics and classifies alternatives based on certain roles (Septiana, Irfan, Atmadja, & Subaeki, 2016) (Gea, 2016) (Dwiyan, 2017). One method to solve the problem of Fuzzy Multi Attribute Decision Making is to use the Simple Additive Weighting (SAW) method to rank after the fuzzy data conversion to crisp data has been carried out (Anjarwati & Nursekha, 2015) (WIKANSARI, SYAHPUTRA, & MURFAT, n.d.) (Hariansyah, 2020).

In the late 19th century to the 20th century, probability theory played an important role in solving the problem of uncertainty (Zarkasi, Lestari, & Kumalasari, 2015) (Yosuanto, 2012) (Kusumaningrum, 2016). This theory continued to develop, until finally in 1965, Lotfi A. Zadeh introduced the fuzzy set theory, which implies that not only probability theory can be used to represent uncertainty problems. However, fuzzy set theory is not a substitute for probability theory. In fuzzy set theory, the main component that is very influential is the membership function. The membership function represents the degree of proximity of an object to certain attributes, while probability theory is more on the use of relative frequency (SUSANTI, 2014) (Ross, 2005). Fuzzy set theory is a mathematical framework used to represent uncertainty, obscurity, imprecision, lack of information, and partial truth (Hardi, 2015) (Yuliandono, Chumaidiyah, & Aurachman, 2015) (Dira Ernawati, 2016).

A complete fuzzy rule-based system consists of three main components, namely Fuzzyfication, Inference and Defuzzy fivation. Fuzzy fication changes inputs whose truth values are definite (crisp input) into fuzzy inputs, which are linguistic values whose semantics are determined based on certain membership functions. Inference reasoning using fuzzy input and fuzzy rules that have been determined so as to produce fuzzy output. Meanwhile, Defuzzification changes the fuzzy output to a crisp value based on a predetermined membership function (Basu, 2012).

2. RESEARCH METHOD

2.1 Research Framework

Several research methods were carried out by the author in order to collect the data needed for research needs. Among them is by way of observations made by the author directly at the research site. For more details below, the author describes the research methods that the author uses, namely: Correlational; Evaluation; Survey; Case study; Basic theory

2.2 System Requirements Analysis

Based on the results of observations made by the authors of the case study company solids, the authors describe the system requirements in the form of a flow of document, as shown in the table below:

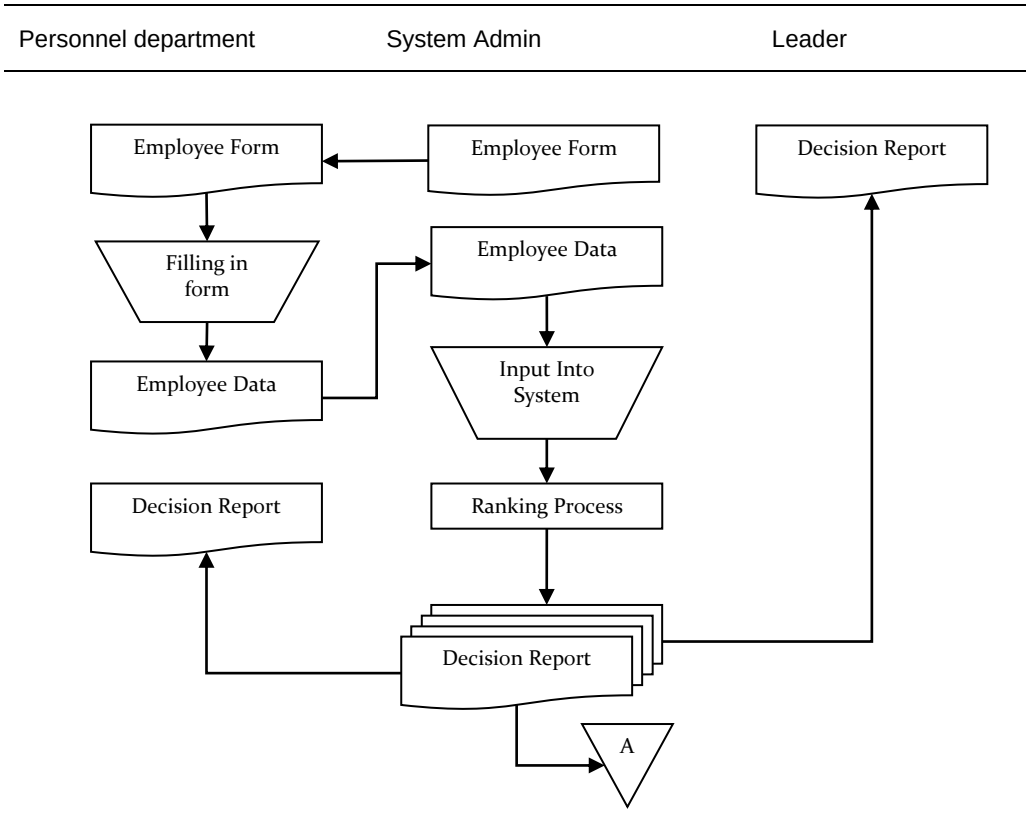

Figure 1. Flow Of Document System Requirements

Based on the observations, the analysis of system requirements can be seen from the flow of document table above, the system requires an Employee data form document as input data so that the system can perform the ranking calculation process using the SAW method.

2.3 SAW method

The SAW method is often also known as the weighted addition method. The basic concept of the SAW method is to find the weighted sum of the performance ratings for each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all existing alternative ratings. The formula for the Simple Additive Weighting (SAW) method can be seen below:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max\ x_{ij}} \ Jika\ j\ adalah\ attribut\ keuntungan\ (benefit) \\ \frac{i}{Min\ x_{ij}} \\ \frac{i}{x_{ij}} \ jika\ j\ adalah\ attribut\ biaya\ (cost) \end{cases} \quad \text{..... (1)}$$

Description:

rij = normalized performance rating value
xij = attribute value owned by each criterion
Max xij = the largest value of each criterion
Min xij = the smallest value of each criterion
benefits = if the largest value is the best
cost = if the smallest value of t is the best

Where rij as the normalized performance rating of alternative Ai on attribute Cj ; i=1,2,…,m and j=1,2,…,n . The preference values for each alternative (Vi) can be seen below:

$$V_i = \sum_{j=1}^{n} W_j \; r_{ij} \quad \ldots\ldots (2)$$

Description:

Vi = ranking for each alternative
Wj = weight value of each criterion
rij = normalized performance rating value

A larger Vi value indicates that alternative Ai is preferred.

2.4 Steps to Solve Using the SAW Method

The steps for solving problems using the Simple Additive Weighting (SAW) method according to Kusumadewi (2006:74):

a. Determine the criteria that will be used as a reference in decision making, namely Ci.
b. Determine the suitability rating of each alternative on each criterion.
c. Make a decision matrix based on the criteria (Ci), then normalize the matrix based on the equation that is adjusted to the type of attribute (profit attribute or cost attribute) in order to obtain a normalized matrix R.
d. The final result is obtained from the ranking process, namely the addition of the normalized matrix multiplication R with the weight vector so that the largest value is chosen as the best alternative (Ai) as the solution.

3. RESULTS AND DISCUSSIONS

3.1 Implementation System

Before implementing the system created, it is necessary to first consider the software requirements and hardware requirements to maintain the stability and smoothness of the system when it is run.

3.2 System Implementation Stages

To implement the system, it is necessary to carry out the stages of implementation, namely as follows:

a. Login

The login form is required for authentication of users who may and may not use the system, the system that is allowed to access the system is a user who has a username and password obtained from the administration system.

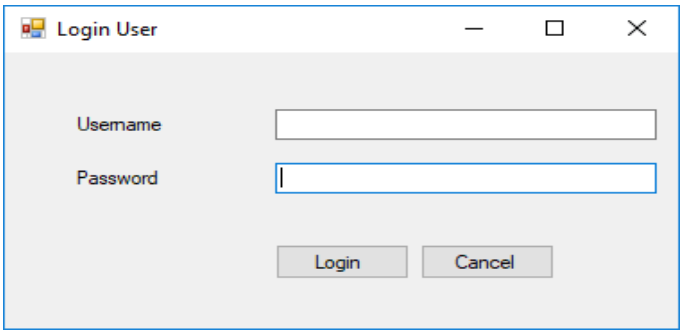

Figure 1. Login Form

b. Main Menu Form

The main menu form will open after the user who has logged in successfully, while the function of the main page is to contain menus that can call each page needed for system purposes.

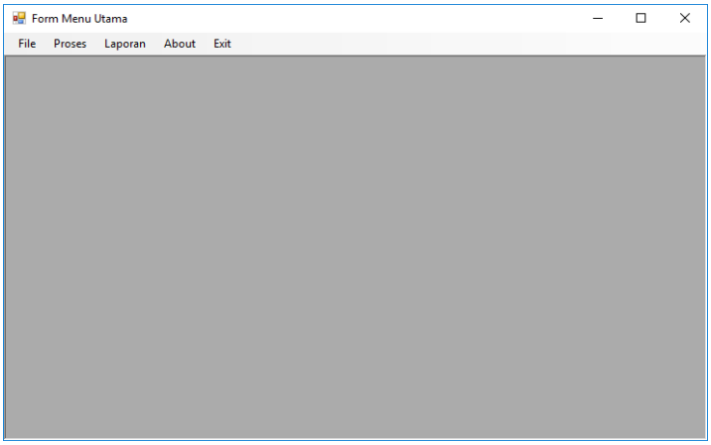

Figure 2. Main Menu Form

c. Employee data

Employee data forms are required to fill out and add employees who will be ranked in the system, additional employees can be accessed by filling out the form and clicking the save button, then changes to employee data can be made by clicking the edit, delete or new button**.**

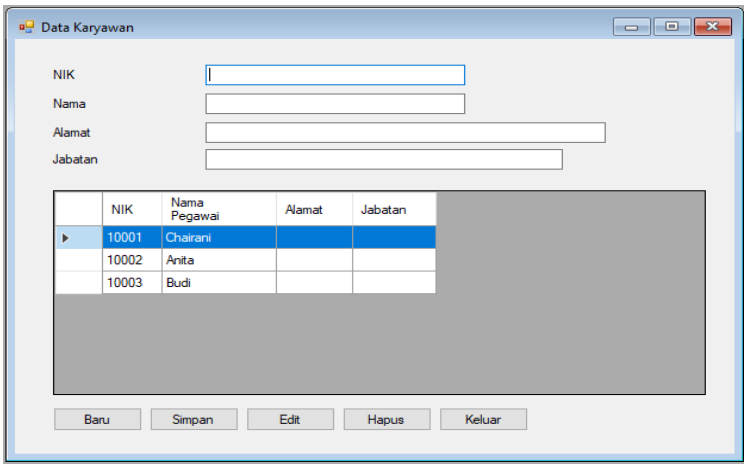

Figure 3. Employee Data Form

Meanwhile, to exit the employee data form page, the user can click the exit button. The employee data form above will be directly connected to the database, so by making changes to employee data, other data related to employee data such as ranking data will also automatically change.

d. Rating Data

The assessment data form can be accessed from the main menu form by clicking on the file menu and the assessment data. While the function of the assessment data is to conduct an assessment of each criterion for each employee, the assessment is carried out by filling in the criteria numbers which can be seen in the fuzzy table in the previous chapter. The numbers in the criteria column will directly affect the ranking results resulting from calculations using the SAW method.

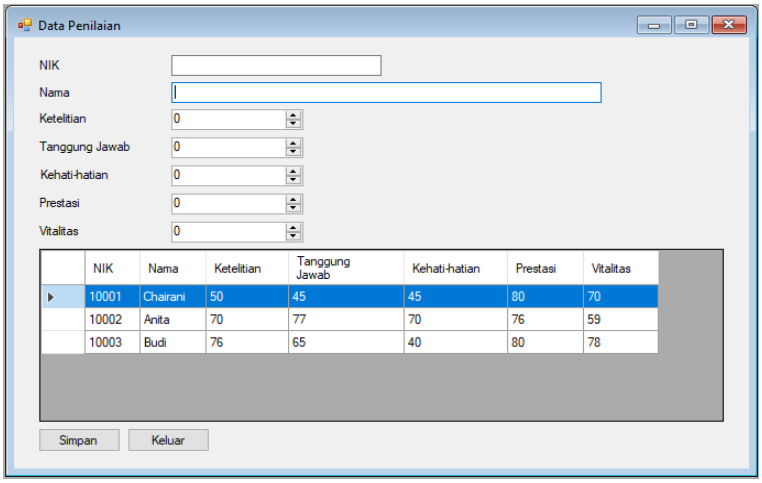

Figure 4. Assessment Data Form

e. Ranking Data

The ranking data form can be accessed from the main menu form by clicking on the process menu and ranking data. While the function of the ranking data form is to calculate and see the highest ranking data as indicated by the percentage increase in salary, the largest salary increase is 0.15 or equal to 15%, while a 0.1 increase in line is the same as a 10% increase in salary.

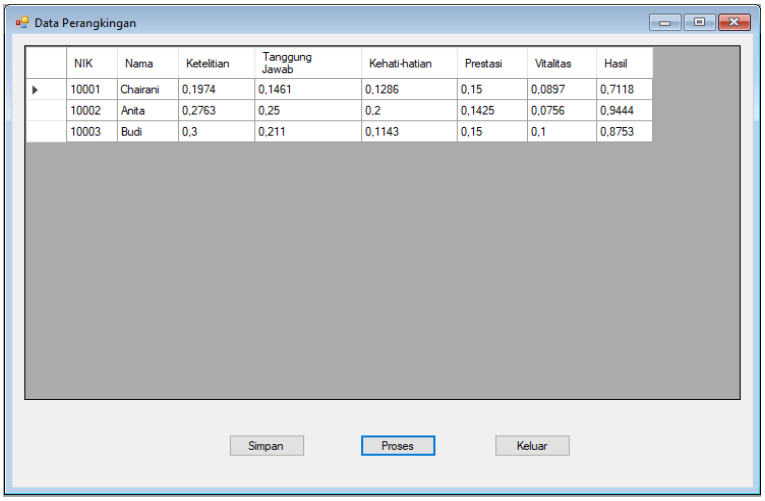

Figure 5. Ranking Data Form

From the results of tests carried out on the system and comparing it with the results of manual calculations, it can be seen that the results of the two calculations are the same and there is no difference at all, it can be concluded that the system built is running as expected or in accordance with the specified goals.

For the ability of the system to rank, it depends on how much alternative data is to be calculated, the more alternative data that is calculated, it is natural that the slower the system works, but as far as the authors carry out the test, there are no significant obstacles that can hinder the running of the system.

4. CONCLUSION

The conclusions obtained from the writing of this thesis are; The process of evaluating the performance of civil servants begins with inputting employee data, inputting assessment data and then processing by ranking until results are obtained and then the level of increase is determined, after which the increase (output) is processed in the form of a report. The application of the Simple Additive Weighting (SAW) method in making decisions about the performance of civil servants is done by finding the weighted sum of the criteria for each alternative and on the attributes that require normalization of the decision matrix, then a ranking process is carried out to the preference value to determine the alternative that obtains an assessment between 5% - 15% or not getting the results of the performance level assessment at all.

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