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Decision Support System for the Level of Employee Salary Increase at PT. Salim Ivomas Pratama Tbk, using the Simple Additive Wheigting (SAW) Method

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ABSTRACT

Utilization of a decision support system using the Simple Additive Weighting (SAW) method is very helpful for managers in making decisions that are faster and more accurate. The basic concept of the SAW method is to find the weighted sum of the performance ratings on each alternative and on all attributes that require the normalization process of the decision matrix (X) to a scale that can be compared with all existing alternative ratings. This method was chosen because it is able to select the best alternative from a number of alternatives based on the specified criteria. The research was conducted by finding the weight value for each attribute and then ranking it to determine the optimal alternative.

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1. INTRODUCTION

The salary that is carried out by PT. Salim Ivomas Pratama Tbk, is carried out every month and the salary received is also in accordance with the position of each employee, if the operator is the salary received in accordance with the UMK. But for Supervisors and Managers, the salary received is in accordance with the performance appraisal of each individual. Salary increases are made once a year.

The salary increase system which is carried out once a year is a long time for Supervisor and Manager positions, salary increases are regulated by the respective performance appraisals and the data obtained is also still using manual data, which usually results in mistakes and injustice for each individual, because the assessment carried out by humans and also recorded manually.

The development of technology and information that continues to progress rapidly can be used to facilitate all activities within the company [1] [2] [3]. Decision support systems are part of a computer-based information system that is included in a knowledge-based system or knowledge management that can be used to support decision making in an organization or company. Decision support systems can help decision makers with data information that has been processed relevantly and needed to make decisions about a problem more quickly and accurately [4].

Simple Additive Weighting (SAW) is a method for making decisions using various criteria and assessments for each criterion, so the basic concept of the SAW method is to find the weighted sum of the performance ratings on each alternative and on all attributes that require a normalization process. decision matrix (X) to a scale that can be compared with all available alternative ratings. The SAW method was chosen because it is able to select the best alternative from a number of alternatives based on the specified criteria [5] [6] [7].

By using a decision support system, the SAW method is estimated to be able to overcome the problems that arise in PT. Salim Ivomas Pratama Tbk. Lubuk Pakam, namely by determining the decision criteria for the rate of increase in employee salaries, collecting employee data based on predetermined criteria so that it can be calculated using the SAW method and an application is built to facilitate the determination of the rate of increase in salary for each employee.

SAW method is often also known as the weighted addition method [8]. 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 [9] [10] [11].

Beginning in October 1994, Booch, Rumbaugh and Jacobson, three of the most widely used methodological figures, pioneered efforts to unify object-oriented design methodologies. In 1995 released the first draft of UML (version 0.8). Since 1996 the development has been coordinated by the Object Management Group (OMG).

Unified Modeling Language (UML) is a language based on graphics or images for visualizing, specifying, building and documenting an Object Oriented-based software development system [12] [13] [14].

2. RESEARCH METHODS

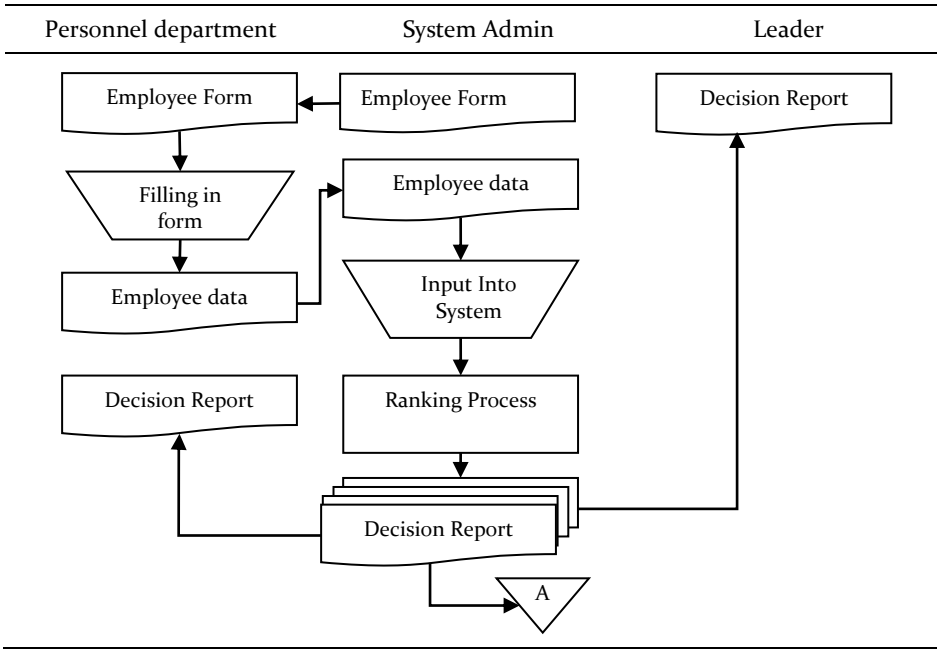
Several research methods were carried out by the author in order to collect the data needed for research needs. Among them is by way of observations made by the author directly at the research site. For more details below, the authors explain the research methods that the authors use, namely: correlational; evaluation; survey; case study; basic theory.

2.1 System Requirements Analysis

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

Table 1. Flow Of Document System Requirements

Personnel department	System Admin	Leader



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

2.2 Simple Additive Weighting (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 [15]. 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 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:

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

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.

2.3 Steps to Solve Using the SAW Method

The steps for solving problems using the Simple Additive Weighting (SAW) method [16]:

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 DISCUSSION

3.1 System Implementation

a. Software Requirements

The software requirements used to run the system created are as follows:

Table 2. Software

No	Software Name	Specification
1	Operating system	Windows 7 32/64 bit
2	.Net Framework	3.5 or higher
3	Microsoft Access	2007
4	Visual Studio	2008 or 2010
5	Microsoft OleDB	12.0

b. Hardware Requirements

The hardware requirements used for the smooth running of the system are as follows:

Table 3. Hardware

No	Hardware Name	Specification
1	Processor	Intel Atom 1.1 Ghz or higher
2	RAM	2Gb or higher
3	HDD	128Gb or Higher
4	Monitor	14 Inch
5	Keyboard	There is
6	Mouse	Optional

Hardware is needed for the smooth process of implementing the system, if the hardware specifications are below the standard specified in the table above, it is possible that the system will run smoothly.

3.2 System Implementation Stages

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

a. Login form

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.

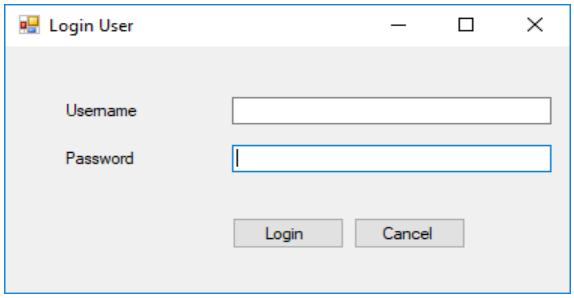


Figure 1. Login Form

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.

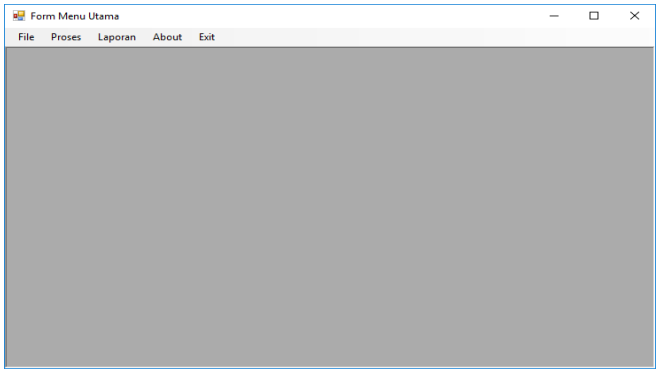


Figure 2.Main Menu Form

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.

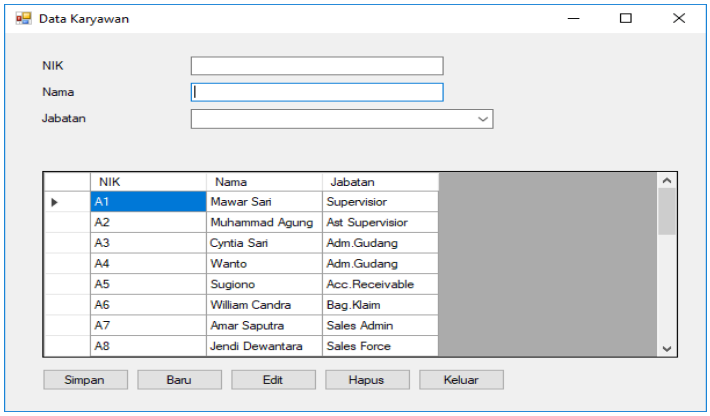


Figure 3. Employee Data Form

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.

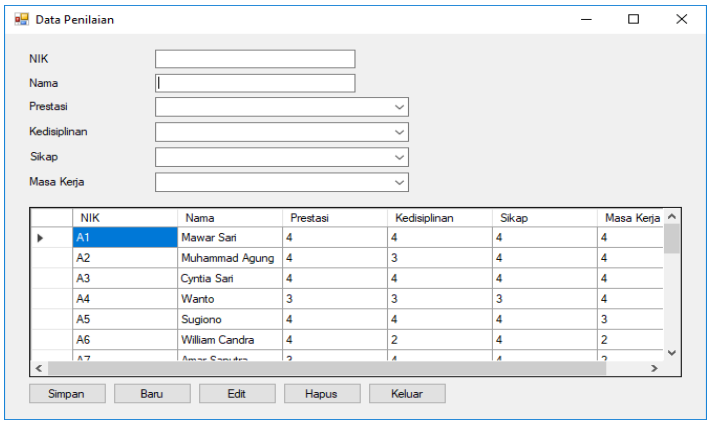


Figure 4. Assessment Data Form

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.

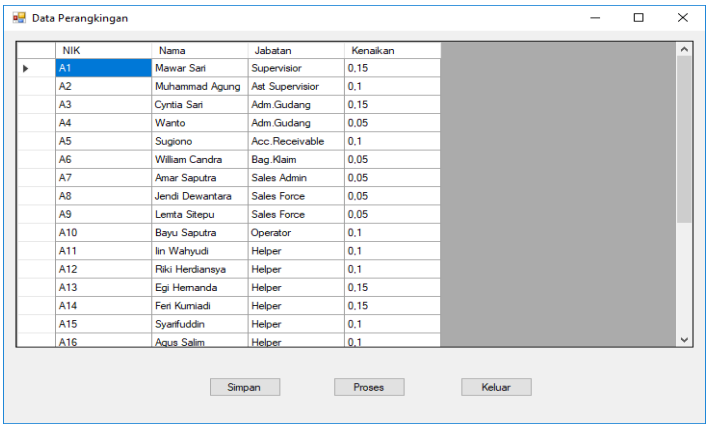


Figure 5. Ranking Data Form

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 writing this thesis are as follows

The process of determining the level of salary increases begins with inputting employee data, inputting assessment data then processing by ranking until results are obtained and then the rate 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 to determine the level of salary increases 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 gets an increase. salary between 5% - 15% or not getting a raise at all.

The decision support system for determining the level of salary increase is designed using the Unified Modeling Language (UML) with Microsoft Visual Basic 2008 (VB.Net) programming language and Microsoft Access 2007 database.

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