Application of The Simple Additive Weighting Method in The Performance Assessment of Leaders, Structural officers and Outstanding Staff

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***Abstract*— At Sekolah Tinggi Manajemen Informatika dan Komputer (STMIK) Sumedang has a performance appraisal program for leaders, structural officials and staff to determine outstanding employees. Employee assessment at the company or agency is very important to achieve company or agency goals to improve performance productivity. At the moment the determination of outstanding employees in Sekolah Tinggi Manajemen Informatika dan Komputer (STMIK) Sumedang is still using conventional calculations in the spreadsheet worksheet application, used to process the data from the questionnaire. For calculations with formulas, starting from adding up the total value of the results of the questionnaire, then ranking using another formula. this requires a long time in the ranking process, consequently having an effect on the time needed in determining employee achievement. Seeing this problem, we need a decision support system that will facilitate the processing of questionnaire data in the ranking process, so that it becomes an alternative in determining employee achievement. Based on the foregoing, the author will design a decision support system for the determination of outstanding employees at STMIK Sumedang using the Simple Additive Weighting (SAW) method. The data used are questionnaires made by the STMIK Sumedang campus. in the design of decision support systems using the prototype method, this system was built using the web-based Hypertext Preprocessor (PHP) programming language, testing the system using Black Box testing. This decision support system is expected to help facilitate the performance evaluation of leaders, structural officials and staff at Sekolah Tinggi Manajemen informatika dan Komputer (STMIK) Sumedang.**

***Keywords*— Black Box Testing, Hypertext Preprocessor, Simple Additive Weighting, Decision Support System.**

I. INTRODUCTION (*HEADING 1*)

In the current era of globalization, the development of information technology is increasingly rapid, with its increasingly rapid development, people are required to be able to follow these developments in order to master and utilize information technology in completing work and also the problems they face [1].

The application of information systems has become a part of today's life. Including in the field of education that applies one type of information system, namely a decision support system. This system aims to assist in decision making from data and criteria owned by decision makers. In implementing a decision support system, a method is needed so that the goals that have been prepared can be achieved properly [2].

Human resources are very important for every company or agency, because the company's performance will increase if the performance of its human resources is good. The quality of human resources is one of the factors needed to increase the productivity of an agency's performance. Therefore, it is necessary to have human resources who have high competence because the expertise or competence will be able to support the improvement of the work performance of each staff. And the results of this assessment will certainly be able to spur other staff to achieve even more [3].

At the Sekolah Tinggi Manajemen Informatika dan Komputer (STMIK) Sumedang also has a performance appraisal program for leaders, structural officers and staff to determine outstanding employees. Currently, the determination of outstanding employees is still using conventional calculations on spreadsheet application, used to process data from questionnaire results in determining the performance appraisal of leaders, structural officials and staff at the Sekolah Tinggi Manajemen Informatika dan Komputer (STMIK) Sumedang. For calculations with formulas, starting from adding up all the results of the questionnaire, then ranking using another formula. This takes a long time in the ranking process, as a result it affects the time it takes to determine outstanding employees.

Seeing these problems, it is necessary to have a decision support system that will facilitate the processing of data from the questionnaire results in the ranking process, so that it becomes an alternative in determining outstanding employees. Decision Support System (DSS) uses data, provides an easy user interface, and can incorporate the thinking of decision makers [4].

Based on the things above, the author will design a decision support system for determining outstanding employees at STMIK Sumedang using the Simple Additive Weighting (SAW) method.

II. METHOD

The Simple Additive Weighting (SAW) method is defined as a system that is able to provide problem-solving skills and communication skills for ranking. The SAW method is the most widely used method because it has a very short calculation and is more time efficient [6].

The Simple Additive Weighting (SAW) method is used because it is considered the most appropriate because the SAW method can determine the weight value for each

attribute, then in the next stage a ranking will be carried out which will select the best alternative. The SAW method is commonly known as the weighted addition method. The SAW method usually uses the concept of a weighted sum of all attributes in each alternative [7].

The completion steps in using SAW [8] are:

1. Determine alternative choices, namely A_i
2. Determine the criteria that will be used as a reference in decision making, namely C_j
3. Divide these criteria into benefit and cost criteria.
4. Provide a rating of the suitability of each alternative on each criterion.
5. Determine the preference weight or level of importance (W) of each criterion.
6. Perform the normalization process on all rating values.
7. Finding the value of V for each A_i by adding up all multiplication (W) with the normalized rating value.

In the calculation using the SAW method, a normalization process is needed from the original or raw data to a scale which is then compared to all ratings for each alternative [7].

$$r_{ij} \begin{cases} \frac{x_{ij}}{max_i x_{ij}}; & \text{if j is an attribute of profit} \\ \frac{min_j x_{ij}}{x_{ij}}; & \text{if j is the attribute of cost} \end{cases}$$

$\frac{x_{ij}}{max_i x_{ij}}$: **The greatest value of each criterion**

$\frac{min_j x_{ij}}{x_{ij}}$: **The smallest value of each criterion**

Description:

1. r_{ij} : Value of normalized performance rating
2. x_{ij}: The attribute value of each criterion
3. Benefit: If the biggest value is the best
4. Cost : If the smallest value is the best

The preference value for each alternative (Vi) is given as follows:

$$v_i = \sum_j^n = 1\ w_j r_{ij}$$

Description:

1. V_i: Ranking for each alternative
2. W_j: The weight value of each criteria

   A larger value of V_i indicates that alternative A_i is preferred

2.1 System Design Using Prototype Method

The method used in modeling the Decision Support System for determining outstanding employees is using the Prototype method. The prototype is evaluated by the user and used as a basis for improving the requirements specification. This process will be repeated until the prototype developed meets all user needs [9].

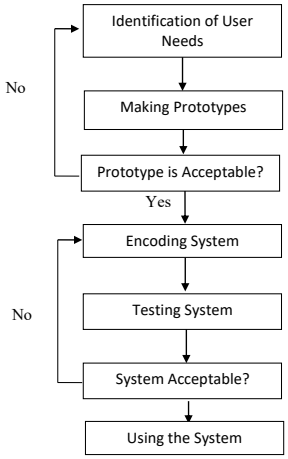


Figure 2.1 Design Stage Framework

2.2 Method of Collecting Data

1. **Observation**
   At the observation stage, the research was carried out directly on the object of research, namely the Sekolah Tinggi Manajemen Informatika dan Komputer (STMIK) Campus. Observations were made to obtain data according to system design requirements.
2. **Interview**
   At this stage, interviews were conducted with the aim of completing the data. During the interview, several questions were asked to the person concerned to suit their needs.

2.3 System Design

At the design stage or system workflow, the system framework is described using the Unified Modeling Language (UML), with the design process starting from Use Case Diagrams, Activity Diagrams, Sequence Diagrams and Class Diagrams.

III. Result and Discussion

3.1 System Testing

System testing is carried out to ensure that the elements or components of the system are functioning as expected. The testing method used in this study is the black box method. This method is used to find out if the software is functioning properly.

The black box testing method is one of the software testing methods that examines the fundamental aspects of the system without paying attention to the logical structure of the software.

NO	Function	Test Scenario	Expected Results	Test Result
1	Login System	User enters Username and Password correctly	Login is successful, the system shows the home page	Login is successful, the system shows the home page
		User entered wrong Username and Password	Login failed, the system displays a notification that the username or password does not match	Login failed, the system displays a notification that the username or password does not match
2	Ranking Menu	User accesses the ranking menu	The system displays the calculation results	The system displays the calculation results
		User accesses the Print button	The system displays a page to download the calculation result file	The system displays a page to download the calculation result file
3	Input Menu	User accesses the ranking category submenu	The system displays the ranking category page	The system displays the ranking category page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
		User accesses employee data submenu	The system displays the employee data page	The system displays the employee data page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
		User accessing criteria submenu	The system displays the criteria page	The system displays the criteria page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
		User accesses submenu model	The system displays the model page	The system displays the model page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
		Users access the assessment submenu	The system displays the rating page	The system displays the rating page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
		User accesses the	The system displays the	The system displays the

		calculation submenu	calculation page	calculation page
			The system is able to save input, update and delete data	The system is able to save input, update and delete data
4	Logout System	Select the logout menu	Return to Login page	Return to Login page

IV. Conclusion

Based on the discussion of the previous chapters, the conclusions that can be drawn in the Application of the Simple Additive Weighting Method in the Performance Assessment of Leaders, Structural Officers. Based on the discussion of the previous chapters, the conclusions that can be drawn in the application of the Simple Additive Weighting Method in the Performance Assessment of Leaders, Structural Officers and Outstanding Staff are the author modeling a system description that will be made using UML. The process and data models of the system are modeled using Use Case Diagrams, Activity Diagrams, Sequence Diagrams and Class Diagrams. The method used in this decision support system is Simple Additive Weighting which is a weighted calculation, so that each criterion has a different weight value. In the previous data processing, the admin performed calculations using the Ms. Excel application by adding up the data from the assessment results, then ranking using the formula in Ms. Excel. Whereas in systems that apply the SAW method, the admin only needs to input the value on the calculation form in the decision support system. Obtaining the highest score as the best candidate to become an outstanding employee.

The results of previous calculations obtained using the Ms. application. Excel is in the form of integers with the highest value acquisition of 2273. While the acquisition of values in calculations using a system that applies the SAW method, the results obtained are decimal numbers with the highest score of 0.95 as the best candidate.

The comparison of the results of obtaining the ranking order between using a spreadsheet and using a system that applies the SAW method is not so significant, because there are only 3 out of 23 data whose results are different, namely in the order of ranking 13-17. The results of the test using the black box testing method, in testing the system's functionality, the result is that the system functions as it should, that is, in accordance with expectations.

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