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Decision Support System for Determining Employee Shift in Hospital. Bhayangkara Tk. II Medan with Simple Additive Weighting (SAW) Method

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ABSTRACT

This study is a Decision Support System for determining employee shifts using the Simple Additive Weighting (SAW) method of the SAW method, which is looking for a weighted sum of performance ratings on each alternative on all criteria, making a suitability rating table for each alternative on each specified criteria and make a decision matrix. The application that is built is a web-based application using the PHP programming language and using a MySQL database. The purpose of this study is to solve the problem of Employee Shift computerized, with the existence of this system the Hospital. Bhayangkara Kindergarten. II Medan can provide fast and accurate information.

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1. INTRODUCTION

The development of information technology has reached into all aspects of people's lives, both in the fields of education, industry, private institutions and government agencies and other institutions. This is because information technology has become something that is common and easy to learn by everyone [1]. By utilizing information technology, an institution can improve performance in order to achieve the goals that have been set for each period [2] [3].

Bhayangkara Tk.II Hospital Medan is a government agency that is engaged in health services according to standard operating procedures (SOP) which can stand and survive until now in the health services of civil servants, police, soldiers and the wider community. To support better employee performance in order to improve services, of course, good time management is needed as the main supporter in carrying out services that are determined every period. So to determine the shift of hospital employees in carrying out good work a time management system is needed, looking at the operational tasks of the hospital serving patients for twenty-four hours every day.

A decision support system is an interactive information system that provides modeling and data manipulation information [4] [5] [6].

Shift work is a system implemented by the company to increase productivity maximally and continuously for 24 hours. The average work shift in Indonesia uses a 3 shift system which is divided into morning, afternoon and evening work with 8 hours of work each [7] [8] [9]. However, in some companies, there are only 2 work shifts covering morning and evening work. The shift system varies by country, for example in European countries as Harrington (2001) said that the shift system usually lasts 6-12 hours of work with shift groups, either on a two, three or four shift system in a 24-hour period [8].

The Simple Additive Weighting (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 [10] [11] [12].

The simple additive weighting method is recommended to solve the selection problem in a multi-process decision-making system [13] [14]. 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] [16]. This method is the most famous and most widely used method in dealing with Multiple Attribute Decision Making (MADM) situations. MADM itself is a method used to find the optimal alternative from a number of alternatives with certain criteria [17] [18]. Several journals are in accordance with the author's guidelines in determining employee shifts using the Simple Additive Weighting (SAW) method.

The SAW method requires the decision maker to determine the weight for each attribute. The total score for the alternatives is obtained by adding up all the multiplication results between the rating (which can be compared across attributes) and the weight of each attribute. The rating of each attribute must be dimension-free in the sense that it has passed the previous matrix normalization process.

2. RESEARCH METHODS

The research used in the preparation of this final project used a descriptive method, where this study aims to describe or describe a condition of the object being studied objectively. This research can be used to explain problems, conditions, or phenomena that are currently being faced. Descriptive research is conducted by focusing on certain aspects and often shows the relationship between various variables.

In writing this thesis, the author uses two data sources, namely: primary data; secondary data.

2.1 System Requirements Analysis

The analysis of the system to be built begins with the identification of users who can use this decision support system, the description of input, output and process requirements. This analysis aims to describe the decision support system that will be built, so that it is in accordance with user needs and is useful for general users. In doing and completing this research, there are several things that are built in system analysis such as input, process and output. The following is a flowchart of the system analysis that was built:

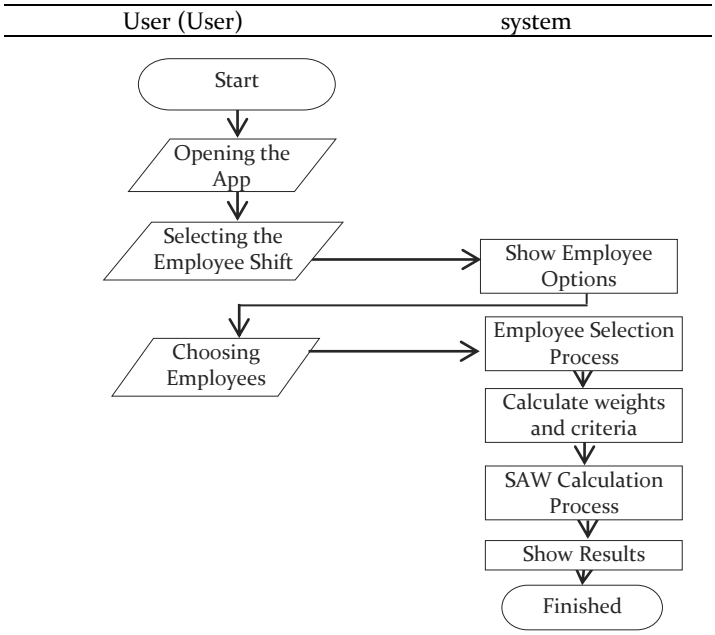

Figure 1. System analysis flowchart built

2.2 Description of the 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. The formula for the Simple Additive Weighting (SAW) method can be seen below:

$$r_{ij} = \begin{cases} \frac{x_{ij}}{Max_i\, x_{ij}} & Jika\ j\ adalah\ attribut\ keuntungan\ (benefit) \\ \frac{Min_i\, x_{ij}}{x_{ij}} & jika\ j\ adalah\ attribut\ biaya\ (cost) \end{cases} \quad \text{.....(1)}$$

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 t 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:

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

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 according to Kusumadewi;

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.

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

System implementation is the stage in implementing the system that has been built, where later it will be known the quality of the system designed, whether it can run well and in accordance with the expected goals. To realize the system that has been designed in the information system, other supporting facilities are needed which in principle are usually referred to as technical aspects, namely hardware, software, brainware.

To implement the application, the design of the user interface must be changed into a programming language using the Web-based PHP programming language with the MVC framework method. The implementation of the interface is carried out with each display of the program that is built.

a. Main page

The main page is the page that will appear when the application is opened. The main page will display the existing menus on the system, namely the Employee Menu, Employee Shift Menu and Login Menu.

Figure 2. Main page

b. Login Page

The login page is the initial page that is displayed when opening the admin page (backend) the page functions for admins or employees to enter the Employee Shift SPK application.

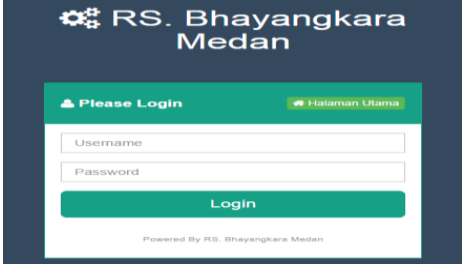

Figure 2. Login Page

c. Admin Page

This page displays a list of admins in the website database. There is an "Add" button that functions to add admin data, an "Edit" button that functions to edit admin data and an "Edit" button that functions to delete one of the admin data.

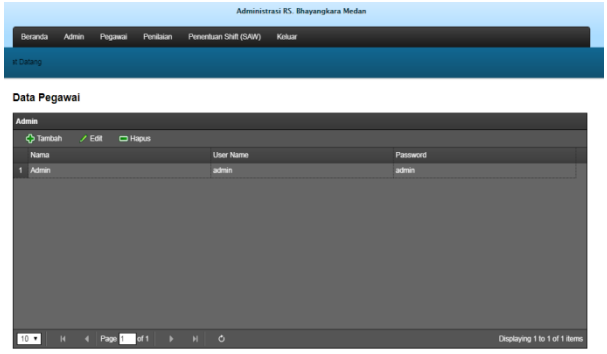

Figure 3. Admin Page

d. Admin Input Form Page

This page displays an input form where this input serves to add admin data.

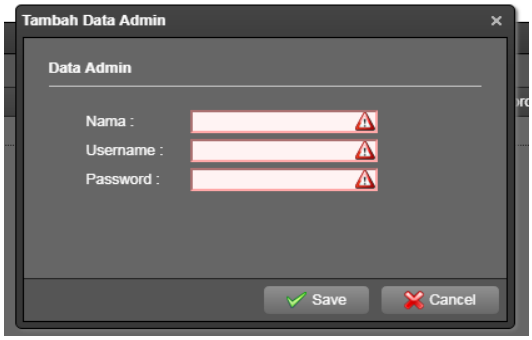

Figure 4. Admin Page Form Add Admin Data

e. Employee Page

This page serves to display a list of employees in the website database. There is an "Add" button that functions to add employee data, an "Edit" button that functions to edit employee data and an "Edit" button that functions to delete one of the employee data.

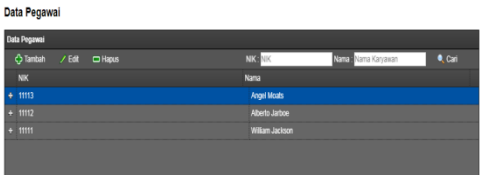

Figure 5. Employee Page

f. Employee Input Form Page

This page displays an input form where this input serves to add employee data.

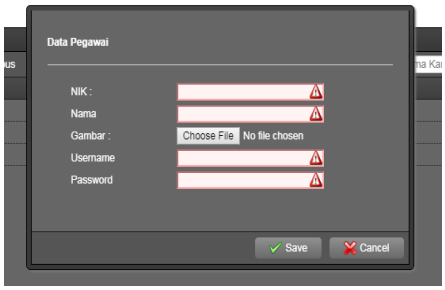

Figure 6. Employee Data Form Admin Page

g. Rating Page

This page serves to display a list of employee ratings in the website database. There is an "Add" button which functions to add employee appraisal data and an "Edit" button which functions to delete one of the employee appraisal data.

Figure 7. Rating Page

h. Employee Assessment Input Form page

This page displays an input form where this input serves to add employee appraisal data.

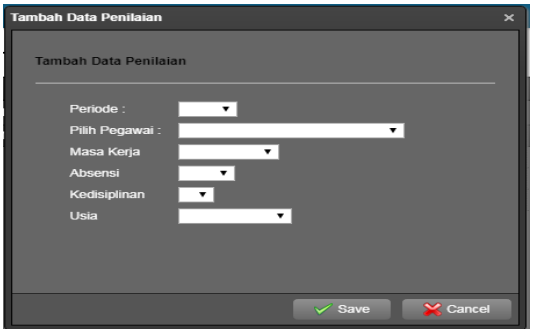

Figure 8. Admin Page Form Add Assessment Data

i. Shift Determination Page

This page serves to display the process of determining employee shifts using the SAW method in the website database. There is an option "Select Period" which serves to display the process of determining employee shifts based on the selected period.

Figure 9. Shift Determination Page Select Period

The selected period will display the employee assessment data page and there is a link "Compatibility Rating Process" which functions to execute the match rating process as shown in Figure 10.

Figure 10. Shift Determination Page of Employee Assessment Results

After the match rating process is complete, the result page of the match rating process will appear and there is a “Normalization Process” link that functions to execute the normalization process as shown in Figure 11.

Figure 11. Match Rating Result Shift Determination Page

After the normalization process is complete, the result page of the normalization process will appear and there is a link "Weight Multiplication Process" which functions to execute the weight multiplication process as shown in Figure 12.

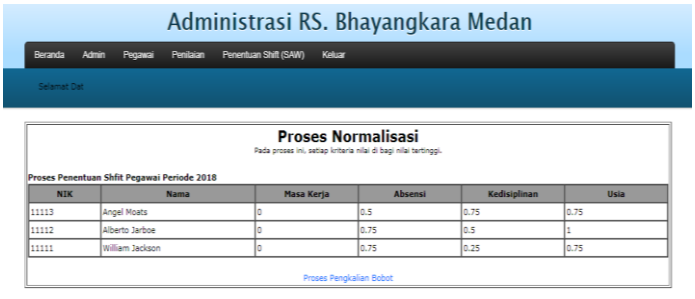

Figure 12. Normalization Result Shift Determination Page

After the weight multiplication process is complete, the SAW process decision result page will appear as shown in Figure 13.

Figure 13. Decision Result Shift Determination Page

4. CONCLUSION

In accordance with the system that the author designed and has described in previous chapters, the following conclusions can be drawn; The system is running at RS. Bhayangkara Tk. II Medan regarding the determination of shifts Employees are still doing data collection manually into the form of books so that it is less efficient and accurate in providing information. With the system that the author designed, it can provide convenience in processing employee shift data, in the form of employee data with the computerized Simple Additive Weighting (SAW) method. The system that the author designed can be used in determining employee shifts at the hospital. Bhayangkara Tk. II Medan. The system that the author designed can present information in a faster, precise and accurate time

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