

Decision Support System for Position Promotion Using Analytical Hierarchy Process (AHP) Method

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Abstract: *PT. Multi Warna Karpetindo Agung is one of the private companies in Purwakarta District which has a considerable number of contract and permanent employees. In the process of promotion the position, an assessment based on achievement and the potential of human resources in accordance with the work unit is needed. Therefore, a decision support system is needed which can recommend employees who will be elected to fulfill a position. The method that will be used for the calculation is the Analytical Hierarchy Process (AHP). The criteria used in this research were the aspects of performance, Absence, education, and experience. AHP produces priority criteria for promotion with performance values of 50%, absence value of 12.5%, education value of 25%, and experience value of 12.5%. The method used for the construction of the system is Waterfall software development method which carried out until construction stage. The system was tested using black box testing. The results of the tests show that the system can be operated according to its functionality.*

Keywords: decision support system, analytical hierarchy process, promotion of position.

1. Introduction

PT. Multi Warna Karpetindo Agung is one of the private companies in Purwakarta District which has a considerable number of contract and permanent employees. In the process of promotion the position, an assessment based on achievement and the potential of human resources in accordance with the work unit is needed. Therefore, a decision support system is needed which can recommend employees who will be elected to fulfill a position.

Decision Support Systems (DSS) is part of computer-based information systems. This system helps support decision-making in individuals and organizations both companies and agencies. DSS can provide an alternative solution if a person or group of people has difficulty in determining the right and appropriate decisions. There are several methods that can be used in DSS, one of the methods is Analytical Hierarchy Process (AHP). AHP method is able to select the best candidates from a number of candidates based on predetermined criteria. In this research, the criteria used were the aspects of performance, Absence, education, and experience. Each criterion is given a weight value which is then used to carry out the ranking process. The ranking process will determine the optimal alternative.

2. Literature Review

2.1 Decision Support System

According to Mann and Watson in Suryadi and Ramdhani [1], decision support system is an interactive system which helps decision making through the use of data and decision models to solve problems that are semi-structured and unstructured. Unstructured problem is a problem that doesn't have elements or relationships between elements that are understood by people who solve problems. A semi-structured problem is a problem that occurs over several elements or relationships that are understood by the problem solver and some that are not understood.

Peter G.W. Keen and Scott Morton defined three objectives that must be issued by a decision support system, namely:

- 1) The system must be able to help managers make decisions to solve semi-structured problems.
- 2) The system must be able to support the manager, not try to replace it.
- 3) The system must be able to improve the effectiveness of manager's decision making.

These goals lead to three basic principles of outcome decisions, namely structure of the problem, decision support, and decision effectiveness. Decision support system have some characteristics, these are interactive, flexible, able to convert quantitative data into qualitative, and contain a procedure which designed based on a formal formula or also some expertise procedures.

2.2 Analytical Hierarchy Process (AHP)

Analytical Hierarchy Process was developed by Thomas L. Saaty. This method is a framework for making effective decisions on complex problems by simplifying and accelerating the decision making process. AHP methods help solve complex problems by structuring a hierarchy of criteria, interested parties, results and by attracting various considerations to develop weight or priority. This method also combines the strengths of the feelings and logic involved in various problems, then synthesizes various diverse considerations into results that match our estimates intuitively as presented at the considerations that have been made[2].

3. Research Methodology

The methodology used in this research is software development model Waterfall. According to Pressman[3], the waterfall model is a classic model that is systematic and sequential in building the software. The stages of the Waterfall method can be seen in figure below:

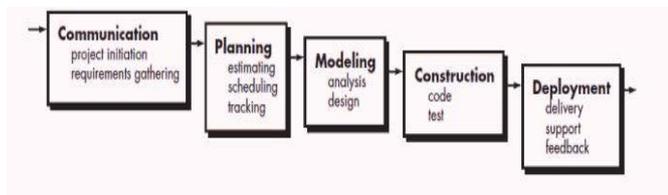


Figure 1: Waterfall Methodology Stages

The Waterfall method consists of five stages. The following is an explanation of each step in the Waterfall method:

1) Communication

At this stage an analysis of software requirements and data collection is carried out by conducting meetings with customers and collecting data through library research.

2) Planning

At this stage the user requirement document will be produced or can be said as data relating to the user's desire in making software, including plans to be carried out.

3) Modeling

At this stage, you will be able to translate the requirements into a software design that can be estimated before coding is made. This process focuses on the design of data structures, software architectures, interface representations, and procedural details.

4) Construction

The construction phase is the stage of the code making process. Coding or coding is a design translation in a language that can be recognized by a computer. The programmer will translate the transaction requested by the user. This stage is a real step in working on software, meaning that the use of computers will be maximized in this stage. After the coding is complete, the system will be tested for testing. The purpose of testing is to find errors in the system and then repair them.

5) Deployment

This stage is the final stage in making a software or system. After doing the analysis, design and coding, the system that has been created will be used by the user. Then the software that has been made must be regularly maintained.

4. Research Result

In this reasearch the Waterfall Method was carried out only until the construction stage. The following are the results of each stage, the calculation of the AHP, and the results of the software.

4.1 Communication

At this stage data was collected through observation and interviews at PT. Multi Warna Karpetindo Agung Purwakarta to find out precisely about the needs of the system to be made. Based on the results, PT. Multi Warna Karpetindo Agung Purwakarta requires a decision support system for employee promotion by considering aspects of performance, Absence, education, and experience.

4.2 Planning

This stage is related to the system to be built. These requirements consist of functional requirements and non-functional requirements of the system. The following is the explanation of each requirement:

1) Functional Requirement

The functional requirement of the system to be built is capability of providing recommendations regarding employees who will be given a promotion based on aspects of performance, absenteeism, education, and employee experience.

2) Non-Functional Requirement

The non-functional requirements of the system to be built are composed of the requirement of hardware and software. The following is an explanation of these requirements:

a) Hardware Requirements

The minimal requirement hardware to operate the system is a PC with 1 GB of RAM and 50 GB of storage.

b) Software Requirements

The minimal requirements software to operate the system are Windows 7 as the minimum operating system, XAMPP, and a browser.

4.3 Modeling

At this stage system design is done using context diagrams, DFD, and ERD. The following are the diagrams used in system design:

1) Context Diagram

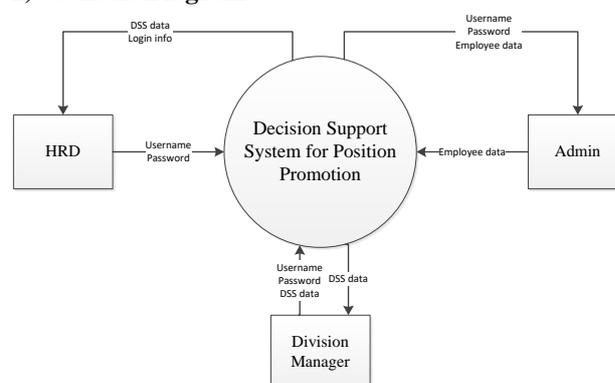


Figure 2: Context Diagram of DSS for Position Promotion

2) Level 0 of Data Flow Diagram

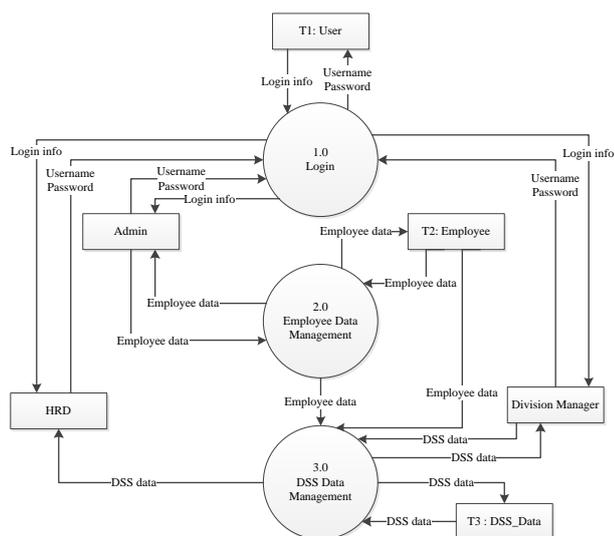


Figure 3: DFD Diagram of DSS for Position Promotion

3) Entity Relationship Diagram (ERD)

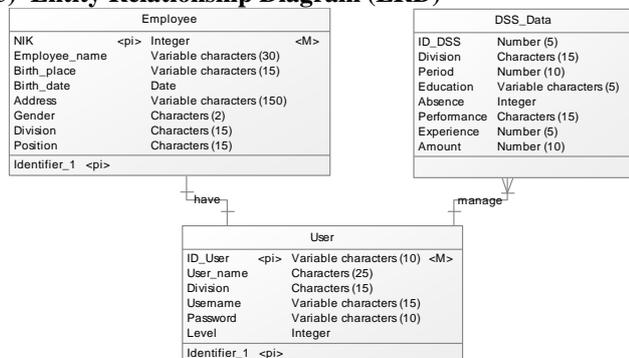


Figure 4: ERD of DSS for Position Promotion

4.4 Construction

The construction phase consists of calculation of the AHP method and the construction of a web-based decision support system. The following is an explanation of each stage.

4.4.1 The Calculation of Analytical Hierarchy Process

The initial step in the calculation phase of the AHP method for decision support systems is employee promotion at PT. Multi Warna Karpetindo Agung Purwakarta is determining the priority weights of the criteria which will be used in AHP method calculation. The result from the calculation produces a consistent of priority criteria for promotion. The calculation of employee promotions value is as follows:

$$\text{Position Promotion Value} = (\text{Performance Value} * 0.5) + (\text{Absence Value} * 0.125) + (\text{Education Value} * 0.25) + (\text{Experience Value} * 0.125)$$

4.4.2 The Construction of Web-Based Decision Support System

At this stage, a real system is made that refers to user needs that have been determined in the previous stages. The results obtained in this stage are a system that can be run. The system is built using the PHP programming language and MySQL database. The following are some of the interfaces

of the system that have been built:

1) Login Page

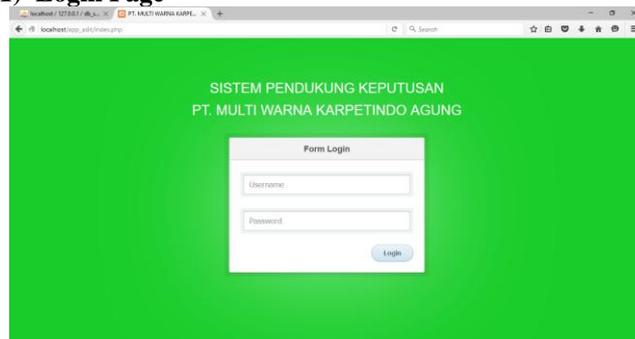


Figure 5: Interface of Login Page

2) Home Page



Figure 6: Interface of Home Page

The decision-making system that has been built is then tested using the black box method. The results of the test can be seen in Table 10.

Table 1: Blackbox Testing Result

No	Function	Expected Output	Output	Conclusion
1	Login	System displaying the home page	System displaying the home page	Success
2	Managing employee data	System successes inputting, editing, deleting employee data	System success inputting, editing, deleting employee data	Success
3	Inputing DSS data	System successes inputting DSS data	System success inputting DSS data	Success
4	Printing DSS data	System successes printing needed DSS data	System successes printing needed DSS data	Success
5	Displaying DSS data result	System successes displaying result from calculation of DSS data	System successes displaying result from calculation of DSS data	Success

5. Conclusion

This decision support system uses four criteria, namely the aspects of performance, absence, education, and experience. The AHP method produces priority criteria for promotion with performance values of 50%, Absence value of 12.5%, education value of 25%, and experience value of 12.5%. This decision support system can provide input in the process of determining promotions at PT. Multi Warna

Karpetindo Agung Purwakarta according to the desired criteria.

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