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DECISION SUPPORT SYSTEM TESTING THE FEASIBILITY OF THE BUS IN PERUM DAMRI KOTA BANDUNG

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ABSTRACT

Feasibility Testing Bus is the examination of the physical part of the bus and the bus engine components that comply with the operational feasibility of mass transit because very related to the safety and comfort of passengers. to decide on the bus that deserves to be operationalized, Manager of Engineering are still experiencing difficulties and long enough in determining the feasibility of the bus because of too many criteria and sub-criteria to be bus components in the analysis of the results of the testing assessment buses that have been tested. Additionally because of the criteria and sub-criteria are tested by Manager Engineering Perum Damri be less rigorous in terms of testing the feasibility of the bus.

Analysis of testing the feasibility of these buses utilizing methods Analytical Hierarchy Process (AHP) as a method of Decision Support Systems (DSS) in the bus component analysis process using multiple criteria (multiple criteria) to determine the feasibility of testing priority right bus. AHP is used as a model for multicriteria weighting in the electoral process priority. Methods of data collection techniques, literature, observation and interviews are used for problems related. In addition, techniques and data analysis model using structured flow method using Data Flow Diagrams (DFD) and Entity Relationship Diagram (ERD). This application is built with PHP my admin tools as the design of the user interface and XAMPP as media database processing.

Based on the results of the testing that has been done is to facilitate the processing of the bus feasibility assessment test results, speeding up the process to determine the feasibility of the bus and were able to reduce the error rate in determining the feasibility of a bus.

Keywords: Decision Support Systems, Feasibility Testing, Analytical Hierarchy Process

1. INTRODUCTION

1.1 Backdrop

PERUM DAMRI is one company that is engaged in passenger transport services by bus. Commercial activities are operations that are directed to gain by not ruling out the service to the general public, PERUM DAMRI include some transport services, transport services in the route network cities such as areas within the city, capital of the province and district service network PERUM DAMRI covering 13 major cities contained in several Indonesian islands like Java, Sumatra and Borneo, as in Java, especially in West Java there is one branch that is experiencing significant progress, PERUM DAMRI in Bandung is one branch company very progress as well as one public transportation that is in demand by the people of Bandung, therefore feasibility bus is one of the most important assets in a company like PERUM DAMRI.

Decision Support System is an interactive system that supports decision in the decision-making process through the alternatives derived from the processing of data, information and design models. AHP (Analytical Hierarchy Process) is a method that can solve complex problems where the criteria taken quite a lot. This complexity is caused by the structure of the problem is not yet clear, uncertainty perception of decision makers as well as the uncertainty of the availability of accurate statistical data or even none at all. Based on the problems that exist today in PERUM DAMRI Bandung, needed a web-based decision support system by the Manager of Engineering.

1.2 Purpose and Objectives

1.2.1 Objectives

The purpose of this research is to develop a decision support system testing Feasibility Bis in PERUM DAMRI Bandung .

1.2.2 Purpose

The objectives to be achieved in this study are:

1. *Assist Manager Techniques for determining the eligibility decision PERUM DAMRI bus in the city of Bandung in accordance with pre-determined parameters .*
2. *Assist the Assistant Manager Operations Control Services to reduce complaints from customers .*

1.3 General Form System

The system is a collection of objects such as people, resources, concepts and procedures that are intended to perform a function that can be identified or to serve a purpose. The system is divided into three distinct parts: input, process and output. The parts are surrounded by an environment and often involve a feedback mechanism. In addition, decision makers also considered as part of the system.

1. *Input*
   Inputs are the elements that go into the system. Examples of the raw material input is entered, such as input data into a web page to query the database.
2. *Process*
   The process is all the necessary elements to convert or transform inputs into outputs. On a computer, including a Web-based computer, a process may include activation commands, execution of computing and information storage.
3. *Output*
   Output is the final product or the consequences they have on the system. For example, a web server can generate a web page dynamically based on inputs and processes.

While the information is data that has been processed in such a way that increases the knowledge of someone who uses such data.
Thus, the information system is a set of components to build a system that has the relationship between the components with other components which aims to produce the information in a particular field. In the system of classification of information needed flow of information, this is due to the need for a diversity of information by the user information. Criteria of information systems, among others, flexible, effective and efficient.
The information system should not involve computers. Computer systems using so-called computer-based information system (Computer Based Information Systems or CBIS). Another definition of the information system is a combination of work procedures, information, people, and information technology organized to achieve goals within an organization.

1.4 Common Criteria for Information Systems

Common Criteria is an information system output variables that are considered as a measure of system performance-employment. The general criteria include:

1. *Debit, ie the amount of data and information flows (bits) per unit time.*
2. *Response time, ie the time between events, reactions to the event until the completion of the event (the sooner the better).*
3. *Cost, namely costs incurred to obtain the information from the data (the lower the better).*
4. *Compliance function, meaning defined functions (requirements) must be executed as planned.*

Computer-based information systems or abbreviated CBIS (Computer-Based Information System) is not a new thing now. This technology is always progressing and changes very rapidly since it was first introduced. The general characteristics of the CBIS is as follows:

1. *The data stored in the media that can be read by machines and are dense (compact) to easier and faster to navigate.*
2. *A set of large-sized data can be stored in one location. While the analysis of*

the various sets of data to obtain a complete picture would be much easier to do.

3. *The data processing speed is very high and has become a priority.*
4. *The data transmission can be done by means of telecommunications (cable,microwave).*
5. *Overall, delay or delays contained in the flow of data and information is relatively small because the processes of search, processing, and transmission of data can be done quickly.*

The locations of the development and operation of systems that spread does not preclude the ease in monitoring and coordinating all related activities.

1.5. Decision Support Systems

According to Keen and Scott Morton " Decision Support Systems (DSS) combining the intellectual resources of individuals with computer capability to improve the quality of decisions . DSS is a computer-based support system for decision makers who handle the management of unstructured problems [2]

1.5.1 Basic Concepts Decision Making

In the face of an electoral process should determine the decision then live in accordance with pilihanya. According to James AF Stoner, the decision is the selection among the alternatives. This definition contains three terms, namely: there is a choice on the basis of logic, there are several alternatives that should and selected the best one and there are goals to be achieved and the decision is getting closer to that goal. [2].

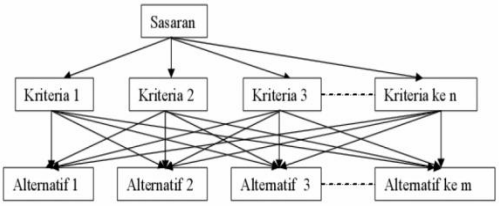
In the process of decision-making models are proposed Simon (1960), which consists of four phases:

1. *Search (Intelligence)*
   This stage is the process of tracking and detection of the scope of the problems and introduction problems. Data input is obtained, processed and tested in order to identify problems.
2. *Design (Design)*
   This stage is the process of discovering, developing, and analyzing alternatives that could be done. This stage includes a process to analyze the problem, lowering solutions and test the feasibility of the solution.
3. *Selection (Choice)*
   Conducted election process among the various alternative measures that may be running. The election results are then implemented in the decision making process.
4. *Implementation (Implementation)*
   This stage is actually a three stage which is the implementation of the decisions taken.

1.6 Analytical Hierarchy Process

AHP is a method of fragmenting a complex situation , unstructured , into their component parts , arranging parts or variables are in the order of hierarchy , gives a numerical value to the consideration of subjective about the relative importance of each variable , and synthesizes various considerations for specify which variable has the highest priority and act to affect the outcome of the situation. [3]

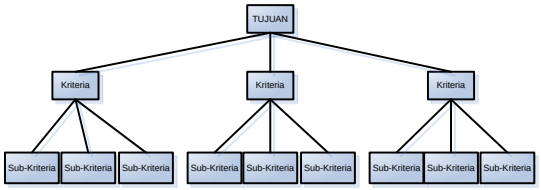
AHP developed by Saaty solves complex in which aspects or criteria taken quite a lot of this complexity desebabkan by many things including the structure of the problem is not yet clear , the uncertainty of decision making as well as the perception of uncertainty is available and accurate statistics or even none at all .



In solving the problem with an explicit logical analysis there are several principles: [3]

1. *Defining the problem and determine the desired solution , then draw up a hierarchy of the problems faced .*

Then arrange the sub - criteria if necessary



2. Determining the priority elements

a) The first step in determining the priority is to make paired comparisons of elements that comparing elements in pairs according to the criteria given .

b) pairwise comparison matrix filled in using numbers to represent the relative importance of one element against another element . Using a ratio scale , where if the matrix is symmetric with diagonal then it will be worth the reverse , or can be formulated

$$Aij = 1 / Aij$$

3.Synthesis

Consideration-consideration of pairwise comparisons in the synthesis to obtain overall priorities. It is done in this step are:

a) Add up the value of each column in the matrix.

b) Divide the total value of each column to the column in question to obtain a normalization matrix.

c) Add up the values of each line and dividing by the number of elements to obtain an average value.

4. Measuring Consistency

In decision-making, it is important to know how well the consistency that is because we do not want a decision based on considerations of consistency is low. The things to do are:

a) Multiply each value in the first column with the relative priority of the first element, the value in the second column with the relative priority of the second element, and so on.

b) Add up each row

c) The result of the summation lines divided by the corresponding relative priority elements.

d) Add up the results of the above with the number of existing elements, the result is called the matrix λ

e) Calculate the consistency index (CI) with the formula (2.2):

CI = (λ max-n) / (n-1)

Where n is the number of elements.

f) Calculate the ratio of consistency / consitency ratio (CR) with the formula (2.3):

CR = CI / IR

Where :

CR = consistency ratio

CI = consistency index

IR = random consistency index

g) Check the consistency of the hierarchy. If the value is more than 10% then judgemenet data assessment should be corrected but if the CR is less than or equal to 0.1, then the calculation results can be considered true. IR list can be seen in the following table:

Ukuran Matriks	Nilai IR
1,2	0,00
3	0,58
4	0,90
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49
11	1,51
12	1,48
13	1,56
14	1,57
15	1,59

2.2 Pairwise comparisons

In the AHP model of decision making to determine the value or score of each alternative on a criterion using the comparison partner . In the comparison partner , the decision-making comparing the two alternatives is based on a criteria .

The standard scale used AHP preferences (to enter the pairwise comparison values) are shown in the table below . Each level

on a scale of preference is based on a comparison of two items.

Tingkat preferensi	Angka
Sama disukai	1
Sama hingga cukup disukai	2
Cukup disukai	3
Cukup hingga sangat disukai	4
Sangat disukai	5
Sangat disukai hingga amat disukai	6
Amat disukai	7
Amat sangat disukai hingga luar biasa disukai	8
Luar biasa disukai	9

2.3 Analysis Application of Analytical Hierarchy Process Method

Some of the criteria and sub-criteria that are needed to support the calculation process AHP , namely :

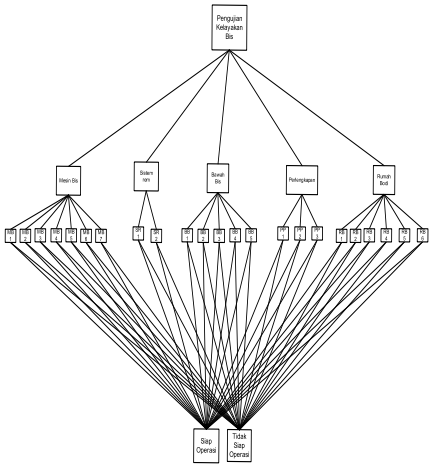
a. Bus engine : Noken , boring liner , piston rings , pistons , engine oil , radiator , kupling .

b . Home of the body : the body of the bus , the passenger seat , emergency door , front door , back door , electricity .

c . Equipment: air conditioner (AC) , wiper motors , wiper .

d . Under the bus : front axle , rear axle , exhaust , suspension , steering .

e . Brake system : tires , brakes



Description hierarchy :

MB : Machinery Bis
MB1 : Noken As
MB2 : Liner Boring
MB3 : Piston Ring
MB4 : Piston
MB5 : Engine Oil
Mb6 : Radiator
MB7 : Clutch
RB : Home Body
RB1 : Body
RB2 : Seating
RB3 : Emergency Exit
RB4 : Door Home
RB5 : Rear Door
RB6 : Electricity
PP : Equipment
PP1 : Air Conditioning (AC)
PP2 : Wiper
PP3 : Wiper Motor
BB : Bottom Bus
BB1 : Front Axle
BB2 : Rear Axle
BB3 : Smoke Exhaust
BB4 : Suspension
BB5 : Stir

SR : Brake System
SR1 : Ban
SR2 : Rem

This is a priority calculation criteria do calculations by comparing the elements according to criteria
which is based on interviews with the Manager of Engineering , the following calculation steps :

Kriteria	PP	RB	MB	BB	SR
PP	1	3	3	5	5
RB	1/3	1	2	5	5
MB	1/3	1/2	1	3	3
BB	1/5	1/5	1/3	1	2
SR	1/5	1/5	1/3	1/2	1

a. *The first step in the calculation is made the priority criteria pairwise comparison matrix with the sample number 1 in column PP PP lines depict the same level of importance between the PP with PP*
b . *number 3 in the column indicates RB RB PP line is more important than the PP*
c . *Number 3 in the column indicates MB MB PP line is more important than the MB*
d . *Figures 5 column line BB BB MB showed a little more important than the MB*
e . *Figures 5 column shows the MB line SR SR little more important than the MB*

Kriteria	MB	RB	PP	BB	SR
MB	1	3	3	5	5
RB	0,33	1	2	5	5
PP	0,33	0,5	1	3	3
BB	0,2	0,2	0,33	1	2
SR	0,2	0,2	0,33	0,5	1
∑kolom	2,1	4,9	6,7	14,5	16

a. *0.33 Figures in the column value MB row RB value is the result of calculations on the value of the MB row column values below RB 1/3 = 0.33 also onwards*

b . *A rate of 2.1 in the column is obtained from the sum of the value of the MB on each column element is concerned, the example in the column value MB Likewise with the figures the sum of each column in the table with the criteria comparison matrix column number , obtained in the same manner .*

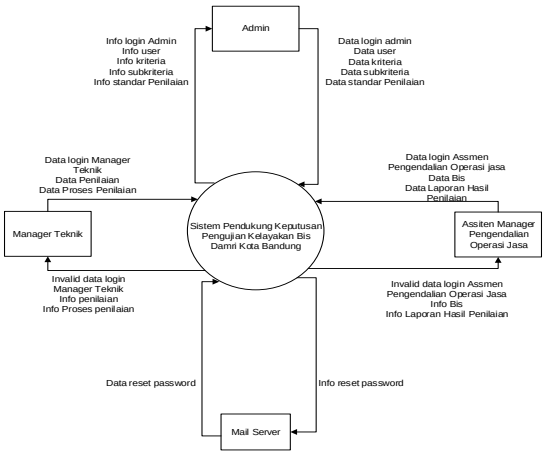
Kriteria	MB	RB	PP	BB	SR	Jumlah	TPV Prioritas (∑ baris/ 5)
MB	0, 48	0, 61	0, 45	0,3 4	0, 31	2,20	0,44
RB	0, 16	0, 10	0, 30	0,3 4	0, 31	1,32	0,26
PP	0, 16	0, 10	0, 15	0,2 1	0, 18	0,81	0,16
BB	0, 09 7	0, 04 1	0, 05	0,0 69	0, 12	0,38	0,08
SR	0, 09 7	0, 04 1	0, 05	0,0 34	0, 06	0,28	0,06

Here is a description of the results of the calculation of the value matrix table 3.3 above criteria , namely :
a) The value of the column 0.48 MB row 3.3 MB table column value is obtained from table 3.2 MB MB line divided the number of columns MB
b) The value of the column number in Table 3.3 is obtained from the sum on each line . For the first line , the value of 2.20 of the sum of 0.48 + 0.61 + 0.45 + 0.34 + 0.31
c) The value in the column TPV priorities derived from the value in column number is divided by the number of criteria , in this case the criterion 5

Kriteria	TPV	∑Kolom	λ Maks/∑ kolom
MB	0,44	2,1	0,91
RB	0,26	4,9	1,3
PP	0,16	6,7	1,08
BB	0,076	14,5	1,11
SR	0,057	16	0.91
∑			5,3

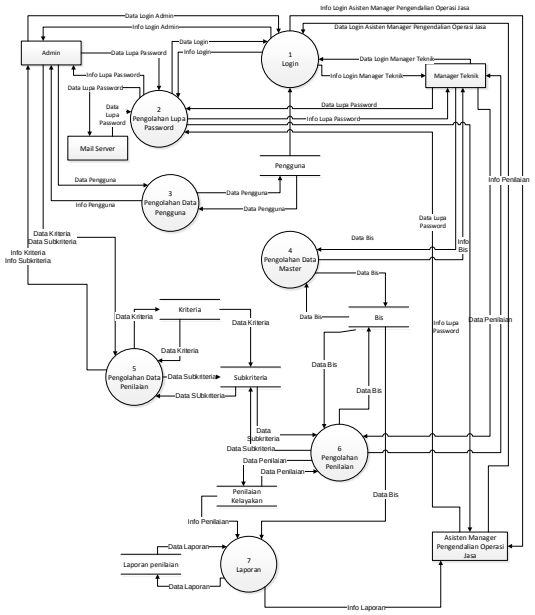
Here is a description of the calculation result λ max calculation table 3.4 above, namely :
Column λ max obtained from TPV Priority column in Table 3.2 to 0.44 multiplied by the number of columns of the matrix comparison criteria 2.1 Table 3.2 .
From Table 3.4 , the values obtained as follows :
n (number of criteria) : 5
CI (λ max - n) / n -1 = (5,3-5) / 5-1 = 0.07
CR (CI / IR (on page 23, table 2.2)) 0.07 / 1.12 = 0.06
Worth criteria matrix consistency ratio 0.06 (0.06 ≤ 0.1) which shows good consistency or received .

2.4 Konteks Diagrams

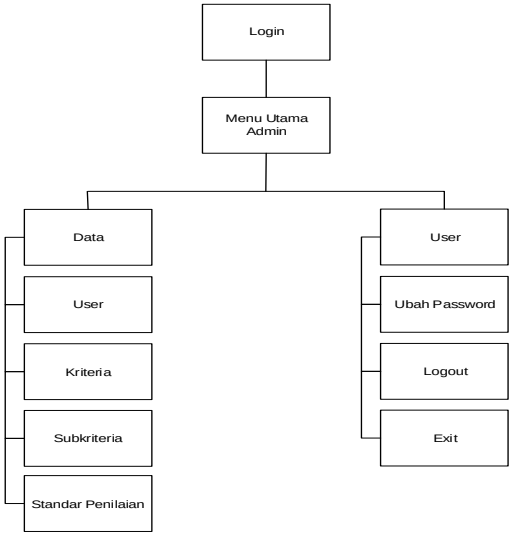


2.5 Data Flow Diagrams (DFD)

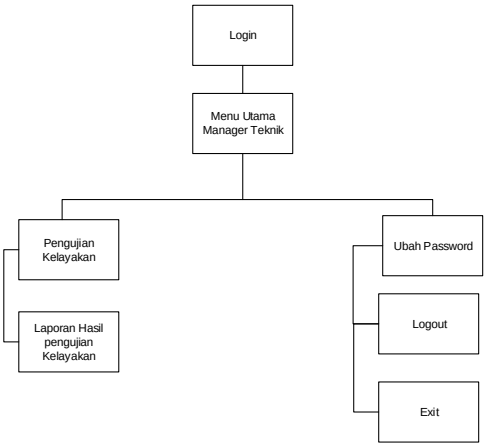
DFD is a logical model of data or processes are created to illustrate where the origin of the data and where the purpose of the data coming out of the system . Here is the DFD level 1 of a system built :



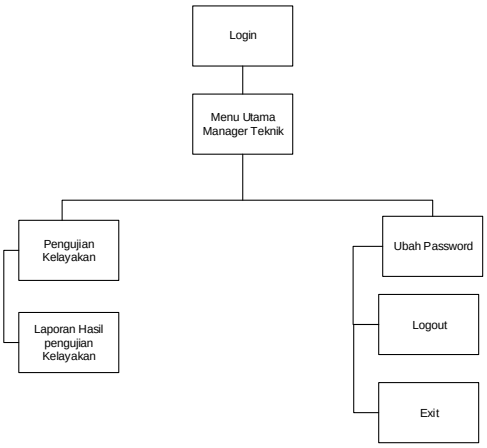
Admin Structure Menu



Manager Teknik Structure Menu



Asisten Manager Pengendalian Operasi Jasa Structure Menu



2.6 Interface Implementation

a. Display Home



Home Page Application

b . Display Main Menu



4. Finallyty

4.1 . conclusion

After doing the analysis , design, implementation and its testing has been done , it can be concluded against the decision support system feasibility testing Damri bus in the city of Bandung as follows :

1. *The decision support system is built to facilitate the processing of the test data bus eligibility .*
2. *Decision support system that was built to speed up the process of examination and in accordance with predetermined parameters .*
3. *The decision support system is built to reduce the error rate testing the feasibility and reduce customer complaints against Assistant Manager Operations Control Services*

4.2 suggestion

Suggestions for further development , as follows :

Management value comparison matrix in AHP calculation is made so much easier for users who are new to the system.

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