

# Designing a Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali

I Gusti Ngurah Wira Partha<sup>1\*</sup>, Philipus Novenando Mamang Weking<sup>2</sup>, and Yanu Prapto Sudarmojo<sup>3</sup>

<sup>1,2</sup> Department of Electrical and Computer Engineering, Post Graduate Program, Udayana University

<sup>3</sup> Department of Electrical and Computer Engineering, Udayana University

\*Email : kobayakawa.sena62@gmail.com

**Abstract**—The chairman and owner of PT. Z Bali considers the employees who work in his company to be very important for the continuity of the industry in his company, so he is very concerned about what the employees need. His attention to the needs of his employees is realized by giving bonuses to employees who have the best performance in the company. Periodically he assigns tasks to the Human Resources Department (HRD) in his company to process the best employee selection or employees who have good quality work.

But the best employee selection process at PT. Z Bali is still done manually and only based on the subjectivity of the HRD, this led to the HRD has trouble making decisions, so sometimes there is an employee who obtained the title of the best people by just looking at the first criteria, but these employees have not been certainly excelled on some other criteria.

Therefore, the purpose of this research is to Designing a Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali to be able to help the difficulties that are being faced by the Human Resources Department (HRD) at PT. Z Bali.

**Keywords**—Decision Support System, Employee, Best Employee Selection, AHP.

## I. INTRODUCTION

Along with the development of technology and the demands of the development of the times, the company's need for quality employees is also increasing. One way to improve the quality of employees of the company is by giving bonuses

to employees who have given their best contribution and ability to the company.

This was also applied by the chairman and owner of PT. Z Bali. He gives bonuses to employees who have good performance in their company. Periodically he gives assignments to the Human Resources Department (HRD) in his company to process the best employee selection or employees who have good quality work.

But the best employee selection process at PT. Z Bali is still done manually and only based on the subjectivity of the HRD, this led to the HRD has trouble making decisions, so sometimes there is an employee who obtained the title of the best people by just looking at the first criteria, but these employees have not been certainly excelled on some other criteria.

To overcome this problem there needs to be a renewal in the process of assessing existing employees. One of the steps to renewal is by Designing a Decision Support System for the Best Employee Selection Using the AHP Method Case Study PT. Z Bali. This system is expected to provide a structured and accurate assessment. The HRD will have a system that will assist in the assessment of employee performance, so that the decision will be stronger because it is supported by a system that provides detailed assessments. Likewise with employees, employees will be more satisfied in accepting the decision of the HRD, because the employee gets a clear assessment and feels the decision given by the HRD is not unilateral.

## II. THEORETICAL BASIS

### A. *Waterfall Method*

The waterfall method is often called the classical life cycle, where it describes a systematic and sequential approach to software development, starting with the specification of user needs and then going through the stages of planning, modeling, construction, and the delivery of the system to customers / users, which ends with support for the complete software produced (Pressman, 2012). The stages of the waterfall method of the system to be designed and built are as follows :

#### 1. *Requirement Analysis*

At this stage the system developer will communicate with the user who aims to understand the software that is expected by the user and the limitations of the software. This information is obtained through interviews, discussions or direct surveys. Information is analyzed to obtain data needed by the user.

#### 2. *System Design*

The specification of requirements from the previous stage will be studied and in this phase the design of the system will be prepared. System design helps in determining hardware, system requirements, and also helps in defining the overall system architecture.

#### 3. *Implementation*

At this stage, the system was first developed in a small program called the unit, which was integrated in the next stage. Each unit is developed and tested for functionality called unit testing.

#### 4. *Integration & Testing*

All units developed in the implementation phase will be integrated into the system after testing carried out by each unit. After integration the entire system is tested to check for any failures or errors.

#### 5. *Operation & Maintenance*

The final stage in the waterfall model. Software that has been created, carried out and

carried out maintenance. Maintenance includes repairing errors not found in the previous step..

### B. *PIECES Analysis*

To identify problems, an analysis of performance, information, economy, application security, efficiency and services must be carried out. This guide is known as PIECES analysis (Performance, Information, Economy, Control, Efficiency, Service). Through this analysis that will come to the surface is not the main problem, but only the symptoms of the main problem.

The following are the main components in the PIECES analysis of the best employee selection system that is still running at PT. Z Bali:

#### 1. *Performance*

The best selection of employees is done manually and uses assessment criteria that are not standardized so as to produce unsatisfactory ratings for employees.

#### 2. *Information*

Information about the results of selecting the best employees is considered less transparent, less accurate, and less satisfying by employees because it is only based on the subjectivity of the HRD only.

#### 3. *Economy*

The costs incurred by the company for the process of selecting the best employees are quite high, this is because the process uses a lot of paper and various kinds of Office Stationery.

#### 4. *Control*

Employee selection data are still vulnerable to manipulation by irresponsible people because the process is still manual and has not used consistent selection criteria.

#### 5. *Efficiency*

The process of selecting the best employees is quite complicated so it requires a long time for HRD to provide the best employee election report to the owner and employees, so that this is considered inefficient for some parties because a lot of time is wasted just to complete the process.

#### 6. *Service*

There are often mistakes in the best employee selection data processing process, resulting in

inaccurate, inconsistent and unsatisfactory decisions for employees.

### C. Decision Support Systems

Decision Support System is a system that works as a problem solving team, which supports a person or a small group of managers in finding solutions to semi-structured problems that work as problem solving teams, by providing information relating to specific decisions.

The concept of this decision support system was first put forward by Michael S. Scott Morton in the early 1970s by Micheal S. Scott Morton with the term Decision Management System. Marton defined the DSS as "Interactive Computer-Based System, which helps decision makers to use data and various models to solve unstructured problems".

The use of AHP begins by making a hierarchical structure of the problem (decomposition), comparing the variables between variables, doing analysis / evaluation, and determining the best alternatives (Saaty, 1993).

### D. AHP (Analytical Hierarchy Process)

The decision making process is basically choosing an alternative. The main equipment of the Analytical Hierarchy Process (AHP) is a functional hierarchy with the main input of human perception. With hierarchy, a complex and unstructured problem is solved into groups. Then the groups are organized into a hierarchical form.

Analytical Hierarchy Process (AHP) or Analytical Hierarchy Process is a device for decision making. The form is simple, flexible and powerful (powerful) to support a multi-criteria decision process, multi-purpose and full of complex situations. This device is also often used to make choices from various difficult alternatives.

AHP is widely used because it can develop a person's ability to use logic in dealing with complex and complex problems. This is possible because AHP provides a procedure for prioritizing rigid choices, whether it is alternative action, planning or policy.

AHP works based on a combination of inputs sharing considerations from decision makers based on information about the supporting elements of the decision, namely to determine a

set of priority measurements in order to evaluate various alternatives to be taken in a product decision.

## III. METHODOLOGY

### A. Research Location

The author conducted research at PT. Z Bali. The author conducts research using the observation method on the work process that occurs in HRD, and during the observation process the author also collects the data needed during the research at that location by using the documentation method, then the author collects information through interviews with HRD from PT. Z Bali.

### B. Data Sources

Data collection method is a method used to collect data needed in research. The method used in this study is:

#### 1. Primary Data

The primary data used in this study are observational data from the system and work processes that occur at the study site and data from interviews with HRD from PT. Z Bali.

#### 2. Secondary Data

Secondary data used in this study are books, journals, documentation data from research locations both in the form of documents, images, photographs and electronics, as well as data from various sources that support the basic concepts of information systems, internet, websites, software, and databases.

### C. Data Collection Techniques

#### 1. Observation

The author made observations at PT. Z Bali. The author observes the work process at PT. Z Bali is in the process of selecting the best employees who will be entitled to get a bonus from the company..

#### 2. Interview

In this interview the author needs to get data on the type of program or application that is in accordance with the needs of the owner and the HRD so that the best employee selection process at PT. Z Bali is faster, more effective, the calculations are more valid and the results

obtained are more accurate. The author interviewed HRD from PT. Z Bali.

3. Literature

The data and information obtained from the literature come from books, journals and data from various sources that support the basic concepts of information systems, the internet, websites, software, and databases.

D. Research Materials

The research material is in the form of data obtained through data collection techniques that have been carried out.

E. Research Instruments

The research tool used by researcher to Designing a Decision Support System for the Best Employee Selection Using the AHP Method Case Study PT. Z Bali is an Acer Aspire laptop with the following details as a specification of a research tool:

1. Hardware
  - a. Processor : intel Core i3
  - b. Memory : 2 GB DDR3
  - c. Hard Disk : 500 GB
2. Software
  - a. Operating System : Windows 7 Ultimate
  - b. Data Processing : Microsoft Office 2016
  - c. System Design : Visual Studio 2010

F. Research Flow

The following are the steps in the research, starting from defining the problem to drawing conclusions:

1. Defining the problem of the system created.
2. Collecting data and library studies related to decision support systems, and AHP (Analytical Hierarchy Process) methods.
3. Learn and understand the processes that occur in the system created.
4. Designing the user interface of the Decision Support System for the Best Employee Selection Using the AHP Method Case Study PT. Z Bali.
5. Taking conclusions.

G. System Analysis

System analysis is done by the author to determine the process that must be done to solve the existing problems. The goal that is carried out after the system analysis stage is to ensure that the system analysis is on the right track.

The best selection of employees is a way to improve employee performance in the company. Selection of the best employees at PT. Z Bali is one way to improve employee performance, not only performance but also motivates employees to work and develop the company where they work. Selection of the best employees at PT. Z Bali is done by giving an assessment in accordance with the criteria set by the company. The name of the criteria at PT. Z Bali, can be seen in Table 3.1.

No.	Criteria	Name of Criteria
1	C1	Discipline
2	C2	Responsible
3	C3	Skill
4	C4	Cooperation

Table 3.1 Criteria Name of the Best Employee Staff

Selection of the best employees at PT. Z Bali is done by giving an assessment to each employee of the criteria that have been set then added up. For employees who have the highest value, the employee is entitled to be awarded as the best employee.

H. Analysis of the New System

The new system that will be built utilizes a decision support system in determining the final outcome and the decision in determining the best employee, because the decision support system can solve the problem with the existing criteria. In the system, the calculation process of pairing is done between criteria, looking for consistency index values, consistency ratio values, priority

weight values which are processes with the AHP method.

*1. Data Analysis*

At this stage analysis of the data used in building a database so that the system can run as expected. The data that will be entered into the system are interrelated between one data and the other data. Existing data relations will become a single unified database. The data needed by the system are as follows:

1. Account Data (admin).
2. Data on user access rights to the system..
3. Alternative data (department, position, employee).
4. Criteria data  
Criteria data explain the criteria used as employee evaluations, namely:
  - a. Discipline  
on time, attendance and comply with regulations and SOPs.
  - b. Responsible  
carry out the tasks given by the boss.
  - c. Skill  
ability possessed.
  - d. Cooperation  
ability to work well together with superiors, fellow employees and other colleagues.
5. Alternative weight data  
In the form of data on the weight of employee values against existing criteria.
6. Criteria weighting data  
Data in the form of weight values of importance of criteria one compared to other criteria.
7. Data involved in the AHP calculation process.  
It is the result of processing master data (criteria, departments, positions and employees) with value weight data from each master data (alternative weights and criteria weights) with the AHP process.

The AHP process describes data:

1. Comparison of AHP paired matrices (criteria and alternatives),
2. Eigen value (criteria),
3. Lamda max value,
4. CI value,
5. CR value where  $CR < 0.1$ ,

(p-issn: 2579-5988, e-issn: 2579-597X)

6. Alternative weight matrix of criteria,
7. Decision matrix.

*J. AHP*

After the data is entered (company data, department data, job data, employee data, and criteria data), a calculation is performed using the AHP method. The problem that must be formulated in carrying out calculations using the AHP method is to determine the value of Priority, CI and CR of the criteria and sub criteria, which will later be used as the basis for evaluating each employee. This assessment is the most important decision in determining the best employees, because the determination of the best employees is the goal to be achieved in building this system.

1. The first step is to analyze the criteria by forming a Pairwise Comparison matrix (Pairing Comparison Matrix) First then doing a comparison assessment of the criteria. (Comparative value data is determined by observing the policies adopted by the assessor and the company concerned) are:
  - a. Discipline criteria are 2 times more important than responsibility, 2 times more important than skills, and 3 times more important than cooperation,
  - b. The responsibility criteria are 2 times more important than skills, and 2 times more important than cooperation,
  - c. Skill criteria are 2 times more important than cooperation

<b>Name of Criteria</b>	<b>Discipline</b>	<b>Responsible</b>	<b>Skill</b>	<b>Cooperation</b>
<b>Discipline</b>	1	2	2	3
<b>Responsible</b>	1/2	1	2	2
<b>Skill</b>	1/2	1/2	1	2

<b>Cooperat ion</b>	1/3	1/2	1/2	1
-------------------------	-----	-----	-----	---

Table 3.2 Pairwise Comparison Matrix

How to get the values from the Pairing Comparison Matrix is by comparing the columns located at the far left with each second, third and fourth column.

Comparison of itself will produce a value of 1. So the value of one will appear diagonally. (Discipline of Discipline, Responsibility for Responsibility, Skill for Skills, and Cooperation on Cooperation).

Comparison of the left column with the next columns. For example, value 2, obtained from the ratio of discipline which is 2 times more important than responsibility (see the value of the comparison above).

Comparison of the left column with the next columns. Suppose the value 1/2 is obtained from a comparison of Responsibilities with Discipline (remember, Discipline is 2 times more important than Responsibility so that the value of Responsibility is 1/2 of Discipline).

- The second step is to determine the ranking criteria in the form of priority vector (also called normalized eigen vector). Change the Pairwise Comparison matrix to a decimal form and add up each column.

<b>Name of Criteria</b>	<b>Discipline</b>	<b>Responsible</b>	<b>Skill</b>	<b>Cooperation</b>
<b>Discipline</b>	1	2	2	3
<b>Responsible</b>	0,5	1	2	2
<b>Skill</b>	0,5	0,5	1	2
<b>Cooperation</b>	0,33	0,5	0,5	1

<b>Total of Columns</b>	2,33	4	5,5	8
-------------------------	------	---	-----	---

Table 3.3 Summing of Pairwise Comparison Matrix (Decimal)

- The third step is to divide the elements of each column with the corresponding number of columns and calculate the normalized Vector Eigen (Priority) of the matrix.

<b>Name of Criteria</b>	<b>Discipline</b>	<b>Responsible</b>	<b>Skill</b>	<b>Cooperation</b>	<b>Total</b>	<b>Priority</b>
<b>Discipline</b>	0,43	0,5	0,36	0,38	1,67	0,42
<b>Responsible</b>	0,21	0,25	0,36	0,25	1,08	0,27
<b>Skill</b>	0,21	0,13	0,18	0,25	0,77	0,19
<b>Cooperation</b>	0,14	0,13	0,09	0,13	0,48	0,12

Table 3.4 Criteria Value Matrix

How to get Value 0.43 is the result of the division between the value 1.00 / 2.33 etc. Then the Amount column is obtained through the sum of each row of criteria, then the Priority value 0.42 is obtained from the Discipline Row 1.67 divided by the number of criteria (n) and so on that all rows and columns are filled. The number of criteria in this case is 4.

- The fourth step is to form an Addition matrix from each Priority Line.

Name of Criteria	Discipline	Responsible	Skill	Cooperation	Total
Discipline	0,42	0,54	0,39	0,36	1,7
Responsible	0,21	0,27	0,39	0,24	1,1
Skill	0,21	0,13	0,19	0,24	0,78
Cooperation	0,14	0,13	0,1	0,12	0,5

Table 3.5 Addition Matrix of Each Priority Line

How to get a Value of 0.42 from the Discipline, ie multiplying the Priority from the Discipline line from the Criteria Value Matrix (Table 3.4) which is 0.42 with the disciplinary value of the Summaries of the Pairing Comparison Matrix (Table 3.3) 1 and then all rows and columns are filled. Then each row is summed and produces the Amount column which is 1.7.

- The fifth step is to make a Consistency Ratio Calculation Matrix which will be used as a basis for calculating the Consistency Ratio Value.

Name of Criteria	Total per line	Priority	Result
Discipline	1,7	0,42	2,12
Responsible	1,1	0,27	1,37
Skill	0,78	0,19	0,97

Cooperation	0,5	0,12	0,62
<b>Total</b>			5,08

Table 3.6 The Consistency Ratio Calculation Matrix

Columns and Values of Number of rows are obtained from Column and Value of Amount in the Addition Matrix of Each Priority Row (Table 3.5).

Columns and Values from Row Priorities are obtained from Columns and Values from Priorities in the Criteria Value Matrix (Table 3.4).

Then Column and Value Results are obtained from the sum of each row of the Amount per Row and Priority column. Then all the result columns are summed so as to produce Amount 5.08.

- The Sixth Step is to determine the IR (Random Consistency Index List) of the calculation according to the number of criteria, the following is the Table of IR determination (List of Random Consistency Indices).

n	IR
1	0,00
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

Table 3.7 List of Random Consistency (IR) Indices

Because in this case we use 4 criteria so that the IR value we use is 0.90.

The next step is to calculate the consistency ratio value to find out whether the comparison of criteria is consistent or not.

<b>Total</b>	<b>5,08</b>
<b>n</b>	<b>4</b>
<b><math>\lambda \text{ max (Total/n)}</math></b>	<b>1,27</b>
<b><math>CI ((\lambda \text{ max-n})/n)</math></b>	<b>-0,68</b>
<b>CR (CI/IR)</b>	<b>-0,76</b>

Table 3.8 Results of Calculation of Consistency Ratio Value

- The amount is the sum of the Result Columns in the Consistency Ratio Calculation Matrix (Table 3.6).
- (n) is the number of criteria in this calculation.

- $\lambda \text{ max}$  obtained from the Amount of Results of Calculation of Matrix Calculation Consistency Ratio is divided by the number of criteria from the calculation. This can be written with the following formula: (total / n).
- CI is obtained from the results of max  $\lambda$  calculation minus the number of criteria, then the reduction results are further divided by the number of criteria, this can be written with the formula  $((\lambda \text{ max-n}) / n)$ .
- CR is obtained from the calculation of CI divided by the List of Random Consistency Index (IR) that we have set before, which is 0.90. This can be written by the formula (CI / IR).
- Furthermore, from the results of these calculations if the value of  $CR \geq 0.1$ , the consistency ratio value is inconsistent or does not meet the requirements and must be repeated from the comparison matrix until the CR value meets the specified conditions.

Because the Consistency Ratio we get from this calculation is -0.76 and meets the CR requirements  $< 0.100$ , so the Consistency Ratio Value is Consistent. generate Amount of 5.08.

- After the Consistency Ratio of the Criteria Analysis is Consistent, then the Sub Criteria Analysis is carried out, do the steps in the analysis of this sub-criterion the same and in accordance with the criteria analysis, namely the first step by forming a Pairwise Comparison matrix (Pairwise Comparison Matrix) First, then make a comparative assessment of the criteria. (Comparative value data is determined by observing the policies adopted by the assessor and the company concerned).

Criteria	Good	Enough	Less
Good	1	3	5
Enough	1/3	1	3
Less	1/5	1/3	1



Table 3.9 Pairwise Comparison Matrix of Disciplinary Sub Criteria

8. The second step is the same as in Table 3.3 which is to determine the ranking of criteria in the form of priority vectors Change the Pairwise Comparison matrix (Paired Comparison Matrix) to decimal form and add up each column.

Criteria	Good	Enough	Less
<b>Good</b>	1	3	5
<b>Enough</b>	0,33	1	3
<b>Less</b>	0,2	0,33	1
<b>Total of Columns</b>	1,53	4,33	9

Table 3.10 Addition of Pairwise Comparison Matrix (Decimal) Disciplinary Sub Criteria

9. The third step is the same as in Table 3.4, which is to divide the elements of each column with the number of columns in question and calculate the normalized Vector Eigen (Priority) of the matrix.

Criteria	Good	Enough	Less	Total	Priority	Sub Priority
<b>Good</b>	0,65	0,69	0,56	1,9	0,63	1
<b>Enough</b>	0,22	0,23	0,33	0,78	0,26	0,41
<b>Less</b>	0,13	0,08	0,11	0,32	0,11	0,17

Table 3.11 Criteria Value Matrix Disciplinary Sub Criteria

10. The fourth step is the same as in Table 3.5, which forms an Addition matrix from each Priority Line.

Criteria	Good	Enough	Less	Total
<b>Good</b>	0,63	0,78	0,55	1,96
<b>Enough</b>	0,21	0,26	0,33	0,8
<b>Less</b>	0,13	0,09	0,11	0,33

Table 3.12 Addition Matrix of Each Priority Row of the Disciplinary Sub Criteria

11. The fifth step is the same as Table 3.6, namely making a Consistency Ratio Calculation Matrix which will be used as a basis for calculating the Consistency Ratio Value.

Criteria	Total per line	Priority	Result
<b>Good</b>	1,96	0,63	2,59
<b>Enough</b>	0,8	0,26	1,06
<b>Less</b>	0,33	0,11	0,44
<b>Total</b>			4,09

Table 3.13 Matrix of Calculation of the Subcritical Disciplinary Ratio Consistency

Then the next step is to calculate the consistency ratio value to find out whether the comparison of the disciplinary sub criteria is consistent or not.

<b>Total</b>	<b>4,09</b>
<b>n</b>	<b>3</b>
<b><math>\lambda</math> max (Total/n)</b>	<b>1,36</b>

<b>CI ((λ max-n)/n)</b>	<b>-0,55</b>
<b>CR (CI/IR)</b>	<b>-0,95</b>

Table 3.14 Results of Calculation of the Sub Criteria Criteria Discipline Ratio

Because the Sub Consistency Ratio Value of the Discipline Criteria that we get from the calculation is -0.95 and meets the CR requirements <0.100, so the Consistency Ratio Value is Consistent.

- After the Consistency Ratio from the Sub-Criteria Analysis of Discipline is Consistent, then do the Responsibility Sub Criteria Analysis, do the steps in the analysis of sub-criteria this responsibility is the same and is in accordance with the sub-disciplinary analysis, which is the first step by forming a Pairwise Comparison matrix (Pairing Comparison Matrix) First then make a comparison assessment of the criteria. (Comparative value data is determined by observing the policies adopted by the assessor and the company concerned).

Criteria	Good	Enough	Less
<b>Good</b>	1	2	6
<b>Enough</b>	1/2	1	2
<b>Less</b>	1/6	1/6	1

Table 3.15 Pairwise Comparison Matrix Responsibility Sub Criteria

- The second step is to determine the ranking of criteria in the form of priority vectors Change the Pairwise Comparison matrix (the Pairing Comparison Matrix) to the decimal form and add the number of each column.

Criteria	Good	Enough	Less
<b>Good</b>	1	2	6
<b>Enough</b>	0,5	1	2
<b>Less</b>	0,17	0,17	1
<b>Total of Columns</b>	1,67	3,17	9

Table 3.16 Addition of Pairwise Comparison Matrix (Decimal) Sub Criteria of Responsibility

- The third step is to divide the elements of each column with the corresponding number of columns and calculate the normalized Vector Eigen (Priority) of the matrix.

Criteria	Good	Enough	Less	Total	Priority	Sub Priority
<b>Good</b>	0,6	0,63	0,67	1,9	0,63	1
<b>Enough</b>	0,3	0,32	0,22	0,84	0,28	0,44
<b>Less</b>	0,1	0,05	0,11	0,26	0,09	0,14

Table 3.17 Criteria Value Matrix Sub Criteria Responsibilities

- The fourth step is to form an Addition matrix from each Priority Line.

Criteria	Good	Enough	Less	Total
<b>Good</b>	0,63	0,56	0,53	1,73
<b>Enough</b>	0,32	0,28	0,18	0,78

<b>Less</b>	0,11	0,05	0,09	0,25
-------------	------	------	------	------

Table 3.18 Addition Matrix of Each Priority Row Sub Criteria Responsibility

16. The fifth step is to make a Consistency Ratio Calculation Matrix which will be used as a basis for calculating the Consistency Ratio Value.

Criteria	Total per line	Priority	Result
<b>Good</b>	1,73	0,63	2,36
<b>Enough</b>	0,78	0,28	1,06
<b>Less</b>	0,25	0,09	0,34
<b>Total</b>			3,76

Table 3.19 Responsibility Calculation Matrix for Sub Criteria Responsibility

Same as in step 6 and in accordance with Table 3.7 because in the sub criteria this responsibility has 3 criteria so that the IR value we use is 0.58.

Then the next step is to calculate the consistency ratio value to find out whether the comparison of the disciplinary sub criteria is consistent or not.

<b>Total</b>	<b>3,76</b>
<b>n</b>	<b>3</b>
<b><math>\lambda</math> max (Total/n)</b>	<b>1,25</b>
<b>CI ((<math>\lambda</math> max-n)/n)</b>	<b>-0,58</b>
<b>CR (CI/IR)</b>	<b>-1</b>

Table 3.20 Results of Calculation of Sub Criteria Responsibility Ratio Consistency Value (p-issn: 2579-5988, e-issn: 2579-597X)

Because the Consistency Ratio Value of the Sub Criteria Responsibility that we get from the calculation is -1 and meets the CR requirements  $<0.100$ , so the Consistency Ratio Value is Consistent.

17. After Consistency Ratio from Analysis of Sub Criteria Responsibility is Consistent, then is to do Sub Skill Analysis, do the steps in the analysis of sub criteria this skill is the same and in accordance with the analysis of sub criteria of responsibility, which is the first step by forming a Pairwise Comparison matrix (Pairing Comparison Matrix) First then make a comparison assessment of the criteria. (Comparative value data is determined by observing the policies adopted by the assessor and the company concerned).

Criteria	Good	Enough	Less
<b>Good</b>	1	3	4
<b>Enough</b>	1/3	1	3
<b>Less</b>	1/4	1/3	1

Table 3.21 Pairwise Comparison Matrix Skill Sub Criteria

18. The second step is to determine the ranking of criteria in the form of priority vectors Change the Pairwise Comparison matrix (the Pairing Comparison Matrix) to the decimal form and add the number of each column.

Criteria	Good	Enough	Less
<b>Good</b>	1	3	4
<b>Enough</b>	0,33	1	3
<b>Less</b>	0,25	0,33	1

<b>Total of Columns</b>	1,58	4,33	8
-------------------------	------	------	---

Table 3.22 Summing of Pairwise Comparison Matrix (Decimal) Skill Sub Criteria

19. The third step is to divide the elements of each column with the corresponding number of columns and calculate the normalized Vector Eigen (Priority) of the matrix.

Criteria	Good	Enough	Less	Total	Priority	Sub Priority
<b>Good</b>	0,63	0,69	0,5	1,82	0,61	1
<b>Enough</b>	0,21	0,23	0,38	0,82	0,27	0,44
<b>Less</b>	0,16	0,08	0,13	0,36	0,12	0,2

Table 3.23 Criteria Value Matrix for Skill Sub Criteria

20. The fourth step is to form an Addition matrix from each Priority Line.

Criteria	Good	Enough	Less	Total
<b>Good</b>	0,61	0,82	0,48	1,9
<b>Enough</b>	0,2	0,27	0,36	0,83
<b>Less</b>	0,15	0,09	0,12	0,36

Table 3.24 Addition Matrix of Each Priority Line Skill Sub Criteria

21. The fifth step is to make a Consistency Ratio Calculation Matrix which will be used as a basis for calculating the Consistency Ratio Value.

Criteria	Total per line	Priority	Result
<b>Good</b>	1,90	0,61	2,51
<b>Enough</b>	0,83	0,27	1,10
<b>Less</b>	0,36	0,12	0,48
<b>Total</b>			4,09

Table 3.25 Matrix for Calculation of the Skill Sub Criteria Consistency Ratio

Same as in step 6 and in accordance with Table 3.7 because in the sub criteria this skill has 3 criteria so that the IR value we use is 0.58.

Then the next step is to calculate the value of the consistency ratio to find out whether the comparison of sub skills criteria is consistent or not.

<b>Total</b>	<b>4,09</b>
<b>n</b>	<b>3</b>
<b><math>\lambda</math> max (Total/n)</b>	<b>1,36</b>
<b>CI ((<math>\lambda</math> max-n)/n)</b>	<b>-0,55</b>
<b>CR (CI/IR)</b>	<b>-0,95</b>

Table 3.26 Results of Calculation of Skill Sub-Criteria Sub-Value Value Ratio

Because the Consistency Ratio Sub Skill Criteria that we get from the calculation is -0.95 and meets the CR requirements  $<0.100$ , so the Consistency Ratio Value is Consistent.

22. After Consistency Ratio from Analysis of Skill Sub Criteria is Consistent, then is to do Sub-Criteria Analysis of Cooperation, do the steps in the analysis of sub-criteria of this cooperation together and in accordance with the analysis of sub skills

criteria, namely the first step by forming a Pairwise Comparison matrix (Pairing Comparison Matrix) First then make a comparison assessment of the criteria. (Comparative value data is determined by observing the policies adopted by the assessor and the company concerned).

Criteria	Good	Enough	Less
<b>Good</b>	1	2	5
<b>Enough</b>	1/2	1	4
<b>Less</b>	1/5	1/4	1

Table 3.27 Pairwise Comparison Matrix Sub Criteria for Cooperation

23. The second step is to determine the ranking of criteria in the form of priority vectors Change the Pairwise Comparison matrix (the Pairing Comparison Matrix) to the decimal form and add the number of each column.

Criteria	Good	Enough	Less
<b>Good</b>	1	2	5
<b>Enough</b>	0,5	1	4
<b>Less</b>	0,2	0,25	1
<b>Total of Columns</b>	1,7	3,25	10

Table 3.28 Addition of Pairwise Comparison Matrix (Decimal) Sub Criteria for Cooperation

24. The third step is to divide the elements of each column with the number of columns in question and calculate the normalized Vector Eigen (Priority) of the matrix.

Criteria	Good	Enough	Less	Total	Priority	Sub Priority
<b>Good</b>	0,59	0,62	0,5	1,70	0,57	1
<b>Enough</b>	0,29	0,31	0,4	1	0,33	0,58
<b>Less</b>	0,12	0,08	0,1	0,3	0,1	0,18

Table 3.29 Criteria Value Matrix Sub Criteria for Cooperation

25. The fourth step is to form an Addition matrix from each Priority Line.

Criteria	Good	Enough	Less	Total
<b>Good</b>	0,57	0,67	0,5	1,73
<b>Enough</b>	0,28	0,33	0,4	1,01
<b>Less</b>	0,11	0,08	0,1	0,29

Table 3.30 Addition Matrix of Each Priority Line Sub Criteria for Cooperation

26. The fifth step is to make a Consistency Ratio Calculation Matrix which will be used as a basis for calculating the Consistency Ratio Value.

Criteria	Total per line	Priority	Result
<b>Good</b>	1,73	0,57	2,30
<b>Enough</b>	1,01	0,33	1,34
<b>Less</b>	0,29	0,1	0,4
<b>Total</b>			4,03

Table 3.31 Matrix of Calculation of Consistency Ratio of Sub Criteria of Cooperation

Same as in step 6 and in accordance with Table 3.7 because in the sub-criteria of this cooperation has 3 criteria so that the IR value we use is 0.58.

Then the next step is to calculate the value of the consistency ratio to find out whether the comparative assessment of cooperation criteria is consistent or not.

<b>Total</b>	<b>4,03</b>
<b>n</b>	<b>3</b>
<b><math>\lambda</math> max (Total/n)</b>	<b>1,34</b>
<b>CI ((<math>\lambda</math> max-n)/n)</b>	<b>-0,55</b>
<b>CR (CI/IR)</b>	<b>-0,95</b>

Table 3.32 Results of Calculation of Consistency Ratio Value for Sub Criteria of Cooperation

Because the Consistency Ratio Value of the Cooperation Criteria Sub we get from the calculation is -0.95 and meets the CR requirements <0.100, so the Consistency Ratio Value is Consistent.

After all the consistency ratio values of the criteria and sub criteria are obtained, then next we will create an assessment table where this table will be used as a reference in evaluating the best employees.

<b>Discipline</b>	<b>Responsible</b>	<b>Skill</b>	<b>Cooperation</b>
0,42	0,27	0,19	0,12
<b>Good</b>	<b>Good</b>	<b>Good</b>	<b>Good</b>

1	1	1	1
<b>Enough</b>	<b>Enough</b>	<b>Enough</b>	<b>Enough</b>
0,41	0,44	0,44	0,58
<b>Less</b>	<b>Less</b>	<b>Less</b>	<b>Less</b>
0,17	0,14	0,2	0,18

Table 3.33 Assessment Table

The value of 0.42 from the disciplinary column is obtained from the priority values that exist in the discipline line in the Criteria Value Matrix (Table 3.4), as well as the responsibility, skill and cooperation columns obtained from each row of sub-criteria in the matrix.

Furthermore for Good Value: 1, Enough: 0.41 and Less: 0.17 which is in the Discipline column obtained from the Priority Value Sub which is in the Discipline Criteria Value Matrix (Table 3.11), for the responsibility column obtained from the Responsibility Criteria Value Matrix Answer (Table 3.17), for the skill column obtained from the Skill Criteria Value Matrix (Table 3.23), and for the collaboration column obtained from the Cooperation Criteria Value Matrix (Table 3.9).

#### IV. RESULTS

Based on the research that has been done, there are 4 criteria used in the process of selecting the best employees at PT. Z Bali, which is discipline, responsibility, skill and cooperation. Then, various results of calculations that have been obtained through the AHP method were adapted and applied to the system that has been designed, resulting in the Design of the Decision Support System for the Best Employee Selection Using the AHP Method Case Study of PT. Z Bali.

Here are some views of the results of the interface Design of the Decision Support System for the Best Employee Selection Using the AHP Method Case Study PT. Z Bali.

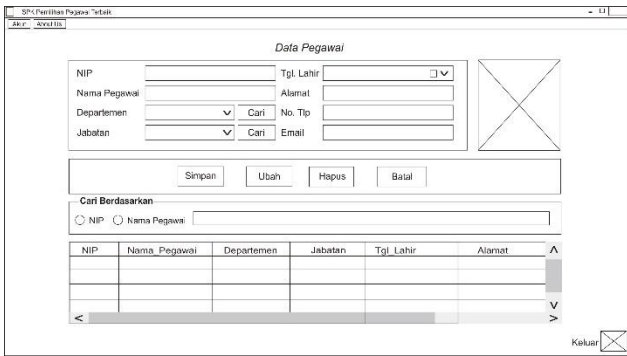


Figure 4.1 Design of the Employee Data Form

In Figure 4.1, the employee data page interface design, this employee data page can be used by the user to input, change, delete and search for employee data in the system.

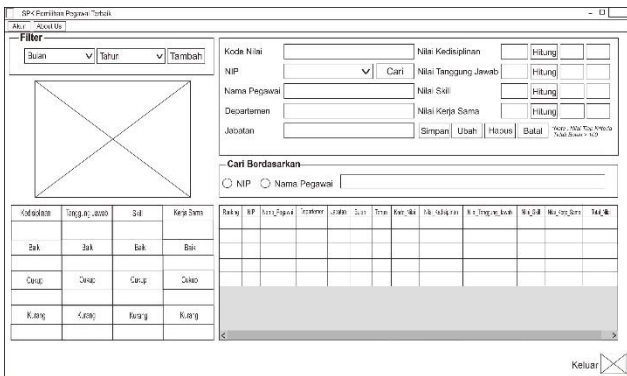


Figure 4.2 Design of the Best Employee Assessment Form

In Figure 4.2 is the design of the best employee rating page interface, the best employee rating page can be used by the user to input assessment data according to the month and year of the assessment that he selected, change, delete and search for the best employee assessment data in the system.

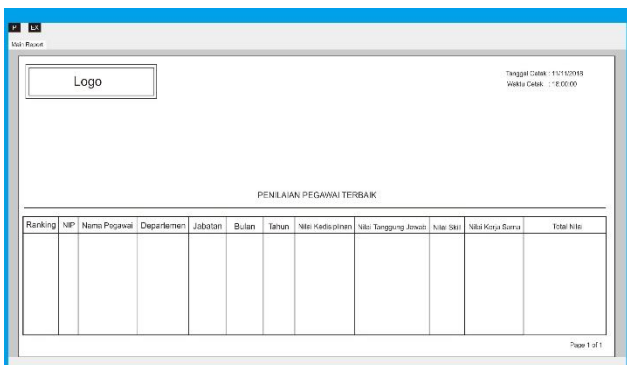


Figure 4.3 Design of the Best Employee Assessment Report Form

In Figure 4.3 is the design of the interface of the best employee assessment report page, the best employee assessment report page can be used by the user to display the results of the best employee appraisal process at PT. Z Bali.

A. User Experience (UX)

Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali is designed so because it aims to facilitate the user in using this system (user friendly), so that it will provide a good experience to the user in using this system, so that this system can be utilized optimally.

B. User Interface (UI)

Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali is designed with the position of menus, buttons, and tables that are good, clear, and not confusing, so that this system can be used easily by user (easy-to-use).

V. CONCLUSION AND RECOMMENDATION

A. Conclusion

In Making of the Design of the Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali it can be concluded that:

1. The calculation process in selecting the best employees can be done using the AHP method which has a better accuracy value than using manual calculations.
2. The Design of the Decision Support System for the Best Employee Selection has been successfully designed and built for PT. Z Bali in the selection of the best employees to produce better, satisfying, computerized decisions and reduce the occurrence of human errors.

B. Recommendation

Recommendations that can be given by the author for further development is that it is expected that the Design of Decision Support System for the Best Employee Selection Using AHP Method Case Study PT. Z Bali can be applied to web and mobile based programs

## REFERENCES

- Al Fatta, Hanif. **Buku Analisis dan Perancangan Sistem Informasi**, Publisher : Andi.
- Fatta. 2008. **Analisis dan Perancangan Sistem Informasi**. Yogyakarta: Publisher ANDI.
- Fitria, Yeni. 2011. **Sistem Pendukung Keputusan Pemilihan Karyawan Berprestasi Menggunakan Metode AHP dan TOPSIS (Studi Kasus: PT. Mitra Beton Mandiri)**. Fakultas Sains dan Teknologi Universitas Islam Negeri Sultan Syarif Kasim Riau Pekanbaru.
- Herman Firdaus, Indra, Gunawan Abdillah, Faiza Renaldi. 2016. **Sistem Pendukung Keputusan Penentuan Karyawan TerGood Menggunakan Metode AHP dan TOPSIS**. Seminar Nasional Teknologi Informasi dan Komunikasi 2016 (SENTIKA 2016) Yogyakarta.
- Kusrini. 2007. **Konsep dan Aplikasi Sistem Pendukung Keputusan**. Yogyakarta: Publisher Andi.
- Lathifah, Siti. 2008. **Prinsip prinsip dasar Analytical Hierarchy Process**.
- M. Azman Maricar, Wahyudin, Made Sudarma. 2016. **Decision Support System of the Employees Acceptance using Analytical Hierarchy Process (AHP) and Multi Factor Evaluation Process (MFEP)**, IJEET Teknik Elektro, Fakultas Teknik, Universitas Udayana.
- Pressman, Roger S. 2012. **Rekayasa Perangkat Lunak – Buku Satu, Pendekatan Praktisi (Edisi 7)**. Yogyakarta: Andi.
- Scott, George M. 2004. **Prinsip-prinsip sistem informasi manajemen**, (diterjemahkan oleh Budiman, Achmad Nashir), Raja Grafindo Persada, Jakarta.
- Thomas L Saaty. 2008. **Decision Making With The Analytic Hierarchy Process**. Int J Services Sciences Vol 1, No. 1.