Decision Support System Application Evaluation of Transformer Isolation Condition with Simple Additive Weighting (SAW) Method

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ABSTRACT

The use of computer technology has spread among workers and companies. Therefore researchers recommend a system that can overcome the problem of assessing the conditions of transformer insulation at PT. Electricity System Cemerlang uses a computer system. The system that researchers use is a decision support system. Decision Support System or often called Decision Support System (DSS) is a model-based system that consists of procedures in data processing and consideration to assist managers in making decisions. In order to succeed in achieving its objectives, the system must be simple, robust, easy to control, easily adaptable to important things and easy to communicate with. Implicitly also means that this system must be computer-based and used as an addition to someone's problem solving capabilities. But to be able to use a decision support system properly, a method or an appropriate method is needed to get the right results. Therefore researchers recommend the method of Simple Additive Weighting (SAW). Simple Additive Weighting (SAW) method is often also known as the weighted sum method. The basic concept of the method of Simple Additive Weighting (SAW) is to find a weighted sum of performance ratings on each alternative on all attributes.

Keyword : *Decision Support System, Simple Additive Weighting (SAW).*

1. INTRODUCTION

PT. PLN (Persero) is a State-Owned Enterprise (BUMN) that serves and supplies the electricity needs of the community, both for household needs, government agencies and industry [1]. In providing services to the community of PT. PLN is always ready and ready in various things that occur. PT. PLN also always checks until repairs of all equipment used in the investigation of isolation distribution of PT PLN (Persero) Area Medan transformers in collaboration with PT. Shining Electrical System that analyzes the quality of transformer insulation in the investigation of electrical substations, then from the results of this assessment PT. Shining Electrical System gives the results to PT. PLN (Persero) Area Medan to follow up as evidence of the assessment of transformer insulation conditions. Assessment of transformer insulation conditions is carried out by expert workers who are familiar with and understand the conditions of transformer isolation, so that the assessment of transformer insulation conditions can be done easily.

The use of computer technology has spread among workers and companies. Therefore researchers recommend a system that can overcome problem of assessing the condition of transformer insulation at PT. Electricity System Cemerlang uses a computer system. The system that researchers use is a decision support system. Decision Support System or often called Decision Support System (DSS) is a model-

based system that consists of procedures in data processing and consideration to assist managers in making decisions. In order to succeed in achieving its objectives, the system must be simple, robust, easy to control, easily adaptable to important things and easy to communicate with. Implicitly also means that this system must be computer-based and used as an addition to one's problem solving ability [2]

However to be able to use a decision support system properly, a method or an appropriate method is needed to get the right results. Therefore researchers recommend the method of Simple Additive Weighting (SAW). Simple Additive Weighting (SAW) method is often also known as the weighted sum method. The basic concept of the method of Simple Additive Weighting (SAW) is to find a weighted sum of performance ratings on each alternative on all attributes. Simple Additive Weighting (SAW) method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings [3]. With the application of a decision support system using the Simple Additive Weighting (SAW) method to assess the condition of transformer isolation, PT. Shining Electricity can be helped and can easily assess computer systems.

2. RESEARCH METHODOLOGY

The method is a systematic way to work on a problem. Research carried out [2] concerning Feasibility Decision Support Systems for Providing Motorcycle Loans Using Simple Additive Weighting Methods at HD Finance Leasing Companies. Research [3] in the development of a new labor recruitment decision support system using Simple Additive Weighting (Case Study of PT. Dbi Medan), in this study [1] discussed the recruitment of new workers. Research [4] regarding the system of decision support for technical services of PT. PLN with the Simple Additive Weighting method, [4] makes the application system support the technical service decisions of PT. PLN with Simple Additive Weighting method. Research [5] regarding the design of the priority decision support system for electric transformer repair using the Simple Additive Weighting (SAW) method, research [5] made an application that can give a decision regarding the priority of repairing electric transformers using the Simple Additive Weighting (SAW) method. Research conducted to build applications that can assess the condition of transformer insulation using the Simple Additive Weighting (SAW) method.

This research will go through several stages. The stages in this study can be modeled on the Fish Bone diagram. The several stages used in this study can be seen in Figure 1.

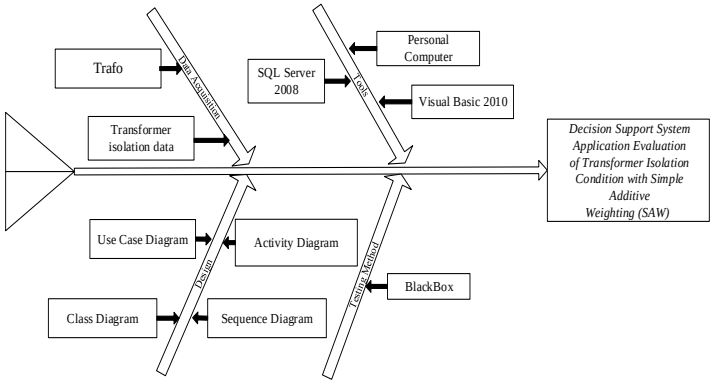

Figure 1. Research Methodology using Fish Bone Diagram

Figure 1. Shows the Fish Bone Diagram of Research Methods starting with:

a. Data acquisition
   At this stage theoretical data collection related to transformer data, idolatrous transformer data is carried out.
b. Design
   At this stage, software design is done using UML modeling, namely use case diagrams, class diagrams, activity diagrams and sequence diagrams.
c. Tools
   At this stage, to make the system implemented into the program code, visual basic 2010 is used and uses SQL Server 2008 databases.
d. Test Method
   Testing is done using blackbox testing. Blackbox testing is a software testing method that tests the application's functionality as opposed to internal structure. Practice testing is done using the Visual Basic 2010 application.
e. Results
   At this stage the decision support system application has been used to assess the condition of transformer insulation using the simple additive weighting (SAW) method.

3. RESULT AND DICUSSION

3.1 Design System Using Unified Modeling Language

This research uses design with diagrams from Unified Modeling Language. Tools used in object-oriented design based on UML are use case diagrams. The design starts from identifying the actor and how the relationship between the actor and the use case in the system. Designing Use Case Diagrams can be seen in Figure 2.

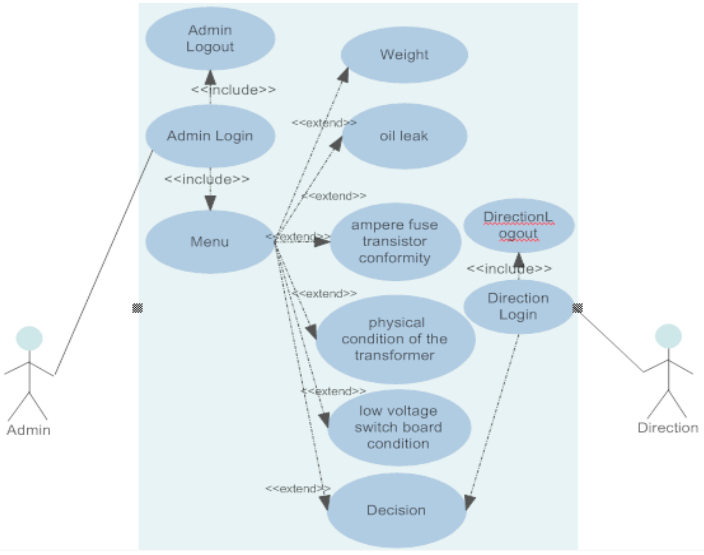

Figure 2. Use Case Decision Support System Application Evaluation of Transformer Isolation Conditions by Simple Additive Weighting Method

3.2 *Simple Additive Weighting* Method

Simple Additive Weighting (SAW) method is often also known as the weighted sum method. The basic concept of the method of Simple Additive Weighting (SAW) is to find a weighted sum of performance ratings on each alternative on all attributes.

The Simple Additive Weighting (SAW) method requires the process of normalizing the decision matrix (X) to a scale that can be compared with all available alternative ratings [3].

$$r_{ij=} \begin{cases} \frac{x_{ij}}{Max\ x_{ij}} if\ j\ benefit \\ \frac{Min\ x_{ij}}{x_{ij}} if\ j\ cost \end{cases} \quad (1)$$

with :

r_{ij} = The transformer rating values are normalized

x_{ij} = attribute values that are owned by each criteria

Max x_{ij} = the maximum value of each criteria

Min x_{ij} = the minimum value of each benefit criterion if the greatest value is best

cost =if the smallest value is best where rij is the rating the normalized transform of the alternative A_i on the attribute C_j; i=1,2,...,m and j=1,2,...,n.

Preference value for each alternative (Vi) given as :

$$V_i = \sum_{j=1}^{n} w_j r_{ij} \quad (2)$$

with :

V_i = ranking for each alternative

w_j = weight values of each criteria

r_{ij} = The transformer rating values are normalized

a larger V_i value indicates that the alternative A_i is more chosen

3.3 Display of Result

Display results from the decision support system application to assess the condition of the transformer insulation using *Simple Additive Weighting* (SAW) method :

1. Form Login

The display presented by the system to display the login form can be seen in Figure 3.

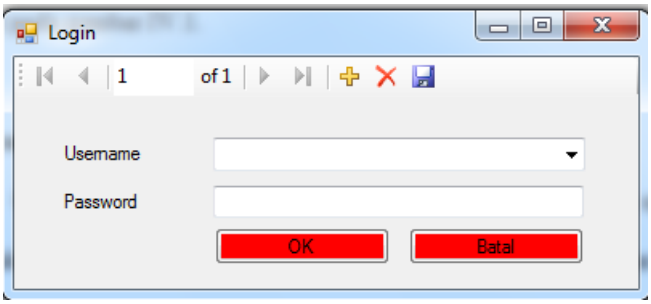

Figure 3. Form Login Display

2. Main Menu Form

The display presented by the system to display the main menu form can be seen in Figure 4.

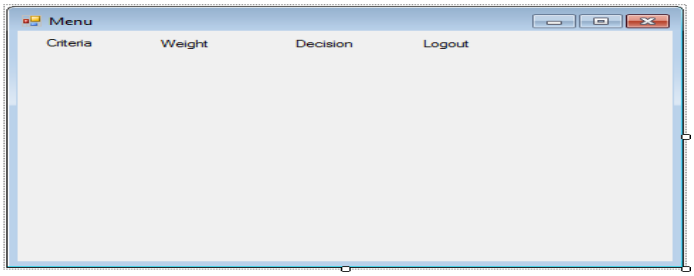

Figure 4. Main Menu Form

3. Display of Oil Leakage Form
The display presented by the system to display the oil leakage form can be seen in Figure 5.

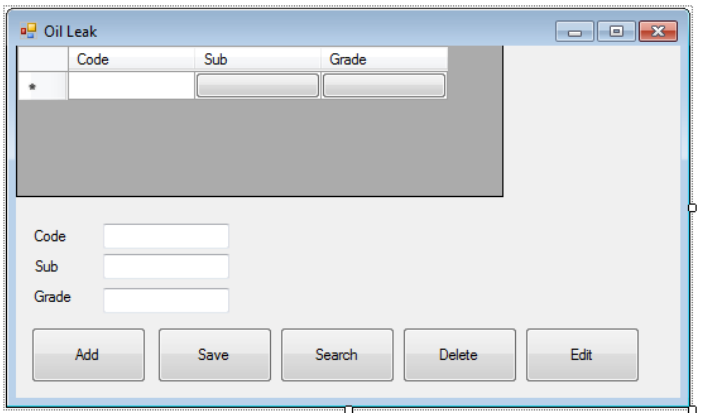

Figure 5. Display of Oil Leakage Form

4. Display of the Amper Fuse Transistor Conformity Form
The display presented by the system to display the form of TR fuse amperage can be seen in Figure 6.

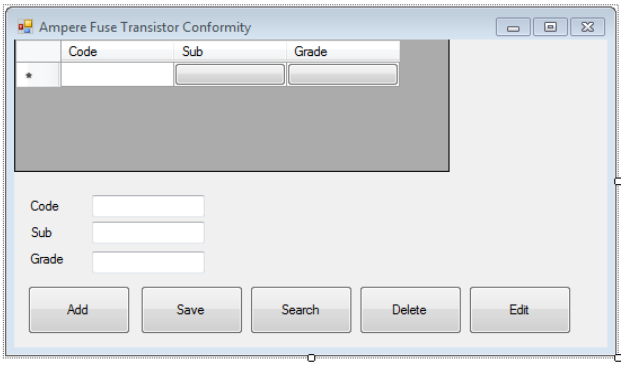

Figure 6. Display of Compatibility Form Amper Fuse Transistor

5. Display of Transformer Physical Condition Form

The display presented by the system to display the transformer physical condition form can be seen in Figure 7.

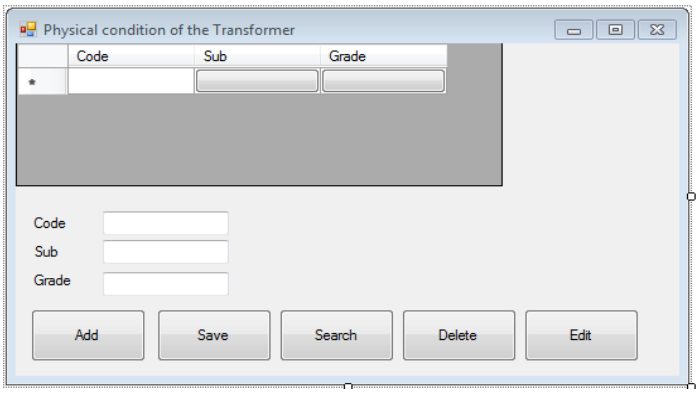

Figure 7. Display of Transformer Physical Condition Form

6. Display Form Low Voltage Switch Board (LVSB) Condition
   The display presented by the system to display the LVSB condition form can be seen in Figure 8.

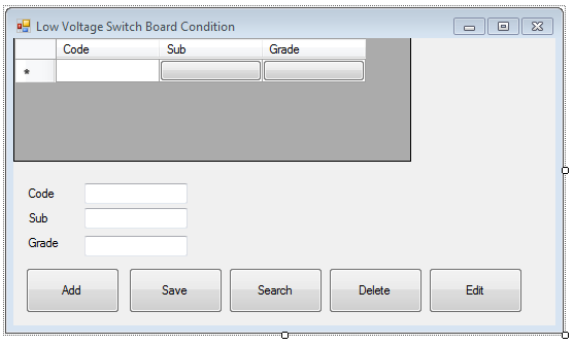

Figure 8. Display of Low Voltage Switch Board Form (LVSB) Condition

7. Display Form Weight
   The display presented by the system to display form weights can be seen in Figure 9.

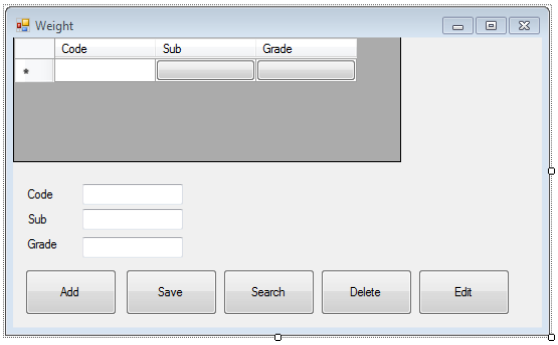

Figure 9. Display of Weight Form

8. Display of Decision Form
   The display presented by the system to display the decision form can be seen in Figure 10.

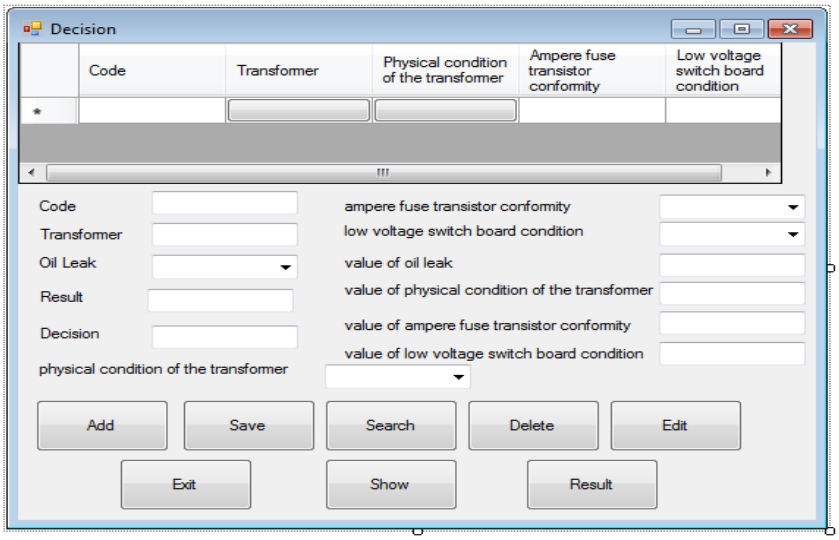

Figure 10. Display of Decision Form

4. CONCLUSION

Based on the results that have been done, it can be concluded that by using a decision support system application to assess the condition of transformer isolation using the Simple Additive Weighting (SAW) method can help PT. Shining Electrical System to get an assessment of transformer insulation conditions.

5. FUTURE WORKS

For further development in the decision support system application, the conditions of transformer insulation with Simple Additive Weighting (SAW) can work well, so some suggestions can be given as follows :

1. It is better if the application has been made using a comparison of several decision support system methods so that it can produce better decisions.
2. We recommend that the application that has been made can be applied online.

REFERNCES

[1] Ladina, Andritya, 2015, "Pengaruh Pelatihan Dan Kompetensi Trainer Terhadap Kinerja Karyawan PT. PLN (Persero) Rayon Manahan", Universitas Muhammadiyah Surakarta.

[2] Oktaputra, Noersasongko , 2014, "*Sistem Pendukung Keputusan Kelayakan Pemberian Kredit Motor Menggunakan Metode Simple Additive Weighting Pada Perusahaan Leasing HD Finance*", Universitas Dian Nuswantoro.

[3] Maulana, 2014, *"Sistem Pendukung Keputusan Seleksi Penerimaan Tenaga Kerja Baru Dengan Menggunakan Simple Additive Weighting (Studi Kasus PT. Dbi Medan)",* STMIK Budi Darma Medan, Jurnal Pelita Informatika Budi Darma, Vol. 6, No.3.

[4] Arni, dkk, 2017, "Sistem Penunjang Keputusan Pelayanan Teknis PT. PLN Dengan *Metode Simple Additive Weighting* (SAW)", Universitas Merdeka

Pasuruan, Jurnal JOINTECS, Vol. 2, No. 2.
[5] Arifia, dkk, 2017, "Rancang Bangun Sistem Pendukung Keputusan Prioritas Perbaikan Trafo Listrik Menggunakan Metode *Simple Additive Weighting* (SAW)", Universitas PGRI Ronggolawe Tuban, Jawa Timur, Jurnal INOVTEK POLBENG, Vol. 2, No. 1.