

## **Design a Desktop-Based Load and Customer Calculation Application Information System (SIAPEL)**

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### **ABSTRACT**

In today's technological developments, many people are using technology to make work easier, as is PT. PLN Persero Customer Service Implementation Unit (UP3) Tasikmalaya. Several parts of this company, especially the section for recording expenses and customers by the PDKB Team, still use manual methods, namely by calculating using a calculator. This method is very risky, especially as it has the potential for errors in calculations or writing of the recorded numbers. Given these problems, a desktop-based load and customer calculation application information system (SIAPEL) was built. Information system solutions for related load and customer data calculation applications (SIAPEL) so that the results obtained are faster and more accurate. By making direct observations or observations, actively communicating with related fields through the interview process, and looking for research materials that support building an application as a solution to the problems faced. The load and customer calculation application information system (SIAPEL) is an application that can calculate load and customer data and can store the data as a form of company archive. The system development used is waterfall with stages or processes carried out sequentially from the system. The software used to build the load and customer calculation application information system (SIAPEL) is NetBeans 8.2, Java Development Kit 1.8, and MySQL. Users can process load calculation data and process customer calculation data. And users can print reports from data that has been entered into the system database. With SIAPEL, it is hoped that it can reduce the risk of information errors and make it easier for users to calculate, store and process data. And it can be used as a more effective way to process data compared to using manual methods.

**Keywords:** Application; Calculation; Waterfall; Information System; NetBeans

### **1. INTRODUCTION**

The rapid development of information technology is very drastic, where the need for professional workers is increasingly needed by large companies and small companies. This cannot be separated from the fact that along with the development of information technology, perfect supporting facilities are needed to support this work, namely computers and applications.

PT. PLN Persero Tasikmalaya Customer Service Implementation Unit (UP3) is a state-owned company operating in the energy sector under the Main Distribution Unit (West Java) located in Bandung. UP3 Tasikmalaya has 7 units Customer Service (ULP), namely ULP Tasikmalaya Kota, ULP Rajapolah, ULP Ciamis, ULP Banjar, ULP Pangandaran, ULP Karangnunggal, and ULP Singaparna, UP3 Tasikmalaya has a special team for Work in Tension Conditions (PDKB) where the team is can carry out electricity network maintenance work without blackouts electricity, with the PDKB team it can reduce the number of electricity customers who have blackouts from electricity network maintenance work. This is done to reduce the level complaints from electricity customers resulting from electricity network maintenance work requires power outages and improving the company's image.

Currently, data calculation activities for electricity customers who were saved from power outages during electricity network maintenance work are still operating using Ms.Excel software, but the process is not yet running optimally, information obtained from the Customer Service Unit (ULP) is related to the amount of 2 electricity customer data. still conveyed through verbal communication and calculations through manual calculations at ULP related to the data they have.

The problem is that the calculation of customer data goes out manually and does not have a special application for processing electricity customer data. Some of the current shortcomings are that it does not have a database and is

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very vulnerable to losing data if in the future the data is needed for company needs. It's no better than having a special application, for a state-owned company as big as PT. PLN (Persero) carries out the customer data calculation process manually (Hamsiah, 2022). The manual calculation process is considered an outdated method considering the large number of computer devices that have been installed in the company. This is what causes the data calculation process to be less accurate when carrying out work. This situation encourages researchers to conduct research and build the load and customer calculation application information system (SIAPEL) to reduce complexity (Alfisyakhrin, 2023) and simplify all data storage and archiving processes. Based on previous research by researchers Rahmawati et al (2021:12), the payroll system is the main thing in a company, not all companies use applications as a medium for recording salary payment activities. Payroll systems that are carried out manually still use paper as a recording medium, allowing input errors to occur, are vulnerable to manipulation, have difficulty finding data and lack the effectiveness of recording. This aims to build a desktop-based payroll information system where recording data related to payroll activities in a business unit can be done easily through application media.

## 2. LITERATURE REVIEW

As a comparison material to dig up information from several previous studies, both regarding the advantages and disadvantages that already exist in the application created, the researcher also explored previously existing information about the theory related to the title used.

### Systems

Research by (Dantes, dkk 2019), (Santi, 2020) sistem adalah tatanan (keterpaduan) yang terdiri atas sejumlah komponen fungsional (dengan suatu fungsi/tugas khusus) yang saling berhubungan dan secara bersama-sama bertujuan untuk memenuhi suatu proses/pekerjaan tertentu.

### Information Systems

Research by (Kadir, 2020), (Zufria, 2022): "Information systems do not actually have to involve computers. Information systems that use computers are usually called computer-based information systems. Information systems are more often used without being computer-based, even though the computer is the most important part."

### Data

Research by (Kristanto, 2019), (Hendra, dkk, 2019), data is the plural of form single data-item. Data is a form which has not been able to provide benefits which is great for the recipient, so need a model that will later grouped and processed for produce information.

### Data processing

Research by (Nawassyarif, M. Julkarnain, and Kiki Rizki Ananda, 2020): "Data processing is the time used to describe the form of data into useful information. Another definition of data processing is the manipulation of data into a more useful and meaningful form in the form of information." Research by (Kristanto, 2018): "Data processing is the time used to describe changes in the form of data into useful information. The more data and the more complex the data processing activities in an organization, be it large organizations or small organizations, then the data processing method used is really needed."

### UML (Unified Modeling Language)

Research by (Munawar, 2021), (Rizky, 2022): "UML is one of the most reliable tools in the world of object-oriented system development, because UML provides a visual modeling language that allows system developers to create blueprints for their vision in a standard, easy form. understandable, and equipped with effective mechanisms for sharing and communicating their designs with others. Based on the definition above, it can be concluded that UML (Unified Modeling Language) is a language that has become a standard for visualizing, designing and documenting software systems. The types or components in creating a UML diagram are:

#### a. Activity Diagrams

An Activity Diagram is a diagram that explains the flow of activities in the program being designed, how the process of preparing the flow begins, decisions that may occur, and how the system will end.

#### b. Use Case Diagrams

Use case diagrams are modeling for the behavior of the information system that will be created. Use Case is used to find out what functions are in the information system and who has the right to use these functions.

### Waterfalls

Research by (Sommerville, 2019), (Putri, dkk, 2019), (Ricky, dkk, 2023) "The Waterfall Model is a model that explains development, validation, and evolution activities, and represents them as separate process phases such as

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requirements specification, software design, implementation, and testing." The Waterfall method itself is an application development model and is included in the classic life cycle, which emphasizes sequential and systematic phases. For the development model, it can be analogous to a waterfall, where each stage is carried out sequentially from top to bottom.

a. Requirements Definition

Operation and maintenance At this stage the developer must know all the information regarding software requirements such as the intended use of the software by the user and software limitations. This information is usually obtained from interviews, surveys or discussions. After that, the information is analyzed to obtain complete data regarding user needs for the software to be developed.

b. Systems Design

Design is done before the coding process begins. This aims to provide a complete picture of what must be done and how the desired system will look. So it helps specify hardware and system requirements, as well as defining the overall system architecture that will be created. The design stage will produce a document called "Software Requirements" which will later become the basis for programmers in creating application codes.

c. Implementation

The code writing process is at this stage. Software creation will be broken down into small modules which will later be combined in the next stage. In this stage, a deeper examination will also be carried out on the module that has been created, whether it fulfills the desired function or not.

d. Integration and System Testing

At this stage, the modules that have been created will be combined. After that, testing will be carried out which aims to find out whether the software matches the desired design and whether there are still errors or not.

e. Operation and Maintenance

At this stage, the software that has been formed will be run or operated by the user. Apart from that, maintenance is also carried out which includes error correction, improving system unit implementation, improving system services according to new needs.

Software maintenance is necessary, including development, because it is not always safe because when it is run there may still be small errors that were not discovered previously during design or there may be additional features that are not available in the software. Development is needed when there are changes external to the company, such as when there is a change in operating system or other devices.

### 3. METHOD

In this method used for system development, namely waterfall, where the waterfall stages carried out include:

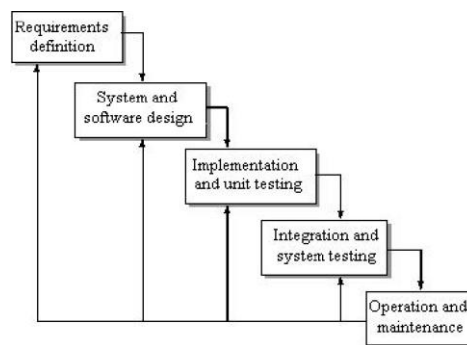


Fig. 1 Stages of the Waterfall Method

#### Requirements Definition

At this stage the user requirements needed are admin/user. Admin/user can carry out data processing, including processing substation data, work data, calculation data, displaying reports. Furthermore, for software needs here we use NetBeans 8.2 software, Java Development Kit 1.8, and MySQL as the database.

#### System Design

At this stage, the design used to build a load and customer calculation application information system (SIAPEL) is a UML (Unified Modeling Language) design, one of which is a Use Case Diagram, Activity Diagram, Sequence

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Diagram and Class Diagram. For database design, use ERD (Entity Relationship Diagram), LRS (Logical Record Structure) and Flowchart for program flow.

### **Implementation**

At this stage, the program code used uses object-oriented programming (OOP) with the JavaScript programming language in NetBeans 8.2 software, Java Development Kit 1.8, and MySQL as the database.

### **Integration and System Testing**

At the integration and system testing stage, program testing is used, namely black box testing, where testing is carried out to test procedural errors in the program running.

### **Operation and Maintenance**

In Operation and Maintenance, this is done by updating the system, maintaining and adjusting the program according to user and company needs.

## **4. RESULT**

The stages that will be discussed in this research, for the running system process taken are as follows:

### a) Job Request Procedure by the PDKB Team

At this stage, employees from the Customer Service Unit (ULP) plan the work to be carried out without power outages and ask the PDKB Team to carry it out to the PDKB Supervisor.

### b) Field Survey

At this stage, work conditions are checked in the field by the PDKB Preparator based on orders from the PDKB SPV to ensure conditions and plan the work, as well as prepare the required equipment and materials to be used.

### c) Creation of SP2B

Based on the results of the survey carried out, a voltage work order (SP2B) was created, along with a load calculation report and the customer's electricity supply could be saved and not experience blackouts with the application that had been made.

### d) Work Implementation

After everything has been prepared by the PDKB preparator based on the results of the survey that has been carried out, the work is carried out by the PDKB Team with supervision by the Head of the PDKB Team and K3L.

### e) Job Report

After the work carried out has been completed, the PDKB SPV confirms it with the relevant ULP, and continues to make a work completion report by the administration section (PDKB Preparator).

### **Software Requirements Analysis**

Employees at the company can carry out data processing and calculations from the admin and user side. The requirements specifications that can be implemented by users are as follows:

1. User/Admin can process substation data
2. User/Admin can process job data
3. User/Admin can process calculation data
4. User/Admin can display substation data reports
5. User/Admin can display job data reports
6. User/Admin can display calculation data reports

### **Design**

At this stage, the application design, database, software architecture and user interface will be explained based on the system that has been created. The application design here uses UML (Unified Modeling Language), namely:

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**Usecase Diagrams**

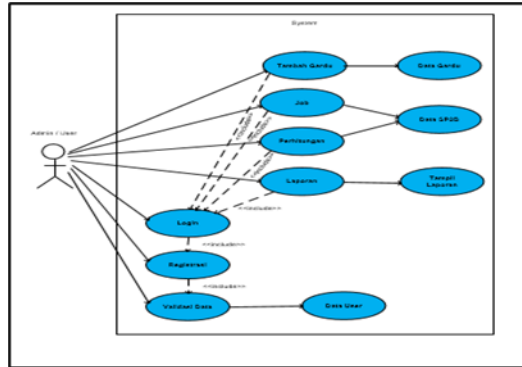


Fig. 2 Use Case Diagram of the load and customer calculation application information system (SIAPTEL)

In the picture above, it can be explained that there is only 1 actor involved, namely the user/admin who can log in, register, validate data, process substation data, process load and customer calculation data, as well as create and display reports.

**Activity Diagram**

1. Activity Diagram Data User

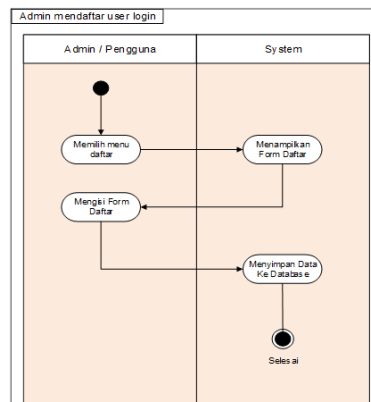


Fig. 3 Activity Diagram Data User

In the picture above it is explained where the admin/user selects the register menu then the system displays the register form then the admin/user fills in the register form then the system saves the data into the database.

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2. Activity Diagram For Substation Data Management

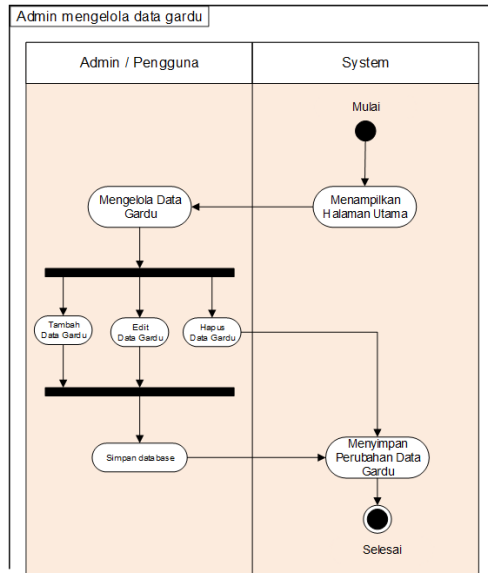


Fig. 4 Activity Diagram For Substation Data Management

In the picture above it is explained that the system displays the main page then the admin/user manages substation data, namely the admin/user can add, edit, delete and save substation data then the system saves changes to substation data.

3. Activity Diagram For Managing Work Data

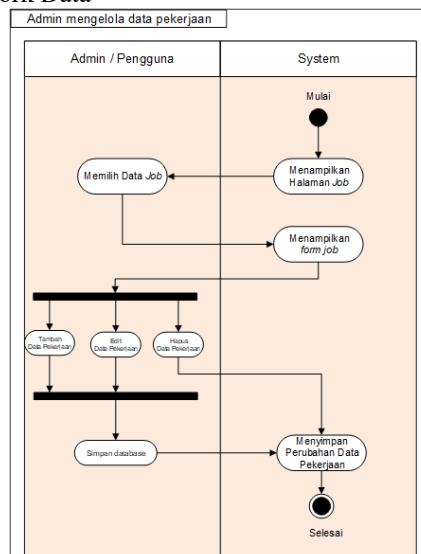


Fig. 5 Activity Diagram For Managing Work Data

In the picture above it is explained that the system displays the job page then the admin/user selects job data then the system displays the job form then the admin/user can add, edit, delete and save job data then the system saves changes to the job/job data.

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**Databases**

The relationships between tables in the database of the system being created are depicted in the form of an Entity Relationship Diagram as follows.

1. Entity Relationship Diagram

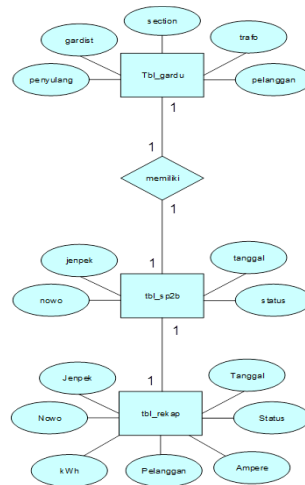


Fig. 6 Entity Relationship Diagram

The fig. 6 above explains that the table used in the system is the substation table which has entities including customer, transformer, section, feeder, gardist as the primary key. The second table is the sp2b table which has entities including nowo as primary key, type, date, status. The next table is a recap table which has entities including nowo, jenpek, date, status, amperage, customer, kWh. The cardinality relationship is one to one.

2. Flowchart Diagram

Apart from the ERD that has been created, it is also depicted in the form of a flowchart of the system that has been created.

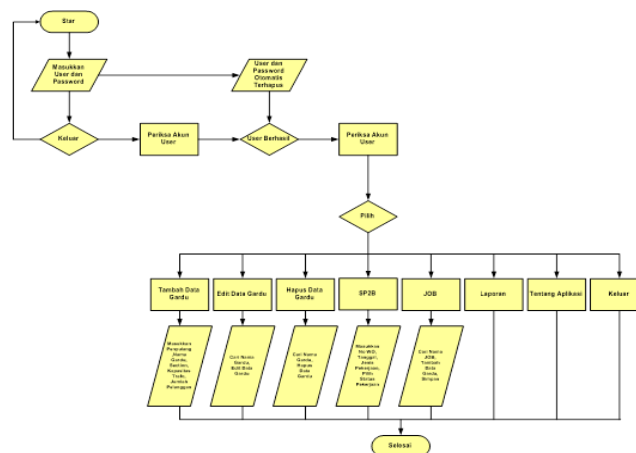


Fig. 7 Flowchart Diagram of the load and customer calculation application information system (SIAPEL)

Figure 7 above explains the work data management flowchart where the flow begins with start as the initial application process, then the user enters the username and password, if both are correct then the user will select program menu options including add substation data, edit substation data, delete substation data. ,SP2B,Job,reports ,about the application and logs out to exit.

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3. Logical Record Structure

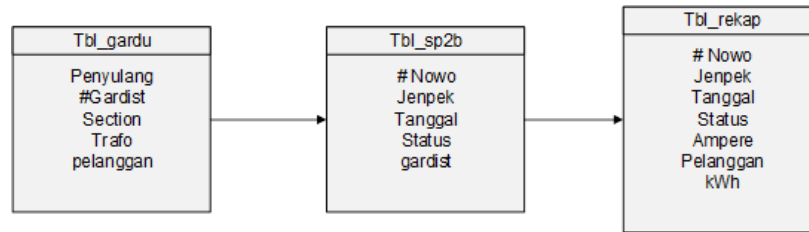


Fig. 8 Logical Record Structure of the load and customer calculation application information system (SIAPEL)

Logical Record Structure is a transformation of the entity relationship diagram design, where each Entity will be transformed into a box with the Entity name outside the box and its attributes inside the box. A Relationship is sometimes combined in a box with an Entity, sometimes it can also be separated in a separate box.

**Software Architecture**

In describing Software Architecture, researchers use object-oriented programming (OOP) and are divided into several diagrams as follows:

1. Sequence Diagram

a. Sequence Diagram Add Job Data

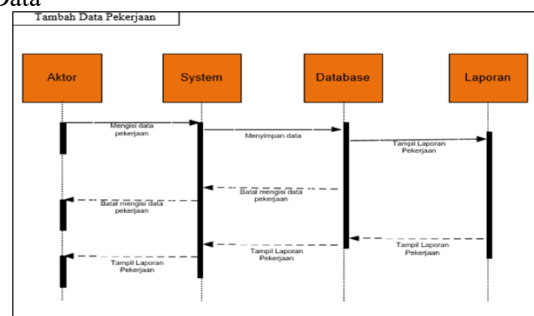


Fig. 9 Sequence Diagram Add Job Data

Figure 9 above explains the sequence diagram for adding job data where the special Team for Work in Stress Conditions (PDKB) as actors or users fills in the job data then the system saves the data to the database and then the application displays the job data.

**User Interface**

1. Login Page Interface Design

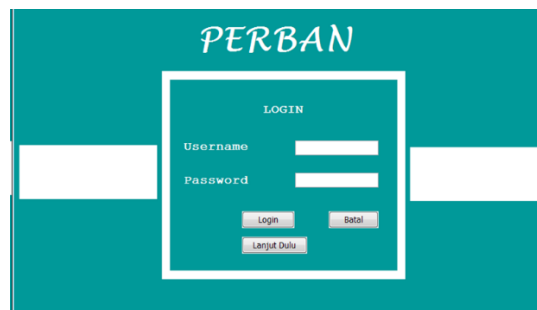


Fig. 10 Login Page Interface Design

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2. Calculation/Job Page Interface Design

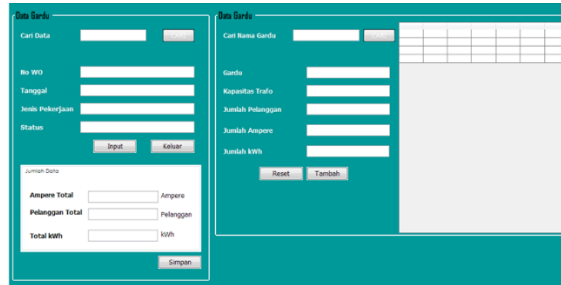


Fig. 11 Calculation/Job Page Interface Design

Testing

Testing the Add Substation Data Form

Below is a black box test for the substation data add form where the test is carried out one by one for each test scenario to get the expected results according to the test results. This test has the advantage of not requiring resources with technical knowledge. In addition, there is no need to check the entire code. For the test results that have been tested, which are valid according to expectations in each scenario, are shown in the table below:

Table 1  
Black Box Testing Results Page Add Substation Data

No	Test Scenario	Test Case	Expected Results	Test Results	Conclusion
1	Feeder Name is not filled	Feeder: (blank)	The system will deny access and data cannot be saved	As expected	Valid
2	Substation Name is not filled in Substation	Name: (blank)	The system will deny access and data cannot be saved	As expected	Valid
3	Section name is not filled	Section: (blank)	The system will deny access and data cannot be saved	As expected	Valid
4	Transformer Capacity is not filled	Transformer Capacity: (empty)	The system will deny access and data cannot be saved	As expected	Valid
5	Number of Customers not filled	Number of Customers: (blank)	The system will deny access and data cannot be saved	As expected	Valid
6	Feeder Name, Substation Name, Section, Transformer Capacity, Number of Customers filled in according to the correct data	Feeder Name: TASK, Substation Name: CITY, Section: Zone 1, Transformer Capacity: 100, Number of Customers: 10	The system receives access data will be stored in Database Meets	As expected	Valid

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## 5. CONCLUSION

The Load and Customer Calculation Application information system (SIAPEL) is a desktop-based application that functions to calculate load and customer data before carrying out each PDKB Team job. This application is considered more effective and efficient compared to the manual calculation method that has been carried out so far. With the Expense and Customer Calculation Application Information System (SIAPEL), the data calculation process is faster and more accurate. In terms of data storage, work does not require a lot of files and the data can be used for a relatively long period of time. The menu provided in this application meets the needs required by the special Team for Work in Tension Conditions (PDKB). The data produced by this application is very accurate so it really helps users in recording and calculating customer expenses, and compiling reports. The system can carry out administrative records for the special Team for Work in Voltage Conditions (PDKB) which includes recording substation data, recording SP2B data, and calculating customer loads or work data so that the special Team Team for Work in Voltage Conditions (PDKB) can control the processing of customer load data. The tests carried out for this application produced valid tests as expected.

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