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The Development of a Web-Based Point of Sale (PoS) and Stock Management System for Warung IT Mart at the Informatics Engineering Laboratory of Ibnu Khaldun University Bogor

Pembangunan Sistem Point of Sale (PoS) *dan Pengurusan Stok Berbasis Web bagi Warung IT Mart di Laboratorium Teknik Informatika Universitas Ibnu Khaldun Bogor*

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ABSTRACT

The Point of Sale and Stock Taking System of Warung IT Mart at the Informatics Engineering Laboratory of Ibnu Khaldun University Bogor aims to develop and implement a Web-based Point of Sale (PoS) and stock taking system at Warung IT Mart, namely the Informatics Engineering Laboratory of Ibnu Khaldun University Bogor. The system development method used is a web-based software development method. The developed system includes features to conduct direct sales transactions, record transactions, manage stock of goods, and carry out the stock up process. This research involves an analysis of user needs as well as a literature study on PoS systems and stock handlers. Its implementation is carried out by utilizing web technology to ensure system accessibility from various devices with an internet connection. System evaluation is carried out through testing of functionality and user response to system usability. The results of the study show that this web-based PoS and stock taking can increase the effectiveness and accuracy in the operations of IT Mart stalls, as well as provide convenience for stock management and daily transactions. It is hoped that this system can be the basis for further development in the context of the implementation of sales and stock management of goods in the Informatics Engineering laboratory environment of Ibnu Khaldun University Bogor.

Keywords: PoS system for IT mart; Stock capture; Stock management

ABSTRAK

Sistem Point of Sale dan Stock Opname Warung IT Mart di Laboratorium Teknik Informatika Universitas Ibn Khaldun Bogor ini bertujuan untuk mengembangkan dan mengimplementasikan sistem Point of Sale (PoS) serta stock opname berbasis web di Warung IT Mart, yang merupakan Laboratorium Teknik

Informatika Universitas Ibn Khaldun Bogor. Metode pengembangan sistem yang digunakan adalah metode pengembangan perangkat lunak berbasis web. Sistem yang dikembangkan mencakup fitur - fitur untuk melakukan transaksi penjualan secara langsung, mencatat transaksi, mengelola stok barang, serta melakukan proses stock opname. Penelitian ini melibatkan analisis kebutuhan dari pengguna serta studi literatur mengenai sistem PoS dan stock opname. Implementasi dilakukan dengan memanfaatkan teknologi web untuk memastikan aksesibilitas sistem dari berbagai perangkat dengan koneksi internet. Evaluasi sistem dilakukan melalui pengujian fungsionalitas dan respons pengguna terhadap kegunaan sistem. Hasil penelitian menunjukkan bahwa sistem PoS dan stock opname berbasis web ini dapat meningkatkan efektifitas dan akurasi dalam operasional warung IT Mart, serta memberikan kemudahan bagi pengelolaan stok dan transaksi harian. Diharapkan sistem ini dapat menjadi landasan untuk pengembangan lebih lanjut dalam konteks aplikasi penjualan dan pengelolaan stok barang di lingkungan laboratorium Teknik Informatika Universitas Ibn Khaldun Bogor.

Kata kunci: Sistem PoS Warung IT mart; Stock opname; Pengelolaan stok

INTRODUCTION

In this digital era, the retail industry is experiencing rapid development. The Point of Sale (PoS) and Stock Taking system is one of the important parts of this business management. PoS systems provide a unified solution for sales transactions and stock management, while Stock Taking is an essential activity to accurately measure the availability of goods. Along with technological developments, the implementation of PoS and stock taking systems can help increase operational effectiveness, reduce inventory errors, and improve customer experience (Martinus, 2011).

Point of Sale (PoS) and Stock Taking systems are key elements of modern inventory management and retail. The research on the integration of these two systems is an answer to the need for a system in the retail sector that will improve management, accuracy and responsiveness to changes in every process. In particular, this study presents the application of technology to improve the sales process and stock management in the retail industry. Many retail businesses, from small to large scales, face the challenge of maintaining inventory appropriately and providing customers with a seamless shopping experience. Common problems include lack of visibility into accurate stock of goods, complexity in making stock adjustments, and delays in identifying shortages or overstocks that can disrupt operational management (Nugraha, 2021). IT Mart is one of the business units of the IT Study Program that operates in the retail sector. The research on the integration of Point of Sale (PoS) and Stock Taking Systems for IT Mart focuses on improving operational management and in-store stock management. Like many other retail businesses, it faces challenges in effective inventory management. Failure to monitor stock accurately and in real-time can result in lost sales or mismatches in the supply of goods. By implementing a PoS system that is integrated with stock taking, it is hoped that IT Mart can improve daily transaction activities, minimize inventory errors, and improve the accuracy of inventory of goods (Nugraha, 2021).

To achieve the desired goals, this research is important to provide in-depth insights into how the integration of PoS and stock taking systems can transform and improve business processes in IT Mart. With the right approach in the implementation and adaptation of the system, it is expected that there will be a significant increase in operational activities and inventory management in this store (Jati & Mulyati, 2023).

In the development of Point of Sale (PoS) and Stock Taking System for IT Mart, the Waterfall method is applied. This approach follows a series of successive stages, starting from needs analysis, design, development, testing, to implementation. The first stage is an in-depth analysis of IT Mart's business needs related to daily transactions and stock management. The design of the PoS system and

inventory will involve designing the appropriate structure, user interface, and workflow. The next step is the development of the system based on the design that has been made, followed by testing to ensure performance that meets the needs. Finally, the implementation of the system to the production and maintenance environment is carried out to maintain optimal system performance. This Waterfall method allows IT Mart to have structured changes, as needed, and minimize significant changes after the initial stages of development (Jati & Mulyati, 2023).

The implementation of a PoS system integrated with the Stock Taking process, expects IT Mart to experience significant improvements in operational efficiency, inventory accuracy, and customer service. Good system integration will result in better inventory management, reduced inventory errors, and improved decision-making regarding inventory and inventory management. Thus, it is hoped that IT Mart will become more competitive in the market and be able to provide a more satisfying customer experience.

PROBLEM STATEMENT

Based on the background of the problems that have been explained in the background description, the formulation of the problems that are the focus of the research is as follows:

1. How to create a management system that can accommodate sales transaction data with stock storage data at Warung IT Mart?
2. How to make detailed and systematic system reports at Warung IT Mart?

LITERATURE REVIEWS

Table 1: Literature Reviews

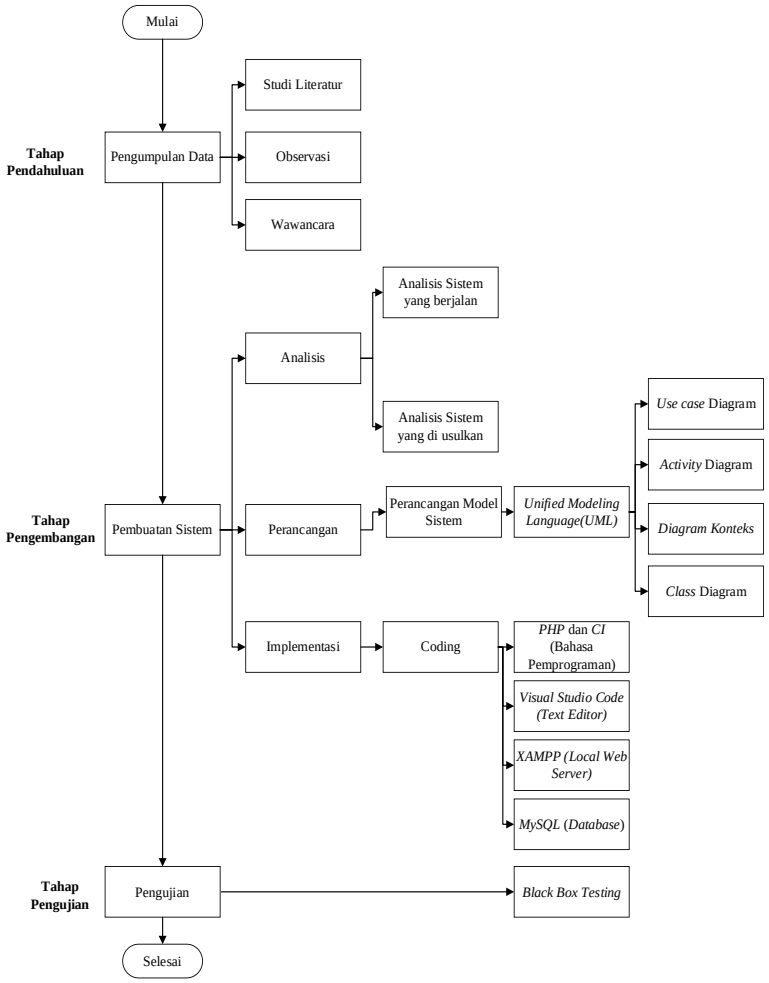
No	Research Title, Author	Research results
1	Design and Build a Point of Sale (PoS) Software Information System with the Web-based Waterfall Method. Nugraha, P Gede.	Build a web-based Point of Sale (PoS) system that can perform transaction processing, product category management, goods management, supplier data management, purchase management, user management and report formation.
2	Application of the Waterfall Method in the Stock Taking Information System. Oky Imawati.	Implement a program to conduct an inventory that helps the stock calculation process. So you can easily see the compatibility of the goods in the warehouse with the data of the goods in the database.
3	The development of a Point of Sale system based on a user-centric design.	The development of this Point of Sale user-centric design system is focused on managing sales data and storing reports to correct errors in search and data entry, which takes a long time to generate reports. So with this system, it will be easier to search for data, manage sales transaction data, and save time with more accurate calculations.
4	Implementation of Inventory Management	This study focuses on the development

No	Research Title, Author	Research results
	System Based on Information Technology for Supply Chain Optimization in Retail Industry. Lona Noviani & Tauffik Qurohman	and implementation of an information technology–based inventory management system aimed at optimizing the retail supply chain. The research demonstrates that the system improves inventory data accuracy, accelerates response time to market demand, and reduces storage and operational costs. The implementation resulted in a 15% reduction in inventory holding costs and a 20% increase in customer satisfaction within the first six months.
5	Revolutionizing Inventory Management: Web-Based System for Accurate and Efficient Reporting. Handi Triwahono, Mochamad Alfan Rosid, Hamzah Setiawan, Hindarto Hindarto.	This research presents the design of a web-based information system for inventory management and consumable goods logistics. The system implements the FIFO (First In, First Out) method to synchronize stock reports with expenditure reports, ensuring alignment between inventory data and financial documentation. The results show that the system significantly improves reporting accuracy, minimizes discrepancies between physical stock and system data, and enhances overall operational efficiency.

METHODOLOGY

This research has been conducted since August 2023 at Warung IT Mart, which is located at the Faculty of Engineering, Ibnu Khaldun University, Bogor. This research follows the Waterfall methodology which is characterized by sequential processes that include: data collection, analysis, design, coding, and testing. The entire research process is illustrated in Figure 1.

Figure 1: Research methods



Analysis Method

At this stage, data collection is carried out by field surveys, literature studies and interviews, as well as analyzing problems that become case studies in research and finding solutions to problems in research. In addition, the system needs analysis process includes system functional needs analysis, non-functional system needs analysis, and system architecture analysis.

Designing (System and Software Design)

At this stage, the design process is carried out using UML (Unified Modelling Language), designing the database obtained at the analysis stage, designing the installation of web services with the REST method. The design that will be presented are:

1. Designing an Implementation Diagram
2. Database Design

Coding (Unit Implementation and Testing)

At this stage, the implementation process is carried out into the program code using a PHP-based programming language with the Codeigniter framework. This process translates the design into a language that is recognized by the computer. After coding, the tests will be carried out on the system created.

Testing (System Integration and Testing)

At this stage, the system testing process is carried out using the black box method to test the functionality of each web service created.

FINDINGS AND DISCUSSION

Running System Analysis

The analysis of the running system explains how the sales and purchase transaction process at the IT Mart stall works.

Figure 2: Sales transactions

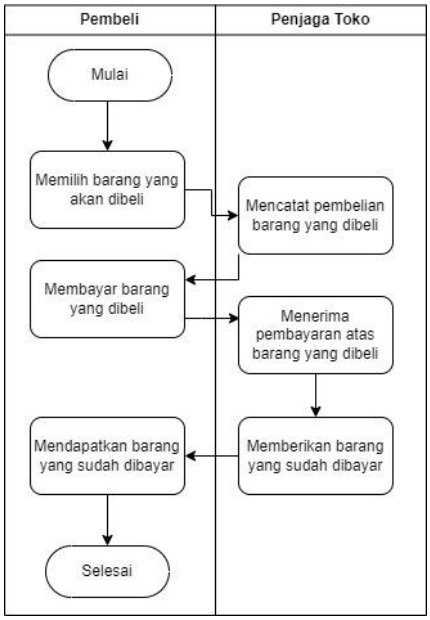


Figure 3: Inventory process

Proposed System Analysis

The proposed system analysis is an overview of how the system will be created and useful so that the system design can be tailored to the main functions of the system's needs. The analysis of the proposed system can be seen in Figure 4 and Figure 5.

Figure 4: Proposed analysis for admin

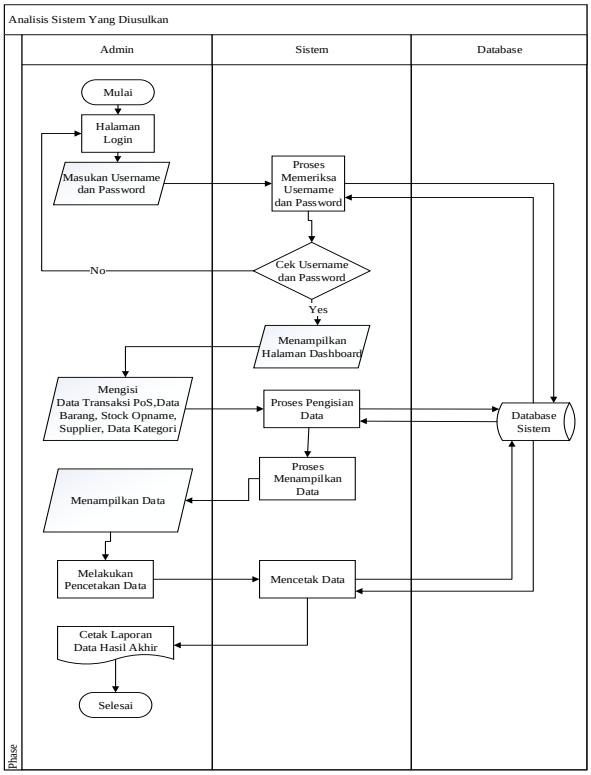
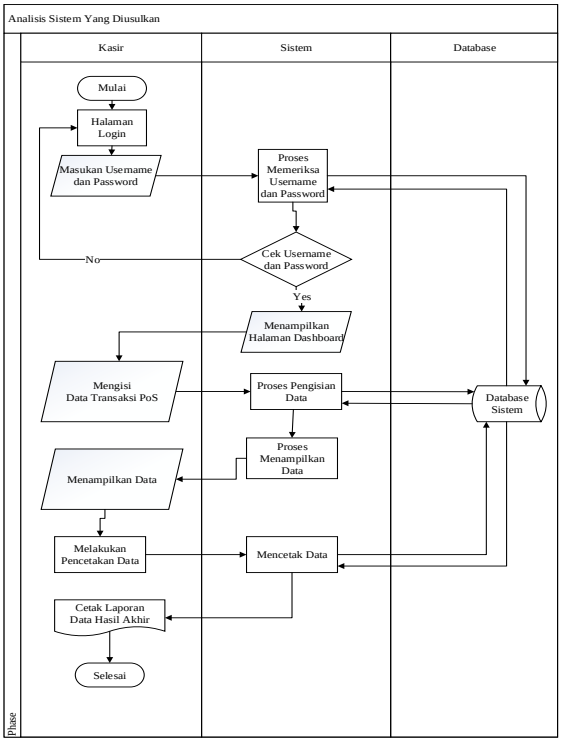


Figure 5: Proposed analysis for cashier



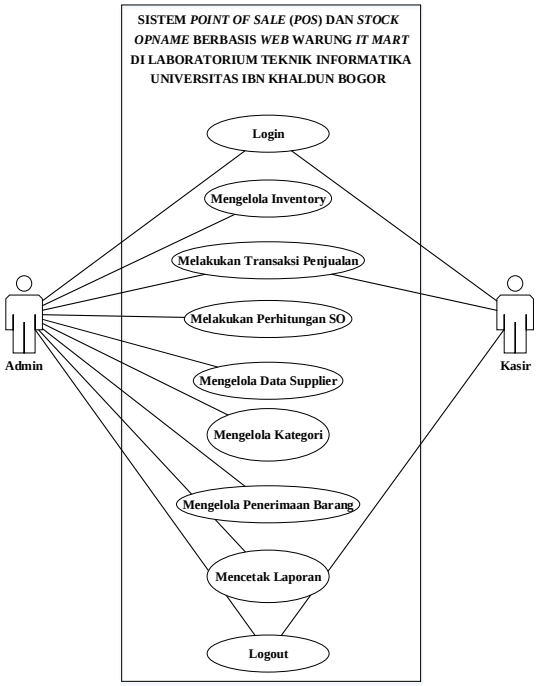
Planning

In this sub-chapter, we will explain how to design using the Unified Modelling Language (UML) which consists of a Use Case diagram, an Activity diagram, a Class diagram and a Sequence diagram.

Use case diagram

Use cases diagram describes the order in which the application works and generates a menu that can be accessed by a particular actor. In Figure 6.

Figure 6: Use case diagram



Context Diagram

A context diagram depicts a graphical representation of a system that shows the relationship between the system and an external entity. The context diagram can be seen in Figure 7.

Figure 7: Context diagram

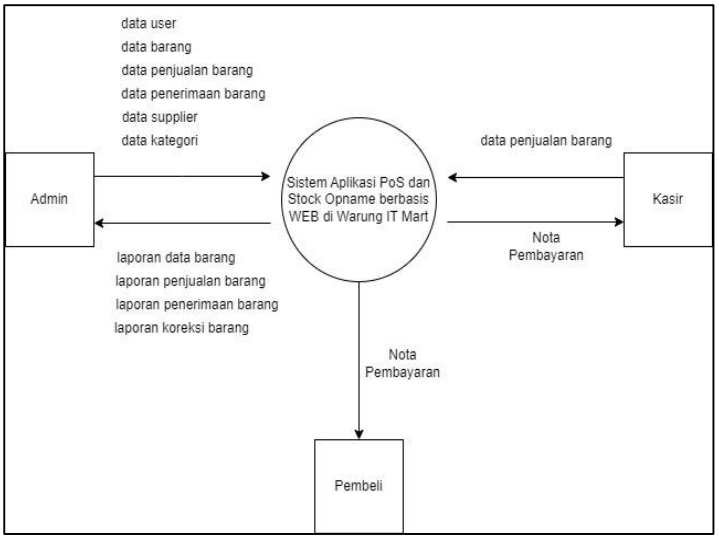
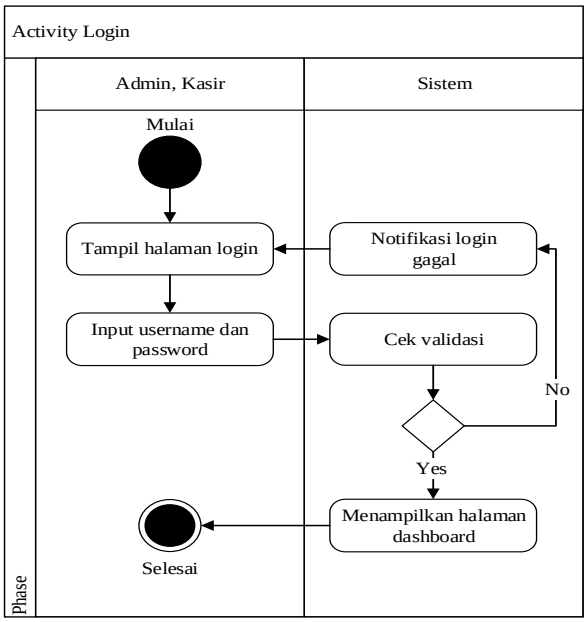


Diagram Activity

1. Activity Diagram Login

The login activity chart describes the user's activity before logging in to the system dashboard page by entering the username and password on the login page. The login activity diagram can be seen in Figure 8.

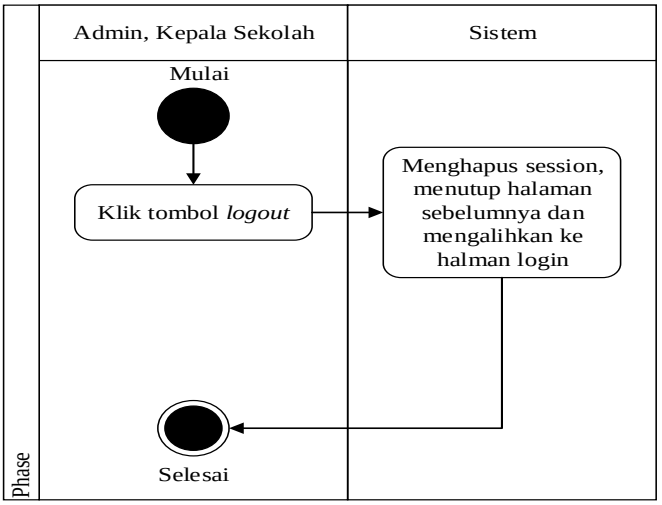
Figure 8: Activity login diagram



2. Exit Activity Diagram

The logout activity chart describes the user's activity when they are about to leave the system. The logout activity diagram can be seen in Figure 9.

Figure 9: Activity logout diagram



3. Activity Chart Inventory

The inventory activity chart describes admin activity when adding, removing, and changing item data. The inventory of activity diagrams can be seen in Figure 10, Figure 11, and Figure 12.

Figure 10: Activity chart adding inventory data

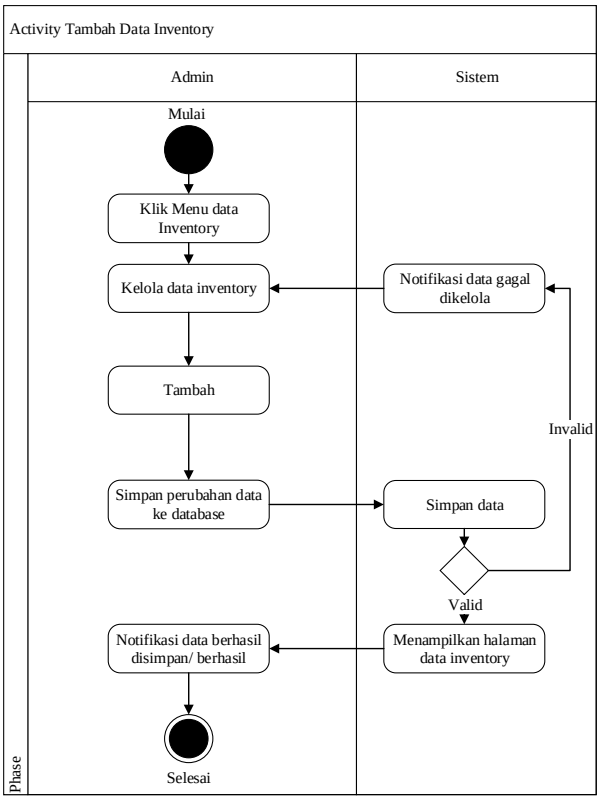


Figure 11: Activity diagram deleting inventory data

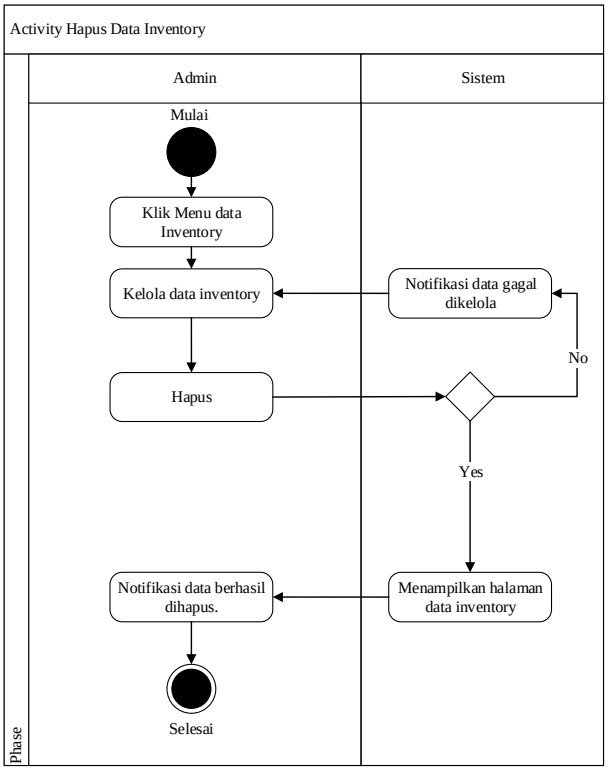
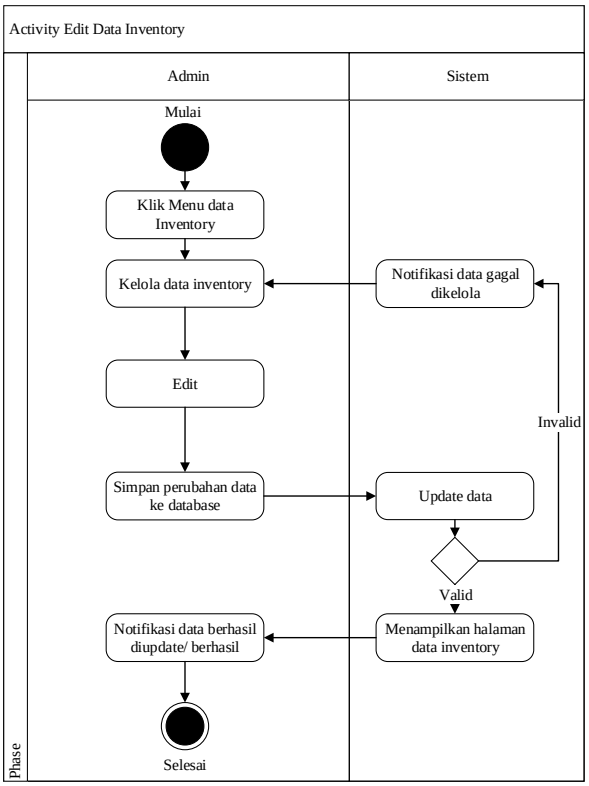


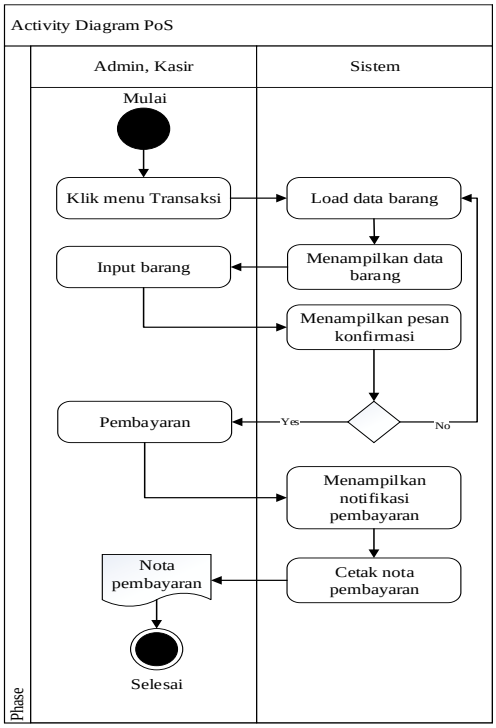
Figure 12: Activity diagram edit inventory data



4. Activity diagram PoS

The PoS activity chart describes the user's activity when making a sales transaction. A diagram of PoS activity can be seen in Figure 13.

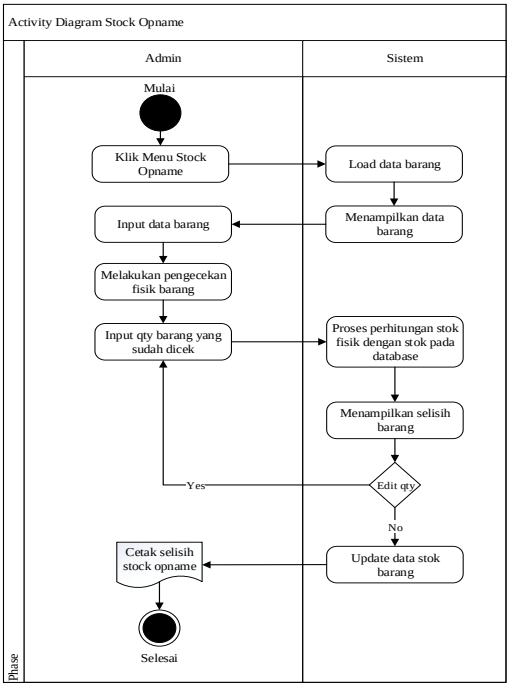
Figure 13: Activity diagram PoS



5. Activity diagram stock recording

Stock taking activity diagram describes the activities of the admin when performing stock taking activities. A diagram of stock taking activity can be seen in Figure 14.

Figure 14: Activity diagram stock capture



6. Activity diagram supplier

The supplier activity chart depicts admin activity when adding, removing, and changing supplier data. A diagram of supplier activity can be seen in Figure 15, Figure 16 and Figure 17.

Figure 15: Activity diagram add supplier

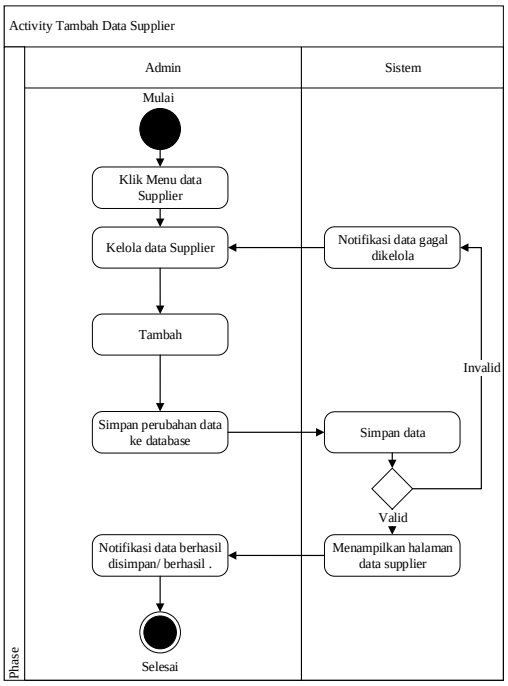


Figure 16: Activity diagram delete supplier

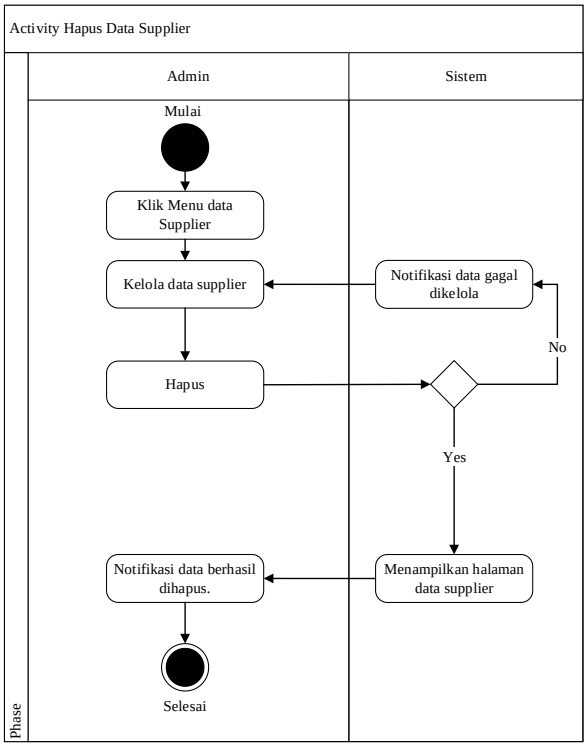
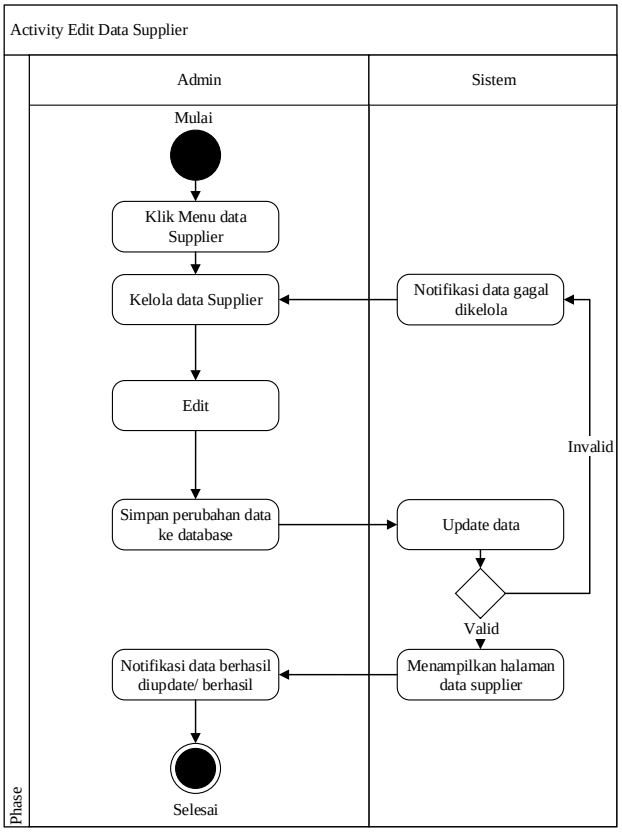


Figure 17: Activity diagram edit supplier



7. Activity Chart Categories

The category activity chart describes the activities of admins as they add, remove, and change category data. The activity chart categories can be seen in Figure 19, Figure 18 and Figure 19.

Figure 18: Activity diagram adding categories

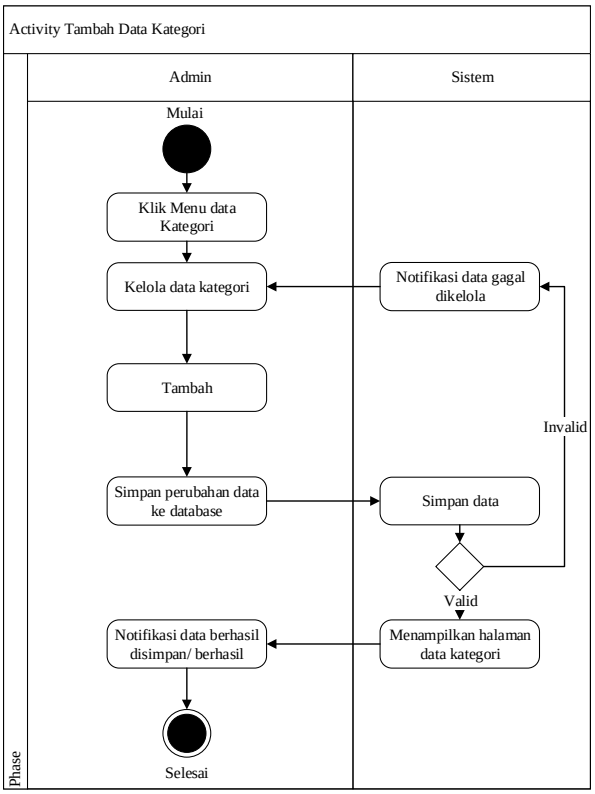


Figure 19: Activity diagram delete category

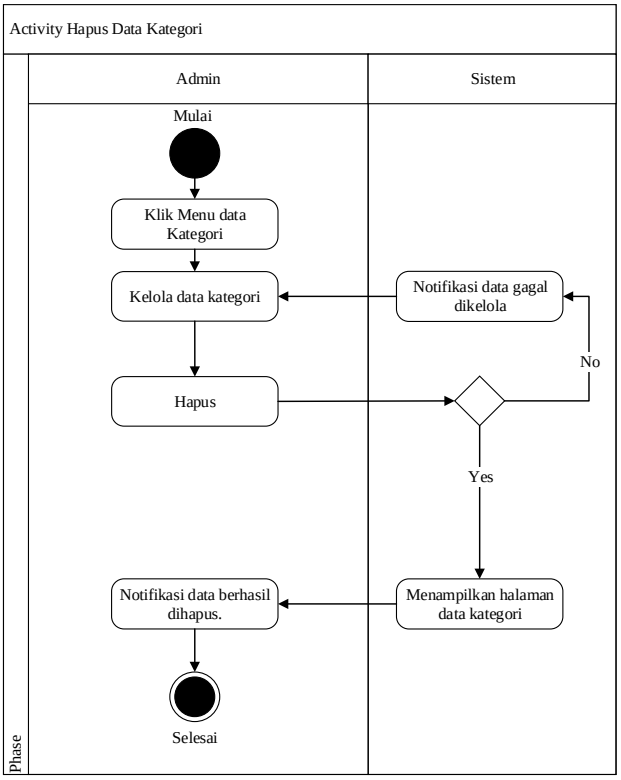
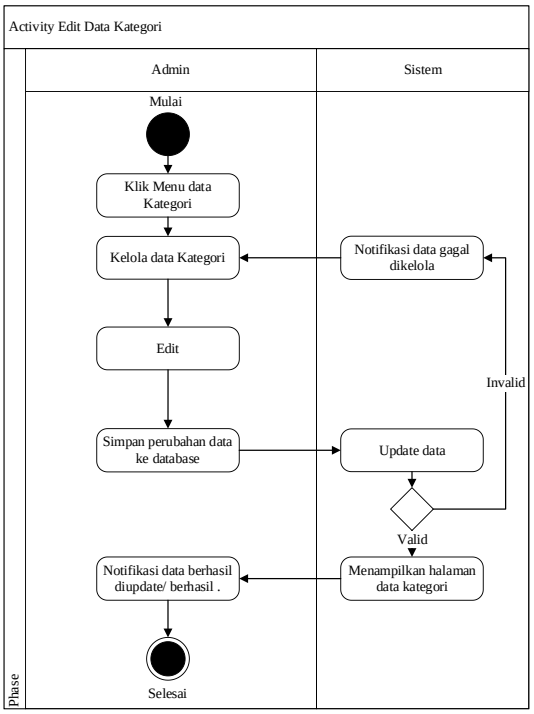


Figure 20: Activity diagram edit categories



8. Activity chart receipts

The receipt activity chart describes the admin activity when performing an item receipt transaction. The activity diagram receipts can be seen in Figure 21, Figure 22 and Figure 23.

Figure 21: Activity diagram adding receipts

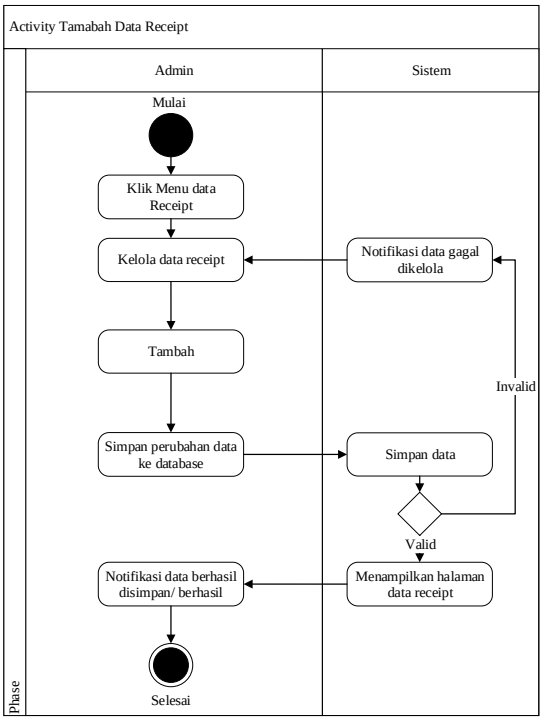


Figure 22: Activity diagram delete receipt

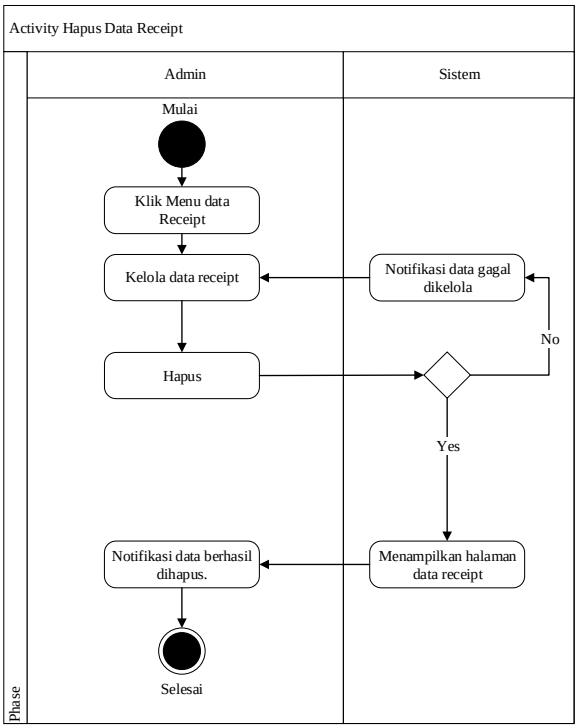
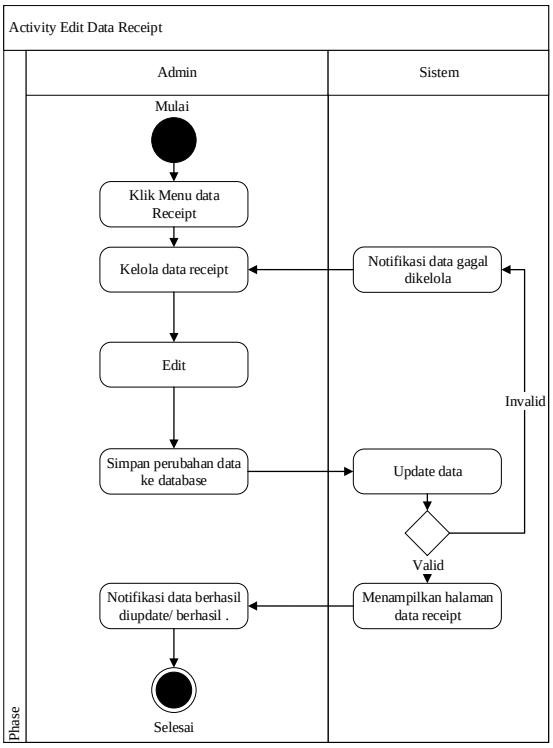


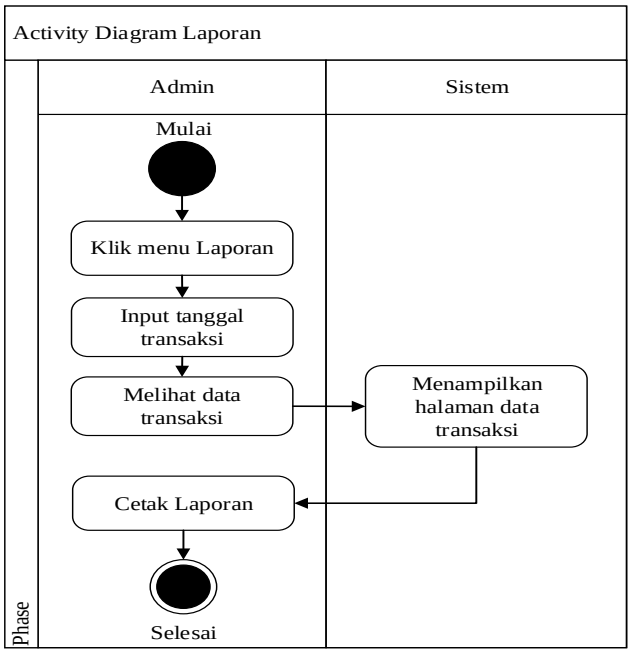
Figure 23: Activity diagram edit receipt



9. Activity chart report

The report activity chart describes the admin's activity when printing the transactions that have been made. The activity diagram of the report can be seen in Figure 24.

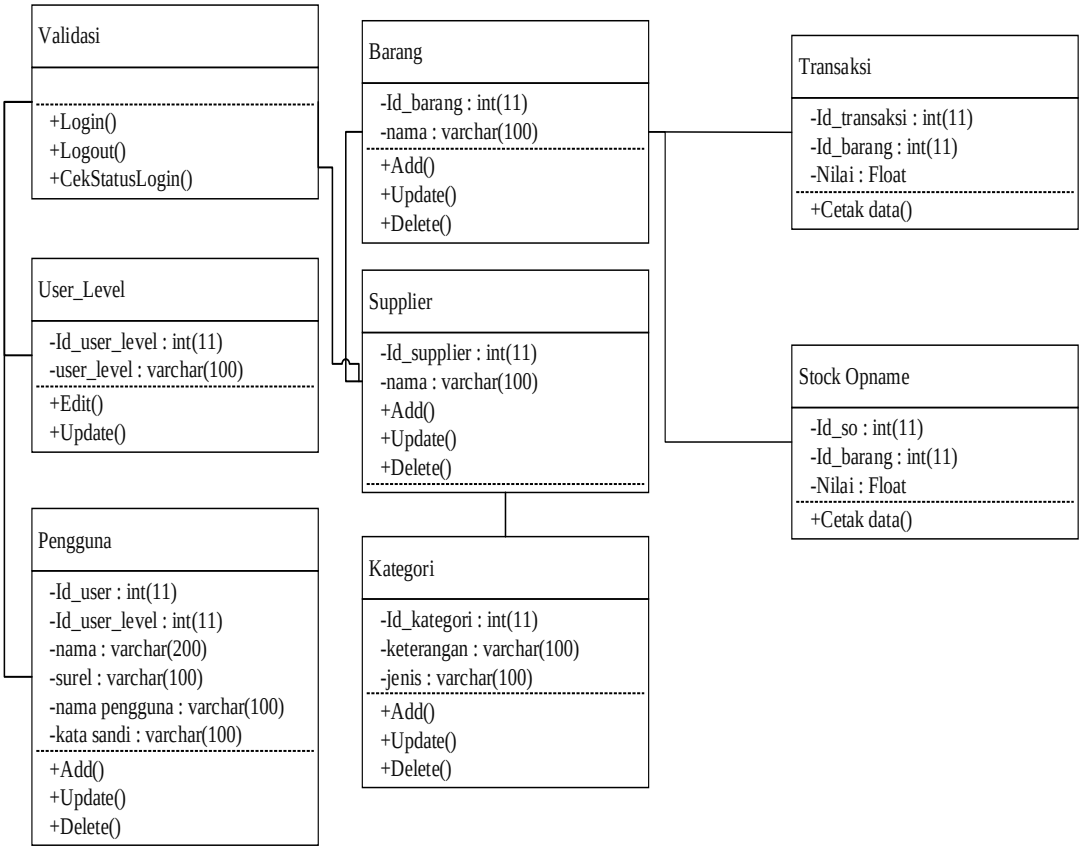
Figure 24: Activity diagram report



Class Chart

Class The diagram depicts class collections, collaboration, and relationships between classes. Class diagram constructed as shown in Figure 24.

Figure 24: Class diagram



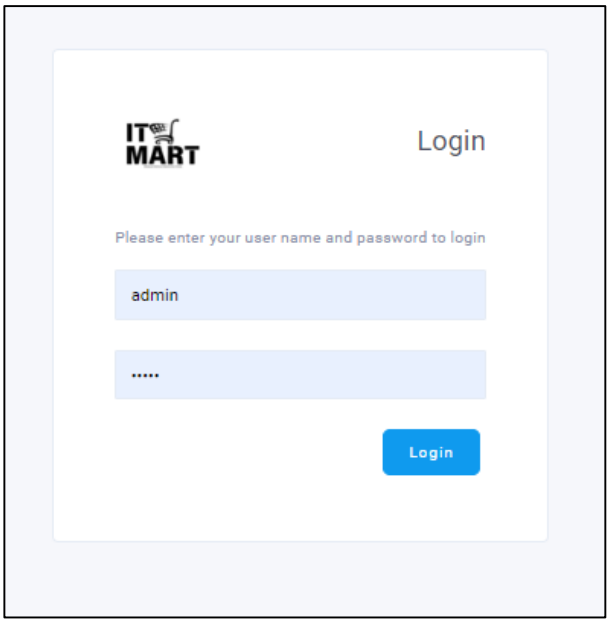
IMPLEMENTATION

The implementation of the PoS system and stock taking at Warung IT Mart was built using a PHP programming system based on the codeigniter framework. The display of the PoS system support system and stock taking at Warung IT Mart is as follows:

1. Login Page

The login page is the initial display on the website, where users must enter the username and password that has been registered to access the application or system. The view of the Login page is shown in Figure 25.

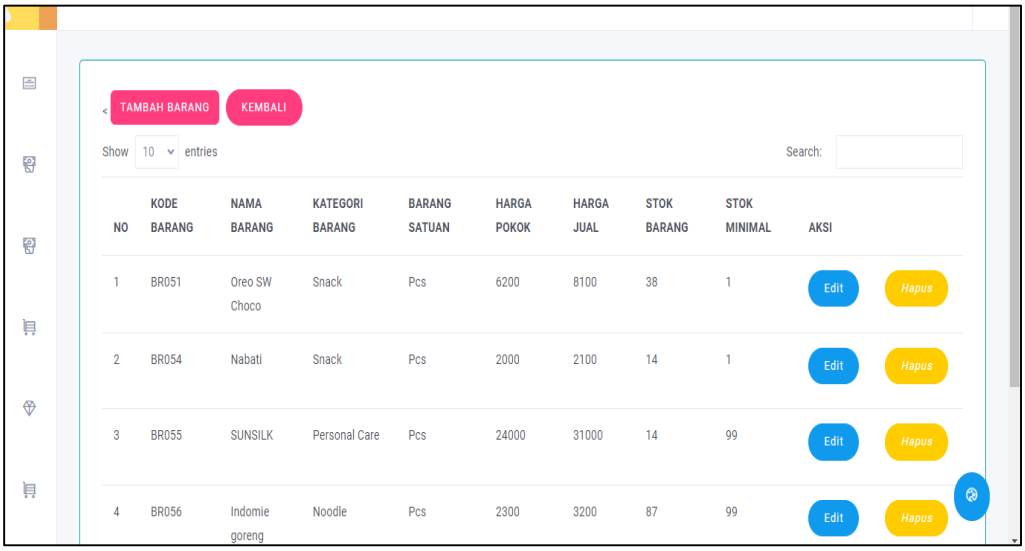
Figure 25: Login page



2. Login Page

The Inventory page is a menu that is used to view the stock data available in the system's database. In addition, this page is used to add new item data. The view of the Inventory page is shown in Figure 26.

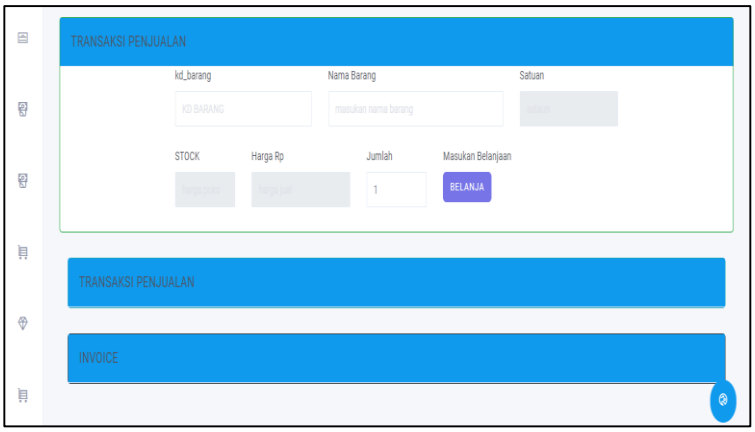
Figure 26: Inventory pages



3. Point of Sale (PoS) Pages

The Point of Sale (PoS) page is a menu used to conduct sales transactions with customers. The use of this menu is done by scanning the barcode listed on each item. The View of the Point of Sale (PoS) page is shown in Figure 27.

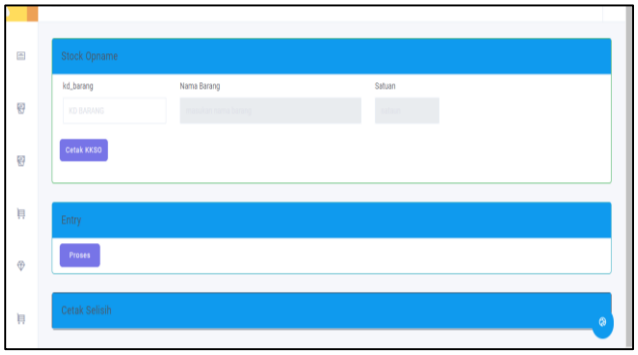
Figure 27: PoS Page



4. Stock Picking Page

The Stock Taking page is a menu used to perform activities that measure the compatibility between warehouse stock items and stock items contained in the system's database. The view of the stock pick-up page is shown in Figure 28.

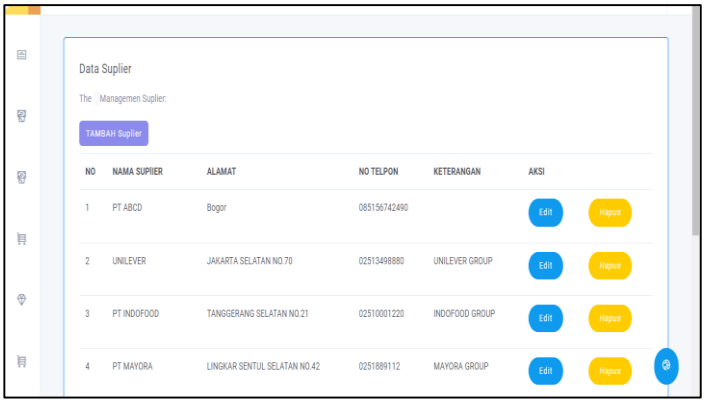
Figure 28: Stock Photos



5. Supplier Page

The Supplier page is a menu used to view and add suppliers or suppliers of goods that will be sold at the IT Mart stall.

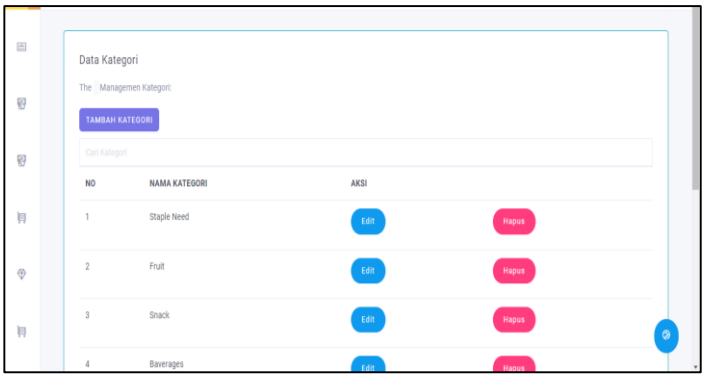
Figure 29: Supplier page



6. Category Pages

The Categories page is a menu that is used to view and add the types of categories that will be listed on each item that will be sold. The category page view is shown in Figure 30.

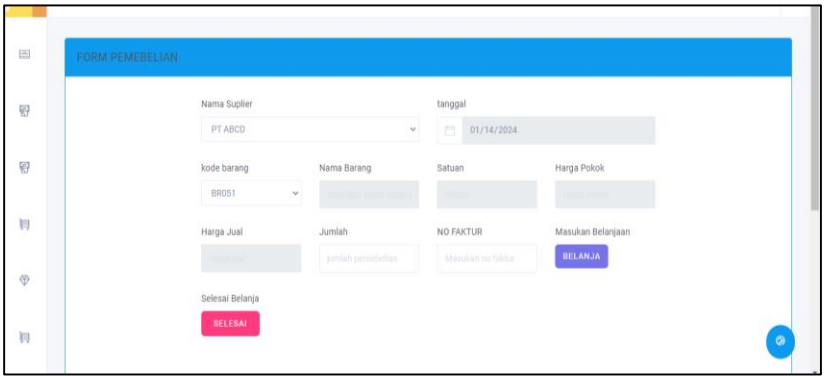
Figure 30: Category Pages



7. Page Receipts

The Receipt page is a menu used to receive items sent by a supplier to a kiosk for sale. Once an item is received, the stock in the database will instantly increase according to the inputs added to this menu. The view of the Receipt page is shown in Figure 31.

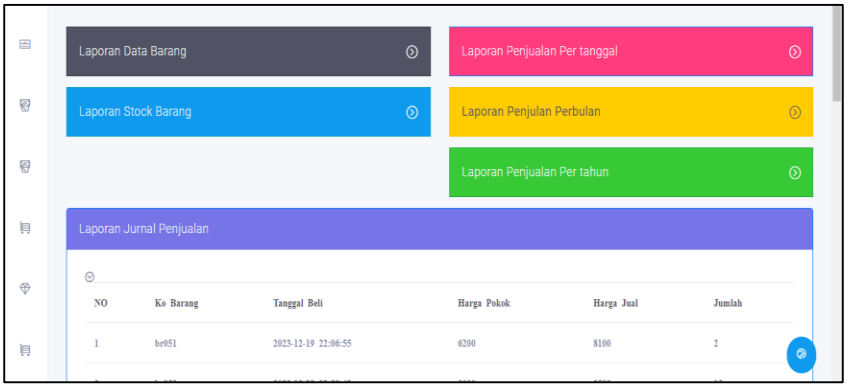
Figure 31: Receipt Page



8. Report Page

The Reports page is a menu that is used to see a recapitulation of all the transactions that occur in the system. All transactions that occur on the system will be recorded in this menu by viewing the date of the transaction. The view of the Report page is directed to Figure 32.

Figure 32: Pages of the report



TESTING

The test was carried out using the black box method. Black-box testing is done by validating the results generated by the system when an action is given to the system and the testing is done by the admin user and the cashier. The black box test can be seen in Table 2.

Table 2: System Testing

No	Testing	Expected output	Result
1	Login	Generates a login page view and logs in to the dashboard page.	Testing Successful.
	Cashier Login	Generate inventory data page views and add data, update data, and delete data.	Testing Successful.
2	Data Inventory Menu	Generate inventory data page views and add data, update data, and delete data.	Testing Successful.
3	Menu Point of Sale (PoS)	Generate a view of sales transaction results.	Testing Successful.
4	Menu Stock Opname	Generate a view of the data from inventory calculations.	Testing Successful.
5	Data Supplier Menu	Generate the supplier's data page view and add data, update the data, and delete the data.	Testing Successful.
6	Category Data Menu	Generate category data page views and add data, update data, and delete data.	Testing Successful.
7	Data Receipt Menu	Generate a receipt data page view and add data, update data, and delete data.	Testing Successful.
8	Report Menu	Displays a view of all transaction reports and sales receipts.	Testing Successful.
9	User Menu	Displays a view of access rights on each user on the system.	Testing Successful.
10	Logout	Displays system exit view.	Testing Successful.

Comparison of PoS systems, stock capture systems, inventory management technologies, IoT-based stock systems, and web-based retail systems.

In the development of Point of Sale (PoS) and Web-Based Stock Management Systems for IT Mart in the Informatics Engineering Laboratory, it is important to understand how various technologies supporting sales and inventory management are interconnected, so that the system built is able to answer operational needs optimally.

1. Point of Sale (PoS) System

The PoS system is a technology that automates the transaction process, records sales, calculates total payments, provides receipts, and automatically updates stock. Recent studies show that modern PoS offers integration with inventory management, real-time reporting, and sales analytics (Rahman et al., 2023). Pros: fast, accurate, multi-user support, and instantly connected to stock. Disadvantages: not all PoS are capable of performing advanced inventory control such as stock prediction or demand analytics.

2. Stock Taking System

Stock taking is the process of physically checking stock in a warehouse or store to match system data. The digital stock recording system utilizes barcode scanners, mobile apps, or electronic inputs to reduce manual errors. Advantages: improve the accuracy of the physical quantity of goods, detect shrinkage (loss), and periodically validate stock. Disadvantages: they are periodic, not real-time, and require time and effort.

3. Inventory Management Technology

The Inventory Management System (IMS) manages the entire stock cycle from receiving goods, storage, movement to distribution. Common features include stock forecasting, reordering systems, batch tracking, and supplier management (Jain & Mehta, 2022). Advantages: systematic, supporting decision-making, and can optimize the amount of stock. Disadvantages: complex, requiring solid integration with PoS and transaction databases.

4. IoT-Based Stock System

IoT allows physical sensors to monitor the availability of goods automatically. In retail systems, IoT can be in the form of load sensors, RFID, or smart shelves that send stock data to servers in real-time (Mahendra et al., 2024). Advantages: 24/7 automatic monitoring, minimal human error, ideal for large warehouses. Disadvantages: high cost, require network infrastructure, and are irrelevant for small-medium-scale businesses such as campus laboratories that only require standard digital systems.

5. Web-Based Retail System

Web-based retail systems integrate sales, product management, transaction reports, and stock control in an internet-based platform. This system is a major trend because it is flexible, can be accessed at any time, is easy to update, and is compatible with Laravel or other modern frameworks (Kurniawan et al., 2023). Pros: multi-platform access, easy integration, real-time monitoring. Cons: it takes a stable network and a good server to handle traffic.

Comparative Analysis and Relevance for IT Mart

The system developed for IT Mart in the Informatics Engineering Laboratory requires a solution capable of handling:

- Fast and accurate sales transactions,
- real-time stock management,
- sales and stock reporting,
- Simple but tidy inventory control,
- Flexible access through the campus network.

As for these technologies:

- Web-based PoS is particularly relevant for IT Mart's daily transaction processing.
- Digital stock capture supports periodic physical checks for stock validation.
- Web-based inventory management is a perfect fit because the complexity of laboratory goods is still on a small–medium scale.
- IoT is not necessary because IT Mart's scale does not demand high-cost automated sensors.
- The web-based retail system provides management flexibility that laboratory managers can access at any time.

CONCLUSION

Sales and inventory management in IT Mart stores: PoS applications help automate the transaction process, reducing the potential for errors such as miscalculations during transactions and report logging. In addition, integration with the stock capture module allows for more effective inventory management with real-time monitoring, thereby improving the accuracy of storage data. The results of this study support the creation of better reports, including sales summaries, stock status, and performance analysis, that are easily accessible to support accurate decision-making. This system also improves data accuracy and report quality, supporting smooth operations through the application of information technology in the field of sales and inventory. For future development, it is hoped that this system can be improved to be more effective, so that users can take full advantage of the system's potential and contribute sustainably to future system innovation and development.

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