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Applying Supply Chain Management in a Web-Based Drug Inventory System

Maysaroh
Information System
Royal University
Kisaran, Indonesia
maysarohmarpaung3@gmail.com

Muhammad Ardiansyah Sembiring
Information System
Royal University
Kisaran, Indonesia
adinmantap88@gmail.com

Sudarmin
Information System
Royal University
Kisaran, Indonesia
edisudarmindra@gmail.com

Abstract— The advancement of information technology has driven digitalization across various sectors, including drug inventory management in the pharmaceutical field. Toko Obat Lamtama still faces challenges in stock management due to the absence of a computerized system, resulting in frequent stock shortages, surpluses, and expired medications. This study aims to design and implement a web-based drug inventory integrated with the concept of Supply Chain Management (SCM) to improve operational efficiency and customer service. The methodology includes needs analysis, system design using UML, and web-based implementation. The results indicate that the system successfully automates drug recording, monitoring, and ordering processes, leading to a 35% reduction in stock errors and a 45% improvement in order processing time. Additionally, the integration of SCM principles helped reduce waste from expired medications by 30%, while enhancing the accuracy of inventory planning and supporting faster, more informed decision-making.

Keywords—Supply Chain Management (SCM), Information System, Drug Inventory, Stock Management

I. INTRODUCTION

The advancement of information technology has had a significant impact across various sectors, including the health and pharmaceutical industries [1]. Digitalization in data management has contributed to improving operational efficiency, particularly in drug inventory management [2]. However, many pharmaceutical businesses, including Toko Obat Lamtama, have not yet implemented computerized systems, resulting in various issues in managing drug inventory.

In the pharmaceutical field, inventory management plays a crucial role in ensuring the availability of medications in the right quantities and at the right time [3]. Inaccurate stock management can lead to shortages that affect service quality, or surpluses that result in waste due to expired medications [4]. This issue is further exacerbated by manual management processes, the absence of an expiration monitoring system, and delays in reporting and decision-making.

Toko Obat Lamtama currently relies on average monthly usage calculations for drug ordering, which are not always accurate. The absence of an integrated system also makes it difficult to monitor minimum stock levels and track medication expiration. Therefore, the implementation of a web-based drug inventory integrated with the concept of Supply Chain Management (SCM) is necessary.

SCM is an integrated approach that manages the flow of goods from suppliers to end consumers [5]. In this context, SCM can assist the pharmacy in managing accurate ordering, reducing the risk of stock shortages or surpluses, and ensuring that medications are available according to customer needs [6]. In addition, the use of a web-based enables real-time data recording and supports fast and accurate decision-making [7].

Several previous studies have implemented the concept of Supply Chain Management (SCM) across various sectors. Implementation of e-SCM at Raja Tape demonstrated that e-SCM can optimize distribution and raw material procurement [8]. Web-based SCM systems have also been applied in agriculture [9], spare part distribution [10], food inventory management [11], and automotive workshops [12], resulting in improved stock management and reporting efficiency.

However, most of these studies focus on medium- to large-scale industries and are unrelated to the pharmaceutical sector. To date, no research has specifically designed a web-based drug inventory management system that integrates SCM principles, particularly for small-scale pharmacies.

This study addresses that gap by developing a web-based integrated with SCM to support automated drug inventory management, ordering, and reporting at Toko Obat Lamtama. The system aims to improve operational efficiency, reduce stock-related errors, and support faster and more accurate decision-making.

II. METHODOLOGY

This study employs a qualitative approach to gain an in-depth understanding of the issues in drug inventory management at Toko Obat Lamtama. This method was chosen because it allows the researcher to explore data thoroughly through direct interaction with respondents, who serve as the primary sources of information [13]. Data collection was carried out using open-ended questions and interviews, allowing respondents to freely express their opinions and experiences [14]. The collected data is descriptive in nature and was analyzed to obtain a comprehensive overview of system requirements, stock management issues, and the potential implementation of a web-based integrated with Supply Chain Management (SCM).

This qualitative approach emphasizes meaning and process rather than mere numbers, aiming to understand phenomena contextually and holistically based on the direct experiences of the informants [15]. The research framework used in this study is illustrated in the following figure 1:

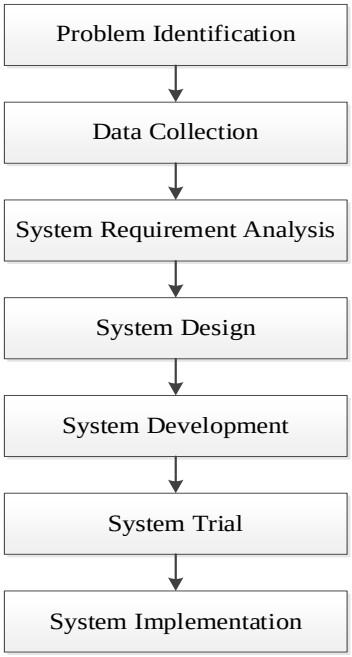

Figure 1. Research Framework

The research framework in this study begins with the identification of problems faced by Toko Obat Lamtama, particularly the manual process of managing drug inventory and the absence of an effective system for monitoring stock levels and expiration dates. Data collection was then carried out through observation, interviews, documentation, and literature review to gather comprehensive information on system requirements. The collected data was used in the system requirements analysis stage to define the features and specifications needed in the system.

The next stage was system design, which involved modeling using Unified Modeling Language (UML), including use case diagrams, activity diagrams, class diagrams, and sequence diagrams. Additionally, Entity Relationship Diagrams (ERD) and flowcharts were used to design the data structure and system process flows.

System development was carried out using the PHP programming language and MySQL database. The system was designed to manage the drug supply chain electronically and can be customized according to operational needs. Once the system was built, it underwent black-box testing to ensure that all functionalities operated as expected. The final stage was system implementation, where the developed system was deployed in Toko Obat Lamtama as a practical solution to the challenges in drug inventory management.

A. System Requirements Analysis

System requirements analysis was conducted to identify the key functionalities, data flows, users, and technical needs required to ensure the system operates as intended. Information was gathered through direct interviews with stakeholders at Toko Obat Lamtama.

Data Requirements

The system processes input data such as product details, stock levels, supplier information, orders, and sales records. These inputs are sourced from Toko Obat Lamtama. The resulting outputs include reports on orders, sales, and suppliers, which can be accessed and printed by the admin. A summary of the input and output documents is presented in Table 1.

Table 1.Input Documents

No	Data Type	Type	Source
1	Product Data	Input	Toko Obat Lamtama
2	Stock Data	Input	Toko Obat Lamtama
3	Supplier Data	Input	Toko Obat Lamtama
4	Product Order Data	Input	Toko Obat Lamtama
5	Product Sales Data	Input	Toko Obat Lamtama
6	Order Report	Output	Toko Obat Lamtama
7	Sales Report	Output	Toko Obat Lamtama
8	Supplier	Output	Toko Obat Lamtama

Process Analysis

Process analysis describes the functions that the system must perform to meet user needs. Based on these requirements, the main functions that the system must carry out are as follows:

1. Displaying supply chain-related information on the E-SCM website for both admin and supplier access.
2. Performing data input and output processes as needed.

User Requirements

Human resource or user requirements refer to the individuals involved in the development and implementation of the system, which include:

1. Admin refers to employees who have access to manage product data and orders, handle purchase requests, maintain product or menu information, manage sales data, input transactions, manage supplier information, generate reports, and log out from the system.
2. Supplier is authorized to input required products into the system and receive product order requests.

Software Requirements

The system runs on a Windows 10 environment using supporting tools such as VSCode, XAMPP, Visual Paradigm, Microsoft Visio, and a web browser.

System Configuration

The system is initially tested locally using a server application like XAMPP, with Apache and MySQL activated. It is accessed via http://localhost/scm-obat before being deployed to an online hosting server for implementation.

B. System Testing Method

System testing ensures that all components and functionalities operate as expected. If issues or inconsistencies are found, revisions and retesting are performed until the system is deemed complete, accurate, and ready for use.

In this study, Black Box Testing was used. This method focuses on evaluating system functionality without examining the internal code structure [16]. Test cases are executed by providing various inputs and observing the outputs to confirm that each feature functions according to the specifications. This technique was applied to assess the reliability of processes such as stock logging, drug ordering, report generation, and interactions between the admin and supplier.

C. Proposed System Analysis

The proposed system is a development of the previous one, focusing on automating the drug inventory management process. In this system, the admin logs in to monitor stock levels, input orders for products that have reached the minimum threshold, and send purchase requests to the supplier via the system. The supplier processes the request and

delivers the products to the store. Once received, the admin verifies the delivery and prints the goods receipt report.

The system also allows the supplier to add new product offerings to the platform, and the admin sets the selling price before making the products available for sale. This process supports operational efficiency and real-time inventory control. The following is a diagram of the proposed information system analysis:

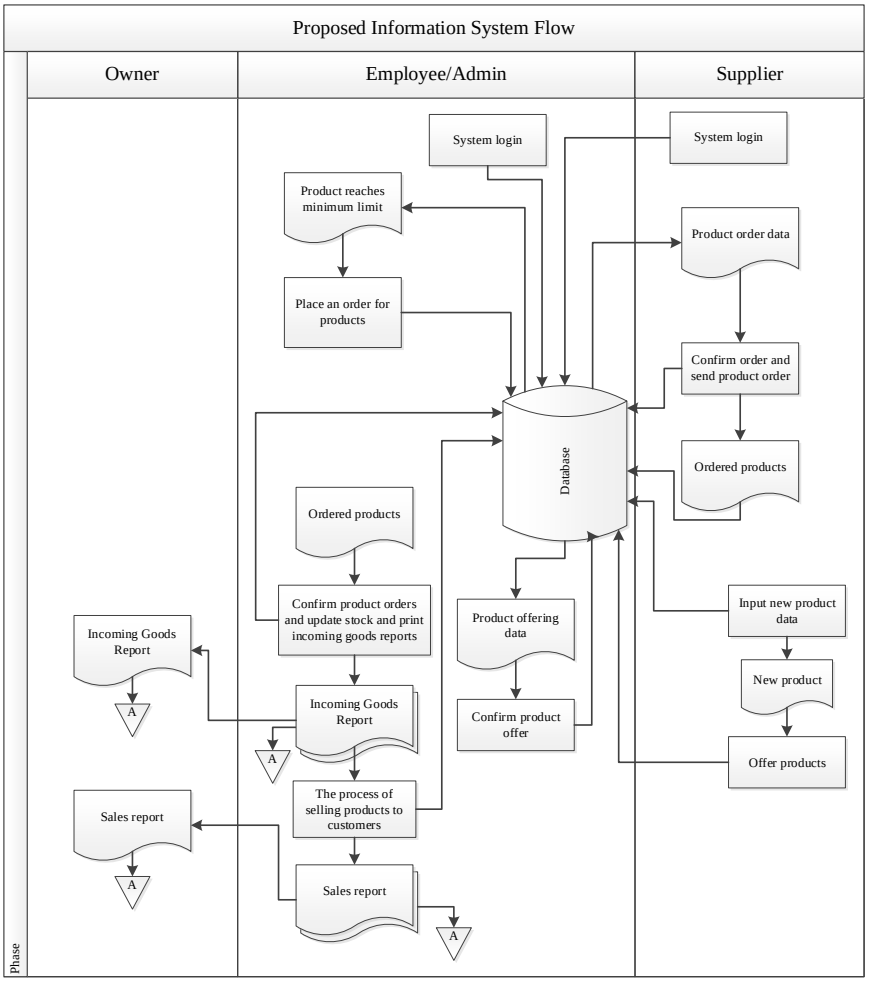

Figure 2. Proposed Information System Analysis

III. RESULT AND DISCUSSION

A. System Design

Unified Modeling Language (UML) is a standardized modeling language used to visualize, design, and document software systems [17]. UML helps developers and project teams understand both the structure and behavior of a system through various types of diagrams, such as Use Case Diagrams, Class Diagrams, Sequence Diagrams, and Activity Diagrams. By using UML, communication among team members becomes clearer, as each system component is described in a structured and consistent manner. The following is a UML design for the implementation of Supply Chain Management (SCM) in drug inventory management at Toko Obat Lamtama.

Usecase Diagram

The Use Case Diagram is one of the diagrams in UML used to illustrate the interaction between users (actors) and the system based on the functions or services provided [18]. This diagram shows who interacts with the system (such as admin or supplier) and what

actions they can perform, represented as use cases. In general, the system processes to be designed are illustrated through the following Use Case Diagram:

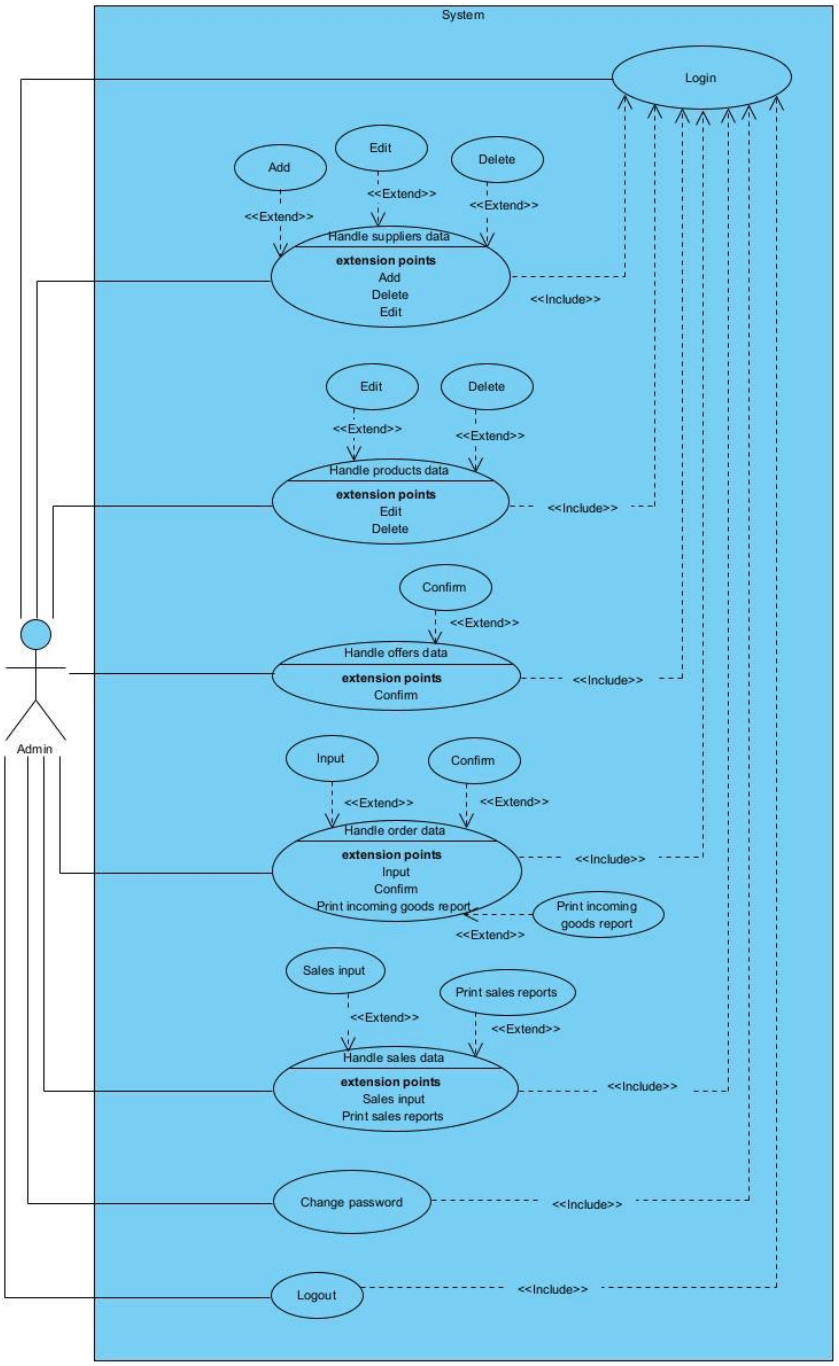

Figure 3. Usecase Diagram

Class Diagram

A Class Diagram describes the structure and specifications of classes and objects, along with the relationships between them [19]. The class structure in this system consists of several main components that are integrated with one another. The Main class acts as the central controller of the system flow, while the Interface class manages the user interface. The Validation class handles data verification in accordance with the validation use case.

For data management, the system includes User, Supplier, Customer, and Product classes, each of which performs CRUD (Create, Read, Update, Delete) operations based on their respective entities. The Sales class is responsible for recording and managing sales transactions. All classes collaborate to ensure the system functions efficiently.

The following is the Class Diagram of the web-based Supply Chain Management designed for drug inventory management at Toko Obat Lamtama:

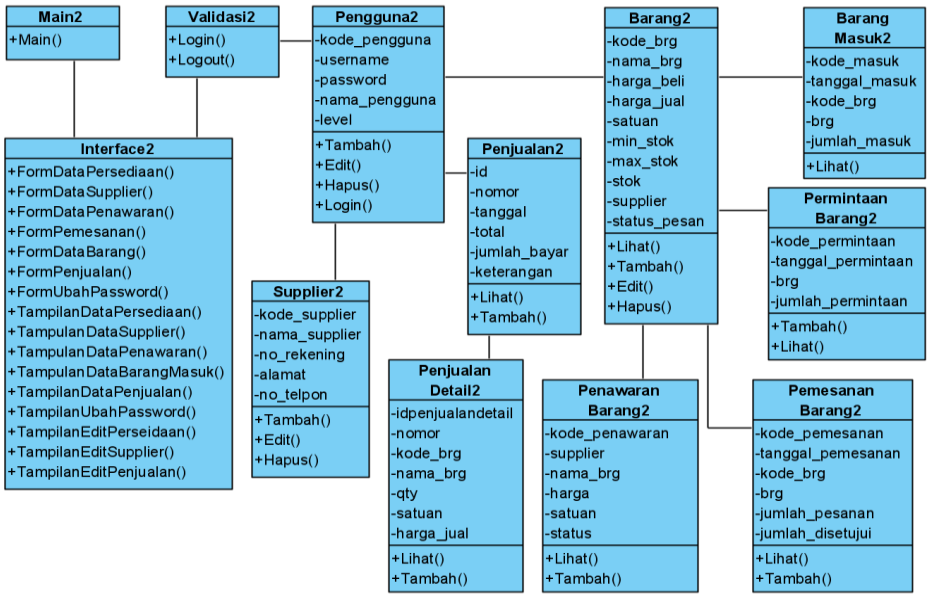

Figure 4. Class Diagram

Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) is used to illustrate the relationships between data entities or data stores [20]. Below is the ERD designed for the web-based Supply Chain Management application developed for inventory and distribution management at Toko Obat Lamtama.

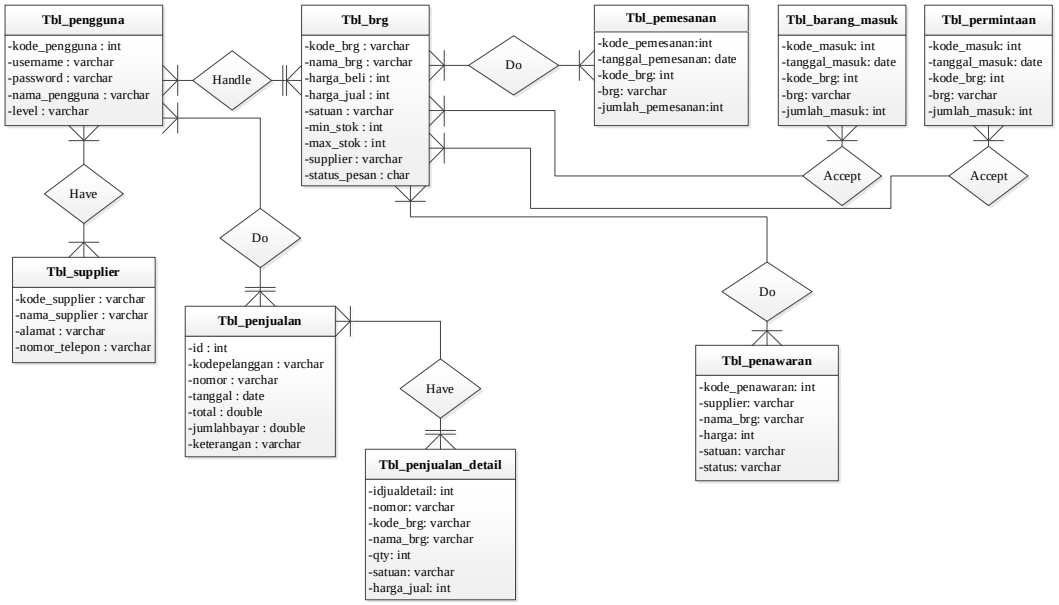

Figure 5. Entity Relationship Diagram

B. System Implementation

System implementation is the stage where the results of prior analysis and design are put into operation. The system is deployed according to user requirements by utilizing the necessary hardware and software. The implementation focuses on the web-based Supply Chain Management system for drug inventory control at Toko Obat Lamtama, aimed at improving efficiency and accuracy in inventory management. This stage also includes system testing to ensure that all functionalities operate according to specifications.

System Configuration

System configuration involves setting up and adjusting both software and hardware components to ensure that the system functions properly and meets user expectations. Proper configuration ensures the system operates efficiently, securely, and in line with the designed specifications. The steps required to configure the system are as follows:

1. Install XAMPP as a local server environment.
2. Install Google Chrome as the web browser.
3. Launch XAMPP and activate both Apache and MySQL services.
4. Move the project folder into the htdocs directory.
5. Access phpMyAdmin via the browser by navigating to localhost/phpmyadmin.
6. Create a local database in XAMPP named **scm_obat**.
7. Configure the system to connect to the database.
8. Run the system by typing the URL localhost/scm-obat in the browser.

Website Implementation

The website implementation represents the visualization of the user interface of the system that has been developed. This section presents how the program appears during operation, including menus, buttons, forms, and other features accessible to users. Below are interface screenshots of the web-based Supply Chain Management system for drug inventory control at Toko Obat Lamtama.

The login page provides an entry form for users to access the system by entering a valid username and password for authentication. The login page interface is shown in the figure below:

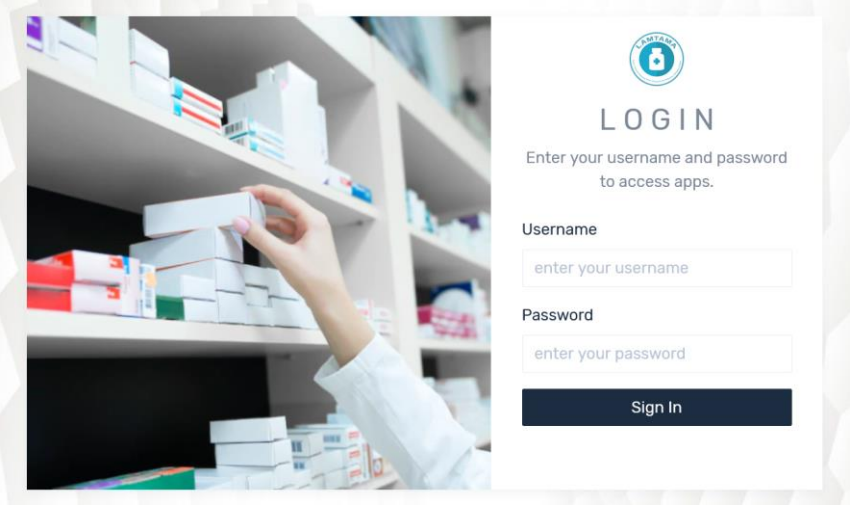

Figure 6. Login Page

The main admin dashboard displays a summary of key data and provides access to management features such as supplier, product, ordering, and sales modules. The admin dashboard interface is illustrated in the following figure:

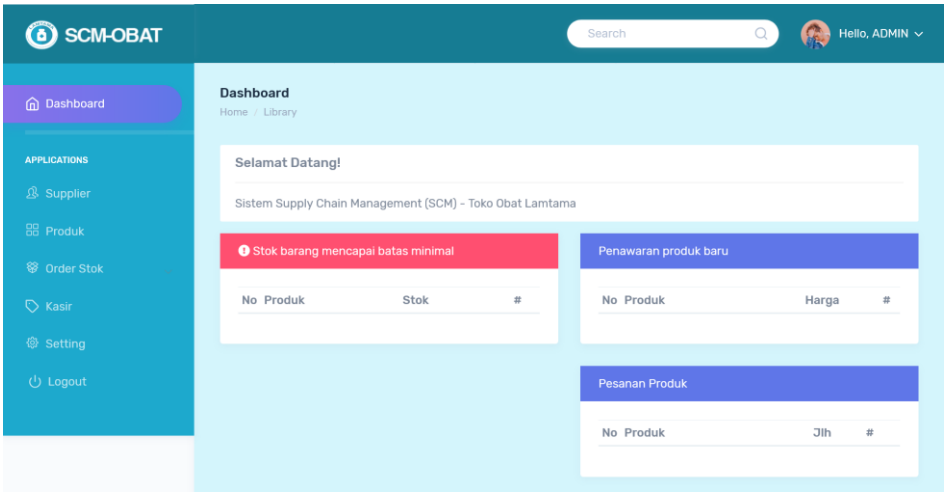

Figure 7. Admin Dashboard

The supplier data page displays a list of registered suppliers. The admin can view, edit, or delete supplier records. The supplier data interface from the admin's perspective is shown in the figure below:

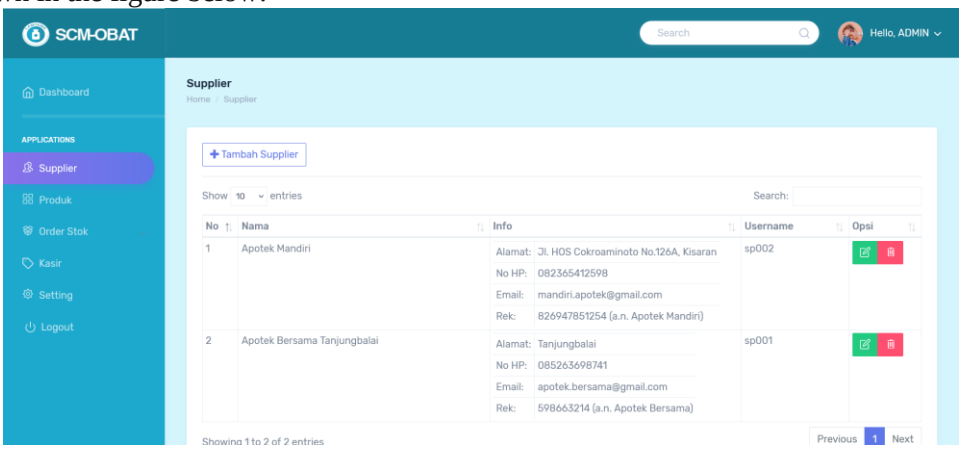

Figure 8. Supplier Data Page (Admin View)

The product data page shows available products, including product names, categories, and stock levels. The admin can manage product data through this page. The product data interface for the admin is shown in the following figure:

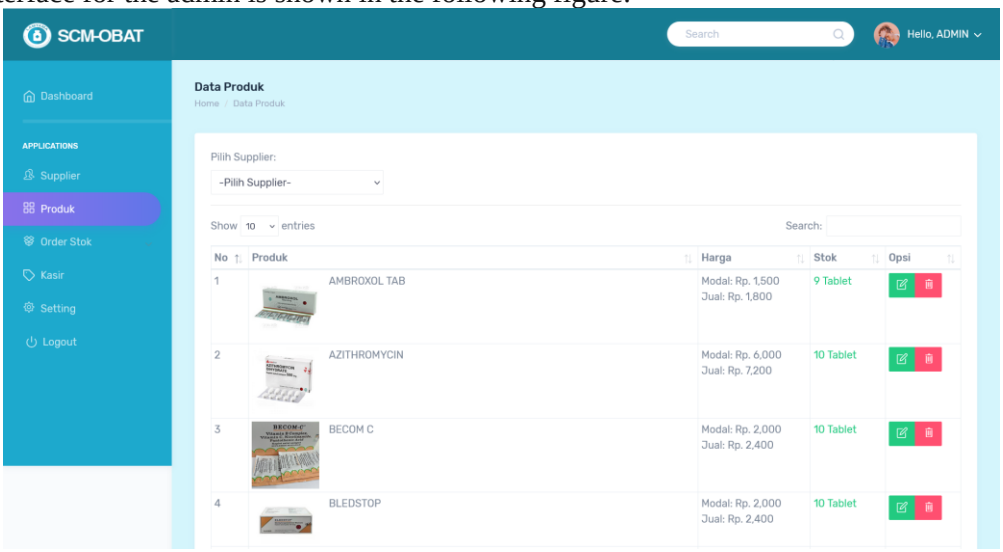

Figure 9. Product Data Page (Admin View)

C. System Testing

System testing is conducted to ensure that every component within the system functions as expected. If the system is found to be inadequate or incomplete, improvements must be made to enhance its accuracy and completeness. Once these improvements are implemented, the system will be re-tested until it meets the criteria for completeness, accuracy, and usability.

In the implementation of the web-based Supply Chain Management system for inventory control at Toko Obat Lamtama, the testing method used is Black Box Testing. The types of tests performed are described as follows:

Login Testing

Testing was performed on the login form by inputting data according to the form provided. For more details, see table 3.

Table 3.Login Test

Input	Expected Process	Observation	Conclusion
Normal Data			
Enter your username and password data completely	Can enter the system via the login form	The process was successful as expected	Working
Inufficient Data			
Did not enter any data	The system rejected process	The process was successful as expected	Working
Wrong Data			
Enter incorrect login data	The system rejected process	The process was successful as expected	Working

Inventory Data Input Testing

Testing of inventory data input was performed by entering inventory data according to the provided form. For more details, see table 4.

Table 4.Inventory Data Input Testing

Input	Expected Process	Observation	Conclusion
Normal Data			
Enter complete inventory data	The system saves the input into the database.	The process was successful as expected	Working
Inufficient Data			
Not filling out the form completely	The system rejected process	The process was successful as expected	Working

Incoming Goods Data Input Testing

Testing of inventory data input was performed by entering inventory data according to the provided form. For more details, see table 5.

Table 5. Incoming Goods Data Input Testing

Input	Expected Process	Observation	Conclusion
Normal Data			
Enter complete incoming goods data	The system saves the input into the database.	The process was successful as expected	Working
Inufficient Data			
Not filling out the form completely	The system rejected process	The process was successful as expected	Working

Testing of Goods Offer Data Input

Testing was conducted on the input of product offering data by inputting the product offering data according to the form provided. For more details, see table 6.

Table 6. Testing of Goods Offer Data Input

Input	Expected Process	Observation	Conclusion
Normal Data			
Enter complete product offer data	The system saves the input into the database.	The process was successful as expected	Working
Inufficient Data			
Not filling out the form completely	The system rejected process	The process was successful as expected	Working

Testing of Goods Offer Data Input

Testing of sales data input was performed by entering sales data according to the provided form. For more details, see table 7.

Table 7. Sales Data Input Testing

Input	Expected Process	Observation	Conclusion
Normal Data			
Enter complete sales data	The system saves the input into the database.	The process was successful as expected	Working
Inufficient Data			
Not filling out the form completely	The system rejected process	The process was successful as expected	Working

IV. CONCLUSION

This study aimed to design and implement a web-based drug inventory integrated with Supply Chain Management (SCM) principles at Toko Obat Lamtama. Based on the results of system design, implementation, and testing, it can be concluded that the developed system effectively addresses the inefficiencies of manual inventory management. The implementation of this system has improved operational efficiency in several key areas, including data recording, real-time stock monitoring, and automated drug ordering. It also reduces the risks of stock shortages and overstocking, which can result in service disruptions or financial losses due to expired medications. Additionally, report generation has become faster and more structured, enabling more accurate and timely decision-making by store management. The use of web-based technology ensures flexible access for both administrators and suppliers, enhancing integration and coordination across the supply chain. The system was tested using the black-box method, and the results confirmed that all major functions operate as intended and meet user requirements. The developed system presents an effective and practical solution for improving drug inventory management in small-scale pharmacies. As a recommendation, small pharmacy owners are encouraged to adopt similar digital systems to enhance operational control and service quality. For future development, the system can be scaled by integrating mobile applications to support field accessibility, incorporating AI-based demand forecasting to optimize stock levels, and enabling multi-store synchronization to support wider implementation across pharmacy networks.

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