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DESIGN AND BUILD A WAREHOUSE MANAGEMENT SYSTEM APPLICATION USING QR CODE (CASE STUDY: PT. POU YUEN INDONESIA)

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Abstract

This study aims to design and develop a web-based Warehouse Management System integrated with QR Code to support the process of recording incoming and outgoing goods at the IT Department of PT. Pou Yuen Indonesia. The system development uses the Waterfall method through the stages of communication, planning, modeling, construction, and deployment. The main features include goods management, goods placement, search, reporting, and QR Code scanning for the outgoing goods process. System testing was conducted using the black box method to evaluate the application's functions. The test results showed that all features functioned as required and were able to assist staff in managing goods data quickly, accurately, and in an integrated manner.

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1. INTRODUCTION

This study aims to design and develop a web-based Warehouse Management System integrated with QR Code to support warehouse management processes. Warehouse management is an important activity in maintaining the smooth flow of goods, from the receiving process, storage, to distribution. At the IT Department of PT. Pou Yuen Indonesia, inventory tracking is still done manually using ledgers. This method has the potential to cause recording errors, slow down information access, make stock tracking difficult, and hinder the efficiency of staff work. These conditions necessitate a technology-based system that can provide accurate, fast, and integrated information.

QR codes are one technology that can be used to improve the efficiency of goods data collection. Compared to barcodes, QR codes have greater storage capacity, faster scanning speeds, and are easier to read from various angles. Integrating QR codes into warehouse systems enables faster goods identification, minimizes input errors, and facilitates goods status tracking.

The creation of this application was motivated by the need for a data collection medium that could replace manual recording, while also facilitating officers in monitoring the flow of incoming and outgoing goods in real time. With a computerized system, data can be managed more neatly, securely, and accessed at any time by authorized parties.

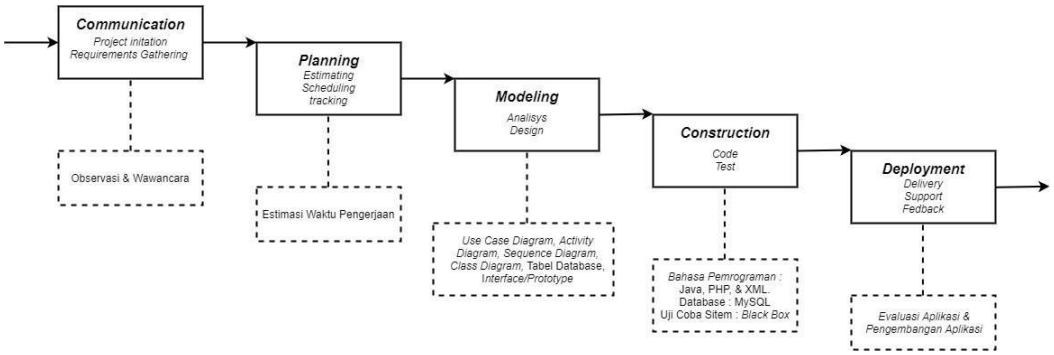
Based on this background, the research questions are: (1) What are the elements involved in the Warehouse Management system in the IT Department? (2) How can we determine the amount of data related to shipping, receiving, and storage? (3) How can we design and build a web-based Warehouse Management information system integrated with QR codes to meet these needs?

This study aims to design and develop a web-based Warehouse Management System integrated with QR Code to facilitate the process of recording incoming and outgoing goods, monitor inventory status, and provide accurate and real-time reports. This system is expected to improve warehouse operational efficiency and support more effective decision-making in the IT Department of PT. Pou Yuen Indonesia.

2. METHOD

This research stems from the problem of limitations in the data management process at the IT Department Warehouse of PT. Pou Yuen Indonesia, which still uses manual recording in ledgers. This process is relatively time-consuming and has a high potential for error, especially when the volume of goods being managed increases. This issue can be formulated as an effort to minimize the time required for recording incoming (input) and outgoing (output) goods and reduce the error rate in data recording.

To achieve this objective, this study employs the Waterfall software development method due to its systematic nature and suitability for projects with clearly defined requirements from the outset.



The development process began with the communication stage, which involved analyzing requirements through direct observation in the field and interviews with relevant parties such as administrators, operators, and warehouse leaders. The next stage was planning, which included estimating the time required for completion, dividing the work into stages, and determining the software and hardware to be used. During the modeling phase, the system is designed using UML, which includes Use Case Diagrams, Activity Diagrams, Sequence Diagrams, and Class Diagrams. The construction phase involves building the application using PHP for the backend, JavaScript for interface interactivity, and MySQL for the database. QR Code technology is integrated as a means of identifying items to speed up the recording process. The final phase is deployment, which involves implementing the system on a local server using XAMPP and distributing the application to users for testing.

The system's workflow begins when an employee logs in to access features according to their access rights. Incoming goods data is entered into the system, and a unique QR code is automatically generated for each item. The items are then placed on shelves according to their designated locations, and the placement data is stored in the database. For outgoing goods, employees scan the QR code using a QR code scanner, and the system automatically updates the stock quantity. All stored data can be processed into inventory reports based on date and item category filters, which can be printed at any time.

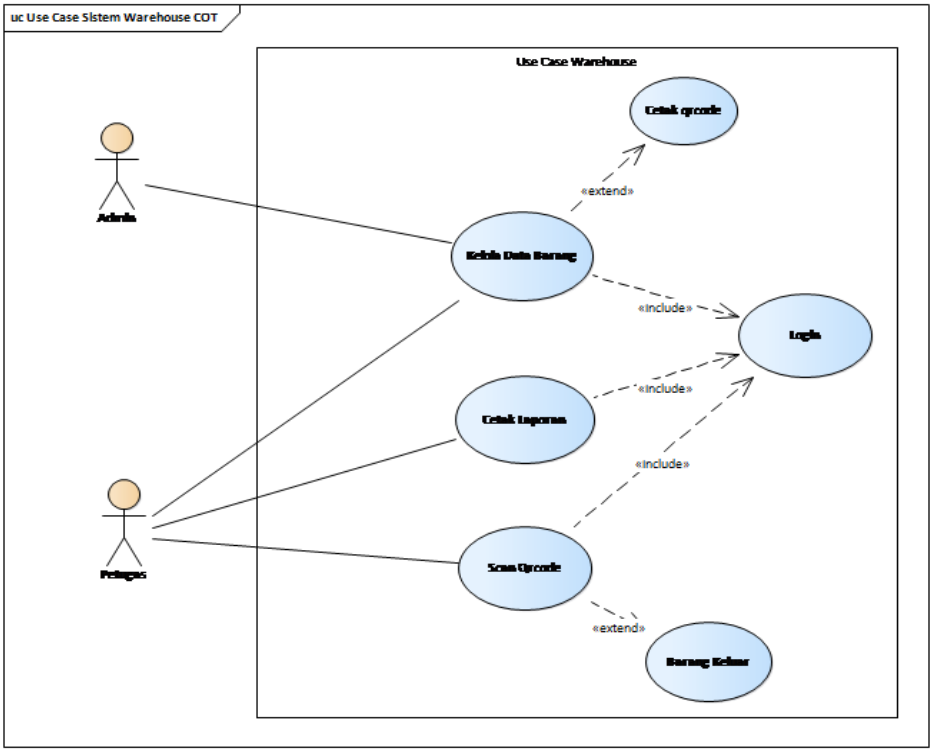
In the context of state-of-the-art technology, previous research has utilized barcodes for item identification in warehouses. However, barcodes have limitations such as low data capacity, limited scanning angles, and dependence on the physical condition of the label.

This study proposes the use of QR Codes because they can store up to 7,089 numeric characters, have a damage tolerance of up to 30%, can be scanned from various angles, and have higher reading speeds. With the integration of QR Codes into a web-based system, inventory tracking becomes faster, more accurate, and can be accessed in real-time by authorized parties.

3. RESULTS AND DISCUSSION

The result of this research is a web-based Warehouse Management System application integrated with QR Code, designed to replace manual recording methods in the IT Department of PT. Pou Yuen Indonesia. The system was developed using PHP for the backend, JavaScript for interactivity, MySQL as the database, and QR Code technology for item identification. The application has been implemented on a local server using XAMPP and tested on Android 10-based smartphones and laptops running Windows 10 Pro.

The resulting system has two types of user access: admin and staff. Administrators have full access to manage master data such as user data, staff data, supplier data, locations, shelves, categories, and items. Administrators can also access comprehensive reports related to incoming, outgoing, and stock items. Meanwhile, staff have limited access, primarily for managing item data, scanning QR Codes when items are outgoing, and printing reports as needed. The system interface is designed to be simple to facilitate users who are not yet familiar with digital applications.



Use Case Diagram

The operational process of the system begins with the recording of incoming goods, where each item entered into the system is automatically assigned a unique QR code that can be printed and affixed to the item. The goods are then placed on specific shelves according to the location data stored in the system. When goods are removed, staff simply scan the QR Code to automatically update inventory levels. Inventory reports can be generated in real-time, complete with information on shelf capacity, stock levels, and the history of goods being added or removed.

4.1. System Implementation

System implementation is the stage of development from design to program code. In the initial phase, the hardware and software specifications to be implemented in the program will be outlined. The core component of program implementation involves translating the design into classes written in the Java programming language syntax. The database is developed using the PHP programming language, with the backend written in PHP and JavaScript. Additionally, the warehouse management system application has been implemented on the Realme 5 Pro smartphone.

4.2. Interface Implementation

The following is the impelmentation of the interfacce of the web Warehouse Management System Application Using Qr Code.

1. Login Page Admin

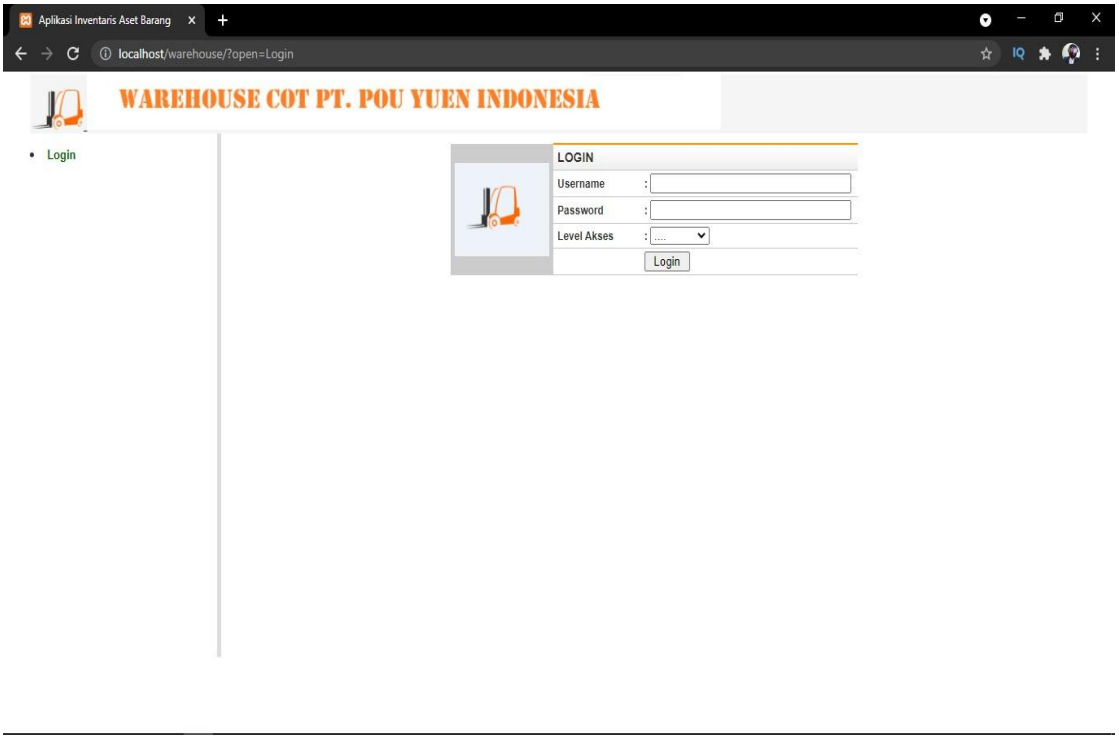


Figure 1 Login Form

2. Dashboard Admin

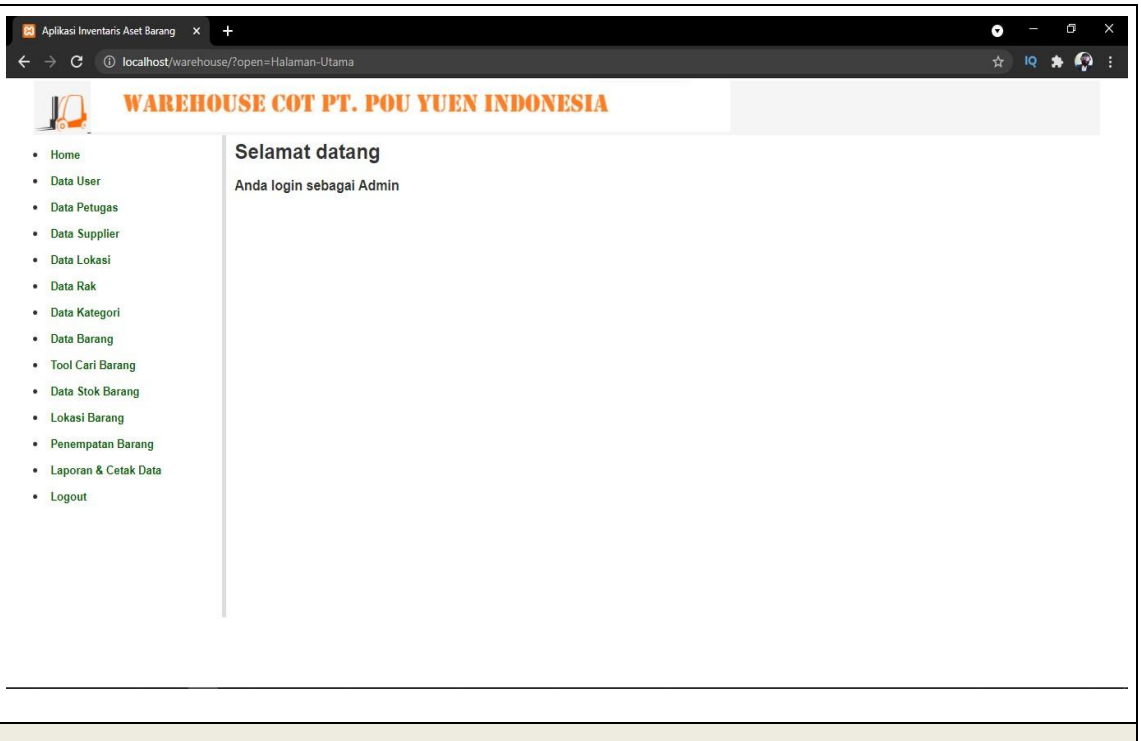


Figure 2 Main admin page form

3. Officer Data Form

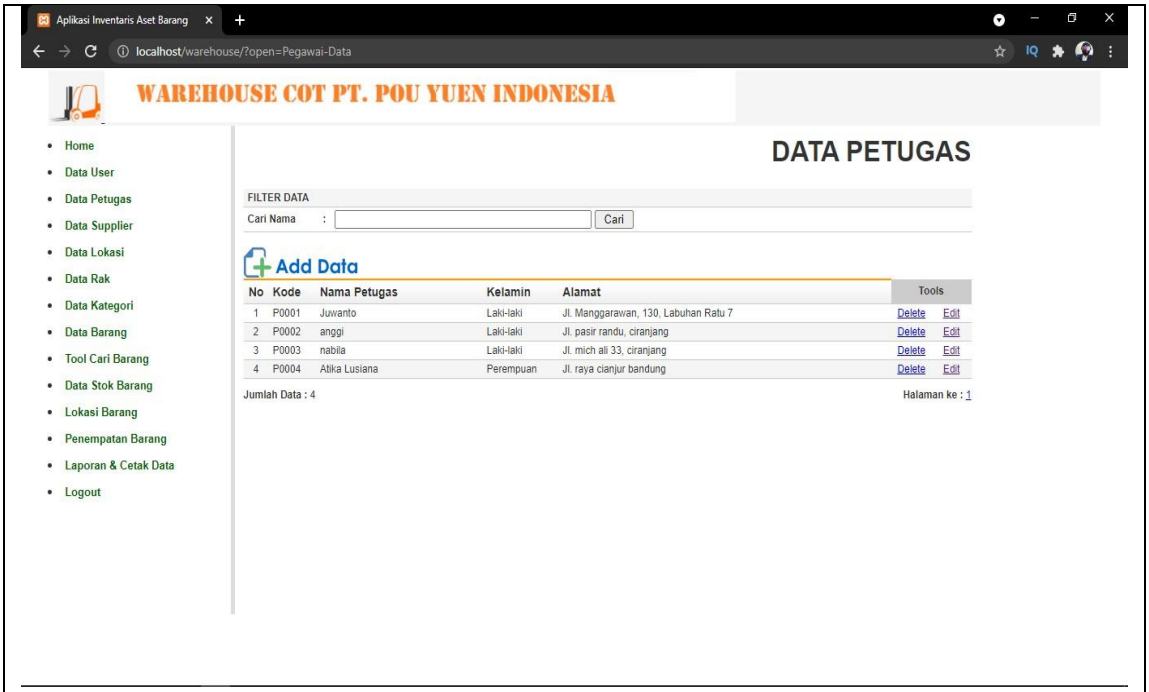


Figure 3. Officer data form

4. Supplier Data Form

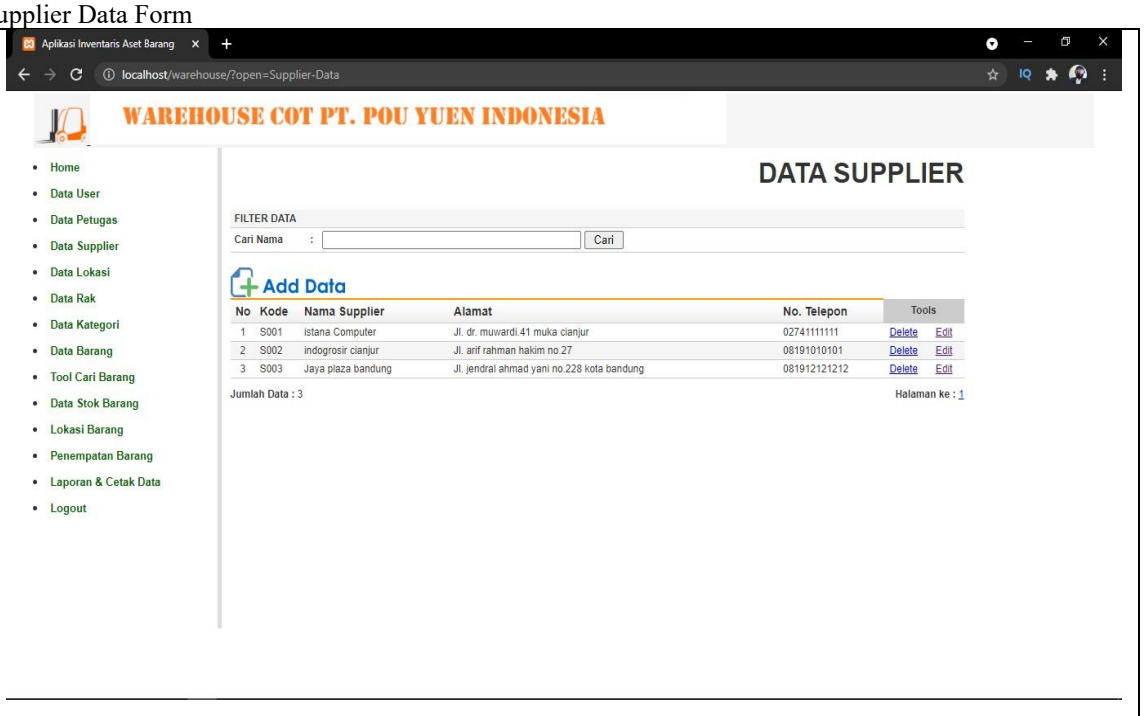


Figure 4. Supplier data form

5. Location Data Form

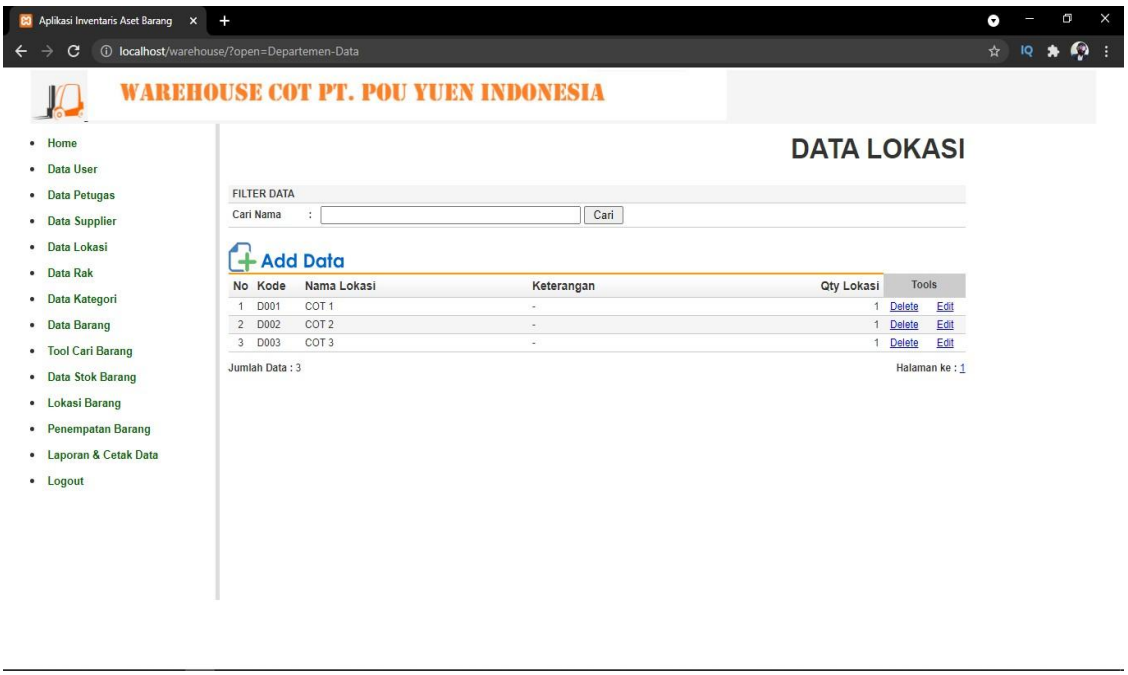


Figure 5. Location data form

6. Shelf Data Form

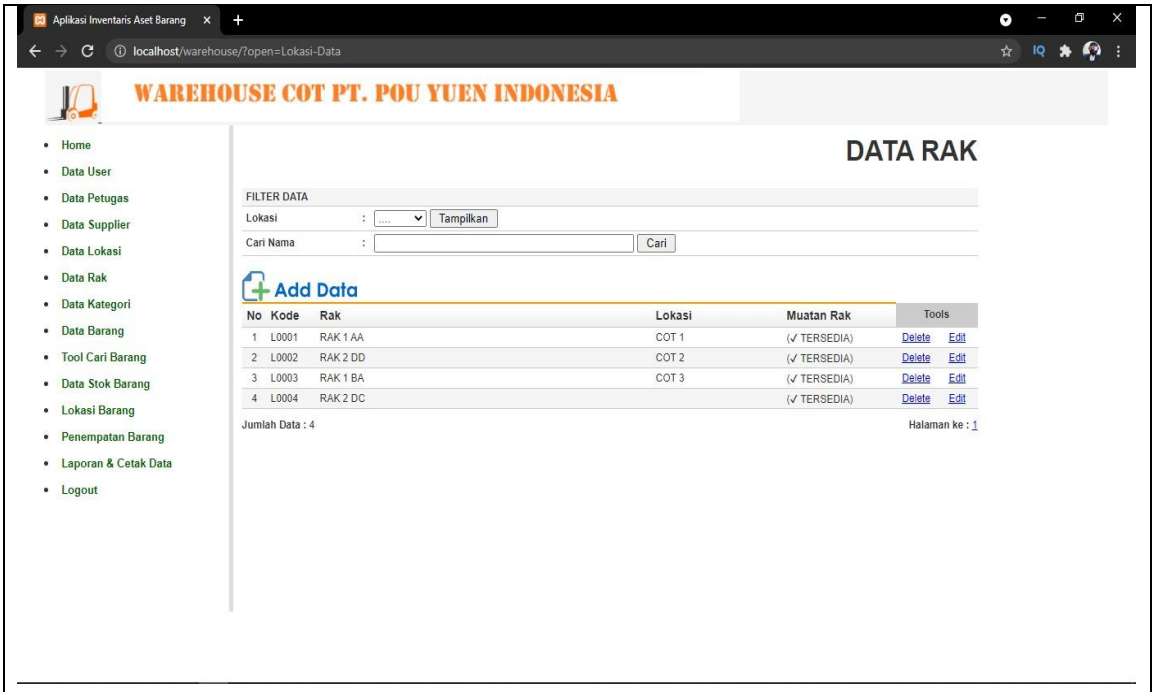


Figure 6. Shelf data form

7. Category Data Form

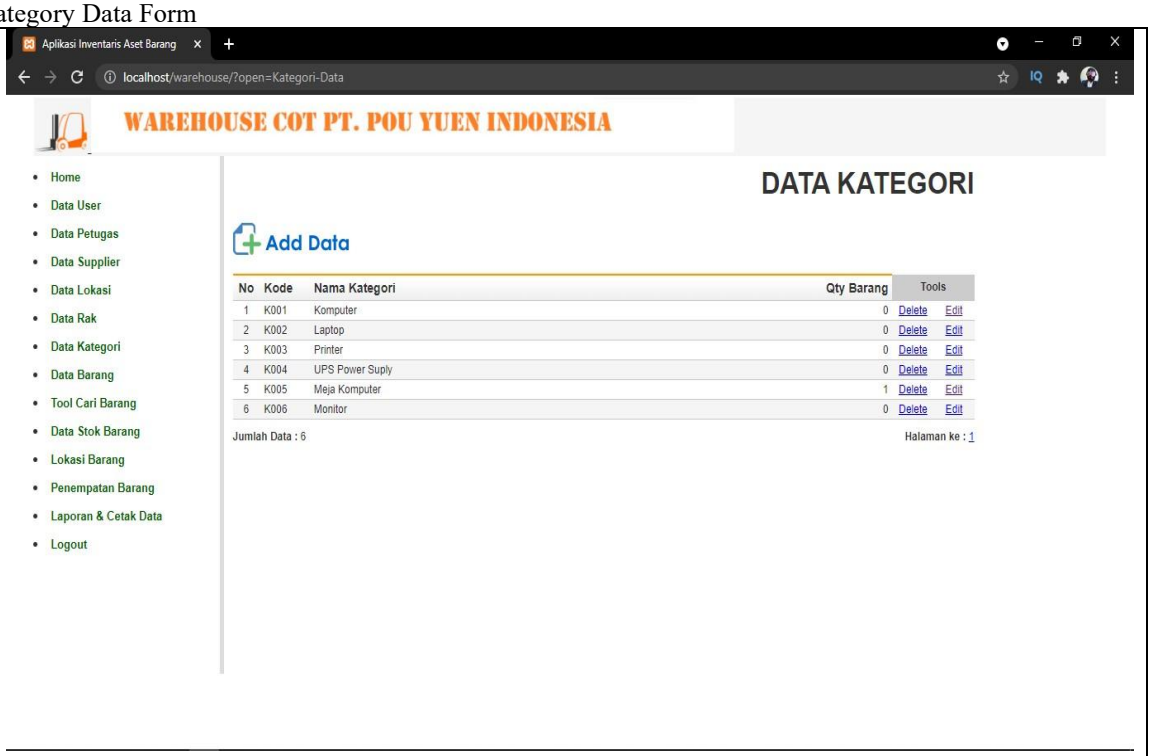


Figure 7. Category data form

8. Item Data Form

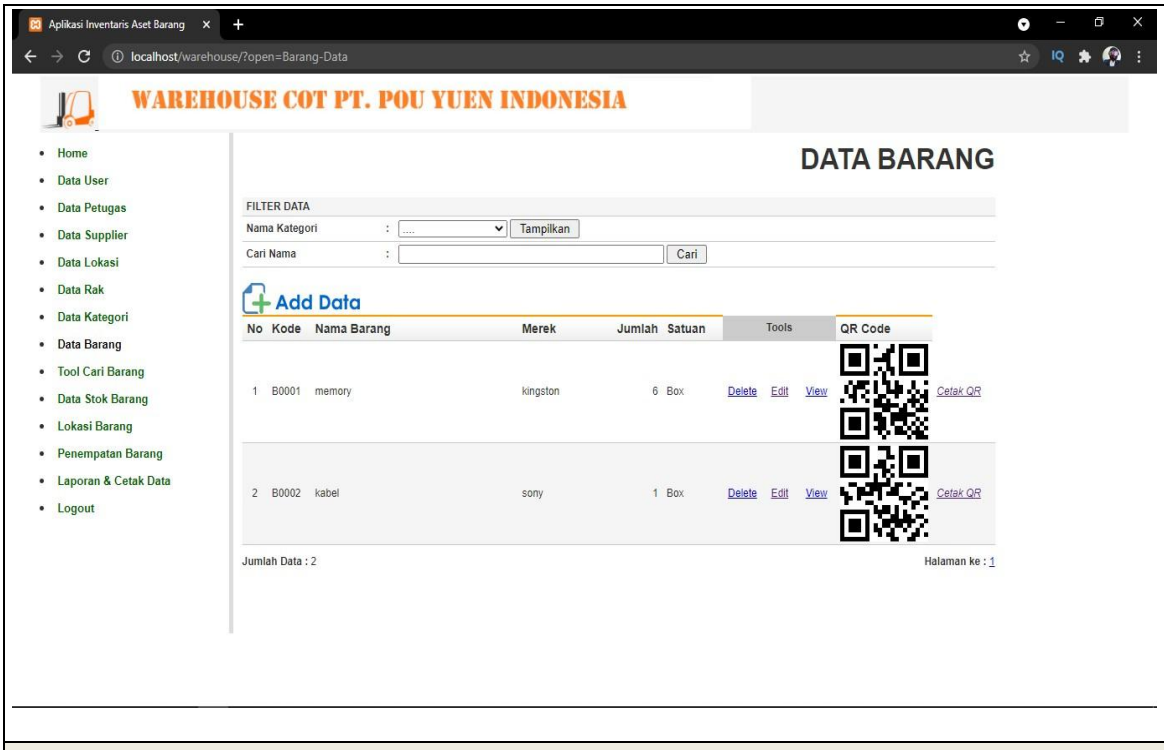


Figure 8. Item data form

9. Search Form

Figure 9. Search form

10. Stock Data Form

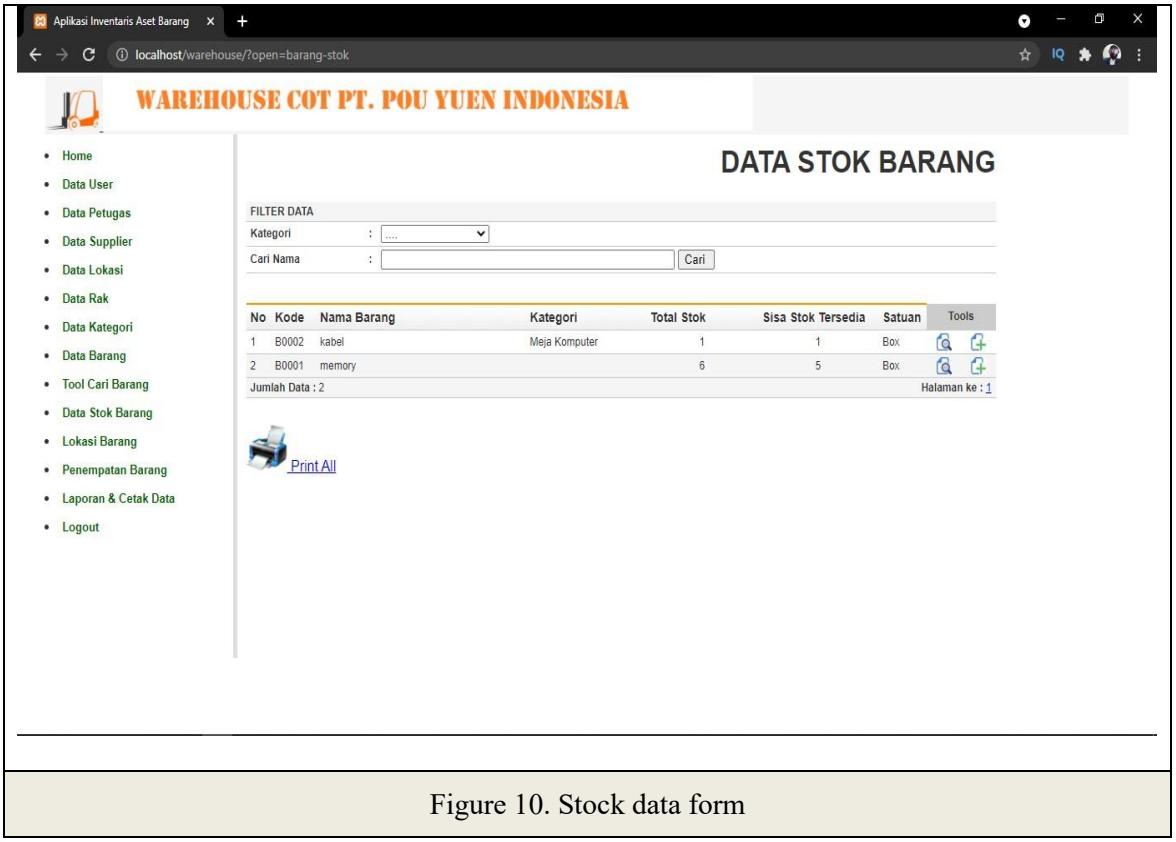


Figure 10. Stock data form

11. Item Location Data Form

Figure 11. Item location data form

12. Goods Placement Data Form

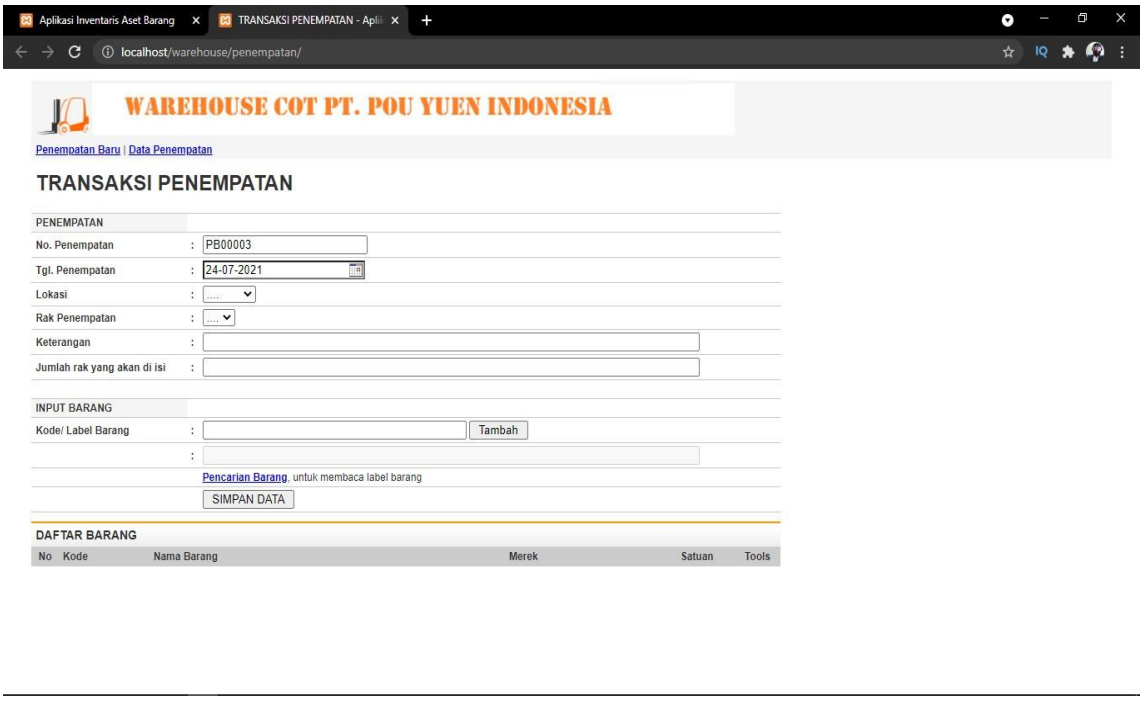


Figure 12. Data placement data form

13. Print Data Form

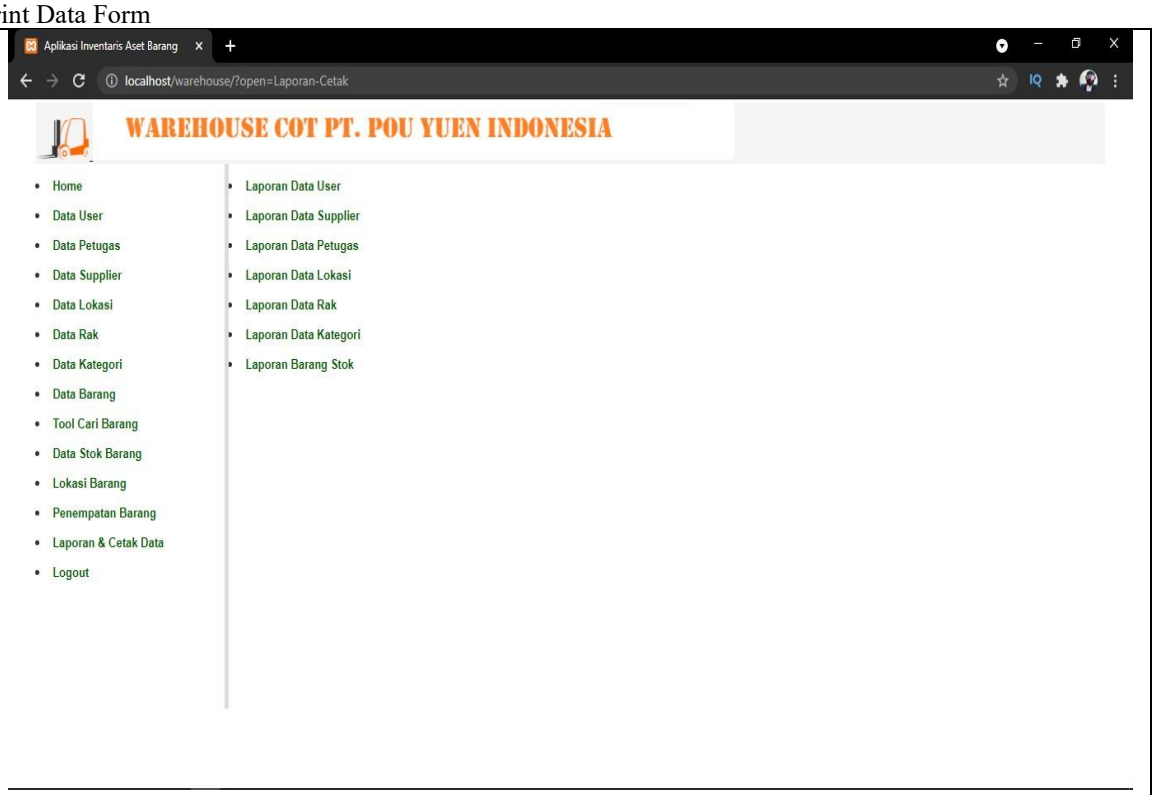


Figure 13. Print data form

14. Dashboard Officer

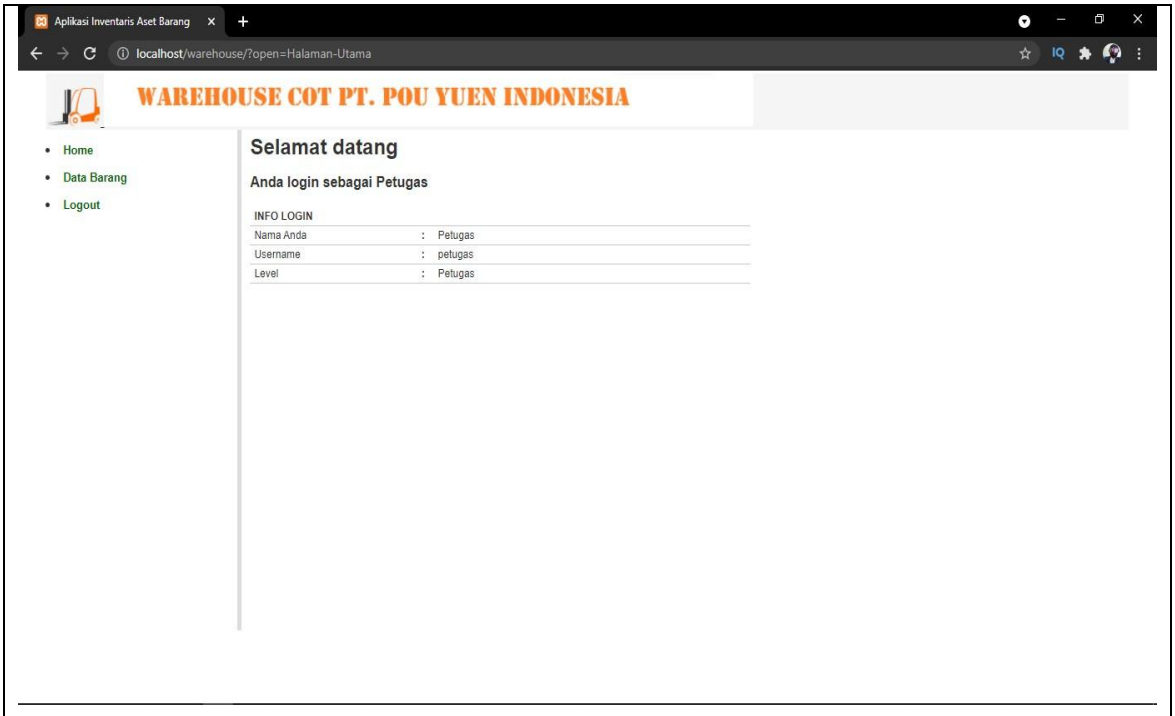


Figure 14. Dashboard officer

15. Officer Item Data Form

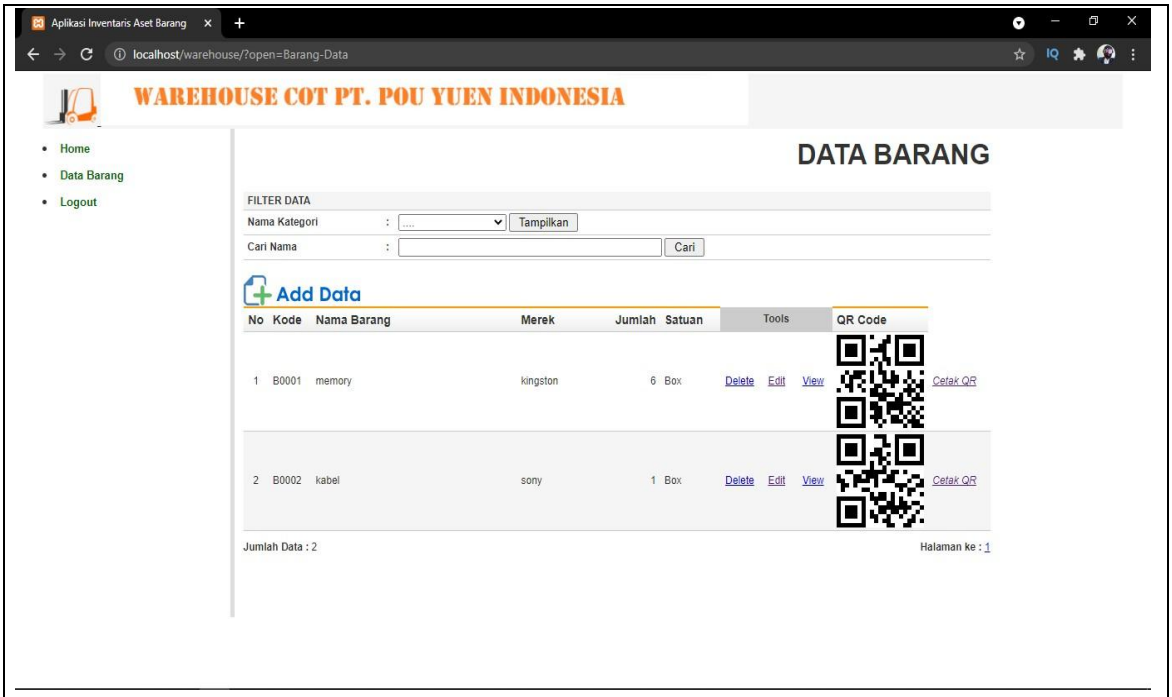


Figure 15. Officer item data form

4.3. System Testing

Testing of this warehouse management system application uses the black box method. Black box testing focuses on the functional requirements of the application being developed.

System testing table

Test Class	Test Item Scenario	Level Testing	Type Testing
Splash Screen	Select the *launcher icon* of the warehouse *management system* application For 3 seconds later Go to the main menu.	Module	*Black Box*
Login	*Input username* and *Password*	Module	*Black Box*
Dashboard	Display *forms* Show all menus, such as user data, officer data, supplier data, location data, shelf data, category data, item data, jar search tool, item stock data, item location, item placement, report and print data	Module	*Black Box*
Data user	Display add user *form* by admin	Module	*Black Box*

Officer's data	Displays app user forms such as admins and officers	Module	*Black Box*
Data supplier	Display *forms* Data of who is the supplier of this application	Module	*Black Box*
Location data	Display *forms* Placement of goods location	Module	*Black Box*
Data rak	Displays *forms on which shelves items are stored*	Module	*Black Box*
Data category	Display *the form* of the names of the goods in the application	Module	*Black Box*
Item data	Display the item data form and print the qr-code	Module	*Black Box*
Item search tool	Display *an item search* form	Module	*Black Box*
Goods stock data	Display stock form	Module	*Black Box*
Item location	Display *item location* form	Module	*Black Box*
Placement of goods	View *item placement* forms	Module	*Black Box*
Report and print data	View report *forms* and print data	Module	*Black Box*

From the results of testing the application with the Black Box case described above, it can be concluded that the application is running optimally, but there is still a possibility that errors may occur at some point while the application is in use. If this happens, the researcher will make improvements so that the application can run properly again.

4. DISCUSSION

This warehouse management system application can already be used to manage goods with a web-based system integrated with QR codes. The process of managing goods, from recording incoming and outgoing goods, is expected to have additional features to support the system's performance in helping officers and administrators manage the warehouse. These include the addition of a scan feature in the process of recording incoming goods and the development of an Android application.

5. CONCLUSION

This study successfully designed and developed a web-based Warehouse Management System integrated with QR Code to support the inventory management process at the IT Department warehouse of PT. Pou Yuen Indonesia. The resulting system facilitates the recording of incoming and outgoing goods, the placement of goods on designated shelves, and the generation of inventory reports quickly, accurately, and in a structured manner.

Testing using the black box method showed that all main system functions, such as login, master data management, QR Code scanning, and report generation, operate as required without significant issues. The implementation of QR Codes has proven to accelerate data recording processes and minimize the potential for data entry errors compared to the previous manual method. However, the system still has limitations, including operating only on a local server and QR code implementation currently focused solely on outgoing goods processes. Future development could focus on integrating with a cloud server for online access, as well as implementing QR code scanning for incoming goods processes to enhance overall efficiency.

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