

# Web-Based Retail Information System for Managing Goods and Sales Using Waterfall Method

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## ABSTRACT

The rapid development of information technology creates both opportunities and challenges for the retail sector. Queen Cell and Queen Baby Shop in Tanggamus Regency still manage inventory and sales transactions manually, which often causes delays in recording, stock mismatches, and financial report errors. This research aims to design and implement a web-based information system to manage goods and sales transactions efficiently and accurately. The system development method uses the Waterfall approach in SDLC, through the stages of needs analysis, system design, implementation using PHP and MySQL, testing using the Black Box method, and maintenance. The system was developed with two types of users, namely admins and employees, and features product data management, transaction recording, and sales report generation. The implementation results show that the system runs as expected, increases work efficiency, and reduces recording errors. The system also supports multiplatform access via the web, making it flexible to use on various devices. Thus, this system is a sustainable solution for small to medium scale retail businesses in facing the challenges of digitalisation.

**Keywords:** web-based application, digitalisation of retail business, inventory management, SDLC waterfall model.

## INTRODUCTION

The rapid development of information technology has affected various business fields, including the retail sector [1]. Retail businesses in Indonesia currently face a lot of competition and challenges to improve operational efficiency while meeting evolving consumer expectations [2]. The management of goods inventory and sales transactions that still use manual recording is one of the main obstacles for retail businesses to be able to develop and compete effectively in the digital era [3]. This condition is increasingly complex with the increase in transactions and products offered, causing manual management to be ineffective and prone to errors [4].

Queen Cell is a mobile phone shop located in Gisting District, Tanggamus Regency. As a growing electronic retail business in the area, Queen Cell faces challenges in monitoring, recording sales transactions and managing inventory of various types of mobile phones, accessories, vouchers and credit. On the other hand, Queen Baby Shop, also located in Gisting Sub-district, Tanggamus Regency, is a clothing store that faces similar challenges in managing inventory with various types of products as well as recording sales transactions that dynamically follow trends.

Both retail businesses still rely on manual recording systems that are not only time-consuming but also prone to human error and loss of goods. These problems have become more pressing as the business grows and the number of transactions increases, demanding a more efficient and accurate management system. This challenge is also exacerbated by the need to produce timely financial reports and sales analysis for business decision-making.

Information system for managing goods and sales transactions is a solution that can optimize business processes in retail businesses such as Queen Cell and Queen Baby Shop. A web-based system that is easy to use and accessible anywhere, allows managers to monitor and manage inventory and transactions. Implementing the right information system has the potential to improve operational efficiency, data accuracy, and ultimately have a positive impact on customer satisfaction and business profitability.

Previous research related to information systems for processing goods and sales transactions has been carried out in various contexts can provide solutions related to processing goods and transactions. Research conducted by Hisbiqal in developing an inventory information system for Toko Rosadah, overcomes the inefficiency of manual data processing in sales and stock management. Although this system provides convenience in transactions and making reports [5]. In addition, other research conducted by Arya, a web-based inventory system for Mamaku MSMEs, increases efficiency in operations and data management, but this system only manages incoming and outgoing goods [6] . Therefore, researchers want to develop a system where there are two users, namely admin users and employees, not only managing goods and reports but also making sales transactions.

In the process of system development, choosing the right method is very important so that the system can be used properly. One approach that is often used is waterfall SDLC [7] SDLC waterfall is a structured development method, where each stage must be completed sequentially and if there is a change in one of the stages below, it must repeat to the top stage or the earliest stage [8]. This method has several stages, namely requirements analysis, design, implementation (coding), testing, and maintenance [9] The structured and sequential characteristics of waterfall make it suitable for projects with clear and stable requirements from the start. Each stage produces complete documentation, making it easier to manage and monitor the software development process. Support for system stability is also reinforced by previous research, which proves that the application of the waterfall method to the development of library information systems is able to produce stable systems with low error rates, especially in managing complex data [10].

This research focuses on the development of a web-based information system used to manage goods and sales transactions in two retail business units, namely Queen Cell and Queen Baby Shop. The approach used in the development of this system is the waterfall method, which allows the work process to take place in a structured manner. The purpose of this system is to improve operations by simplifying inventory management, speeding up the transaction process, and minimizing errors due to manual recording. In addition, this system is designed to present financial reports and sales data accurately. With two types of users, namely admins and employees, this system not only handles stock recording and report preparation, but also covers the entire sales transaction process as a whole. Hopefully, this system can support the smooth running of business activities and support business growth in a more directed and professional manner.

## RESEARCH METHODS

Research methods are the stages and designs used to carry out research systematically. With this method, the research process can be structured, scientific, objective, and has value [11]. In this study, the workflow starts from the needs analysis, design, implementation, testing, to the maintenance stage. At the system design stage, the SDLC (Systems Development Life Cycle) approach is used, because this approach provides clear and sequential stages, where the results of one stage become the basis for the next stage [12]. The following waterfall stages are shown in Figure 1.

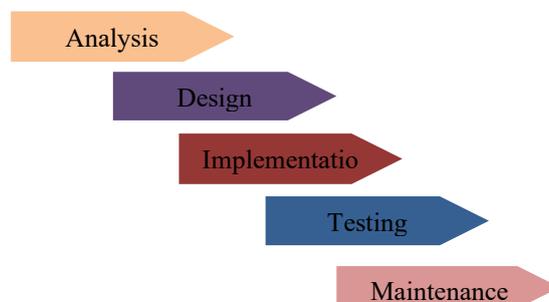


Figure 1. Flow chart

## Analysis

The first stage in the waterfall type System Development Life Cycle (SDLC) model is to thoroughly understand user needs, because this aspect becomes the foundation for the entire system development process to be carried out [13]. In this study, the needs analysis stage was carried out through direct interviews with Queen Cell and Queen Baby Shop. Based on the results of the interview, it is known that the store needs a web-based application that can assist in the process of recording goods, sales, and making reports. The initial stage of designing this information system has the main objective of exploring and formulating system requirements, both in terms of functional and non-functional.

### 1. Functional Requirements

Functional requirements relate to the functions that the system must have in order to meet user needs [14]. In this system, there are two main types of users, namely admins and employees, with the following detailed needs:

- a. Admin can add employees.
- b. Admins and employees can manage product data, including adding, editing, and deleting products.
- c. Admins and employees can perform sales transactions and access daily, monthly, and annual sales reports.
- d. Admins can monitor reports.

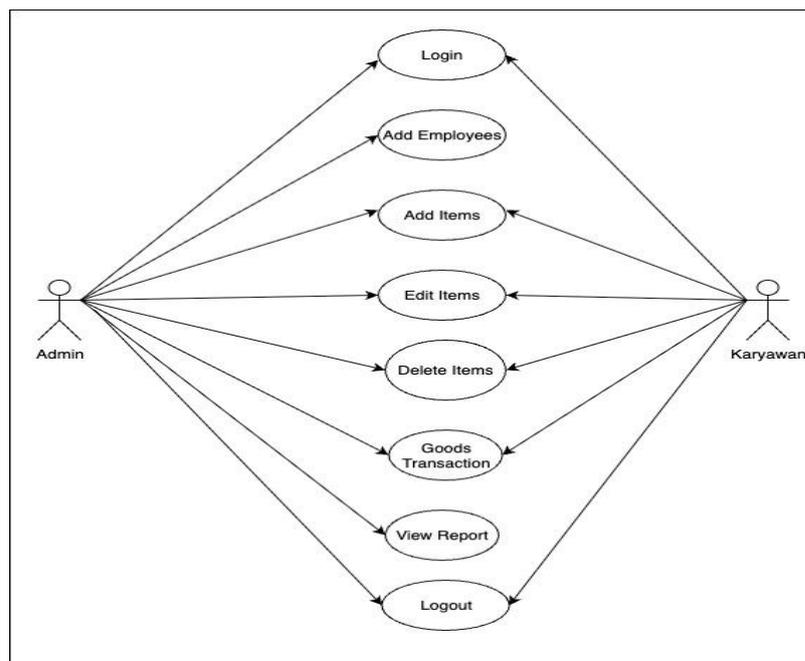
### 2. Non-Functional Needs

Non-functional requirements are supporting devices needed so that the system can run properly [15]. Some of these needs include:

- a. The system can be used on a PC or smartphone
- b. The system can be accessed via the web such as Google Chrome.

## Desain

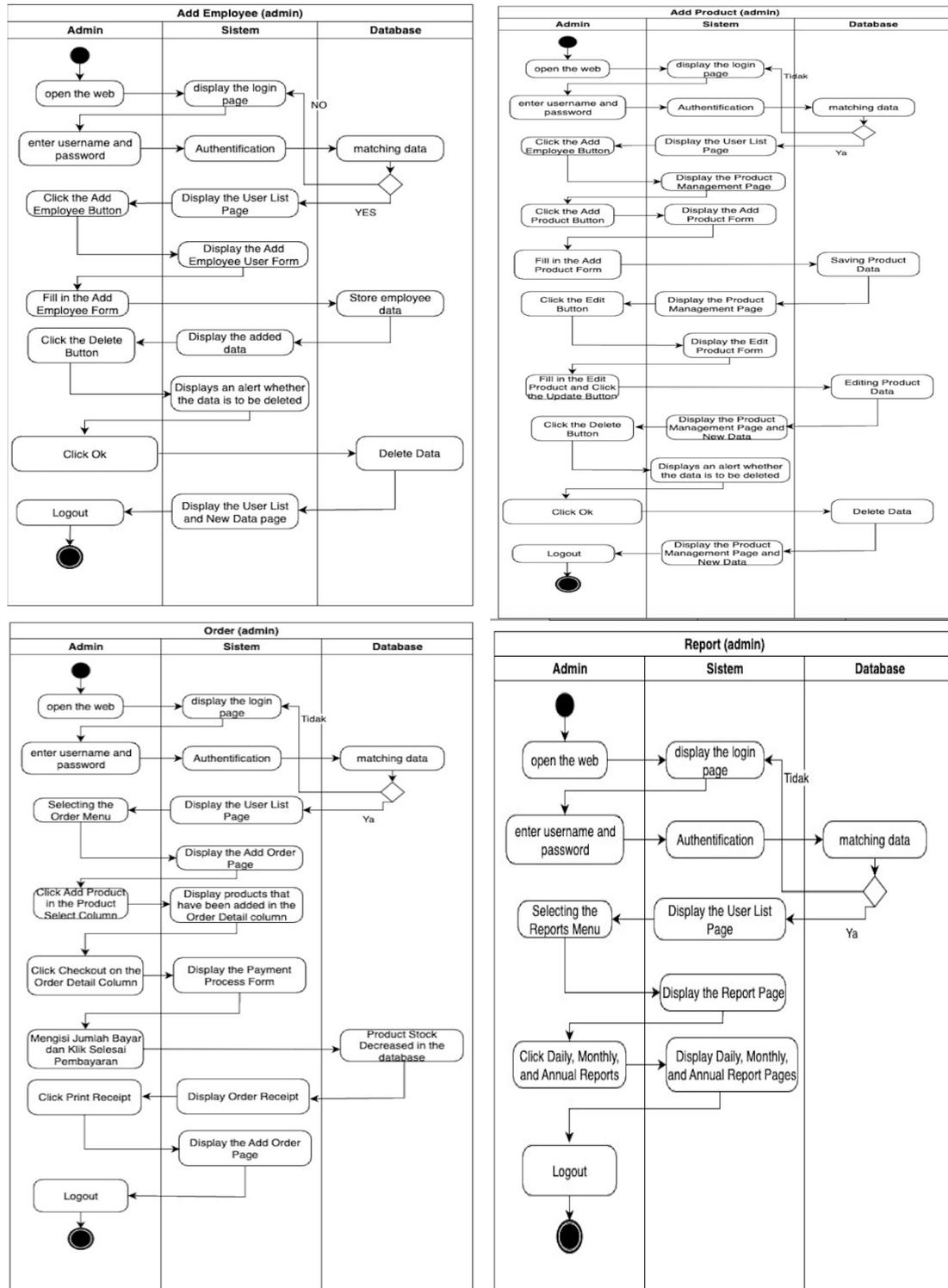
Use case diagram is a visual form of how the system works by displaying the various functions or services provided by the system and to find out users or actors interacting with these functions [16]. The following use case design is shown in Figure 2.



**Figure 2.** Use Case Diagram of Admin and Employee

Activity diagram serves to show the workflow of a system along with the sequence from the beginning to the end of the process that occurs in it [17]. The following process flow for admins and employees is shown in Figure 3 and Figure 4.

**Figure 3. Activity Diagram Admin**



Admin starts with the login process, then can perform operations such as adding items, editing items, deleting items, making transactions and viewing sales reports.

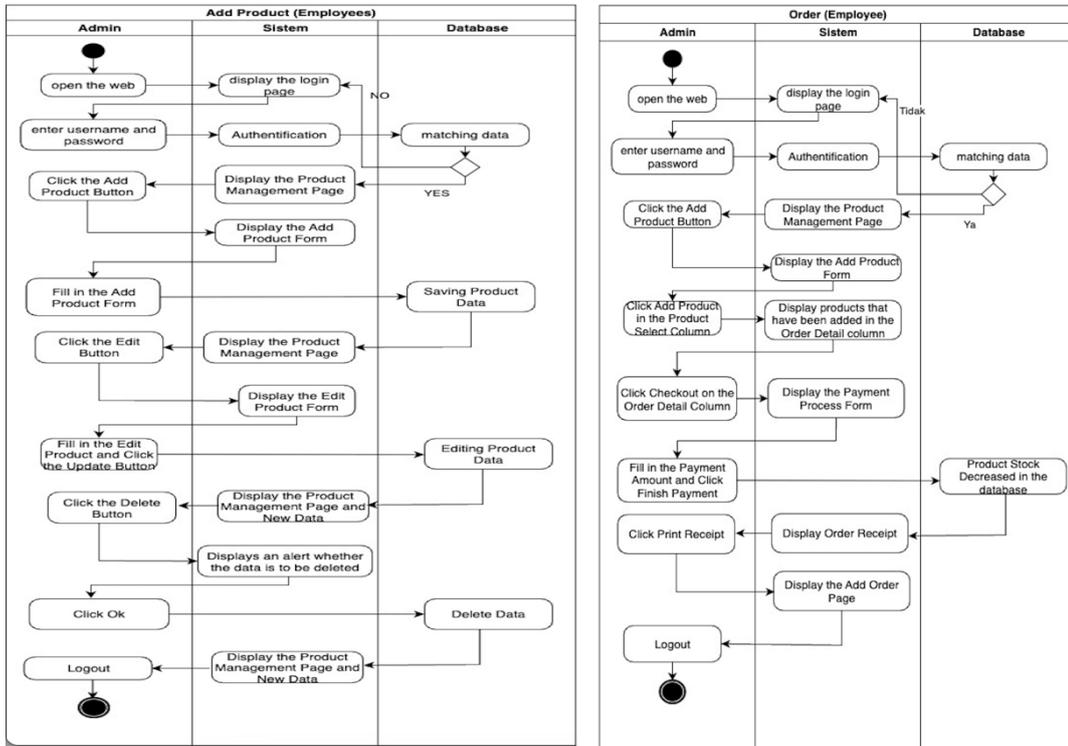


Figure 4. Employee Activity Diagram

Entity Relationship Diagram (ERD) is the relationship between 1 table and other tables in the database, based on the concept in the real world consisting of interconnected entities [18]. The following ERD on the goods management system and sales transactions are shown in Figure 5.

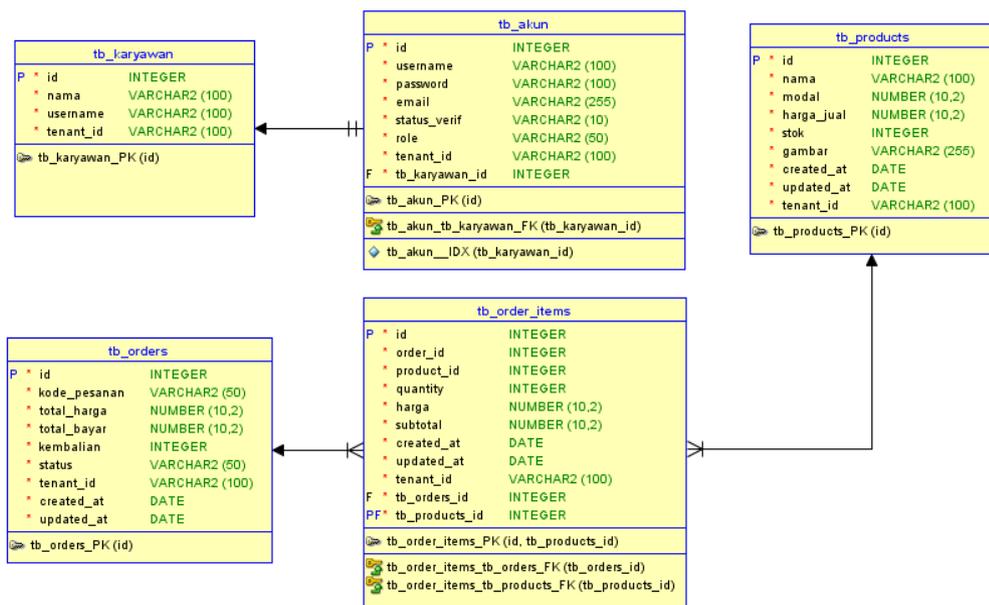


Figure 5. Design Relationship Diagram (ERD)

This diagram depicts an inventory system with five main tables: Accounts for user data, Employees for staff information, Products for item details, Orders for recording transactions, and Order Items to link orders with products. Each table is interconnected to ensure structured management of users, stock, and transactions.

### **Implementation**

After the design stage is carried out, the next process is implementation, the implementation stage is the stage that converts the design into program code that can be run on a computer [19]. In the development of information systems to manage data on goods and sales transactions, the PHP programming language is used, while MySQL is chosen as the database for storing information. system development is carried out through Visual Studio Code software as a text editor, as well as XAMPP as a local server that allows the system testing process directly in the development environment. After the programming process was completed, the system was tested to ensure that the implementation results were in accordance with the design and were able to meet the user's needs as previously defined [20].

### **Testing**

After the implementation stage is carried out, the next step is testing the system. The black box testing method was chosen to conduct testing with the aim of evaluating the extent to which the developed application runs as expected. This testing method is focused on testing the functions in the system without paying attention to the details of its internal code structure. Each test result will be recorded as "valid" if it runs correctly, or "failed" if there are errors, and these results are used to find and fix existing bugs [21]. The test results become the basis for improving the system, before finally entering the maintenance stage.

### **Maintenance**

After the testing phase is carried out, the next step is maintenance. Maintenance is the last step of the waterfall stage. After the system has been developed, the system will be run and maintained regularly to identify and correct errors that may appear during its use [22]. This stage is ongoing to ensure the system continues to run well and as needed after the initial implementation. Input from users during the maintenance process also plays an important role in determining system improvements and updates.

## **RESULT AND DISCUSSION**

This research successfully created a system that is utilized for Queen cell and Queen Baby Shop to manage goods and make transactions. Overall, the design of this system successfully fulfills functional needs such as managing goods and making transactions, as well as non-functional needs such as access through various devices.

### **System View**

The initial display on this website is the login page. Users must first register. After filling out the registration form, users can log in to the inventory website using their username and password. The following main page is shown in Figure 6.

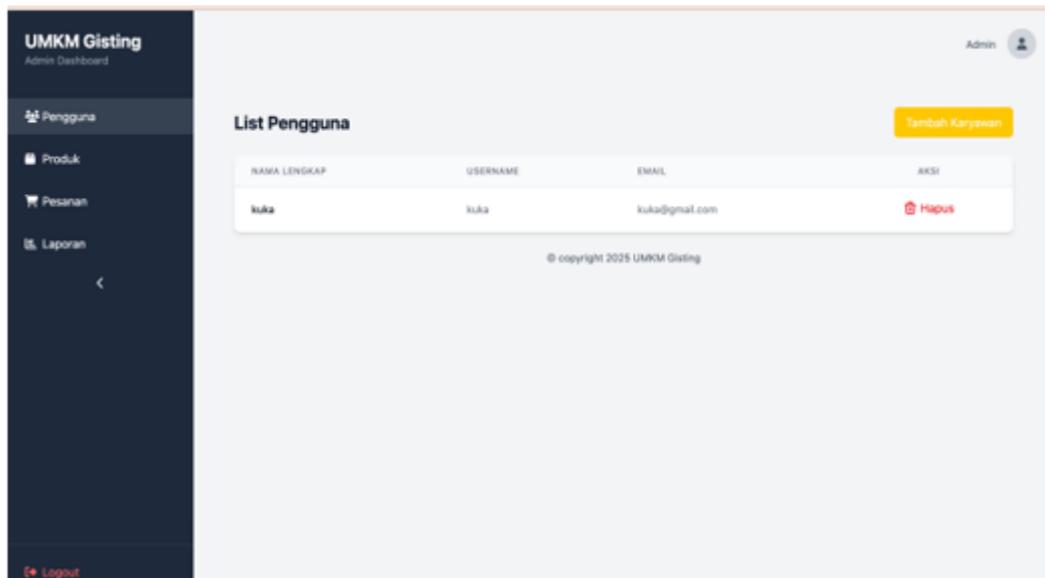


The login page features a central form with the following elements:

- Header: Selamat Datang DI WEBSITE INVENTORY
- Username field: A text input box with the placeholder text 'Username'.
- Password field: A text input box with placeholder dots '.....'.
- Login button: A yellow button labeled 'Masuk'.
- Registration link: A blue link labeled 'Belum punya akun admin? Daftar Admin'.
- Footer: Copyright notice '© copyright 2025 UMKM Gisting'.

Figure 6. Main page

After successful login, the user will become an admin. The admin can add employees by clicking the 'Add Employee' button. After clicking the button, the admin will fill in the employee registration form. After the employee is successfully registered, users with the employee role can log in to this website. The following user list page is shown in Figure 7.



The user list page includes a sidebar with navigation options: 'Pengguna', 'Produk', 'Pesanan', and 'Laporan'. The main content area displays a table of users and a 'Tambah Karyawan' button.

NAMA LENGKAP	USERNAME	EMAIL	AKSI
kuka	kuka	kuka@gmail.com	<a href="#">Hapus</a>

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Figure 7. User list

The next page is products. On this page, both admins and employees can add products by clicking the 'Add Product' button. After that, they will fill out a form containing the product name, capital, selling price, and stock quantity. Once the form is filled in, the product data will be displayed on the product management page. Admins or employees can edit items and delete items. The product page view is seen in figure 8.

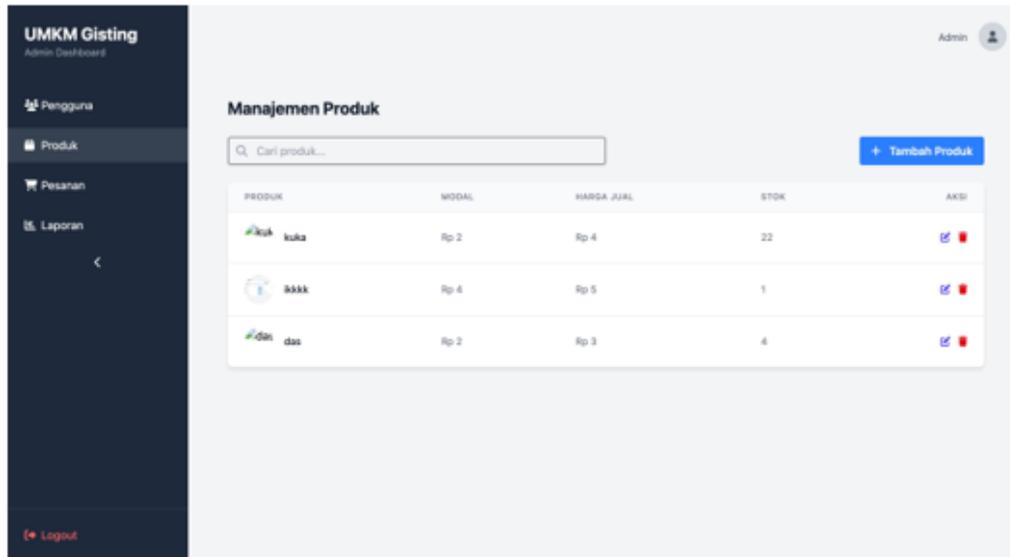


Figure 8. Products

After the product page, the user is directed to the order page. On this page, all products that have been previously added will be displayed in the 'Select Product' column. Admins or employees can select the ordered products. When the 'Add' button is clicked, the product will be added to the 'Order Detail' column. After the product is added to the order details, the 'Checkout' button will appear. Users will be directed to the payment process stage. The display of the add order page can be seen in Figure 9.

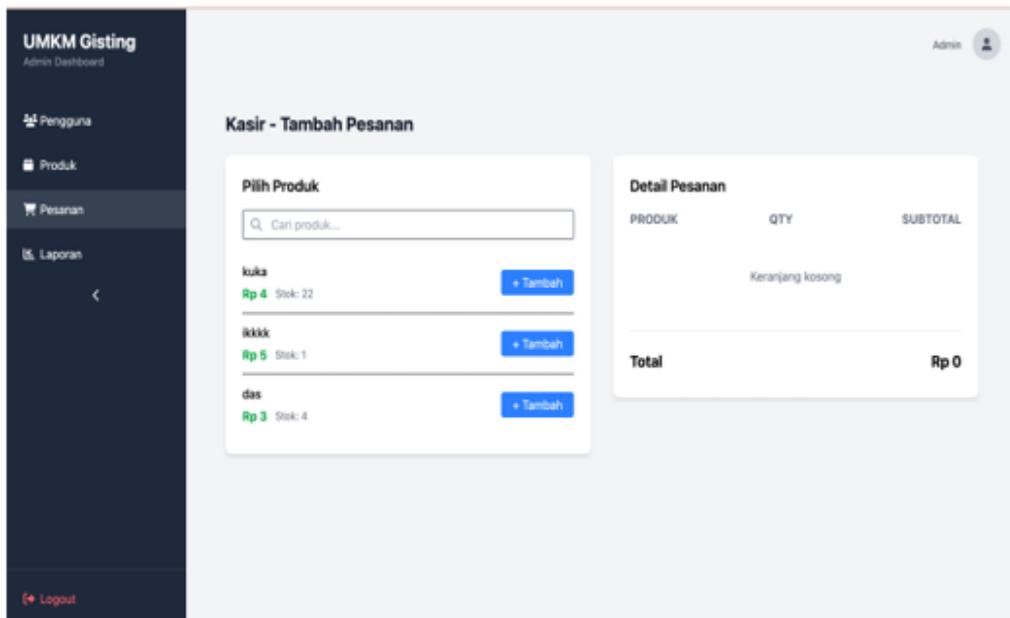


Figure 9. Order

At this stage, the shopping total is displayed, and the user is prompted to enter the amount of money to be paid. After the payment amount is entered, the user presses the Complete Payment button. After the payment is completed, the system will display the Order Receipt. The receipt display is seen in Figure 10.

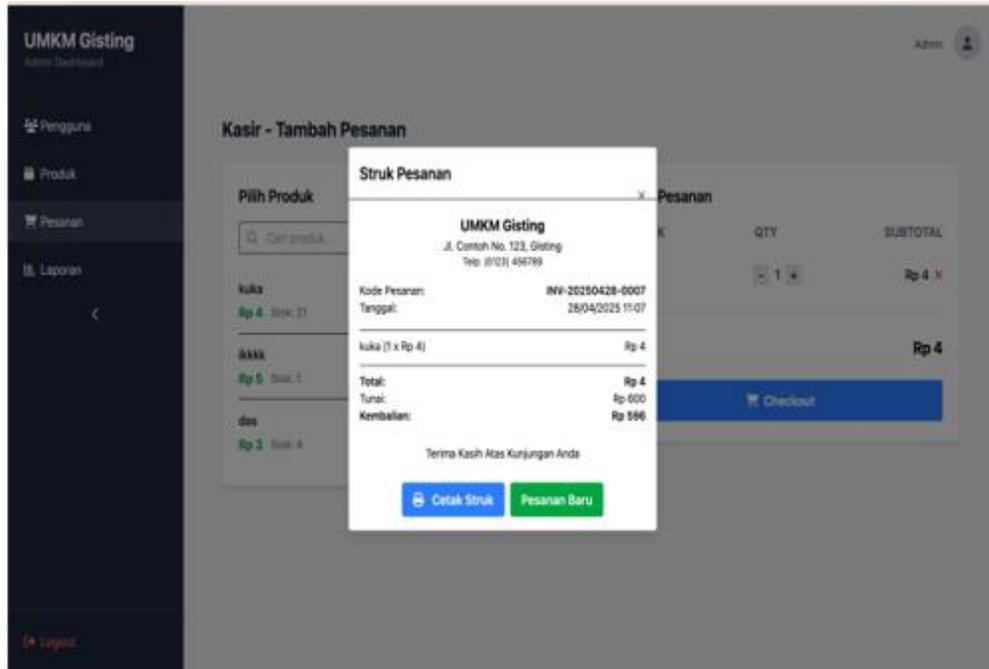


Figure 10. print receipt

On the next page is the sales report. On this page, the admin can see a recap of sales data based on three categories: Daily Reports, Monthly Reports, and Annual Reports. The following report page is shown in Figure 11.

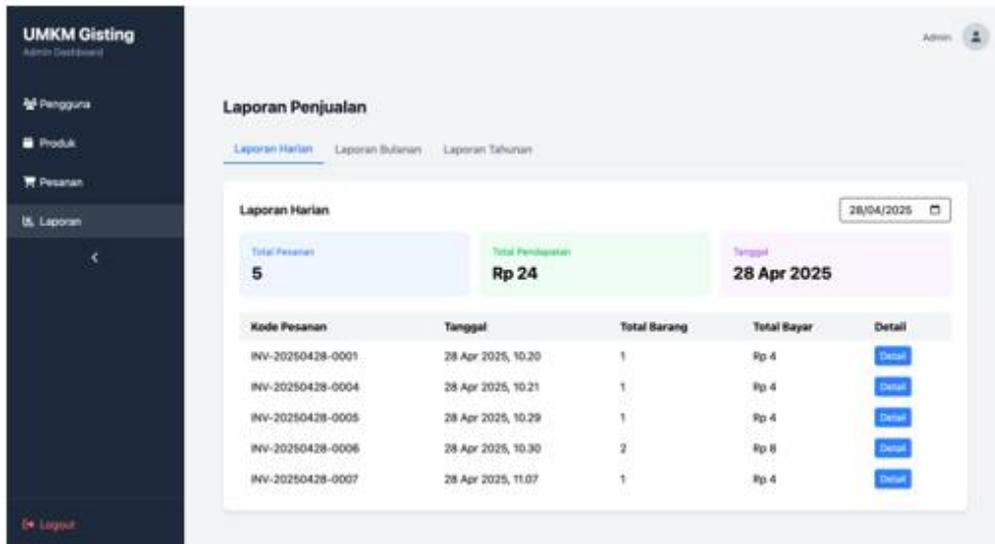


Figure 11. Report

**Black Box Testing**

This test is conducted on the admin and employee side and the results show that this processing and transaction system can function properly and in accordance with the specifications that have been designed. All main features, such as add employees, add products, edit products, delete products, and sales reports have been tested and provide valid results. The following are the results

of tests that have been carried out on the goods processing system and sales transactions at the queen cell and queen babyshop stores.

**Table 1. Black Box Testing**

Requires a table explanation and must be discussed according to a clear concept.

Menu	Part tested	Scenario	Expected result	Result
User page	“Add Employee” button	Select the “Add” button	Display the add user form	<i>Valid</i>
Add user form	Add employee data	Select the “Add Employee” button	Display employee data	<i>Valid</i>
User page	“Delete” button	Select the “Delete” button	Display the latest data	<i>Valid</i>
Product page	“Add Product” button	Select the “Add Product” button	Displays product add form	<i>Valid</i>
Product add form	“Save” button	Select the “Save” button	Displays product data displayed	<i>Valid</i>
Product page	“Delete” button	Select the “Delete” button	Display the latest data	<i>Valid</i>
Product page	“Edit” button	Select the “Edit” button	Display edited product data	<i>Valid</i>
Product page	“Add” button on product select column	Select the “Add” button	Displays products in the order details column	<i>Valid</i>
Order Page	“Checkout” button in the order details column	Select the “Checkout” button	Displays the payment process	<i>Valid</i>
Order Page	“Finish Payment” button	Select the “Finish payment” button	Displays an order receipt	<i>Valid</i>
Order Page	“Print receipt” button	Select the “Print Receipt” button	Print the receipt and display the order page	<i>Valid</i>
Order Page	“Details” button	Select the “Details” button	View all sales reports	<i>Valid</i>

Table 1 shows the results of Black Box Testing on key system functions used by admin and employee roles. The test verifies whether each feature such as adding users, managing products, processing transactions, and viewing reports functions as expected. Each scenario was tested based on its expected output. All features produced valid results, indicating the system works correctly and meets user requirements. This confirms that the system is reliable, user friendly, and ready to support inventory and sales operations effectively.

## CONCLUSION

The development of a web-based information system for goods and sales transaction management using the Waterfall method has successfully achieved the objectives set out in this research. The system simplifies inventory management and accelerates transaction processes by replacing manual methods with digital workflows. As a result, errors due to manual data handling are minimized, and the accuracy of inventory and sales records is significantly improved. The system also provides structured sales reports, enabling better financial oversight and decision-making. By supporting multi-platform access and role separation between admins and employees, the system enhances operational efficiency and fosters a more professional business process. This solution not only addresses the current needs of Queen Cell and Queen Baby Shop but also serves as a scalable model for similar small to medium-sized retail businesses aiming to adapt to digital transformation.

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