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Design of Point of Sale Information System Case Study: Maju Jaya Grocery Store

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ABSTRACT

Objective: *This study aims to design and implement a* ***Point of Sale (POS) system*** *as a technological solution to enhance sales transaction efficiency, inventory management, and customer data processing in retail and service-oriented businesses.* ***Method:*** *The research adopts a* ***software engineering approach****, encompassing* ***user requirements analysis****,* ***interface design****, and* ***system testing*** *to ensure the application meets user and operational needs. The system integrates* ***payment processing****,* ***receipt generation****, and* ***real-time sales recording*** *within a unified platform, while also supporting* ***cloud connectivity*** *and* ***cashless transactions*** *to align with modern digital practices.* ***Results:*** *The implementation of the POS system demonstrated improvements in* ***service speed****,* ***accuracy of transaction recording****, and* ***overall customer satisfaction****.* ***Novelty:*** *This study provides an applicable model for developing* ***integrated, cloud-connected POS systems****, emphasizing the role of* ***digital transformation*** *in enhancing business performance and operational reliability in the retail sector.*

INTRODUCTION

A Point of Sale (POS) system is a technological solution used to simplify and accelerate sales transactions in various types of businesses, particularly in the retail and culinary sectors. This system integrates various key functions such as sales recording, inventory management, customer data management, and automated financial reporting [1]. The goal of developing a POS system is to improve operational efficiency, minimize human error, and provide accurate data for business decision-making [2].

In developing this system, web-based technology with a user-friendly interface and a database capable of storing information in a structured and secure manner was used [3]. Test results show that the POS system built is able to carry out its main functions effectively and provides convenience for users in managing daily sales activities. With this system, it is hoped that business actors can optimize business processes more professionally and efficiently, such as customer recording, billing recording, and monthly fee payments. This causes several obstacles, such as low data accuracy, slow response time, and less than optimal customer service [4].

It is hoped that the creation of this administrative information system can help in the data processing process and will improve the performance of each section and the information needed by each section can be produced quickly and accurately [5]. Based on the background above, the author is interested in raising the title.

RESEARCH METHOD

To obtain the materials needed in this research, the author used several methods to obtain the data and information needed to design the system to be developed [6]. Some of the methods used include the following:

1. Method of collecting data :
   a. Observation is a data collection technique by conducting direct observations of the object to be studied in order to obtain data [7]. The following data is obtained in the form of data.
   b. Interviews (Interviews) in order to obtain appropriate data needed by the author, the author conducted direct interviews with related parties to study the system currently used in order to analyze existing deficiencies, so that they can be used as a reference in program development.
   c. Documentation is a technique for collecting data regarding activities, business profiles, and existing organizations to be used as a basis for system development.
   d. Literature study, the activity of collecting data or information from sources relevant to the research topic.
2. This system is designed with reference to relevant case studies and user needs in software development planning [8].
   a. System Flowmap Proposal

      The purpose of this proposed system flowmap is to explain the steps and procedures implemented. The following figure shows a flowchart depicting the interactions between the running system, the administrator, and the customer. The diagram below provides a clear overview of this flowmap.

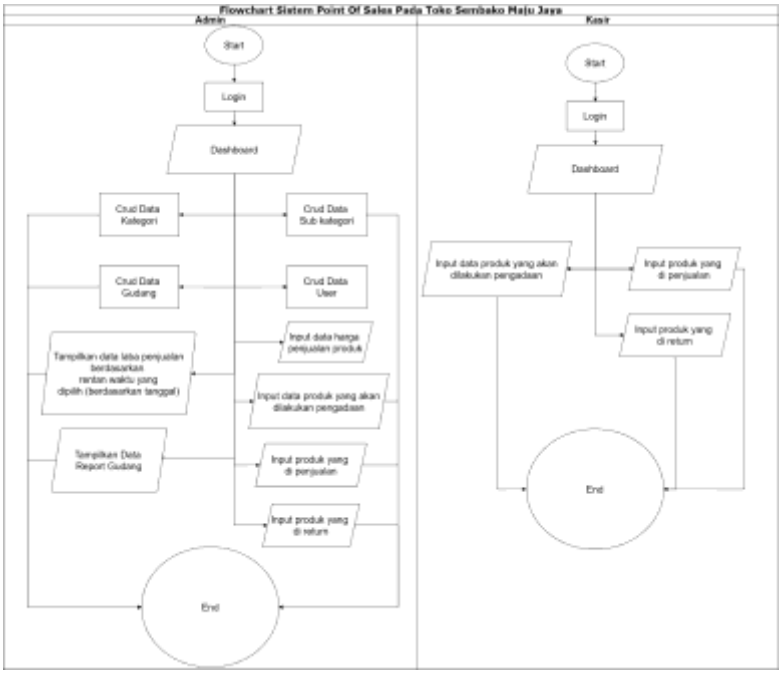
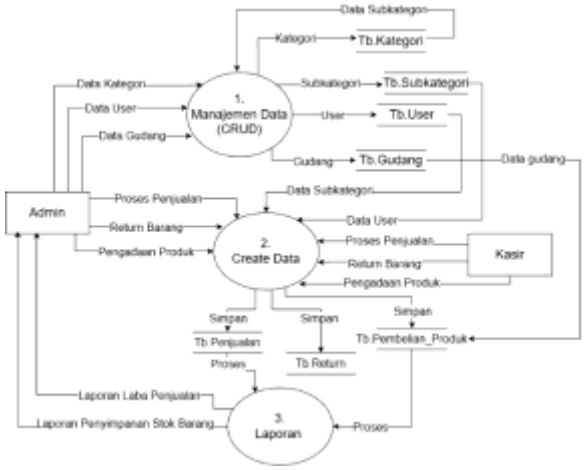


Figure 1. Proposed System *Flowmap*

b. Context Diagram

In the context diagram, each data flow entering the process is clearly displayed. This system is run by two entities: the admin and the customer, each

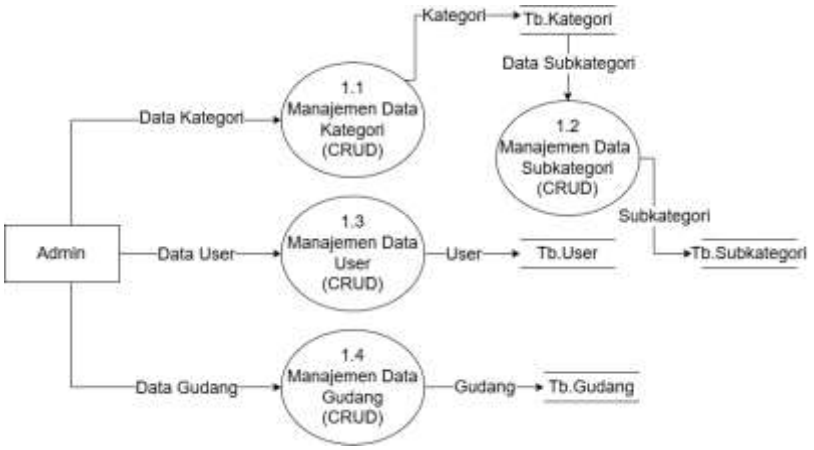


of which has input and output data. The following figure illustrates these details.

Figure 2. *DFD level* 0

c. DFD level 1

DFD level 1 is an extension of the context diagram. In DFD level 1, there are three entities involved: admin, customer, and proof of payment, each with its own data flow. Each data flow will be stored in the database [9]. The following image is DFD level 1.



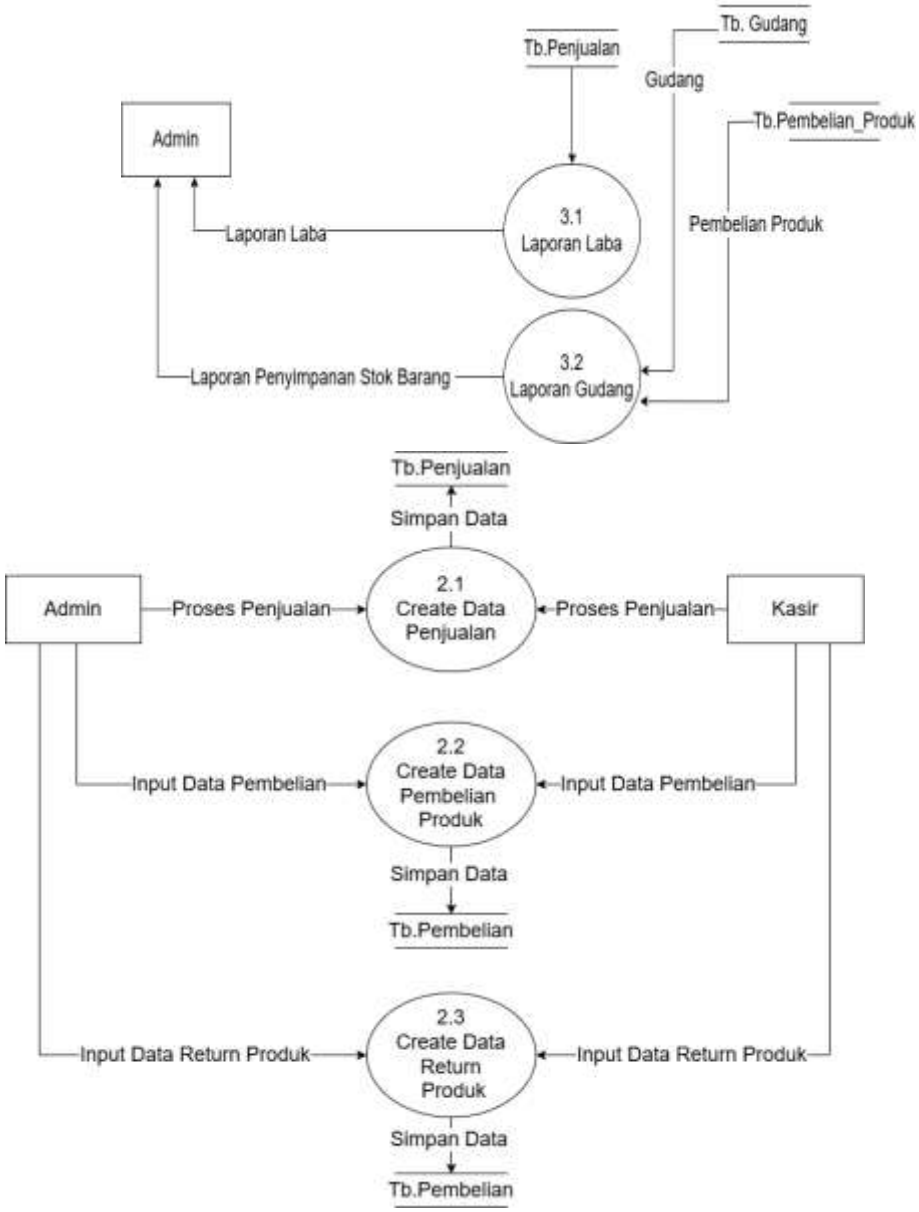


Figure 3. DFD level 1

d. ERD (Entity Relationship Diagram)

A set of entities and a set of relationships that form the basic structure of an information system. Each entity represents a real object in the system, while relationships show the relationships between these entities. The following figure shows a diagram of the relationships between entities in the system being analyzed. The attributes of both entities and relationships can be entered into a table [10].

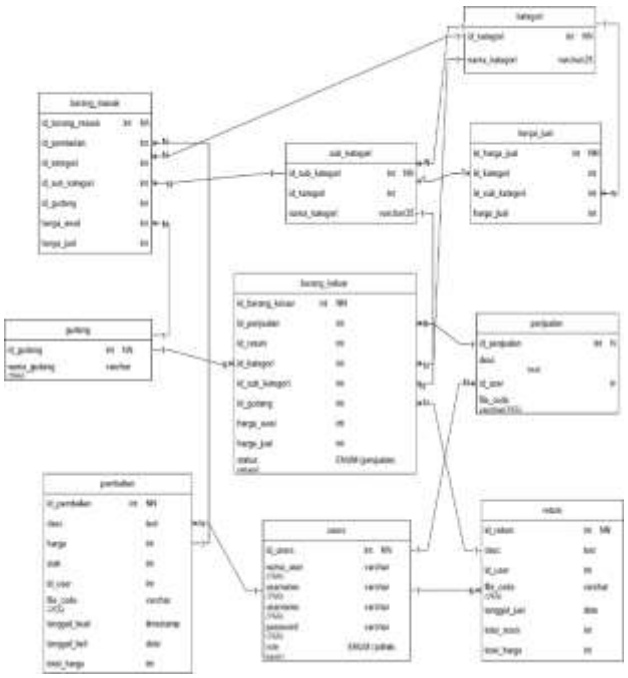


Figure 4. *ERD* (*Entity Relationship Diagram*)

RESULTS AND DISCUSSION

A. System Research Results

Based on the results of the system and interface research, the results obtained were in the form of a main website display that meets user needs. After completing the system design and application interface design stages, the next stage is the implementation stage. Following is appearance from website page and various menus as following.

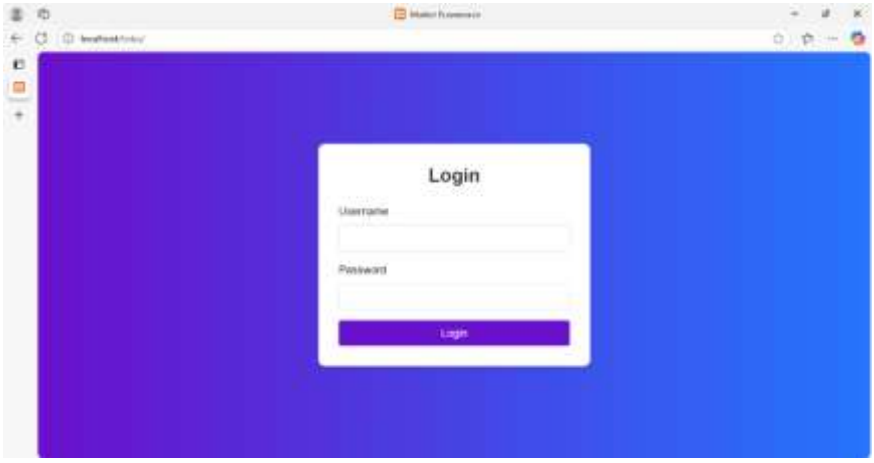


Figure 5. Website Home Page

In figure 5, when First time access website then will appear Login screen. This login page is accessible to both admin and user users. The username and password are provided during new customer registration.

1. Administrator Menu Page

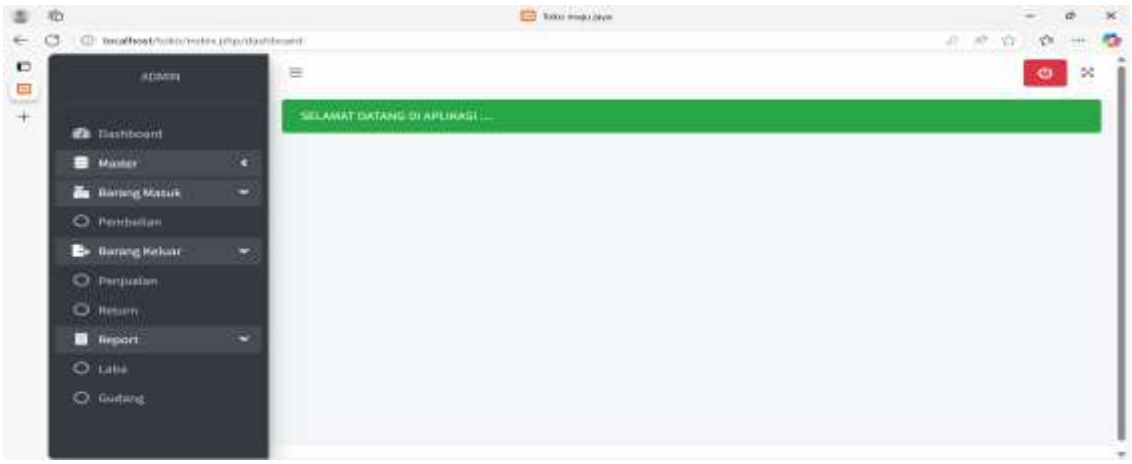


Figure 6. Admin Dashboard

In Figure 6, the Admin Dashboard displays the admin's name on the initial page of the website. Only admins can access it; the system directs users to a submenu accessible only to admins.

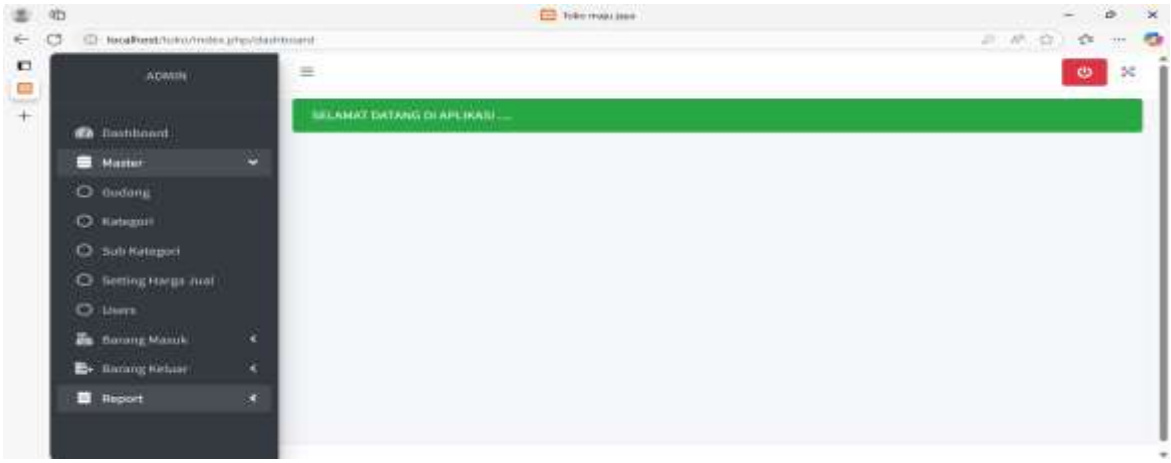


Figure 7. Master Data Page

Figure 7 displays the customer data page. In this menu, the admin can add new customer/employee data. Users can also edit customer data as needed. After registering, new customers receive a username and password from the admin.

Figure 8. Warehouse Data Page

In Figure 8, this page displays warehouse information, users can change, add and delete available data.

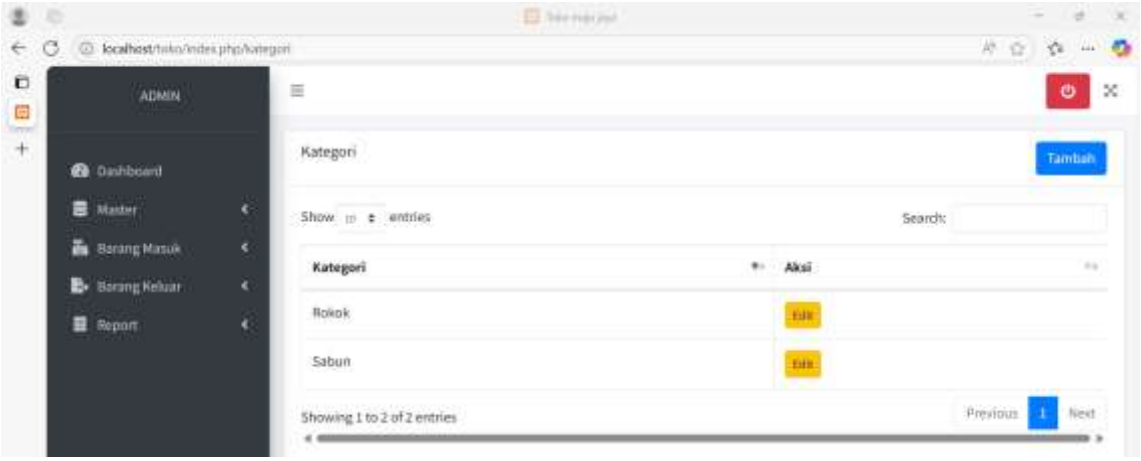


Figure 9. Edit Category Data Page

In Figure 9, this page displays a summary of item categories which only admins can access, the summary report can be printed according to needs.

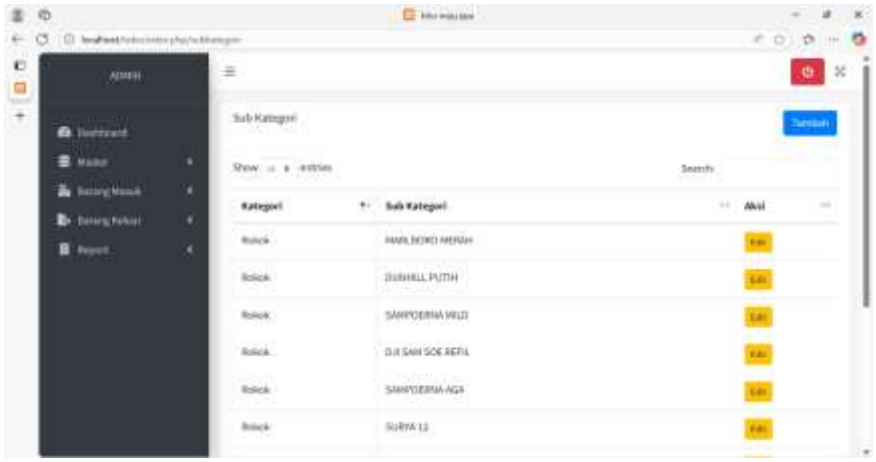


Figure 10. Edit Subcategory View

In figure 10, this figure displays the sub categories.

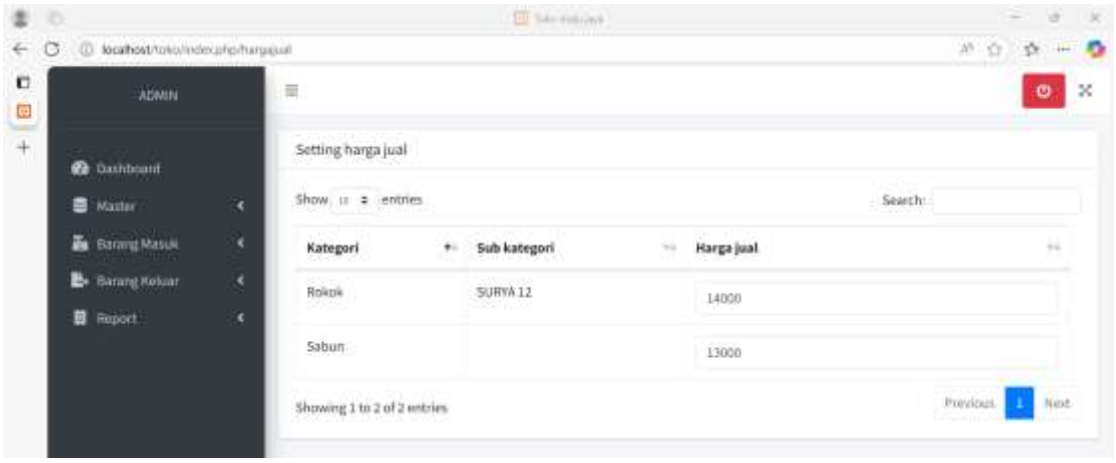


Figure 11. Selling Price Settings Page

In Figure 11, it displays the product selling price settings, which displays the customer's name, the admin can edit the desired selling price.

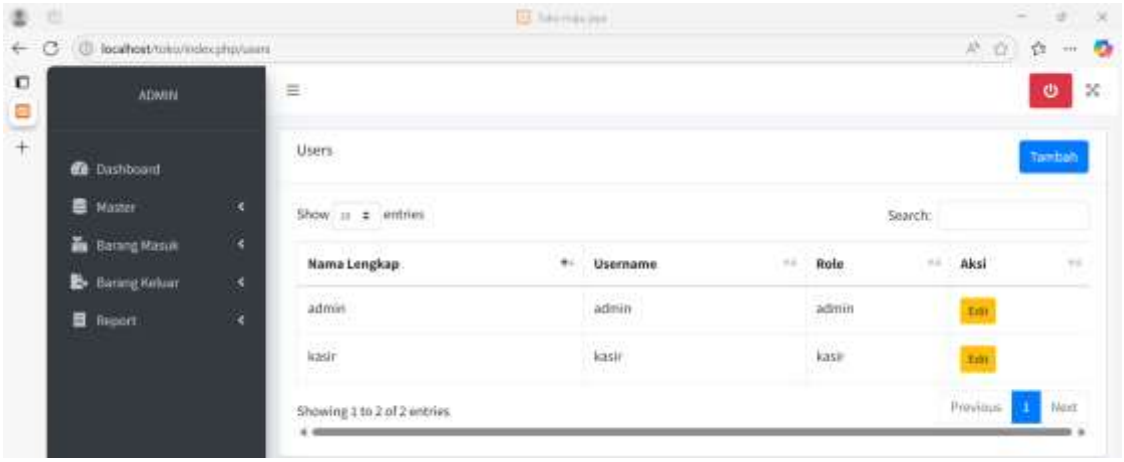


Figure 12. Edit User Data Page

In Figure 12, this page displays a menu for user/employee settings.

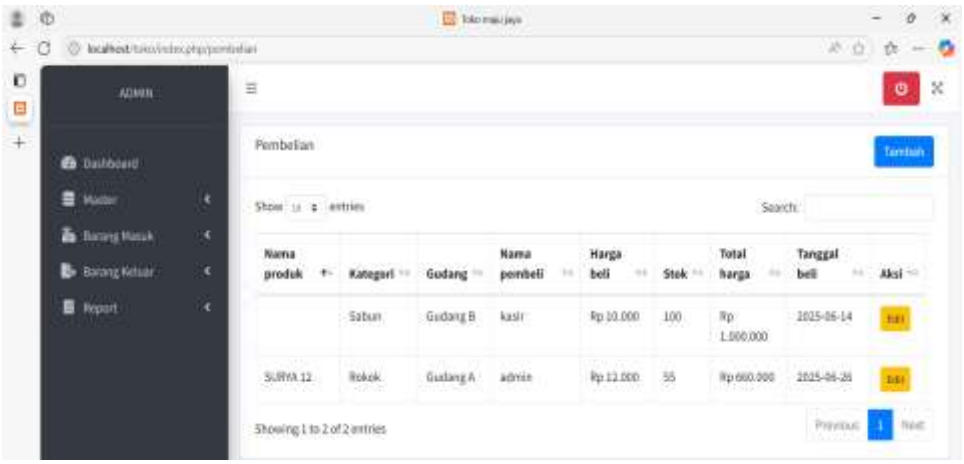


Figure 13. Incoming Goods Data

In Figure 13, this page displays a menu for incoming data.

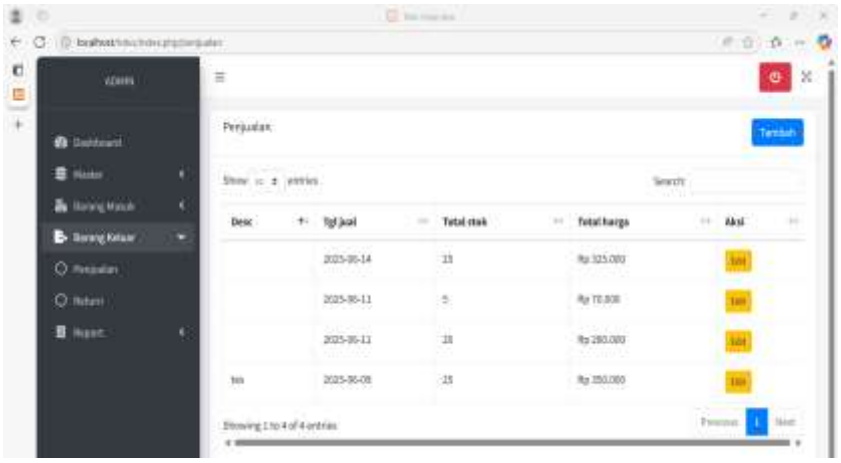


Figure 14. Outgoing Goods Data

In Figure 14, this page displays the data menu for outgoing goods.

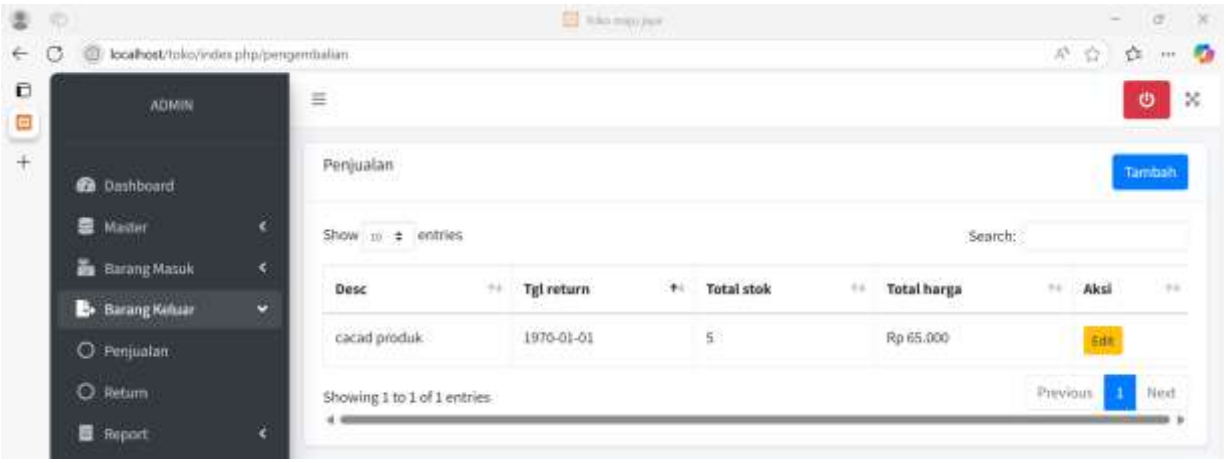
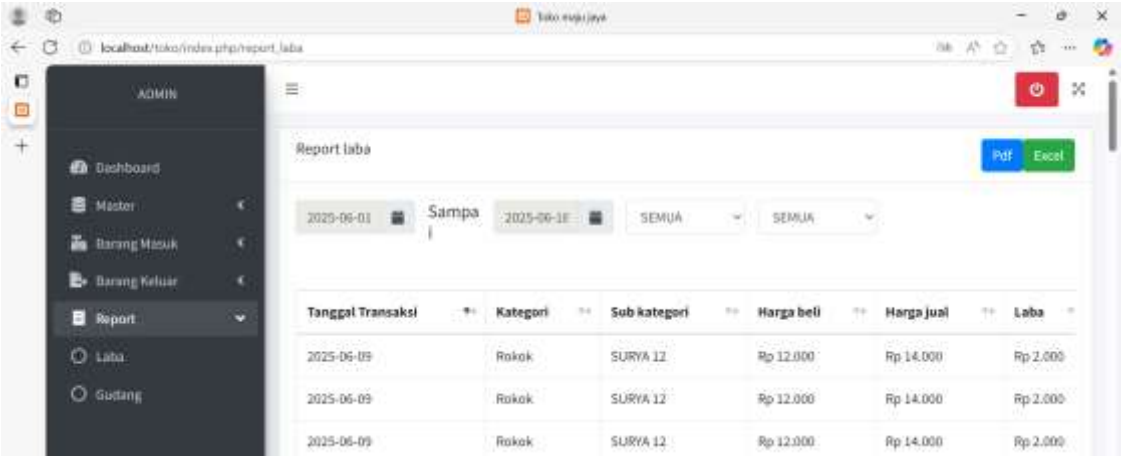


Figure 15. Returned Goods Data

In Figure 15, this page displays the data menu for returning goods.



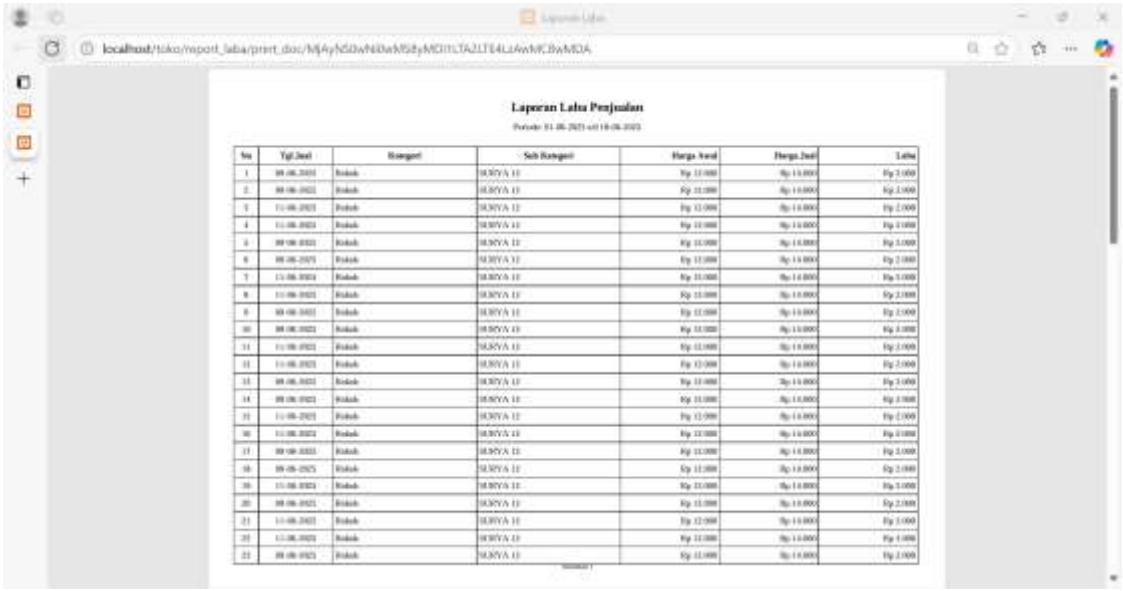


Figure 16. Payment Report Summary

In Figure 16, this page displays a menu showing the results of the transaction report summary.

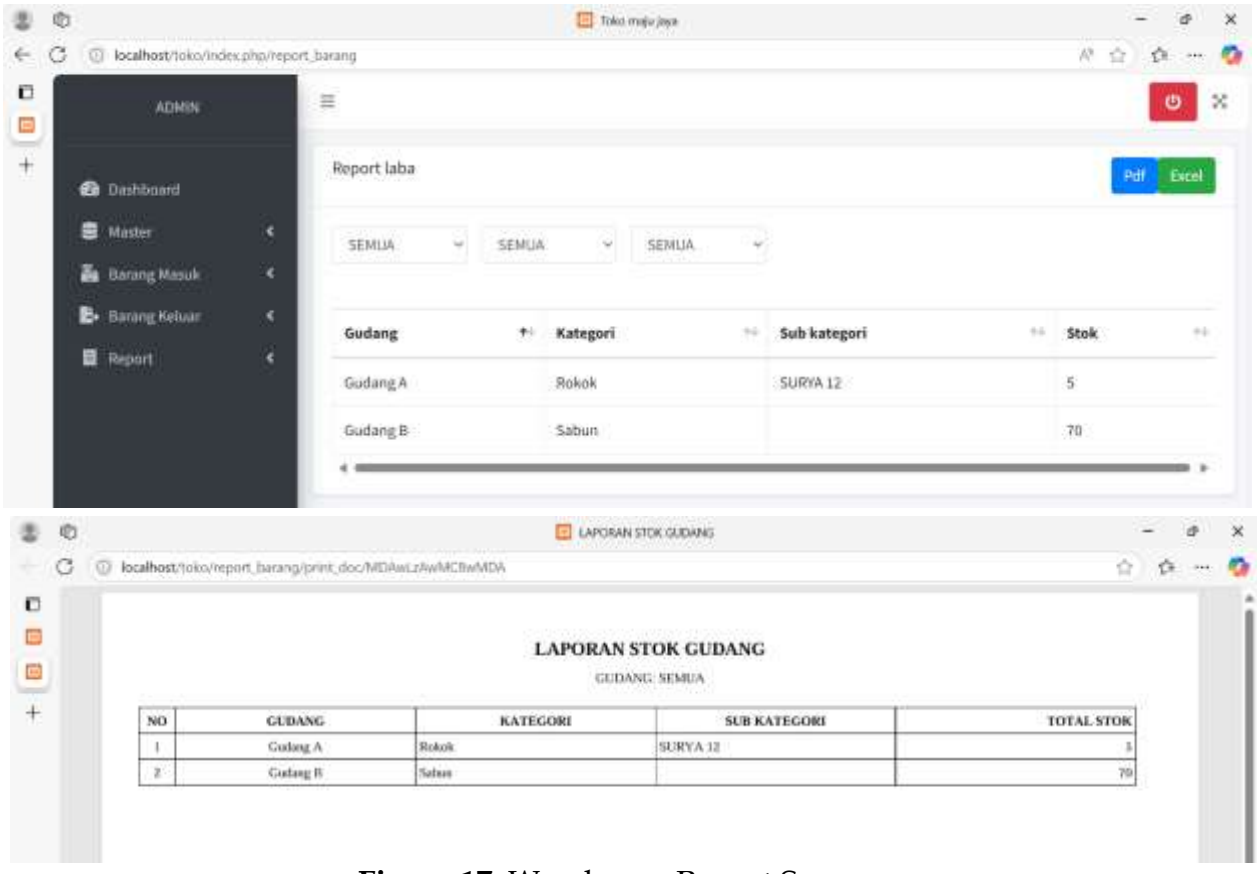


Figure 17. Warehouse Report Summary

In Figure 17, this page displays a menu displaying a summary of the warehouse report.

2. User Menu Page

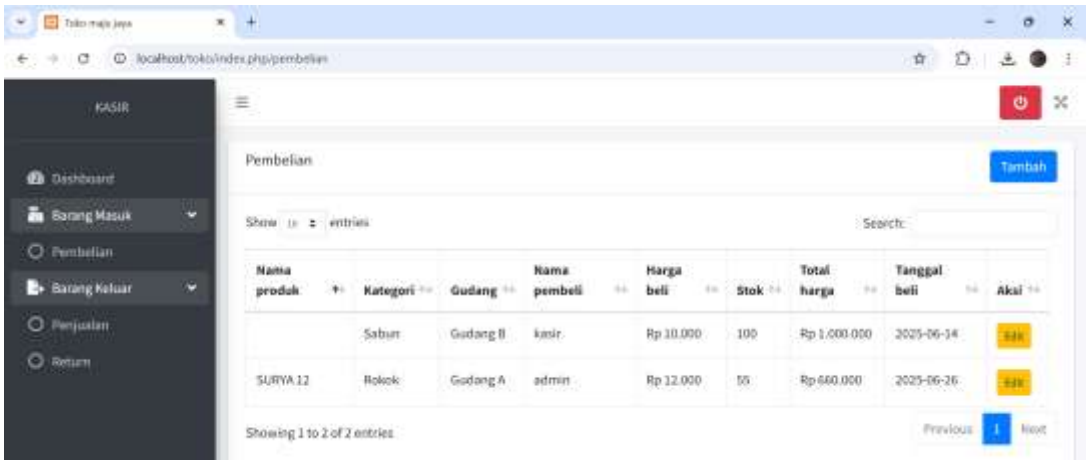


Figure 18. User & Incoming Goods Dashboard

In Figure 18, after accessing the website and logging in, it displays the incoming goods data entered by the user.

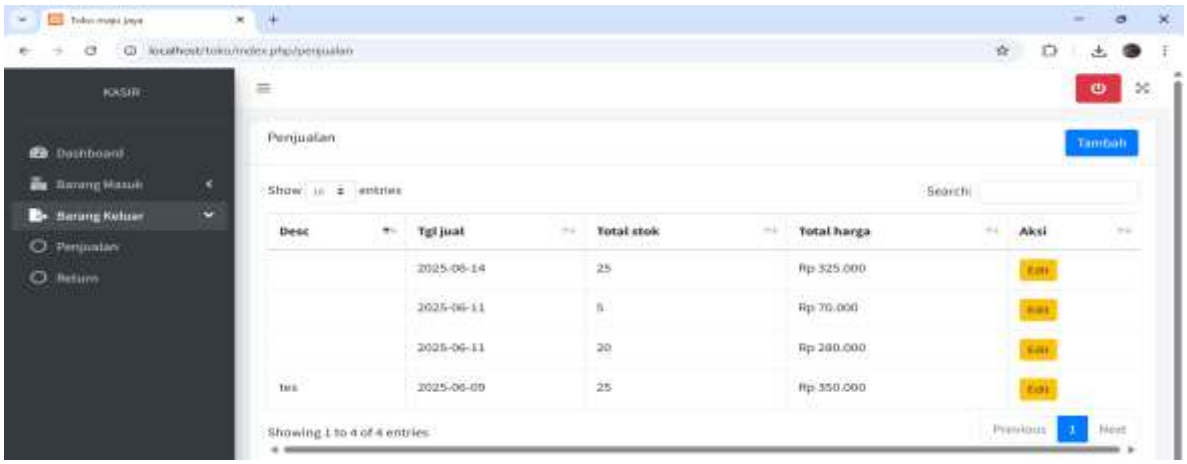


Figure 19. Sales Page

Figure 19 displays the sales menu, where customers can make new payments and check previous payments. This menu also displays the payment date and validates whether the invoice is paid in full or pending.

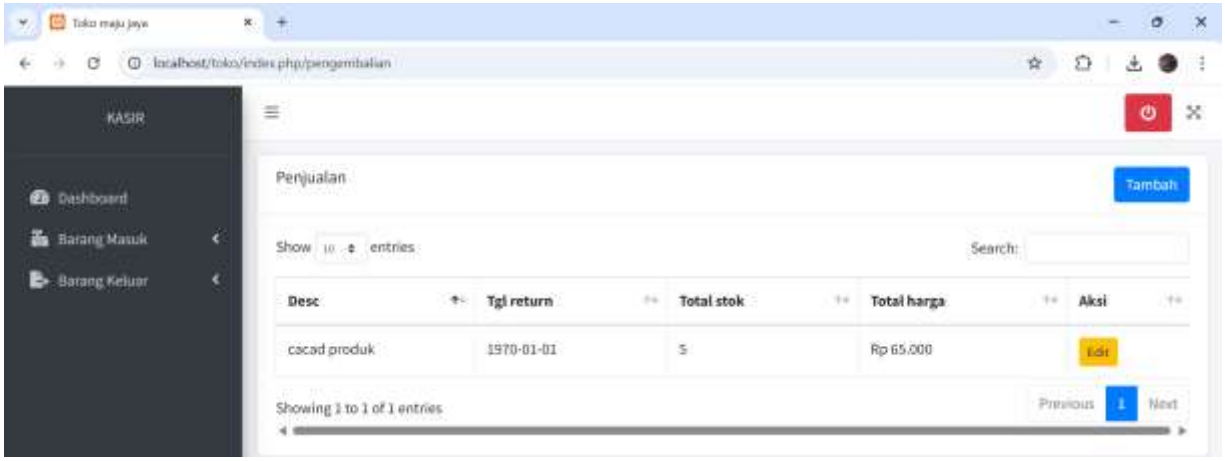


Figure 20. Return Page

In Figure 20, the returns page displays, customers can return the product if there is damage.

B. Black-Box Testing Results

The Black Box Testing method tests a program without looking at its internal details. Black Box Testing tests the program that has been created by trying to enter data into each form [11]. This testing is needed to ensure that the program meets company requirements [12]. The Black Box method is used to test the system with the aim of identifying existing weaknesses, ensuring that the output data matches the input data after the execution process, and to avoid errors and deficiencies in the application before it is used by the user [13].

Table 1. Testing Blackbox Testing Admin

No.	Testing	Test Case	Hope	Results
1	Website access	Enter the website domain address	Go to the login page	Correct
2	Login	Username and password are correct	Enter the dashboard page	Correct
3	Admin	View admin details	Show admin details	Correct
4	Dashboard	View admin and user sub-menus	Can switch to dashboard page and display data on time	Correct
5	Warehouse Data	Admin adds and edits warehouse data	Displays complete warehouse data details with information.	Correct
6	Category Data	Admin adds category data	Show category details	Correct
7	Sub Category Data	Admin added sub category.	Displays subcategory details.	Correct
8	Selling Price Setting	Admin edits the selling price	Displays the selling price setting results.	Correct
9	User Data	Admin edits user data	Displaying user data	Correct
10	Incoming goods	Admin displays incoming items.	Display incoming goods.	Correct
11	Exit item	Admin displays outgoing items.	Displaying outgoing goods	Correct
12	Return Items	Admin displays return items.	Displaying returned items.	Correct
13	Transaction Report	Admin displays transaction report.	Displays transaction reports.	Correct
14		Admin displays warehouse report.		

No.	Testing	Test Case	Hope	Results
15	Warehouse Report Logout	Admin presses the logout button.	 Displays warehouse reports. Displays the login page.	Correct

Table 2. Testing Blackbox User Testing

No.	Testing	Test Case	Hope	Results
1	Website access	Enter the website domain address	Go to the login page	Correct
2	Login	Username and password are correct	Enter the dashboard page	Correct
3	Dashboard	View sub-menu and incoming goods report data	Displaying transaction results	Correct
4	Sale	View sales details	Displaying sales results	Correct
5	Return	Adding return items	Displays return item details	Correct

Testing an information system using the black box testing method functionally demonstrates that the testing process on the system features is able to verify the user's ability to log in using their respective usernames and passwords [14]. Testing with normal data shows no errors in the system, thus indicating that the program has run according to the expected results. To maintain the stability of the website's functions, clear usage procedures and limitations are required [15].

Non-functionally, the testing process is carried out by adding various additional aspects to determine the ability of the software or application to execute certain commands [16]. This testing also aims to ensure that the application can run properly on the user's device and functions to maintain program security [17].

CONCLUSION

Fundamental Finding : This study demonstrates that the Mamdani fuzzy logic method can be effectively applied to predict grocery store revenue with high accuracy, using three key input variables—quantity of goods sold, price of goods, and operational costs—to represent the complexity and uncertainty inherent in retail operations. The implementation using Matlab R2021a produced a predicted revenue of Rp10,000,000 with

100% accuracy based on MAPE analysis, validating the model's precision. **Implication :** These results highlight the potential of fuzzy logic as a reliable decision-support tool for financial forecasting, enabling micro and small businesses to enhance planning accuracy and respond proactively to market fluctuations. **Limitation :** However, the model's testing was limited to a controlled dataset, and the absence of real-time or large-scale data may restrict the generalizability of the outcomes. **Future Research :** Subsequent studies should incorporate broader datasets, include real-time data integration, and explore hybrid approaches combining fuzzy logic with machine learning to improve adaptability and predictive performance in diverse retail contexts.

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