Development of a Cashier Business Transaction System using the Android Based Agile Method

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Abstract – The grocery retail sector in Indonesia plays an important role in meeting people's basic needs, with grocery merchants in urban and rural areas serving as the main middlemen in the distribution of staples to end consumers. Grocery merchants in Indonesia often face challenges in improving sales efficiency due to the use of conventional methods that are slow, unstructured, and prone to recording errors. These challenges can potentially lead to loss of customers, financial losses, and hinder business growth. This research aims to develop an Android-based cashier application specifically designed for grocery merchants to improve transaction efficiency and stock management. Using a qualitative approach, in-depth interviews were conducted to understand the needs and constraints faced by merchants in the transaction process. The findings were used to design the main features of the application, such as CRUD-based item management (Create, Read, Update, Delete), barcode scanning with a smartphone camera, digital receipt sending via WhatsApp, and payment support via QRIS E-wallet and cash transactions. This application is assumed to be used on Android devices with adequate internet access. The results show that this application is able to reduce recording errors, speed up transactions, and increase customer satisfaction compared to the manual method. The solution is expected to improve productivity, drive business growth, service quality and customer satisfaction as well as the competitiveness of grocers in the digital era. Future recommendations include the development of analytics features to monitor sales performance and support strategic decision-making.

Keywords – Cashier Application, Grocery Merchant, Transaction Efficiency, Stock Management, Android, Firebase

I. INTRODUCTION

In today's all-digital development of modern technology, all store management activities, such as buying and selling and transactions of physical, digital, and service products, can be done quickly, cheaply, and easily, without space and time constraints [1]. The grocery retail sector in Indonesia plays an important role in meeting people's basic needs, with grocery traders in urban and rural areas serving as the main middlemen in the distribution of staples to end consumers. Nine basic commodities or sembako is a much-needed business for the community, which requires a nearby grocery store that sells daily necessities at affordable prices, including a wide variety of food and beverages such as rice, vegetables, sugar, cooking oil, LPG gas, and other basic needs [2]. Thus, the existence of basic necessities is needed by the community to fulfill their needs [3].

Griya Sembako Abadi is a grocery store owned by Mrs. Endang Susanti located in Donokerto Village, Turi, Sleman Regency, Yogyakarta. Although this grocery store business is growing rapidly because it has an important role in the community's basic needs sector, the adoption of technology to support business efficiency is still very limited, especially among small and medium-sized traders. Toko Griya Sembako Abadi currently faces considerable challenges in its daily operations, especially in conducting transactions efficiently. Conventional methods such as manual recording make them prone to errors, such as miscalculations and stock mismatches that can lead to losing customers. Difficulties in managing stock in real-time often lead to out-of-stocks or excess items, resulting in financial losses. All of these factors hinder business adaptation to changing consumer behavior and pressure

from supermarkets that have implemented advanced technology. These problems indicate that Toko Griya Sembako Abadi needs a system that can monitor stock items, calculate financial income and expenses, and make it easier for customers to make transactions and see available stock items [4]. Therefore, MSMEs must continue to be empowered even in difficult circumstances by integrating them with digital technology [5].

Based on these problems, the solution offered is to adopt technology by developing an Android-based cashier application that is easily accessible to grocery traders to improve operational efficiency, from recording transactions to managing stock items. This application is designed using Android Studio software, Android Studio is an Integrated Development Environment (IDE) which is specialized for building applications that run on the Android platform [6]. The programming language used is Kotlin, Kotlin is a Java Virtual Machine (JVM) based programming language developed by JetBrains for Android applications, combining object-oriented and functional programming, and can be integrated with Java in the same project [7]. Then the database used in designing this application is a firebase realtime database that does not have a relationship or is called NoSQL. With features such as item management, barcode scanning using a smartphone camera, and digital receipt printing that can be sent via WhatsApp, merchants can speed up the transaction process and reduce recording errors. In addition, the app also supports various payment methods, both cash and electronic through QRIS, thus providing more flexibility to customers.

To strengthen the basis of research, a literature review is needed as a literature study. In research conducted by Kurniawati and Lukman [8], the development of mobile

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technology for cashier systems using firebase and java was carried out. The system can perform total grocery calculations quickly and accurately and can display sales reports. Furthermore, the design of a sales application with a barcode scanner made by Novia [9] based on Android. The system created is able to provide information and reports on the results of sales or purchase transactions that occur in graphic form. Then in research conducted by Azhari and Linda [10] related to the design of mobile-based cashier applications using java. The resulting system can perform sales and purchase transactions. The menu provided is also complete until the addition of employees. Then in the design of the Point of Sales (POS) application conducted by Restiawan and Ramos [11] using Firebase. Android-based POS applications have succeeded in speeding up transactions, and Warkop owners find it easy to use and as needed. In research conducted by Beny and Imam [12] in designing cashier applications at Aira Motor using flutter and firebase. Android-based cashier application using Firebase Realtime Database as a solution to improve transaction services at Aira Motor Padangjaya, a trusted motorcycle workshop in Padangjaya.

This research aims to understand the challenges faced by grocery merchants in managing their business, especially regarding transaction efficiency and stock management, provide guidance for developers in designing cashier applications that can improve the efficiency of grocery store businesses, increase merchants' awareness of the importance of technology to be able to compete in the market, and contribute to the development of Android cashier applications that are relevant to the needs of merchants. In addition, this research aims to improve service quality and customer satisfaction, while driving business growth. The system is developed using the Agile Method and manages the database using firebase. By utilizing this technology, it is expected that merchants can be more competitive in the digital era, increase productivity, and strengthen relationships with customers through faster and more efficient services.

II. RESEARCH METHODOLOGY

Agile Software Development is a software development method that has various development principles that are easily adaptable to various forms of change that occur in a relatively short time [13]. The research stages in building applications using the Agile Software Development method have several stages. The following are the stages carried out in this study.

A. Planning

In this planning stage, an analysis of the current system is carried out. Through this analysis, the problems that exist in the system can be known. Planning is described in the research framework by including the initial conditions of the system with the proposed new system. The research framework can be seen as follows.
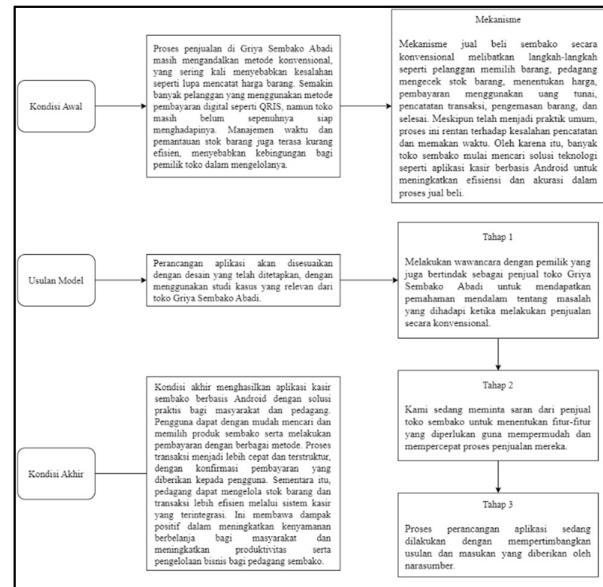

Figure 1. Research Framework

B. Design

The design is also done using Unified Modeling Language (UML) modeling because of the flexibility of many and varied diagrams [14]. The diagrams used are Use Case Diagram, Activity Diagram, and Sequence Diagram. This diagram serves to design the performance flow of the new system by identifying what activities can be performed on the system.

C. Analysis

The analysis stage is carried out by analyzing existing problems to find the right solution. System development with transaction features can be a good solution in creating shopping convenience and increasing productivity.

D. Implementation

The system design is then implemented by coding and implementing firebase as a data manager in the system. Firebase is offered by Google as a solution to simplify mobile and web application development and has a realtime database [15].

E. Testing

Testing as the final stage of development is the most important part that should not be missed. The black box testing method is used by creating several test scenarios to see the program is the same as the program task without knowing the program code used [16].

III. RESULTS AND DISCUSSION

This research shows that the Android-based grocery cashier application has been able to perform most of the main functions, including item code scanning, QRIS payment integration, and presentation of transaction reports; although there are still technical challenges such as connection stability and the need for optimisation of the barcode upload feature, these findings indicate the need for further development to enrich the user experience and add features that display transaction details to support more efficient inventory management for sellers.

A. System Design

After conducting a sales system analysis using conventional methods, the next step is to design a proposed system by considering the shortcomings of previous sales using conventional methods. The following is the proposed system design.
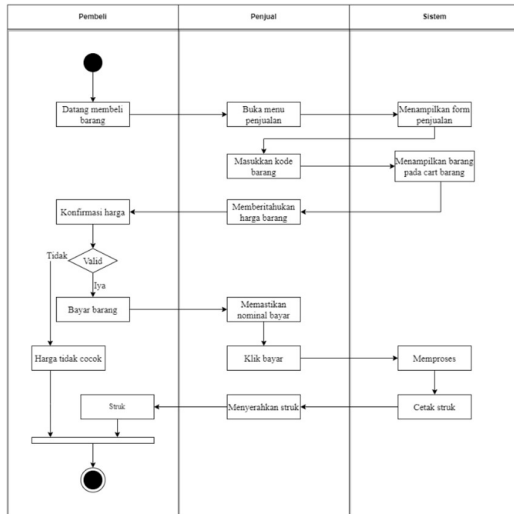

Figure 2. System Design

B. Analysis of Current System

Model architecture is used to provide a more detailed explanation of the various types of models, while designing a new model structure to address problems in the previous system, by analyzing the current system. The following image shows the sales process flow using the conventional method, depicting the current system.
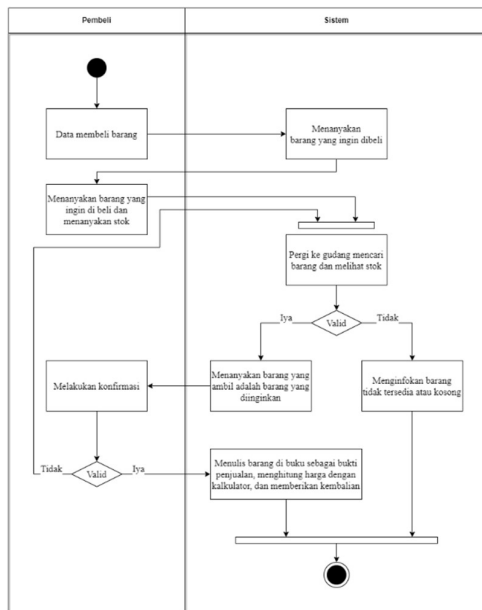
Figure 3. Analysis of Current System

C. Use Case Diagram

Here is a use case that describes the functionality performed by one actor, namely the seller. In the form of Login, Goods, Sales, Customer List, Cashier Report, Sales Report, Profile, and Logout
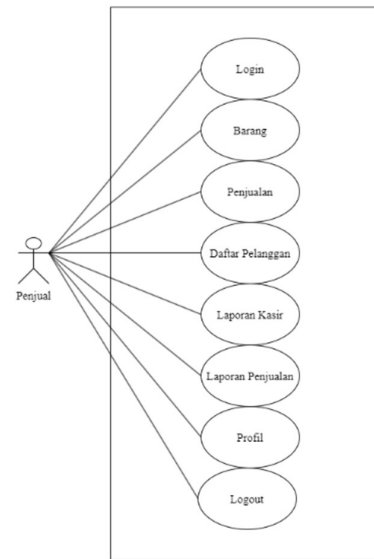
Figure 4. Use Case Diagram

D. Activity Diagram

Activity diagram is a visual representation of the workflow that occurs in a running system. Activity diagrams are used to define the display sequence of activities that occur in a system, as used in this study. In an activity diagram, components are connected using arrows, which direct the sequence of activities from start to finish. The diagram below is an activity for the login process when the user wants to enter the grocery cashier sales application.
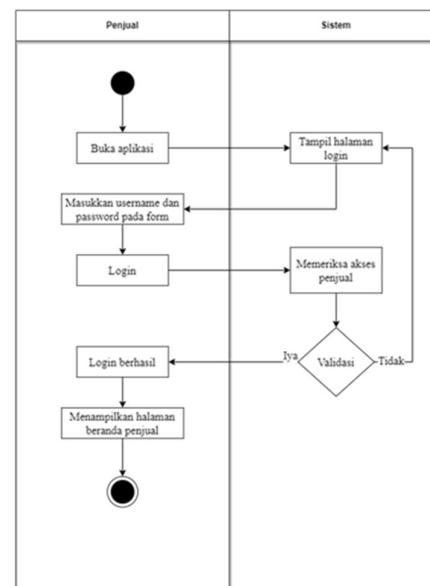

Figure 5. Login Activity Diagram

The next diagram is the item activity diagram. The diagram below is an activity that we can do to perform basic CRUD operations to make it easier to use the application.
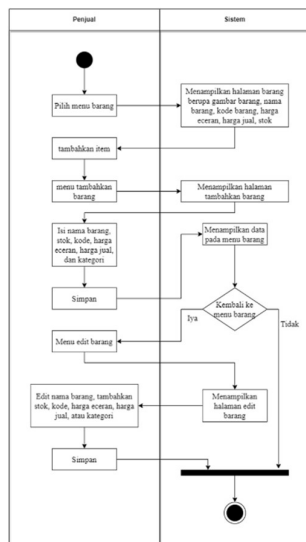
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Figure 6. Item Activity Diagram

The next diagram is a sales diagram that illustrates sales activities, which include the selection of item names to the payment process.
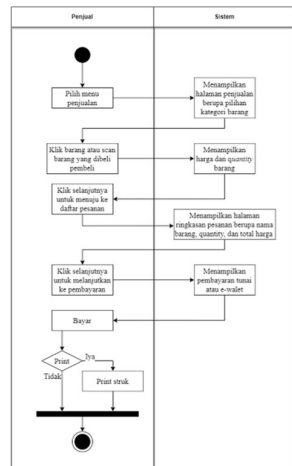

Figure 7. Sales Activity Diagram

Customer List Activity Diagram is a customer list activity in the form of customer data details to provide information if there are new products or requests for items that are not in the store.
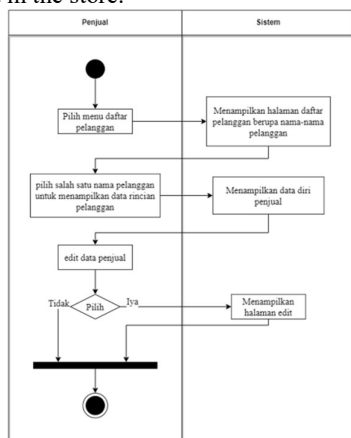

Figure 8. Customer List Activity Diagram

Cashier report activities in the form of payment data from physical money, e-wallets, and total revenue are also diagrammed as follows
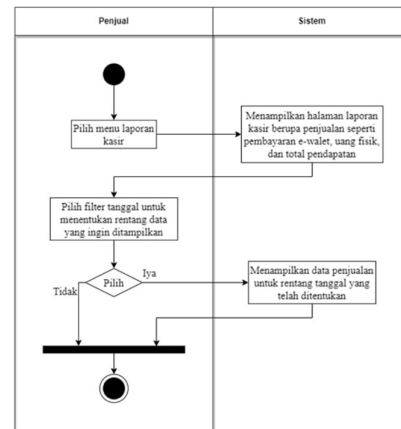
Figure 9. Cashier Report Activity Diagram

The diagram below is an activity diagram that describes the process of viewing the history of sales made in the form of total revenue and total transactions.
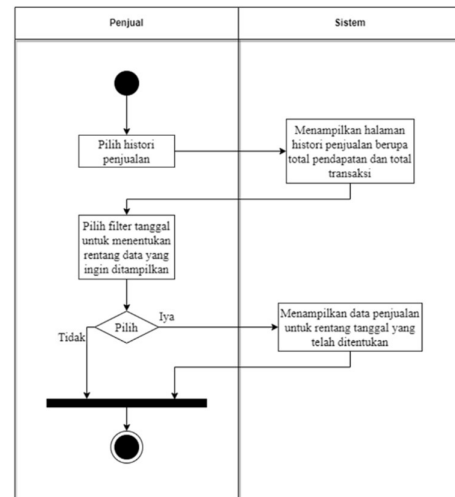

Figure 10. Sales Report Activity Diagram

The diagram below is an activity to view profile data and can also edit profiles.
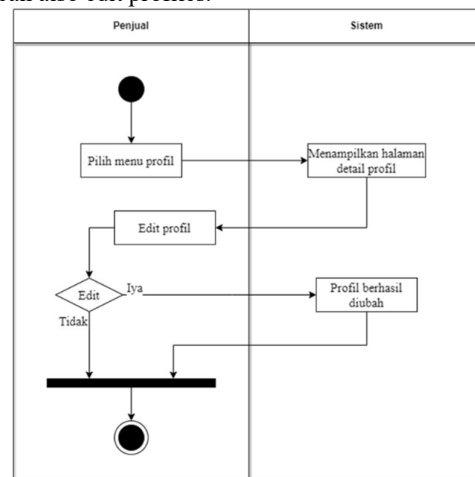

Figure 11. Profile Activity Diagram

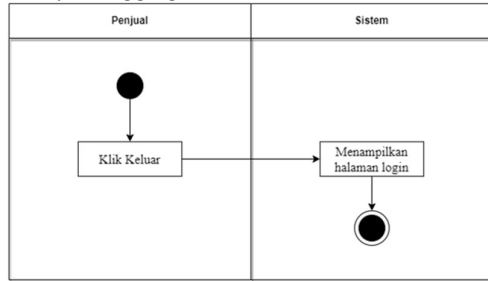Furthermore, the Logout Activity Diagram describes the activity of logging out of the account.

Figure 12. Logout Activity Diagram

E. Sequence Diagram

Sequence diagrams are diagrams used to explain interactions between objects in a system so that they are easier to understand. The login sequence diagram displays the process where the seller logs in and the required data is retrieved from the database. If the data is found, the user will be directed to the main page. Below are several sequence diagrams.
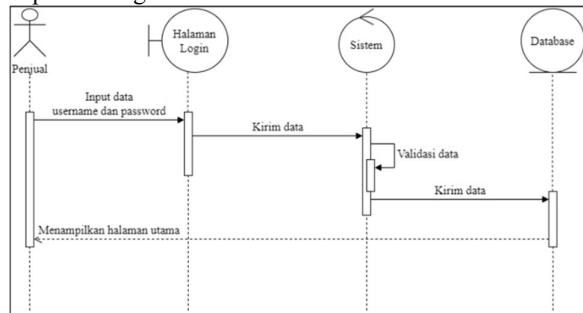

Figure 13. Login Sequence Diagram

The item sequence diagram shows the steps when the seller performs CRUD operations on the sale of goods. The seller starts by clicking on the item menu in the application, then there can edit items or add items such as item name, stock, code, retail price, selling price, and category. After that, the data entered will be stored in the database.
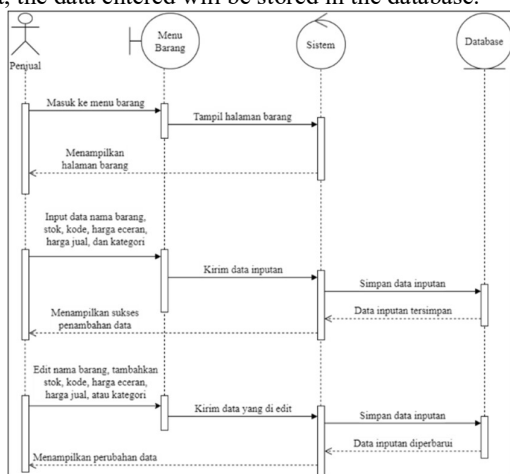

Figure 14. Item Sequence Diagram

The sequence diagram for the sales process starts when the seller inputs the goods purchased by the customer. Purchased item data is retrieved from the item database. Then display the order list to check what items are

purchased. After that, choose a payment method, which can be done in cash or using an e-wallet. The payment information is then saved into the database.
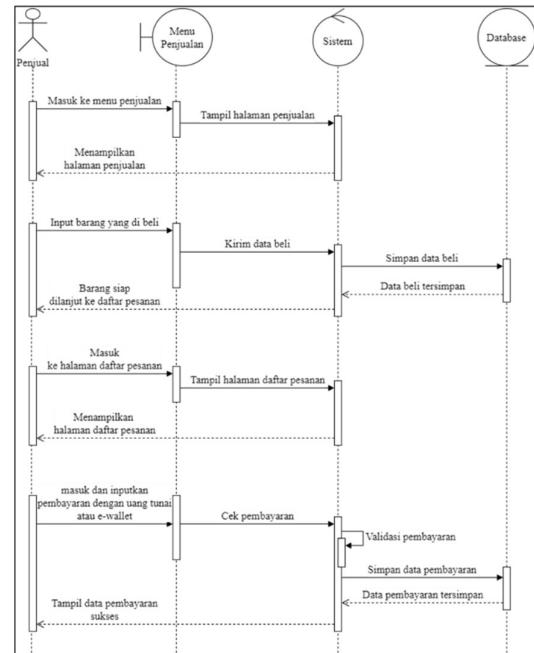

Figure 15. Sales Sequence Diagram

The sequence diagram for the customer list starts when the seller selects the customer list menu option. Customer data will be processed, retrieved from the database, and displayed to the seller.
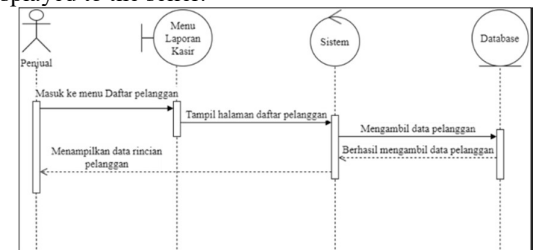

Figure 16. Customer List Sequence Diagram

The sequence diagram for the cashier's report shows that the seller can view the cashier's report which includes turnover from sales made from e-wallet payments, physical money, and total revenue.
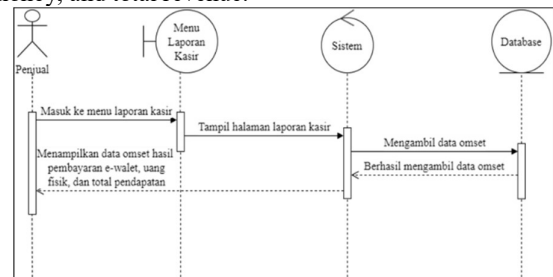

Figure 17. Cashier Report Sequence Diagram

The Sales Report Diagram illustrates the process where the seller views the sales report by retrieving data from the database, which then displays the sales report in the form of total revenue and the number of transactions that have occurred.
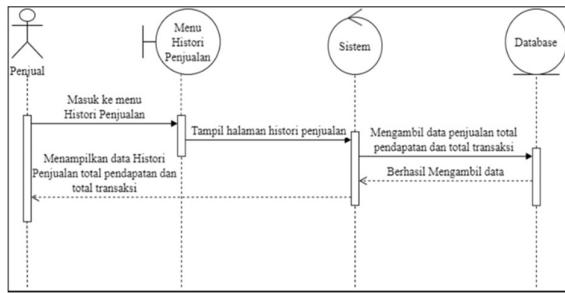
Figure 18. Sales Report Sequence Diagram

Sequence diagram for profile, where the seller enters the profile menu to edit his profile, then the data that has been changed will be saved to the database, and the results will be displayed again on the profile page.
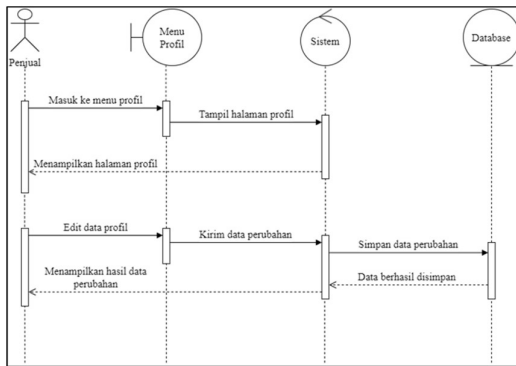

Figure 19. Profile Sequence Diagram

The sequence diagram for the logout process starts when the seller decides to exit the system. After the seller logs out, the system will respond by displaying the login page again.
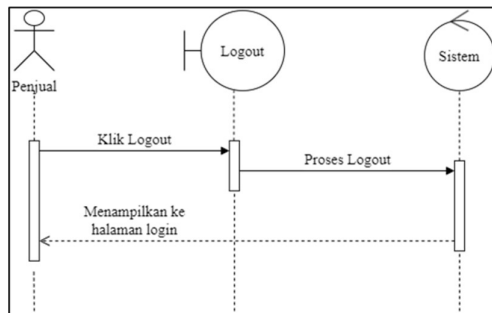

Figure 20. Logout Sequence Diagram

F. Implementation

In this phase, the system is implemented following the design specifications, with the results illustrated through application screenshots to showcase its functionality.

1. Splash Screen And Login

The splash screen page displays the logo and name of the app to give the user an initial impression, while also assisting in loading the required content, creating an engaging visual experience, as well as indicating that the app is being prepared before the user enters the main interface. Meanwhile, the login page will appear when the user has not logged into the application, where they must enter the email address and password set by the admin.

After filling in the data correctly, users can press the 'login' button to access the application.
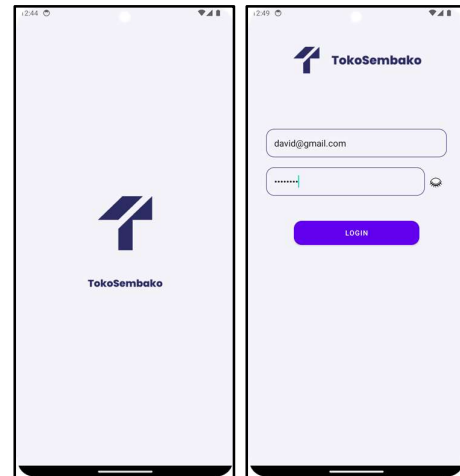

Figure 21. Splash Screen And Login

2. Home And Profile

The home page displays 3 menus, namely the goods menu containing goods management, the sales menu as sales transactions, and the customer list menu to store customer data if goods in the shop are not available. And the profile page displays store data such as store name, telephone number, and store address.
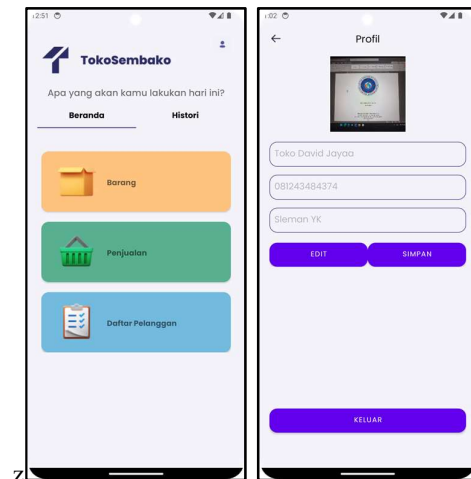

Figure 22. Home And Profile

3. Sales and Order List

The sales page displays all items for sale in terms of name, price, and stock, and displays the subtotal when selecting an item. The order list page displays details of the purchased items in the form of total items, subtotals and features for adding, reducing and deleting items if the customer reduces their order.
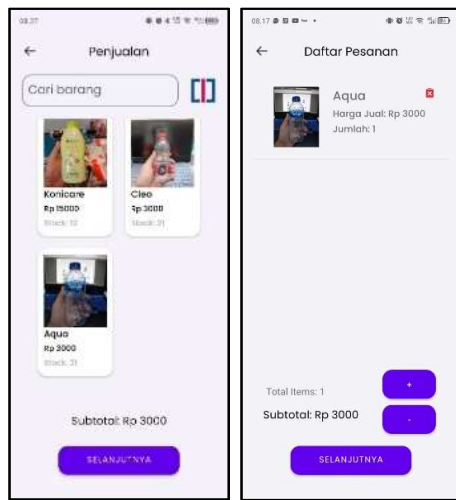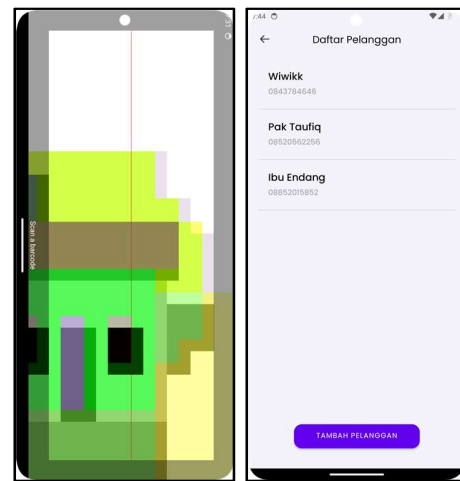
Figure 23. Penjualan And Daftar Pesanan

4. Item and Add Item

Item page as a treatment for adding items, editing, deleting, and displaying item data in the form of name, code, retail price, selling price, and item stock. The add item page consists of filling in data in the form of name, code that has been integrated with moving barcodes, retail price, selling price, stock of goods, and category choices for each item.
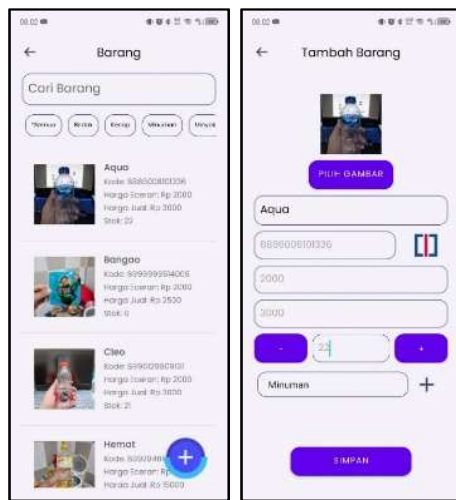

Figure 24. Barang And Tambah Barang

5. Scan Code And Customer List

The barcode scanning page appears when you click on the barcode icon, which acts as a barcode scanner for items. The customer list page displays a list of customer names in the form of names and phone numbers. Its function is to provide information to customers because the goods in the store are not yet available.

Figure 25. Pindai Kode And Daftar Pelanggan

6. Cash and Cashless Payment

The cash payment page displays the nominal input if the price is more than IDR 100,000, the nominal options start from IDR 5,000 to IDR 100,000, and item details to check the purchased items. The ewallet payment page consists of entering the QR code for all online payments, and displays the item details.
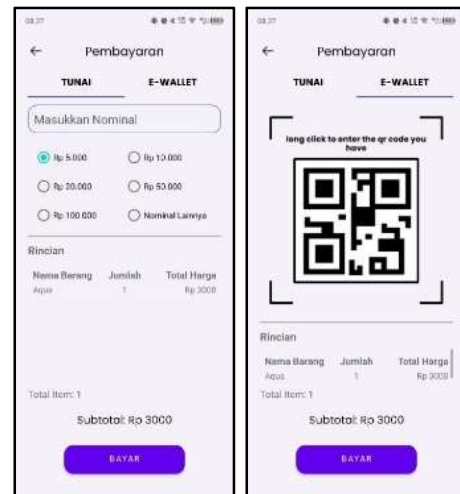
Figure 26. Pembayaran Tunai And Non Tunai

G. Testing

In this study, system testing was conducted using the blackbox method which was tested by 5 people. This approach focuses on functionality without knowing the internal structure and program code. In this blackbox testing, it is carried out critically from income calculations, input validation, data storage to the database and displaying appropriate or inappropriate results on each page. The results of testing with the blackbox method can be seen in the following table.

Table 1. Black Box Testing

Test Class	Skenario Uji	Expected Result	Conclusion
Process of Managing Goods Data	Enter item data such as image, name, code,	New item data is successfully	Succes

	price, stock and item category. Click the add button.	added to the database.	
	Opens the goods menu that will display the goods data.	Display the item data that has been added.	Success
	Clicking on one of the items will go to the edit page and change the item, then click save.	The data is successfully updated as desired.	Success
	Clicking on one of the items will enter the edit page and click delete.	The selected item is successfully removed from the ui and database.	Success
Transaction Process	Select one of the items and the prices will be summed up immediately, then click next.	The selected item is successfully displayed on the order list along with the total price of the item.	Success
	Select the desired payment method (Cash or non-cash)	Successfully totaled the calculated groceries correctly and displayed the payment method options.	Success
	Click the pay button to complete the transaction	Cash payment will calculate the change correctly and display a successful transaction and save with payment details.	Success
Stock Items	Click on items until they exceed the stock held	Display a notification that the item is out of stock and the order quantity will stop growing	Success
Sending Via WhatsApp	On the successful transaction page, click the "Share via WhatsApp," button and enter the destination number.	The transaction details will be sent to the number in the form of a digital receipt format.	Success

Based on testing with the scenarios made, it can be concluded that the application can run well. This is because all scenarios are 100% successful.

IV. CONCLUSION

From the research and testing conducted, it was found that the system has successfully displayed transaction reports and cashier reports according to the selected date, integrating the scanning of item codes from the addition process to the display of the list of items, providing receipt options that can be shared via WhatsApp, and activating the QRIS e-wallet payment method through uploading barcodes that have been created, with automatic stock reduction when transactions occur. Although this Android-based grocery cashier application is functional and ready to use, further development is still needed to optimize application performance, for example by adding an online payment feature to facilitate transactions for buyers who are short of cash, as well as a transaction details feature that includes the number of items sold, the number of transactions, and total revenue so that sellers can recap outgoing goods data more easily.

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