

# Transformative Implementation of Android-Based Point of Sale System at Shafira's Buffet Stall

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**Abstract.** Shafira's Buffet Stall is a small eatery located at 37 Gubeng Kertajaya V Raya Street. They offer a diverse range of delicacies, from fried snacks to vegetable dishes. The typical business process at the stall involves customers either dining in or requesting takeaways. After making their selections, the customers proceed to the cashier to have their orders tallied. Observing this process, the idea of developing an Android-based Point of Sale (POS) system struck the author. This system aims to streamline and record all transactions efficiently. The Point-of-Sale system is designed to facilitate seamless transactions and includes a cashier module to record sales. The decision to develop this POS application was driven by the need for accurate transaction records and seamless management. The Android platform was chosen due to its popularity as the most widely used mobile operating system in Indonesia, boasting an impressive 89% market share as of December 28, 2022. Additionally, in urban areas of East Java, around 68.75% of the population utilize mobile phones, further justifying the choice of the Android platform for the system. The application offers features such as login credentials for two types of accounts: cashier and administrator (faktur). It allows access to functions like managing transactions, adding new menu items, listing available menu items, and generating daily and weekly transaction reports. The implementation and testing of the application were performed through two iterations. After incorporating the necessary improvements based on black box testing, all features functioned smoothly. Usability testing resulted in a remarkable 5.73% increase in overall user satisfaction. This Android-based POS application proves to be an invaluable tool for the business owner, providing insights into popular menu items and their daily and weekly sales. It assists in making informed decisions regarding menu restocking and daily sales strategies.

## 1 Introduction

Shafira's Buffet Stall is located at 37 Gubeng Kertajaya V Raya Street, offering a variety of foods from vegetables to fried snacks. The business process at this stall allows customers to serve themselves and then proceed to the cashier for item tallying and transaction processing.

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Previous research efforts included the development of a website-based Point of Sale (POS) system, exemplified by the application 'Point Of Sales Using Laravel Framework' [1]. The study highlighted the convenience of generating sales reports and the reliability of the system. Another prior research project focused on an Android-based POS application titled 'Design and Development of Android POS (Point of Sale) Application for Café with Portable Cashier and Bluetooth Printer' [2]. This study also demonstrated the benefits of having a dedicated POS system, replacing the previously used Excel-based recording.

Analyzing the business process at the buffet stall revealed the absence of transaction records, leading to challenges such as inability to track daily transactions, identify top-selling items, and other related information [3]. To address these issues, an Android-based application was developed to support Shafira's Buffet Stall.

Android is one of the most popular mobile operating systems in Indonesia, with a market share of 89% as of December 28, 2022 [4]. In East Java, approximately 68.75% of urban residents use or own Android-based mobile phones [5], primarily due to its affordability and user-friendly interface [6]. Hence, the decision to build the system on the Android platform was made, considering the proficiency of Shafira's Buffet Stall owner in using Android devices. The Android-based Point of Sale application was designed to enable both cashiers and administrators to record transactions effectively.

According to [7], a Point of Sale system allows for seamless transactions and includes a cashier module to record transactions, which further justifies the choice of developing a POS application. After successful implementation, the application was evaluated to meet Shafira's Buffet Stall requirements through black box testing and feasibility analysis.

## **2 Materials and methods**

### **2.1 Materials**

#### *2.1.1 Android Application*

Android is one of the most widely used operating systems among the Indonesian population, as evidenced by its market share of 89% as of December 28, 2022 [4]. Being an open-source operating system [8,9], Android allows anyone to develop applications or modify the system itself. Android offers several tools for application development, ranging from Android Studio to Kodular [10].

#### *2.1.2 Point of Sale*

Point of Sale refers to sales-oriented activities and systems that facilitate transaction processes [11]. Typically, Point of Sale systems record transaction data comprehensively and process it into easily analyzable reports [12,13]. The essential data that the Point of Sale system should include are transaction data, product data, customer data, expenditure data, and daily profit data [14].

#### *2.1.3 Kodular*

Kodular is a web-based software that simplifies the process of creating Android applications with a material design [15]. It is user-friendly, utilizing blocks that allow users to drag and drop elements instead of writing complex code manually. Kodular is based on MIT App Inventor, which also employs blocks as its coding medium. The choice of Kodular for this

research is due to its ease of use and rich features, such as tinyDB, a component for storing application data without the need for third-party software. Additionally, Kodular has a large open-source community that creates extensions for use in the platform.

2.2 Materials

The development of the Point of Sale [16] application for Shafira's Buffet Stall follows the methodology depicted in Figure 1. The research process begins with an analysis of the requirements specific to Shafira's Buffet Stall. Based on these requirements, the system design is formulated to cater to the unique needs of the establishment. Once the design phase is completed, the system is built and subjected to rigorous testing. If the system proves to be suitable and fulfills the needs of Shafira's Buffet Stall, it can be immediately implemented. However, if any shortcomings are identified, the system will be revised and improved accordingly.

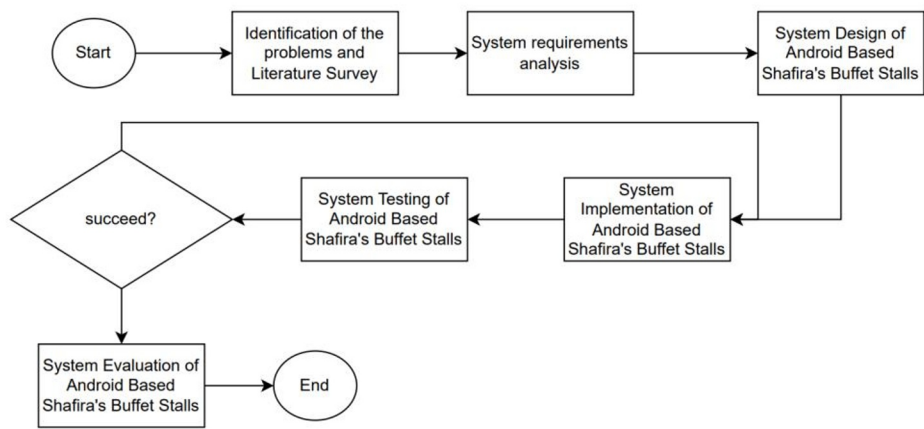


Fig. 1. Research’s methodology.

2.3 Data Analysis

The data will be analyzed as follows:

2.3.1 Functional and Non-Functional Requirements

According to Setiyani and Tjandra [17], functional requirements encompass the processes that the system should be capable of performing. Conversely, as stated by Niki Ratma and Munawaroh [18], non-functional requirements refer to supporting functions that aid the smooth operation of the built system [19].

2.3.2 Black Box Testing

As described by Azhari [20], Black Box Testing is a method that evaluates the functional requirements of an application using test cases.

2.3.3 Usability Testing

According to [21], usability testing aims to measure efficiency, ease of learning the system, and the ability to remember how to use it without difficulty or errors. Usability testing involves five key elements:

- a. Learnability  
This element refers to how quickly a user can learn and use the system when using it for the first time.
- b. Efficiency  
This element evaluates how swiftly a user can achieve their objectives within the system.
- c. Memorability  
This element assesses a user's ability to recall the location of buttons, pages, and menus within a certain period.
- d. Errors  
This element examines the number of mistakes that occur during system usage.
- e. Satisfaction  
This element represents the subjective measure of a user's contentment while using the tested system.

3 Result and discussion

3.1 Requirement Analysis

From the conducted requirement analysis, the following findings were obtained:

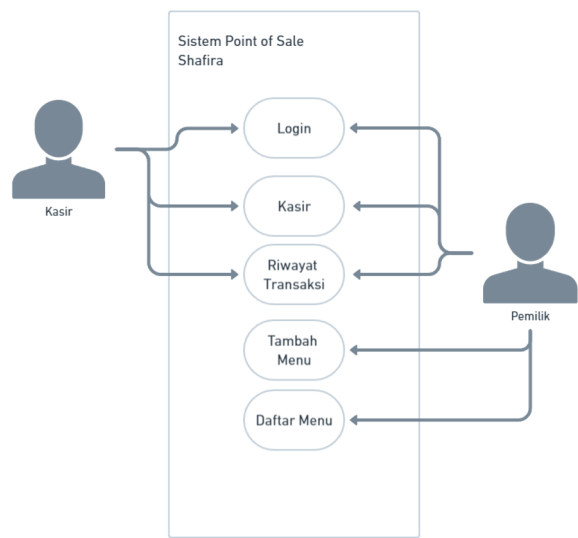
- 1. Functional Requirement Analysis
  - a. Business Process The business process at Shafira's Buffet Stall is relatively simple. Customers either self-serve by selecting their own food or request assistance from the staff to pack the items. Afterward, they bring the chosen items to the cashier for tallying and payment.
  - b. Analysis of the Existing System The current transaction recording system at the stall is non-existent, with only income and expenditure records being maintained at the end of the day.
  - c. New System Requirements The essential feature required is a transaction recording or cashier system for the stall.
  - d. Purpose The purpose is to digitize transaction recording and enhance efficiency.
- 2. Non-Functional Requirement Analysis

Table 1. shows the results of the Non-Functional Requirement Analysis.

| Hardware             | Software                                                     |
|----------------------|--------------------------------------------------------------|
| Samsung Galaxy Tab A | Android-Based Point of Sale System at Shafira's Buffet Stall |

3.2 System Design

3.2.1 Diagram Use Case



**Fig.2.** Diagram Use Case.

3.2.2 Use Case Diagram

The use case diagram is as follows:

- 1. Customer:
  - View Menu
  - Select Food Items
  - Request Food Packaging
  - Proceed to Cashier for Payment
- 2. Cashier:
  - Record Transaction
  - Calculate Total Payment
  - Accept Payment
  - Provide Receipt

The Point of Sale application for Shafira's Buffet Stall has two actors: cashier and owner (admin). The cashier can access features such as login, cashier functionalities, and transaction history. On the other hand, the owner or admin can access login, cashier functionalities, transaction history, add menu items, and view the menu list.

3.2.3 Diagram Activity

1. Login

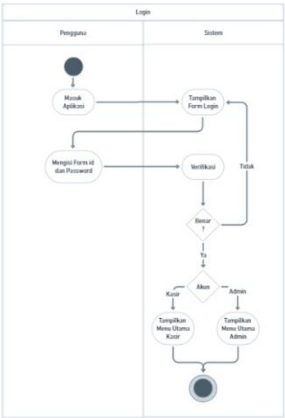


Fig.3. Diagram Activity Login.

The login feature can be accessed by both actors, allowing them to choose whether to log in as an admin or a cashier. If they select "cashier," they will be directed to the main menu immediately. However, if they choose "admin," they need to fill out a form with their ID and password, which will be verified for accuracy. If the credentials are correct, the user will be directed to the main menu. On the other hand, if the credentials are incorrect, they will be redirected back to the admin login form.

2. Cashier

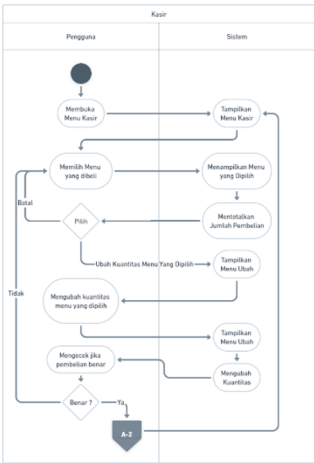
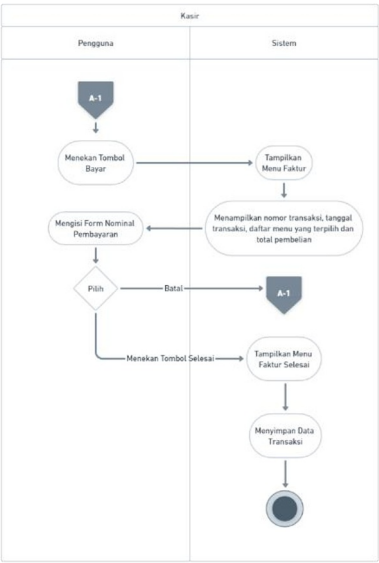


Fig.4. Activity Diagram of Cashier A-1.

This feature is used for transaction recording, where users can select the items they want to purchase, and the system will calculate the total price based on the quantity and prices of the selected items [22]. Additionally, if a user decides to cancel their selections after adding items to the total list, the list will be cleared. However, if the user taps on a specific item in the total list, they can modify the quantity of that item or remove it from the list. Once the user confirms that their purchase is accurate, they can press the "Pay" button, which will display the invoice menu.

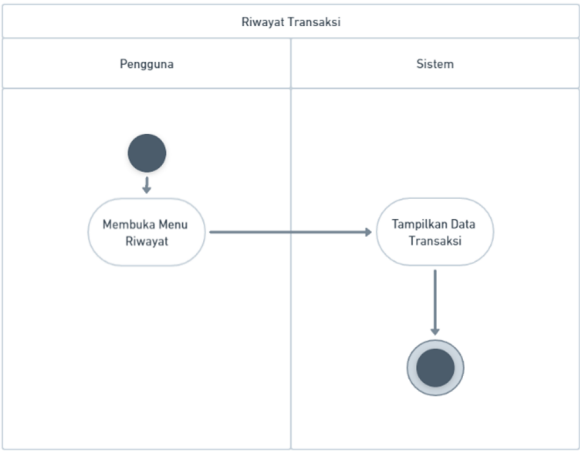


**Fig.5.** Activity Diagram of Cashier A-2.

The invoice menu will display the transaction number, date of the transaction, the list of purchased items, and the total amount of the purchase. Users can return to the cashier menu if there are any discrepancies or proceed by filling out the payment form and pressing the "Done" button. Upon doing so, the transaction data will be saved, and the system will provide the change amount resulting from the transaction.

3. Record Transaction

The "Record Transaction" feature plays a vital role in streamlining the sales process, maintaining accurate records, and providing valuable insights to the business owner for informed decision-making and better management of Shafira's Buffet Stall.



**Fig.6.** Activity Diagram of Record Transactions

4. Add Menu

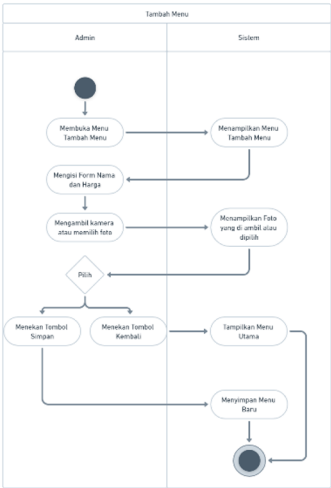


Fig.7. Activity Diagram of Add Menu

This feature is accessible exclusively to users who have logged in as administrators. Administrators have the authority to add new menu items by filling out the required fields, such as the menu name and price, and can also capture an image of the menu item using the device camera or selecting an image from the storage. The administrator is provided with the flexibility to either navigate back without saving the data and return to the main menu or save the newly added menu item by clicking the "Save" button.

5. List Menu

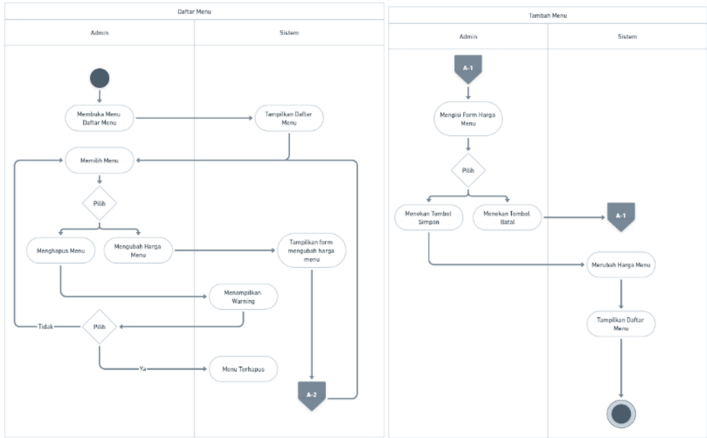


Fig.8. Activity Diagram of Menu List

This "Menu List" feature is exclusively accessible to users who have logged in as administrators. As an admin, they have the privilege to view the existing menu list and can also perform actions such as deleting or modifying menu prices as needed.

3.2.3 Wireframe

Here is the wireframe of the POS application for Shafira's Buffet Stall:

1. Login page



**Fig.9.** Menu of Login Page

2. Main page



**Fig.10.** Main page

This page is used to access various menus within the application, such as adding menu items, cashier functions, menu list, transaction history, and account settings. In addition to accessing other menus, this page will also display data summarizing today's earnings and the best-selling menu items for the day. The page will have two views: for users logged in as cashiers, only the cashier and transaction history menus will be accessible, while administrators can access the "Add Menu" and "Menu List" menus.

3. Add Menu Page



Fig.11. Add page

This page is used to add new menu items that will be sold by the user.

4. Menu List Page

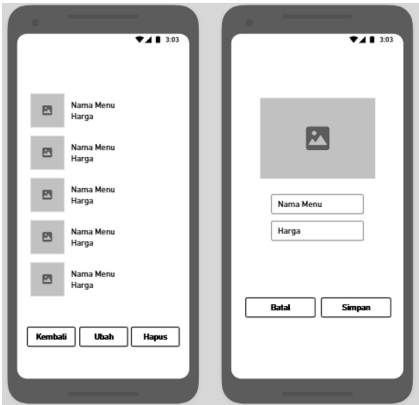


Fig.12. Menu List page

This page is used to view the menus that are being sold, edit those menus, or delete them.

5. Cashier Page

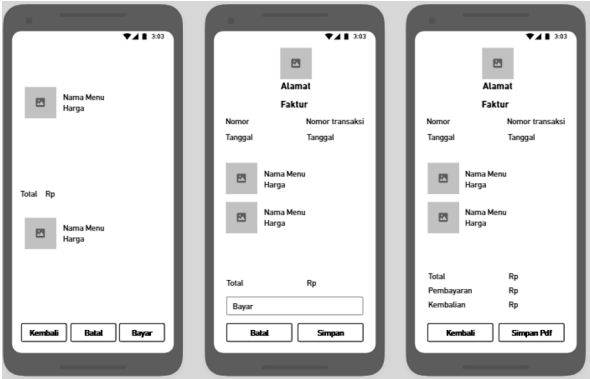


Fig.13. Cashier Page

This page is used for transaction recording, where users can select items from the menu. Once they have selected the correct items, they can press the "Pay" button, which will lead them to the invoice page. On the invoice page, users can input the payment amount, and the data will be saved to the database.

6. Record transaction page

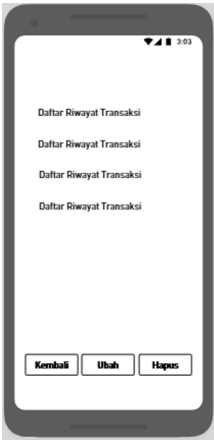


Fig.14. Record transaction page

This page is used to view the transaction history that has been conducted or stored in the database.

3.3 System Implementation

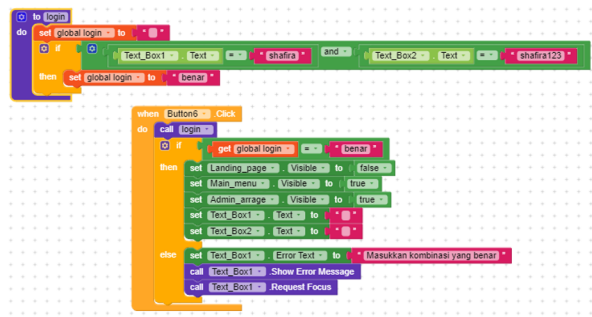
The point of sale application is built using Kodular and requires an Android-based smartphone with a minimum version of 7.0 or Nougat. This application also utilizes Firebase for data storage of transactions and menu items. The following are the pages available in this point of sale application:

3.3.1 Login Page



Fig.15. Login Page

This page provides options for the application users to perform login. For cashiers, there is no need to enter an ID and password; they only need to press the button labeled "Cashier." On the other hand, for administrators, they need to follow the authentication algorithm for admin login:



**Fig.16.** Algorithm of Admin Login Authentication

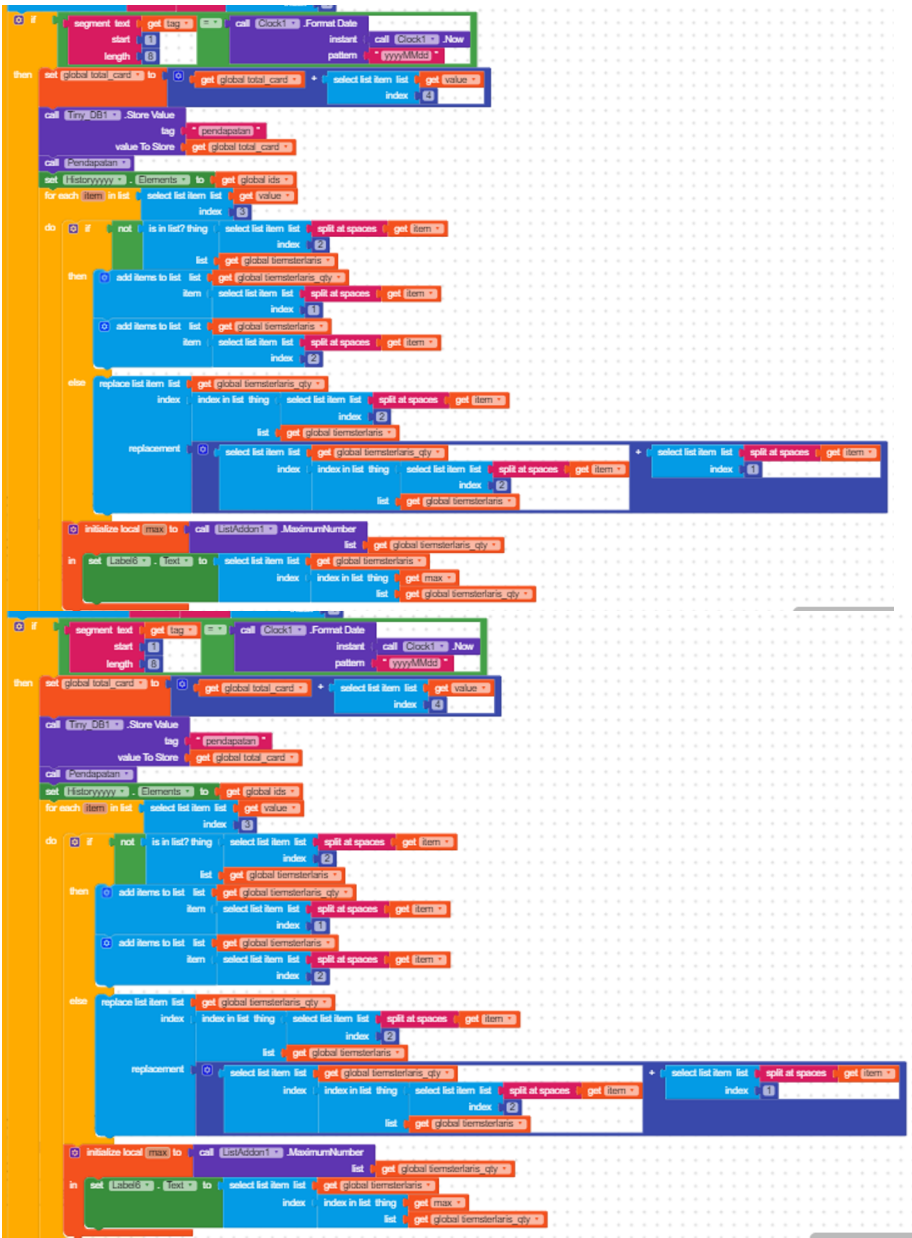
It can be observed that if the user enters "shafira" and "shafira123" in the ID and password fields, the main menu and specific admin menu will be displayed. Conversely, if the form is not filled in with the correct "shafira" and "shafira123," the user will be unable to log in, and the form will display a warning to enter the correct data.

3.3.2 Main Page



**Fig.17.** Main page Menu.

On this page, users can perform several actions. If logged in as an admin, the user can access the "Add Menu" menu, view the "Menu List," access the "Cashier" menu, view the "Transaction History," or return to the login page by pressing the "Change Account" button. Conversely, for users logged in as cashiers, they can only access the "Cashier" menu, view the "Transaction History," and change accounts. In addition to accessing these menus, users can also view the total earnings for today and the best-selling menu. The system achieves this by retrieving transaction data stored in the Firebase Realtime Database and analyzing it based on the following logic:



**Fig.18.** Logic Block for Recording Transaction Data.

It can be observed that the transaction data being read must have today's date in the format year/month/day. This is done to reset the total earnings for today to 0 when the day changes. Then, the system calculates the total earnings for today from the transaction data of the current day. Additionally, it determines the best-selling menu by selecting the maximum from the list of transaction data for today.

3.3.3 New Menu Addition Page

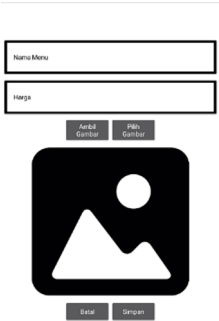


Fig.19. New Menu Addition Page.

On this page, users logged in as administrators can add new menu data that will be sold. The page contains two text boxes and options to take a picture using the camera or select an image from the smartphone's storage. After the user fills in the menu name and price in the text boxes and takes or selects an image, they can choose to return to the main page or save the data. The saved data will be stored in the Firebase Realtime Database with the menu name as the tag, and the image will be stored in TinyDB.



Fig.20. Block for Saving New Menu.

This block is responsible for saving the data of the newly added menu. When the user chooses to save the menu data, the block will store the menu name, price, and image into the Firebase Realtime Database. The menu name will be used as the tag to identify the data in the database. Additionally, the image will be saved in TinyDB for efficient storage and retrieval. This ensures that the newly added menu is successfully stored and can be accessed and displayed in the application as needed.

3.3.4 List Menu Page



Fig.21. List Menu Page on Apps.

3.3.5 Cashier Page on Apps

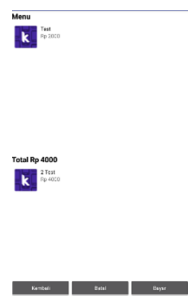


Fig.22. Cashier Page on Apps.

This page can be accessed by users who have logged in as administrators or cashiers. On this page, users can record transactions by tapping on the menu items listed above, and the selected items will be added to the list below, which displays the total purchase amount, the quantity of each item purchased, and the total amount for each item. If the user taps on an item in the purchase list, a menu will appear allowing them to modify the quantity of the selected item.

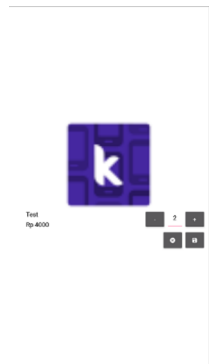


Fig.23. Menu to Change the Quantity of Purchased Items.

Once the menu selection is complete, the user can return to the main menu, delete the selected purchase list, or press the "Pay" button, which will open the invoice page.



Fig.24. Invoice on Apps.

On this page, users can view the transaction number, date of the transaction, the items purchased, the total transaction amount, and enter the payment amount made by the buyer.

Afterward, the user can return to the cashier page or press "Finish" if the payment amount is greater than or equal to the total purchase amount. Upon pressing the "Finish" button, the transaction data will be saved, including the transaction number, date, purchased items, total purchase amount, total payment, and change.

Faktur

No  
Tgl  
Items

1-20230624111001  
24-06-2023 11:10:01 PM  
2 Test

Rp 4000

Total  
Bayar  
Kembalian

Rp 4000  
Rp 5000  
Rp 1000

Kembalian

**Fig.25.** Invoice Completion Page

On this page, the user can view the transaction number, date of the transaction, the items purchased, the total transaction amount, and enter the payment amount made by the buyer. Afterward, the user can return to the cashier page or press the "Finish" button if the payment amount is greater than or equal to the total purchase amount. Upon pressing the "Finish" button, the transaction data will be saved, including the transaction number, date, purchased items, total purchase amount, total payment, and change.

3.3.6 Record Transaction on Apps

1-20230624111001  
Tgl: 24-06-2023 11:10:01 PM  
Items: (2 Test)  
Total: Rp 4000

**Fig.26.** Record Transaction on Apps

This page is accessible to users who log in as cashiers or administrators. On this page, users can view the transaction history, which contains a detailed list of transactions, including the transaction number, date, quantity of items purchased, and total purchase amount.

3.4 System Testing

3.4.1 Black Box Testing

This testing was conducted with two iterations. In the first iteration of the 42 black box tests performed, four tests did not pass, resulting in a success rate of 90.48% for the first iteration of black box testing. This indicates that the point of sale application is functioning as expected, although some improvements may still be needed. For the second iteration, after fixing the bugs, it was found that all tests passed successfully.

### 3.4.2 Usability Testing

Here are the results of the usability testing conducted by Siti Mahmudah (Owner) and Rokiyah (Cashier), where according to (Yumarlin, 2016), if the score is 1, it is considered very poor, 2 is Poor, 3 is Fair, 4 is Good, and 5 is Excellent. From the results of the table above, the first trial obtained the following scores:

1. Learnability: Obtained a score of 3.67, which is the average of the scores obtained per person for the Learnability questions. This score indicates that users can learn the application reasonably well.
2. Efficiency: Obtained a score of 3.5, which is the average score for the Efficiency questions. This score indicates that users consider the application to be reasonably efficient in supporting business processes.
3. Memorability: Obtained a score of 4, which is the average score for the Memorability questions. This score indicates that users can remember the application's usage flow quite well.
- 4.Errors: Obtained a score of 4.25, which is the average score for the Errors questions. This score indicates that users did not encounter many errors while using the application, showing reasonably good performance.
5. Satisfaction: Obtained a score of 3.5, which is the average score for the Satisfaction questions. This score indicates that the testers were relatively satisfied with the application during the testing, showing a reasonably good level of satisfaction.

For the second iteration of testing, the scores obtained are as follows:

1. Learnability: Obtained a score of 4, indicating that users can learn the application well.
2. Efficiency: Obtained a score of 3.75, indicating that users still consider the application to be reasonably efficient in supporting business processes.
3. Memorability: Obtained a score of 4, showing that users can still remember the application's usage flow quite well.
4. Errors: Obtained a score of 4.5, indicating that users encountered fewer errors during the testing, indicating a nearly excellent level of performance.
5. Satisfaction: Obtained a score of 3.75, indicating that the testers were still relatively satisfied with the application during the testing, showing a reasonably good level of satisfaction.

### 3.5 System Testing



**Fig.27.** Implementation of Application

After implementation and testing with two iterations, it was found that the application showed improvement after making adjustments. In the black box testing, there were no failed features, and in the usability testing, there was an increase of 5.726872228%. The application

also proved to be beneficial in aiding the owner's decision-making process regarding which menu items are popular and should be sold daily and weekly.

## 4 Conclusion

The conclusions drawn from this project are as follows: First, the development of an Android-based point of sale application has successfully facilitated transaction recording at Warung Prasmanan Shafira. The application can efficiently track daily income and the most popular menu items based on transaction data. Second, the black box testing resulted in a success rate of 90.48%, indicating that the application functions as intended, but some improvements are needed to address the issues encountered during testing. Third, the usability testing scored 75.43%, indicating that the application performs reasonably well, but there are areas for improvement, such as user experience and font size. The last one, after conducting the second iteration of testing, it was found that there were no failed features in the black box testing, and the usability testing showed an improvement of 5.726872228%.

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