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Mobile Point of Sales (Mi-POS) Application for Cashiers Using React Native Framework A Case Study at Fajar Jaya Snack Shop

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ABSTRACT

Toko Snack Fajar Jaya is one of the small and medium enterprises (UMKM) located in Surakarta. The store is selling snacks in both bulk and retail. The store's current system still relies on manual bookkeeping which causes errors and uncertainties in data management and sales reports. For example, the shop owner sometimes receives a monthly report that is not synced with the real product stock in the store. To solve these problems, a mobile application called Mi-POS is proposed using React Native framework to facilitate the development process. The application has functionalities to record customer transactions, view customer transaction history, manage product inventory, and print receipts. The development process of the system adopts the SDLC waterfall method. The method consists of several steps, starting from requirement analysis, design application, design interface, coding, testing, and, lastly maintenance. To ensure the application's quality and effectiveness, several testing strategies are involved such as using Black-box Testing and System Usability Scale (SUS). Results from Black-box Testing showed that all the features can run smoothly with an error rate of 0%. Meanwhile, SUS testing showed a score of 63.4, which falls in the "OK and usable" category indicating that the application can be adapted to support users' business activity.

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1. INTRODUCTION

Technology has had a significant impact on society over time, affecting not only the upper middle class but also the lower middle class. This is because of technology's ability to facilitate various activities. One example is the widespread use of Android smartphones, as said by [1], nearly 25% of the Indonesian population, or around 65 million people, use Android devices. Many of these users use them for both business and daily life [2] such as snack business. However, some individuals like the owner of Fajar Jaya Snack Shop, continue to rely on manual methods for tasks such as sales transactions and inventory management, instead of utilizing technology. This can lead to difficulties in running their business, as stated by [3].

One example of difficulties is the potential for errors when calculating the total purchase price for customers, particularly when buying in large quantities. These mistakes can lead to financial losses if not handled properly. As said by [4], using manual bookkeeping methods can lead to difficulties in record-keeping and can cause further issues.

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2. RESEARCH METHOD

The research was conducted at Fajar Jaya Snack Shop located in Surakarta. In order to gain a deeper understanding of the needs and requirements of the snack shop owners and cashiers, the research employed a qualitative approach. The data was collected through direct observation at the research site and interviews with the snack shop owners and cashiers. This allowed the researcher to gain a more subjective and personal perspective of the problems and needs of the shop owner and cashier. Then, in the application design, the method used is the Software Development Life Cycle (SDLC) model Waterfall Method. The method is adopted because of its systematic and sequential approach to software development and has been widely used in development [6]. The steps in this method include Requirement, Design, Implementation, Testing, and Maintenance. This can be seen in Figure 1.

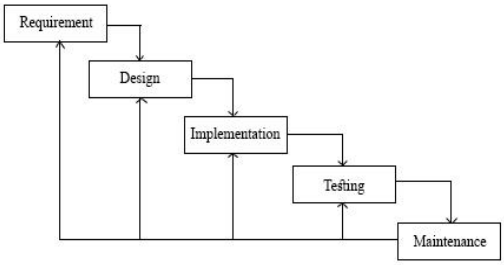

Figure 1. Waterfall Diagram

2.1. Direct Observation and Interviews

Direct observation at the research site and interviews were performed to gain a deeper understanding of the needs and requirements of the snack shop owner and cashier. The objective of direct observation was to observe the current processes of transactions that happen in the shop. The researcher spent several hours at the shop, observing the work of the shop owner and employees, and took notes on the processes and procedures used in the operation of the shop. In the meantime, interviews are performed to understand the experiences of the shop owner and employees during the transaction, using a questionnaire that covered various aspects of the business, including the types of products offered and the pricing. Their opinions and suggestions will be used for the development of the application to ensure the needs. The observation carries several findings such as the system needs two types of users i.e., cashier and administrator. It requires one database server to store the product and transaction record and also a Bluetooth printer to print the customer transaction receipt.

2.2. Requirement

The initial step is to identify the functional and non-functional requirements after gathering all necessary data. Functional requirements refer to the features and functions that the system should have, as per [7], while non-functional requirements include the software and hardware needed for the system's development, as stated by [8]. These requirements are described in Table 1.

Table 1. Requirement Analysis

No	Requirement	Description
1	Functional	• Admin can create, change and/or delete cashier accounts. • Admin can create receipts. • Admin can create, view, change and/or delete items. • Admin can view and delete transaction history. • Cashier can create receipts. • Cashier can view items. • Cashier can view transaction history. • Cashier can change their account password.
2	Non-functional	• The application is run on an Android device. • The application is made on a computer. • The application can print receipts. • The application is designed with a default computer program. • The application is made with the React Native framework. • Writing application code using Visual Studio Code.

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2.3. System Design

1. Use Case Diagram and Activity Diagram

According to [9], the use case diagram contains an explanation of the interactions that actors can have with the application. This designed application has two actors, namely the admin, and the cashier. Meanwhile, then Activity Diagram contains the system workflow of an application. This is as said by [10], this diagram describes the system process that users can do. This can be seen in Figure 2.

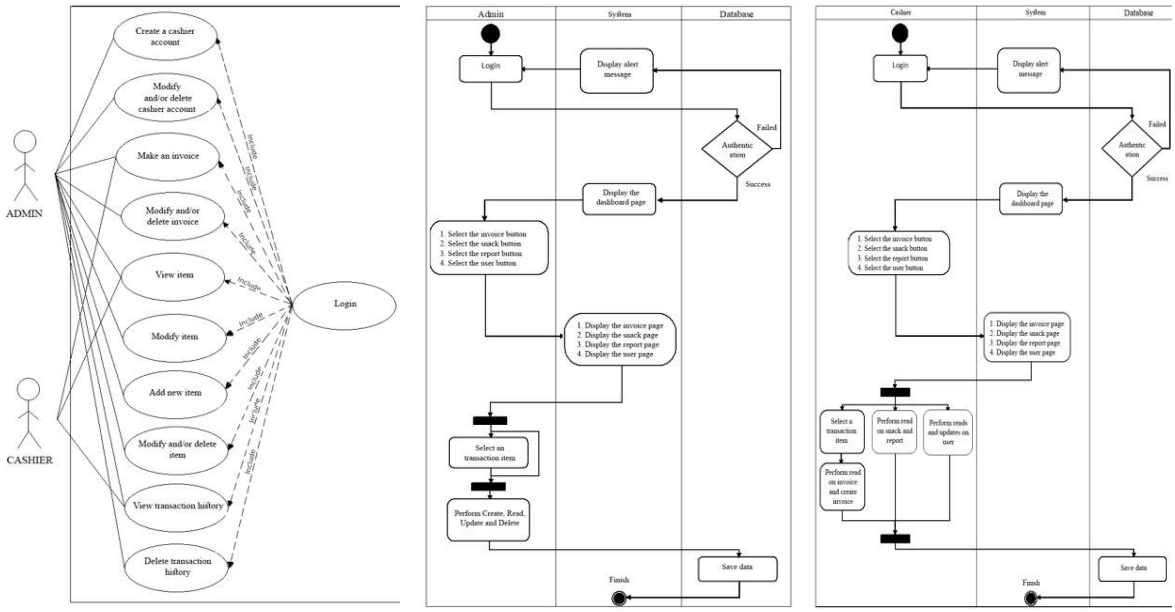

Figure 2. Use Case Diagram, Admin and, Cashier Activity Diagram

2. Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is a description or modeling of the relationship between one entity and another. This diagram helps to plan the database that will be used in the application later [11]. This is explained in the following Figure 3.

3. Mockup

Mockup is a representation of the application interface, and Balsamiq Mockup software will be used because it is a popular choice among developers [12]. In addition, according to [13], this software offers a variety of templates to aid. The interface that will be developed is divided into 5 sections.

a. Login page and dashboard page

The login page is the initial page that distinguishes the type of account. Once the user has logged in, the dashboard page appears, which contains a menu of features, as depicted in Figure 4.

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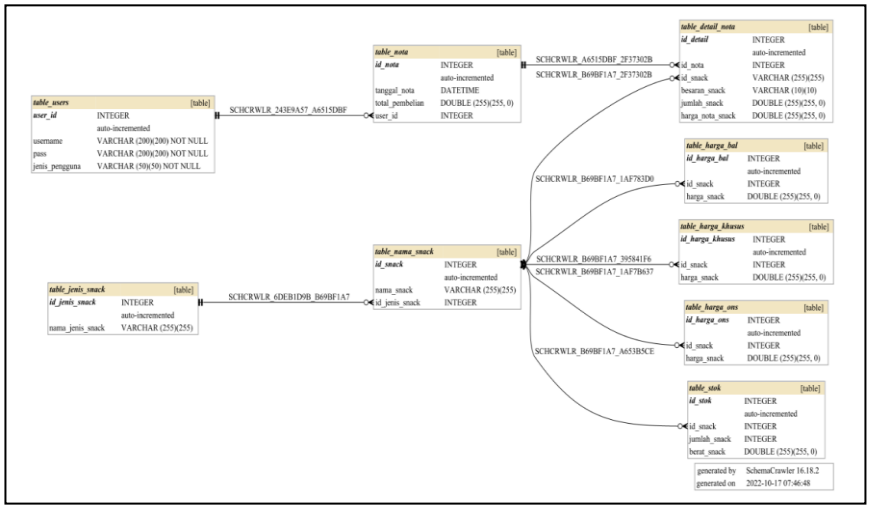

Figure 3. Entity Relationship Diagram

Figure 4. Login Page and Dashboard Page Mockup

b. Receipt Page

The page allows creation a receipt/transaction that will be printed and stored in the database. No functional restrictions between admin and cashier accounts, as seen in Figure 5.

Figure 5. Receipt Page Mockup

c. Snack Page

The snack page allows for the management of snack items, including adding, editing, and deleting. There is a difference in access between admin and cashier accounts, where the admin has full control over the snack items, while the cashier account is limited to viewing the items. This can be seen in Figure 6.

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Figure 6. Snack Page Mockup

d. Report Page

The report page contains transaction history. There is a difference in access between admin and cashier accounts, which the admin has full control over, such as deleting while the cashier account is limited to viewing. This can be seen in Figure 7.

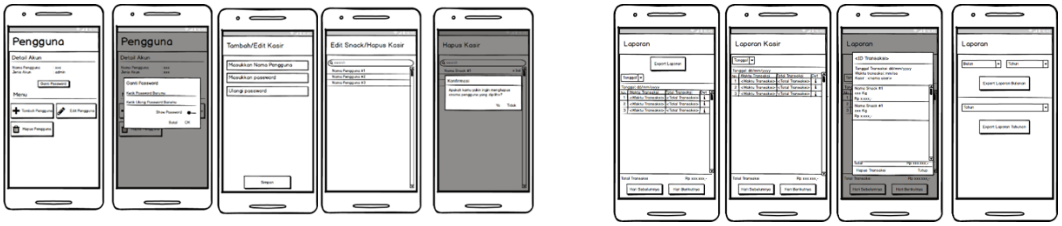

Figure 7. User Page and Report Page Mockup

e. User Page

This page is used to manage or manipulate user data. In the admin account, there are features to add, edit, and delete cashier accounts and change their passwords. However, in the cashier account, you can only see your username and change your password. This can be seen more clearly in figure 7.

2.4. Implementation

The next step is about creating the application using the modeled system design. This starts with creating an SQLite format database, which is used because it provides better performance than other Android databases such as Firebase [14]. Then, React Native framework is used for application development as it allows real-time code changes and is more popular than others [15]. Visual Studio Code is also preferred due to its lightweight nature and features that aid development as a text editor. During development, an emulator with Android version 5.1.1 is used to test the application's appearance and functions. The outcome is a "apk" file that can be installed on an Android device.

2.5. Testing

After the application is made, it will be tested using Black-box Testing and System Usability Scale (SUS). Black-box Testing focuses on the software's functional specifications with the test data sought as the output as expected, while SUS is a method of usability testing using 10 scales that provide a comprehensive view of the user experience. The basis for the assessment of this test is obtained from the experience felt by the user when using the application. SUS is done in the form of an online questionnaire with 10 questions as can be seen in Table 2, and scores range from 0 to 100. The SUS score assessment can be seen in Figure 9.

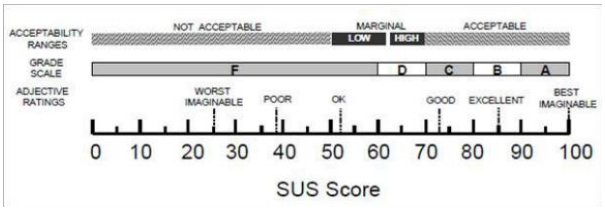

Figure 9. SUS Score

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The questionnaire scores are calculated by answered score will be subtracted with 1 (q-1) from odd questions and on even questions, the answered score will be subtracted from 5 (5-q). The final result is obtained by multiplying the total points by 2.5. This method is applied to all respondents, including 25 shop owners, cashiers, and members of the general public.

2.6. Maintenance

This step aims to monitor the performance of the application in the field. This step also includes fixing errors that were not present in the previous step.

Table 2. Requirement Analysis

Statement
I think I will use this app again
I find this app complicated to use
I find this app easy to use
I need help from other people or technicians in using this application
I feel that the features of this app are working properly
I feel there are many inconsistencies (mismatches in this app)
I feel others will understand how to use this app quickly
I find this system confusing
I feel no obstacles in using this application
I need to familiarize myself first before using this app

3. RESULTS AND DISCUSSION

3.1. Results

In this sub-chapter, we will discuss the results obtained from the application development process that has been carried out.

1. Login Page and Dashboard Page

Figure 10**.** Login Page and Dashboard Page

Figure 10 shows the login page, where the user must enter a correct user id and password to access the system according to the account rights. After logging in, the dashboard page appears, with four buttons; create a note for new transactions, snack for managing snack data, report for viewing transaction reports, user to manage user data, and a logout button to exit the system.

2. Receipt Page

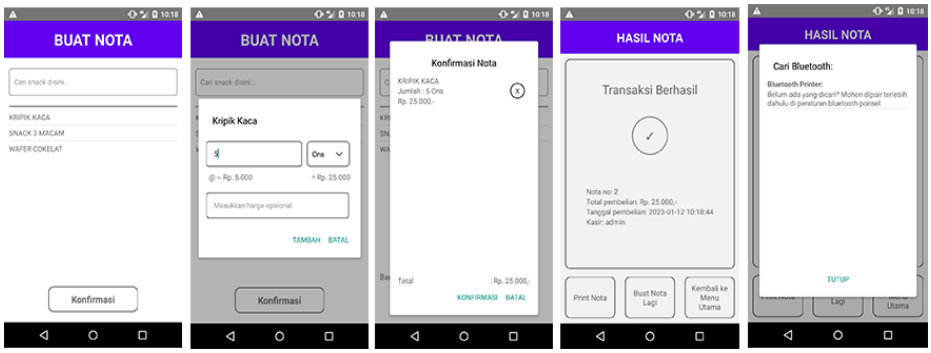

Figure 11. Receipt Page

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Figure 11 is a receipt page where the admin user or cashier will enter the snacks that the customer will buy into the cart. After finishing putting it into the cart, the user will confirm first before the transaction is entered into the database. When the transaction has been entered, the user can print the receipt or create another receipt.

3. Snack Page

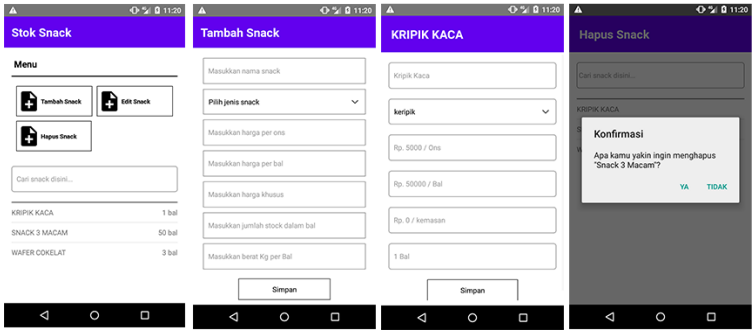

Figure 12. Snack Page

Figure 12 is a snack management page for checking, adding, editing, and deleting snacks. Users on this page are divided into cashiers and admins with different access rights. Cashier users can only check snacks while admin users have full access.

4. Report Page

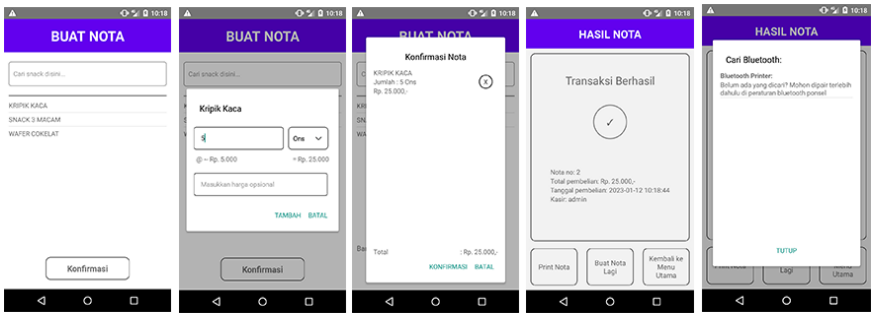

Figure 13**.** Report Page

Figure 13 is used to check reports, and delete transactions. Checking can be done per transaction on the selected date, per day in a month, and per month in a year. However, deletion can only be per transaction and can only be done by the admin.

5. User Page

Figure 14 is a user page used to manage user accounts. Users on this page are divided into 2 namely admin and cashier. Admin users can manage users by adding, editing, and deleting cashier accounts. Then, the cashier user can only edit the password on his account.

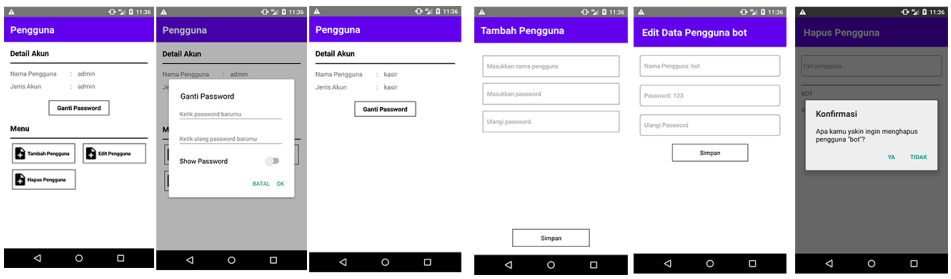

Figure 14. User Page

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3.2. Testing and Discussion

1. Black-box Testing

The following are the results of Black-box testing conducted on the Mi-Pos mobile application. These tests include functionality, ease of use, compatibility, performance, and security tests. The results of each test are shown in Table 3.

Table 3. Black-box Testing

Criteria	Scenario	Expected results	Test results
Login Page			
Login button	If user id and password are correct	Users can enter the dashboard page and access features that match their access rights.	Valid
	If user id and password are incorrect	The system displays an error message and the user cannot enter the application.	Valid
Dashboard Page			
Receipt Button	Pressing the create Receipt button	Users can enter the Receipt creation page	Valid
Snack Button	Pressing the snack button	Users can enter the snack page	Valid
Report Button	Pressing the report button	Users can enter the report page	Valid
User Button	Pressing the User button	Users can enter the user page	Valid
Receipt Page			
Click on the snack name	Pressing the snack to be made a receipt	The system displays the Receipt input dialog	Valid
Confirm button	If there is already data in the cart	The system displays a receipt confirmation dialog	Valid
	If there is no data in the cart	The system displays an error message	Valid
Back to the main menu button	Pressing the back to the main menu button	Users return to the dashboard page	Valid
Snack page			
Add, edit and delete Snack button	Pressing the add, edit, and delete snack button	Users enter the add, edit, and delete snack page	Valid
Report page			
Select month button	Pressing the select month button	The system displays a dialog to select the month and year	Valid
Select date button	Pressing the select date button	The system displays a dialog to select a date	Valid
Select Year	Pressing the select year button	The system displays a dialog to select the year	Valid
User page			
Password change button	Pressing the password change button	The system displays the password change dialog	Valid
Add, edit, delete User button	Pressing the add, edit and delete user button	Users enters the add, edit, delete user page	Valid

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2. Usability Testing

Table 4. SUS score calculation

Respondents	Questionnaire Calculation Score										Total	Score (Total x 2.5)
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10		
1	3	3	4	3	3	3	3	1	0	3	26	65
2	3	3	3	3	3	3	3	1	3	3	28	70
3	3	2	3	3	3	2	3	1	2	1	23	57,5
4	4	0	4	2	4	0	4	0	4	0	22	55
5	4	2	2	1	3	1	2	2	4	0	21	52,5
6	3	3	3	2	3	2	3	1	3	3	26	65
7	2	3	2	1	2	1	3	1	1	2	18	45
8	3	4	3	4	3	3	4	1	1	4	30	75
9	0	1	4	3	3	4	3	0	1	4	23	57,5
10	3	3	3	3	3	2	2	2	3	3	27	67,5
11	4	4	4	4	4	4	4	0	0	4	32	80
12	1	3	3	3	3	3	3	1	1	3	24	60
13	4	3	3	3	4	3	3	1	1	3	28	70
14	3	3	3	3	3	3	3	1	3	3	28	70
15	3	3	3	3	4	4	3	1	1	2	27	67,5
16	2	2	3	1	2	2	3	1	2	2	20	50
17	2	3	3	2	2	1	3	1	3	2	22	55
18	3	3	3	4	3	3	3	1	1	3	27	67,5
19	3	4	4	3	4	4	2	0	2	4	30	75
20	3	3	3	3	2	3	3	1	1	3	25	62,5
21	2	3	3	3	3	3	3	1	3	3	27	67,5
22	3	3	3	2	3	3	3	1	3	3	27	67,5
23	3	3	3	1	3	3	3	1	1	2	23	57,5
24	3	2	2	1	3	1	2	1	3	2	20	50
25	3	3	3	3	3	3	3	3	3	3	30	75

Table 4 is the result of calculating the SUS score of 25 respondents. Then, after being calculated as a whole and averaged, a score of 63.4 is obtained which is Grade D which is included in the OK category with Marginal Low.

4. CONCLUSION

The mi-POS application has been successfully developed to meet the requirements of the Fajar Jaya Store in recording customer transactions, viewing transaction history, product inventory, and printing transaction receipts. The system is successfully deployed on Android phones. To access and store the data, the application requires communication between the application and its database using SQLite. Ensuring the quality of the system is a crucial part, and therefore; several tests are conducted such as using black-box testing and SUS testing. The results from Black-box Testing showed that all features ran smoothly with an error rate of 0%. Meanwhile, SUS testing showed a score of 63.4, which falls in the "OK and usable" category, indicating the application is acceptable to users but further improvement and development are still needed.

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