Implementation of Data Collection and Payment Control Systems Automatically Using Android - Based QR Code

Afifah Nur Fauziah[1], Abdul Rasyid [2], Rieke Adriati W. [3]

[1,3] Digital Telecommunication Networks Study Program, [2] Telecommunication Engineering Study Program
Departement of Electrical Engineering, State Polytechnic of Malang, Indonesia
[1] afifahhnurfauziahh@gmail.com, [2] abdul.rasyid@polinema.ac.id , [3] riekeaw@polinema.ac.id

Abstract— **The wider spread of the use of smartphones is also very helpful for UMKM not only in terms of marketing or sales, but daily operations. On the Senyum Manis cafe, the business owner conducts data on stocks of goods, materials, and prices for drinks manually. When doing the process of collecting the goods manually there is an error in stock calculation so that it takes a long time to check the stock of the item. QR Code consists of black points and white spaces arranged in the form of boxes and each element has its own meaning. With this innovation using the application of QR Code which can be used as a label in every stock of goods and beverage materials. In this case the implementation of the RFID tag is also used to get the customer queue number. From this researcher the system is considered successful because the data input can appear in the application, QOS (Quality of Service) test results when uploading data get a 33K throughput value that belongs to the medium category, Packet Loss produces a value of 0.097% which is classified in a very good category, average delay produces a value of 87.4 s which is classified in a very good category. Review a review of the cashier system and the warehouse admin This aims to anticipate changes that will occur, the review is useful to see the condition of whether the system is in accordance with the needs of a sweet smile cafe and whether it is necessary to add or change the existing system in order to keep up with development technology.**

Keywords: Data collection systems, payment systems, Quality of Service (QOS), QR Code, and RFID.

I. INTRODUCTION

UMKM are trading businesses managed by business entities or individuals that refer to productive economic businesses. Although the targeted business scale is not as big as a company, many people are comfortable doing business at this level [1]. The latest technology is easier to do to increase the growth of the MSME business because of the ease of the system. Smartphone is a device with advanced technology and functions similar to the operation of the computer and easier [2].

In this study a case study was taken at the Senyum Manis cafe which was a business in the field of beverage sales in Penanggungan Village, Klojen, Malang City. When doing the process of collecting the goods manually there are many errors in stock calculation so that it takes a long time to check the stock of goods [3].

The solution to overcome this problem is to create an innovation to take advantage of the Quick Response Code or QR Code feature on the control system for data collection of goods and beverage materials [4]. QR Code consists of black points and white spaces arranged in the form of boxes and each element has its own meaning [5]. With this innovation using the application of QR Code which can be used as a label in every stock of goods and beverage materials.

RFID devices are currently widely used for several business fields such as hospitals, libraries, and are also used for the process of tracking an object [6].

RFID implementation has not been found in the field of UMKM business [7]. In this case the RFID tag implementation is used to get a customer queue number.

RFID technology services show a technology that is consistent, accurate, easy to learn, and flexible [8].

On the web interface, the raw material information has been stated, how to access the web interface of the goods data must be registered first, then it can log in. After the log in a second display appears, namely the data information from the name of the raw material, type, number to the QR Code symbol [9].

II. METHOD

This research is a type of research, manufacturing or development. To answer the formulation of the problem, the stages of making system design are needed, the design of tools, preparation of tools and materials, determining parameters, implementation of design, up to the formation of a suitable system.
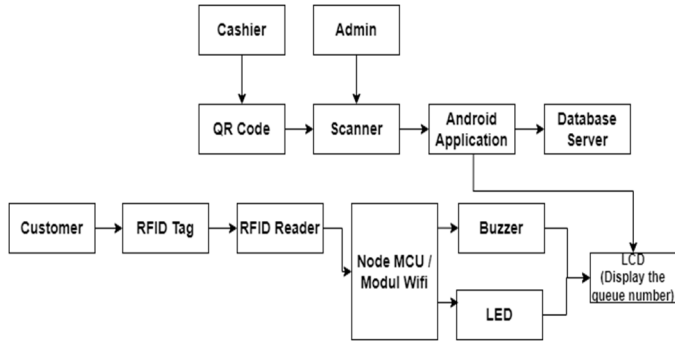
A. Block Diagram of System

Figure 1. Block Diagram of System

Fig. 1 shows about the system diagram block in the research conducted. Users (cashier or admin) login first to the application to enter the system. The application is connected to the local network contained in the sweet smile cafe. After the user logs in the smartphone, the OTG cable is connected to the smartphone and QR Code Scanner. If the user enters as an admin, the user can change the stock of raw materials that enter, position, and user data. If the user enters as a cashier, users can directly make payment transactions and print receipts. Data will be stored on the database server. When customers come can tap the RFID card that has been provided. If the card is tapped, the RFID module will read the customer queue number indicated by the buzzer sound, the LED lights will turn on and the queue number will appear on the LCD and on the cashier system. Then the cashier will process orders with the QR scan of the beverage available with a scanner, after completing the cashier order can print receipts in PDF form.

B. Quality of service (QoS)

Quality of service is a measurement that shows the quality of network data packages. QoS aims to help users increase productivity by ensuring that users get reliable performance from network -based applications. In this measurement using four parameters namely delay, packet loss, and throughput [10]. QoS Parameter is shown in Table 1:

TABLE I
QOS PARAMETER INDEX

Nilai	Presentase (%)	Indeks
3,8 - 4	95-100	Very Good
3 – 3,79	75 – 94,75	Good
2 – 2,99	50 – 74,75	Currently
1 – 1,99	25 – 49,75	Bad

As for some things that we can make a reference as a network performance includes:

1) *Throughput:* Throughput is the speed of effective data transfer, measured in BPS. Throughput is the total number of successful packages that are observed at the destination during a certain time interval divided by the duration of the time interval [11]. Network performance based on Tiphon standards for throughput parameters is as follows:

TABLE II
THROUGHPUT PARAMETERS

Throughput (%)	Indeks	Category
76 – 100	4	Sangat Bagus
51 – 75	3	Bagus
26 – 50	2	Sedang
<25	1	Buruk

To calculate the throughput value:

$$Throughput = \frac{The\ amount\ of\ data\ sent\ \left(\frac{byte}{s}\right)}{Delivery\ time\ (time\ span)}$$

2) *Packet Loss:* Packet loss is a parameter that describes a condition that shows the total number of missing packages, this can occur because of several possibilities, among others, overload in a network, collisions in the network, errors that occur in physical media, failures that occur on the receiving side, among others, it can be caused by the router buffer over flow or congestion [12]. Network performance based on Tiphon standards for Packet Loss parameters is as follows:

TABLE III
PACKET LOSS PARAMETERS

Packet Loss (%)	Indeks	Category
0≤p<3	4	Very Good
3≤p<15	3	Good
15≤p<25	2	Currently
>25	1	Bad

To calculate the packet loss value:

$$Packet\ Loss\ (\%) = \frac{(Data\ package\ sent - The\ data\ package\ is\ received)}{Data\ package\ sent} \times 100$$

3) *Delay:* Delay is the time needed by the data to travel from origin to destination. Delay can be influenced by distance, physical media, congestion or long processing time [13]. Network performance based on Tiphon standards for the delay parameter is as follows [14]:

TABLE IV
DELAY PARAMETERS

Delay (ms)	Indeks	Category
<150	4	Very Good
150 - 300	3	Good
300 - 450	2	Currently
>450	1	Bad

To calculate the delay value [15]:

$$delay = send\ time - receive\ time$$

C. Data Flow Diagram (DFD)

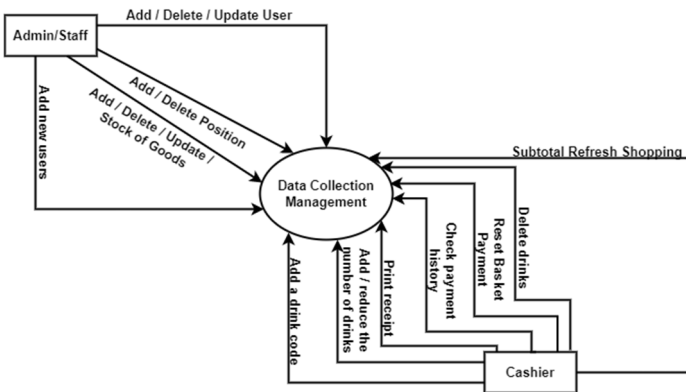Data Flow Diagram of this system is shown in Fig 2 below:

Figure 2. Data Flow Diagram

Fig. 2 Explain the following data collection management application:

1) *Admin/staff:* The admin is tasked with adding, removing, renewing stock of goods, adding, removing positions, adding, deleting, renewing stock of goods, and adding new users.

2) *Cashier*: The cashier uses the application to refresh subtotal shopping, delete the wrong beverage data, reset the payment basket, check the history of payment, print transaction receipts, add or reduce the number of drinks, and increase the drink code.

D. Flowchart System Works

The following sub -chapters will discuss the way the data collection and payment system works.

1) *Admin Flowchart:* The admin flowchart will be discussed how the admin system works starting from the QR scanning to entering the database. Fig. 3 is a sequence carried out by the admin, which is done the first time, namely logging in using the username and password that has been provided. Then it will enter the Sap application initial page as an admin, where there are various menus, namely the job page, user, and goods. In the position menu, the admin can add names and positions, in addition to adding new position data the admin can edit the name of the position and delete positions if the user is no longer working. On the user page, the admin can add new users by adding names, usernames, passwords and new positions. Admin can also update the latest user data, and delete old users. Then on the item page, there are 2 menus namely add new items and edit goods. In the adding menu admin item can add the name of the item, item code, price, and amount of stock. On the item editing page, the admin can change the name of the item, item code, price, amount of stock according to the condition of the existing goods.

2) *Payment Flowchart:* The payment flowchart will be discussed how the payment system works. In the system, the cashier and admin pages are distinguished. When the cashier is successfully logged in, it will enter the "Welcome Cashier" page, and is done according to the system, as explained in the Fig 4.
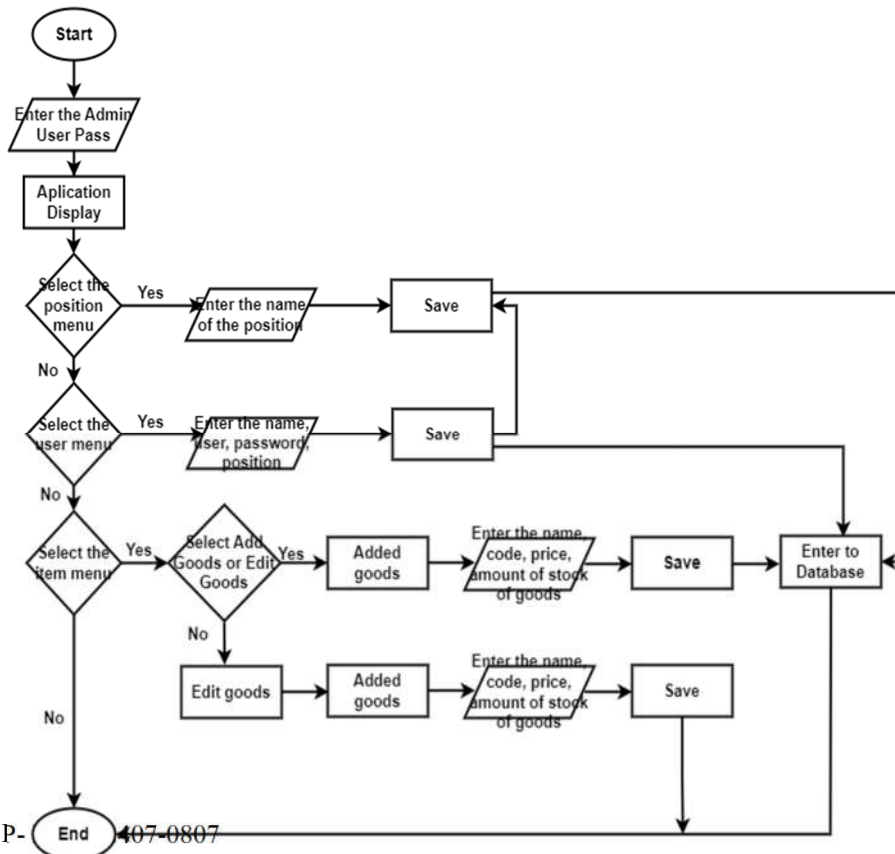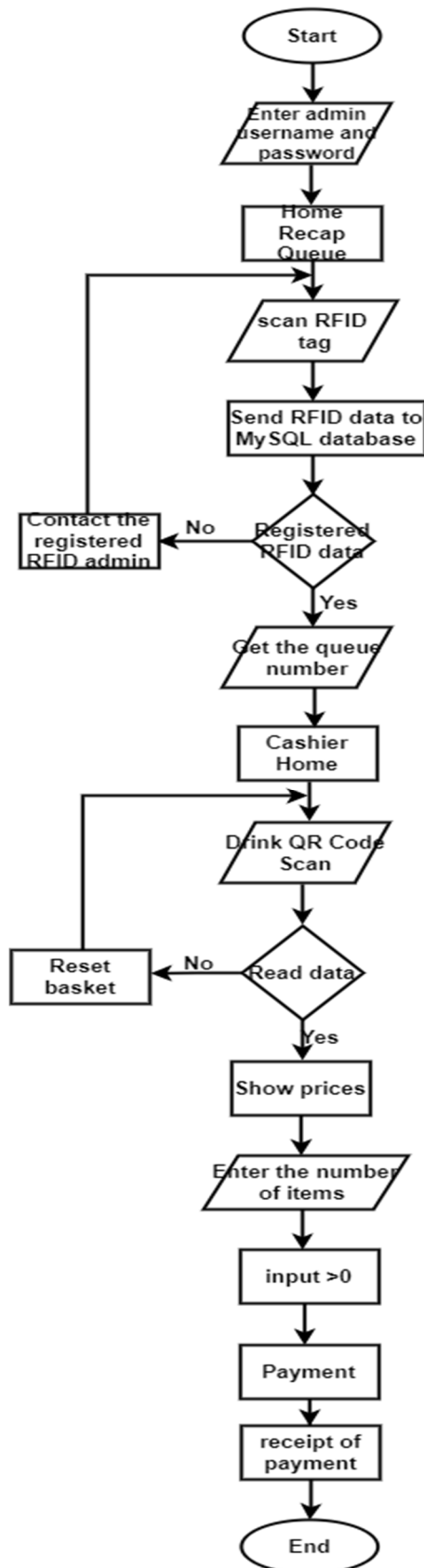
Figure 3. Flowchart of Admin

Figure 3. Flowchart of Payment

Fig. 4 explains the process on the payment application page. Cashier enters using the username and password that has been provided. Then the pages of the home -up of the queue will appear. Then, the card tag customers in the RFID module, the queue number data will be sent to the database. If the RFID data is registered, the customer will get the queue number and will automatically enter the home page, but if the RFID data is not registered, it will automatically contact the database and re -tag it on the RFID. After getting the queue number, the cashier can scan the QR Code on the drinks ordered by the buyer. If the data is read, it will display the price, if the data is not read, the cashier must reset the basket and re -scan the drink QR code until it is read. After the price appears in the application, the cashier can add the amount of drink. Then the payment process by the customer, after the payment process is complete, a purchase receipt will appear in the form of a PDF file that can be used for the purchase archive.

III. RESULTS AND DISCUSSION

This chapter will discuss the application check. Testing is carried out to determine the system that runs in accordance with the specified system. The application checking in the form of installation/installation and checking features on several different types and versions of Android smartphones. And the Quality of Service (QoS) testing uses the Wireshark application.

A. Application Interface Results

The login page is the initial page that will be displayed on the application. On this page the user can log in as an admin or as a cashier. On the user login form can enter the username and password.

Figure 5. Application Interface Results

1) Admin Page: The first page after the login successfully displays the start page. There are 5 choices that can be made by the admin, namely position, user, goods, discount of goods, and logout/exit as admin. The display page is shown in the following image:
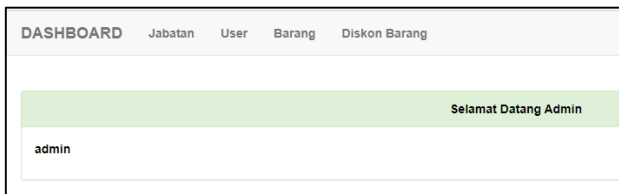
Figure 6. Admin Page

2) Payment Page: After logging in as a successful cashier, the initial display of the application will appear there is a RFID data feature, queue recap, transaction history, and there is a hand and loading symbol that shows that RFID is in standby position. In RFID data there is a table that shows the queue number, user, transaction date, customer arrival time, and payment. After getting the queue number, the cashier can process payments. The display page is shown in the following image:
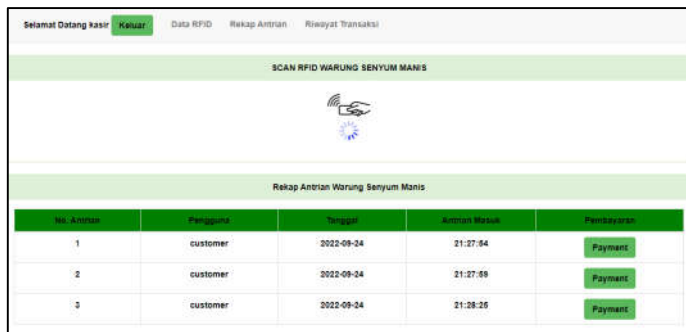

Figure 7. Payment Page

B. Discussion of Application System

The results of the application system testing will be discussed by comparing the display on the application and database. If the data is complete, it will appear in the application and database display.
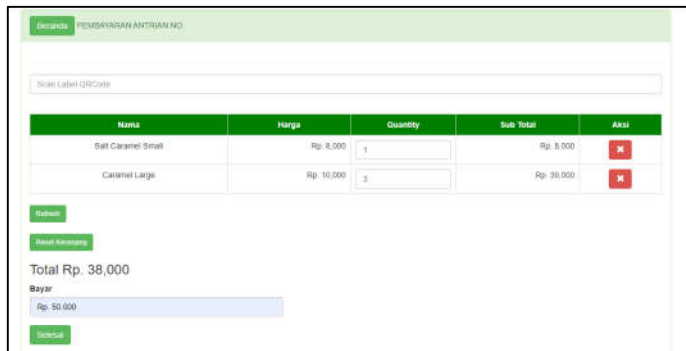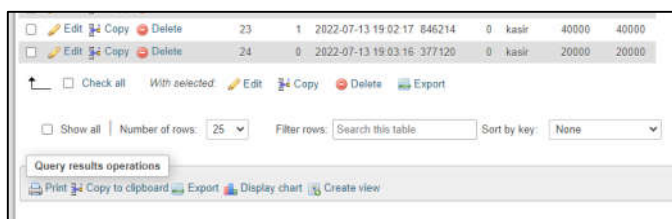

Figure 8. Application Page

Figure 9. Database Page

Fig. 8 and Fig. 9 show the application display on the payment menu and database display. Because the data in the application display is synchronous with the database, the system is successful. This shows in Fig. 8 data has entered the database, so that the application page will appear as shown in Fig. 9.

C. QR Code Results

The results will be discussed about the results of the QR code of the goods that have been made. QR Code Items and Beverages are made using the QR Code Generator available on the website https://id.qr-code-generator.com/ by entering the desired name or goods code or drink. QR Code is made based on the name of the item that is usually used in a sweet smile cafe and a list of available menus.

TABLE V
QR CODE RESULTS

No.	Raw Material Name	QR Code Results
1.	Large Cup Glass	
2.	Medium Cup Glass	
3.	Small Cup Glass	
4.	Sweetened Condensed Milk	
5.	Creamer	
6.	Sugar	
7.	Thai Tea	
8.	Boba	

| 9. | Little Straw |
| 10. | Big Straw |

ID Barang	Kode	Nama	Harga	Jumlah Stok	Aksi	
33	GelasCupBesar	Gelas Cup Besar	80000	150	Edit	Hapus
34	GelasCupMedium	Gelas Cup Medium	60000	127	Edit	Hapus
35	GelasCupKecil	Gelas Cup Kecil	45000	87	Edit	Hapus
36	SusuKentalManis	Susu Kental Manis	15000	7	Edit	Hapus
37	Creamer	Creamer	45000	2	Edit	Hapus
38	121Gula	Gula	13500	5	Edit	Hapus
39	ThaiTea	Thai Tea	35000	3	Edit	Hapus
40	764Boba	Boba	18000	3	Edit	Hapus
41	SedotanKecil	Sedotan Kecil	25000	50	Edit	Hapus
42	SedotanBoba	Sedotan Besar	29000	15	Edit	Hapus

Figure 10. Application Page

Fig. 10 shows the display of the application of the results of the QR Code of Goods / Raw Materials in Table 5 QR code that appears on the application page in accordance with the code created previously, and has been stored in the database. This shows that the scanner can read the code that has been created, so that the item/raw material code can be stored in the database and the Android application display will be like Fig. 10.

Figure 11. Minimum Distance

Figure 12. Maximum Distance

Fig.11 and Fig.12 are minimum and maximum distance reading of the QR code reading on the BS-895 VSC type scanner. Fig.11 shows the minimum distance of the scanner reading, which starts from 4 cm and Fig.12 shows the maximum distance of the scanner reading, which is 45 cm. This shows that the QR code will not be read if the user is scanned at a distance below 4 cm and above 45 cm. If the code has been read, the data will be stored in the database, the data can be seen by opening the XAMPP application, then pressing the "Start" Apache and MySQL buttons, then opening a web browser and type http: // localhost/phpmyadmin/. So that the code that has been created will appear on the display of the Android application that was previously designed using the Visual Code application.

TABLE VI
TABLE DISTANCE SCANNING QR CODE

No.	Distance (cm)	Results
1.	0	Not Successful
2.	2	Not Successful
3.	4	Succeed
4.	8	Succeed
5.	10	Succeed
6.	20	Succeed
7.	30	Succeed
8.	40	Succeed
9.	45	Succeed
10.	47	Not Successful

D. *Hardware Design Results*

In the image the hardware design results will be shown, and hardware testing will be carried out using the card tap distance and the results that match the application display.
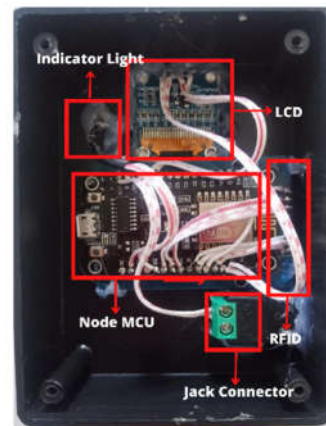

Figure 13. Hardware design results

Figure 14. Image when the card is tap

Figure 17. Maximum Distance

Fig.13 is a picture of hardware design results. Fig.14 shows the hardware that has been connected to the connector jack, when it is connected the LCD will light up and the words "Tap ID Card, your queue:". If the customer taps the RFID card, the RFID card can be tapped with a maximum distance of 3 cm as shown in Fig.14, then the indicator lights light green if the RFID tag / card is posted on the RFID module, on the LCD website display the queue number appears shown with Fig.15. If the customer uses another card, the indicator lights will turn on longer, on the website display the words will appear "Maaf kartu tidak dikenali" as shown in Fig.16 and the queue number does not appear on the website.

This shows that customers will get a queue number if using a card whose data is already stored in the database, when the card is still not registered in the database, the customer will not get the queue number, so that the Android application display will appear "Sorry your card is not recognized". Customers can tap cards with a maximum distance of 3 cm, as shown in Fig.17.

TABLE VII
CARD TAP DISTANCE

No.	Distance (cm)	Result
1.	0	Succeed
2.	1	Succeed
3.	2	Succeed
4.	3	Succeed
5.	4	Not Successful

Table 7 shows the minimum and maximum distance of the user/customer in tapping RFID. If the user taps more than 3 cm, the customer will not get a queue number.

Figure 15. Application Page

IV. CONCLUSION

The control system of data collection of goods and payments using QR Code is read using a scanner VSC type BS-895 with a reading distance of 4 cm to 45 cm so that the data is stored in the database using XAMPP and the data will appear on the Android application. Android programming used to display data stock, price, and beverage materials on Android applications that have been designed using Visual Code. So that the user can easily operate the control system of data collection and payment. Use of RFID in getting a customer queue number, with LCD display and Android application display. RFID card reading has a maximum distance of 3 cm. Needs to be held to the cashier system and the warehouse admin, this aims to anticipate changes that will occur, the review is useful to see the condition of whether the system is in accordance with the needs of a sweet smile cafe and whether it is necessary to add or change the existing system in order to keep up with development technology. Review needs to be held

Figure 16. Application Page

to the cashier system and the warehouse admin, this aims to anticipate changes that will occur, the review is useful to see the condition of whether the system is in accordance with the needs of a sweet smile cafe and whether it is necessary to add or change the existing system in order to keep up with development technology.

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