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Mobile-Based Customers Management System in Ayunadi Supermarket

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Abstract

Ayunadi Swalayan is one of the retail companies that still relies on offline stores as the product marketing medium which makes Ayunadi Swalayan has difficulty in promoting their product to the customers. Ayunadi Swalayan needs the member data as well as the transaction data done by the members in order to convey the promotion. Furthermore, Ayunadi also needs an online product marketing medium which can make them able to compete with other more advanced retail companies. From those problems, therefore, it is needed to build a system that can manage the member data and the member transaction data as well as a medium to promote the product and convey the promotions to the customers. The system built is a mobile-based items ordering application by utilizing the push notification feature to convey the promotions, meanwhile the data such as the member data and the member transaction data are managed through the website. Member management system developed using Software Development Life Cycle (SDLC). The stages in the SDLC are the requirements, design, development, testing, and evaluation phases. The testing phases of the system are: (1) black-box testing method, (2) compatibility approach, and (3) portability approach. According to the result of the testing, it shown that the system built are able to manage the member data, the transaction member data, including sending the promotional messages and creating reports through the website. Meanwhile, the mobile application is able to run the items ordering process and receive the promotional messages which are sent through the website.

Keywords: member management system, black-box, compatibility, portability.

1. Introduction

The customers loyalty and their satisfaction are one of the factors that must be considered by the business men, especially those who engaged in retail companies. The retail companies as the bridge of the items distribution process to the customers have to maintain a good relationship with the consumers in order to increase the commerce.

Along with the development of technology, currently there are so many retail companies that use computerized systems to support their operational systems as well as mange the data needed by the company. In order to increase the sales of products, some of the retail companies, especially the modern retail companies, have a mobile application to help them in promoting their product through online. Apart from being a product marketing medium, the application also has a function as a medium to convey promotions to the customers so that it can increase the customers loyalty. However, there are also some retail companies that still promoting their product by using the offline stores. If these retail companies do not innovate and refuse to develop, it will most likely lose in competition with the other retail companies that have more advanced way of thinking. One of the companies that still promote their product through the offline stores is Ayunadi Supermarket. Ayunadi Supermarket is one of the modern retail companies that provides various daily needs of the community. The average transaction numbers per day is 1.000 transactions with a total approximately 15.000 items. Along with the huge numbers of transactions indicated that Ayunadi Supermarket is trusted by the community.

Currently Ayunadi Supermarket uses a computerized system to support the operational system of the company. However, the company does not have the customers data management since it does not yet apply the member system. The weaknesses in informational system owned by the company have resulted the lack of information in the side of the customers. The customers' information is really important for a company in formulating promotion strategies because it can help the company to retain the loyalty of Ayunadi's customers. Retaining customers who have shopped in Ayunadi is an important thing for the company since retaining the existing customers is cheaper than creating the new customers [1].

In order to solve the lack information from the side of the customers, Ayunadi Supermarket needs to develop a customer management system in conducting the shopping transactions. This article describes a website and mobile-based customers management system. The customers can become a member in Ayunadi Supermarket by installing a member application on their smartphone. The use of mobile-based member application is easier for the customers since nowadays, the use of smartphones has become a daily habit for everyone [2]. Apart from become a member, this application can also be used to order items in Ayunadi Supermarket so that the customers do not need to come directly to Ayunadi Supermarket since they can order the items through the application. The existence of the application is hoped to help Ayunadi to develop promotional strategies so that it does not lose in the competition amid the rapid development of information and communication. This article structured into some sections, those are: the related works in section 2, research methodology in section 3, results and discussion in section 4, and conclusion in section 5.

2. Research Method

The software development of Ayunadi Supermarket customers management system used software development lifecycle (SDLC) method. The SDLC model used in this article was the waterfall model. In the waterfall model, each phases have to be completed before starting the next phase [3]. The phase in waterfall model included the requirements analysis, designing, development, testing, and evaluation [4]. Picture 1 shows the phase in the software development of Ayunadi Supermarket customers management system.

Requirements analysis is a phase to gather the features and information requirements that are the system output. The results of collecting system requirements then become the basis for the design phase. At the design stage, the architectural system design is developed with the object-oriented approach. The design generated is a system overview and a use case diagrams. The design phase is continued with the development phase, wich is the system development phase using the Flutter and PHP programming languages. The results of the system development phase then tested in the testing phase. The testing phase is a system trial phase with compatibility and protability testing methods for the web and mobile applications. The last

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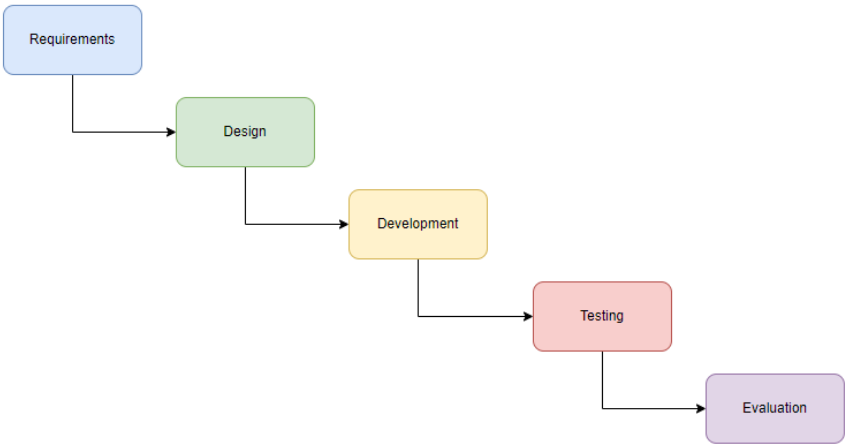
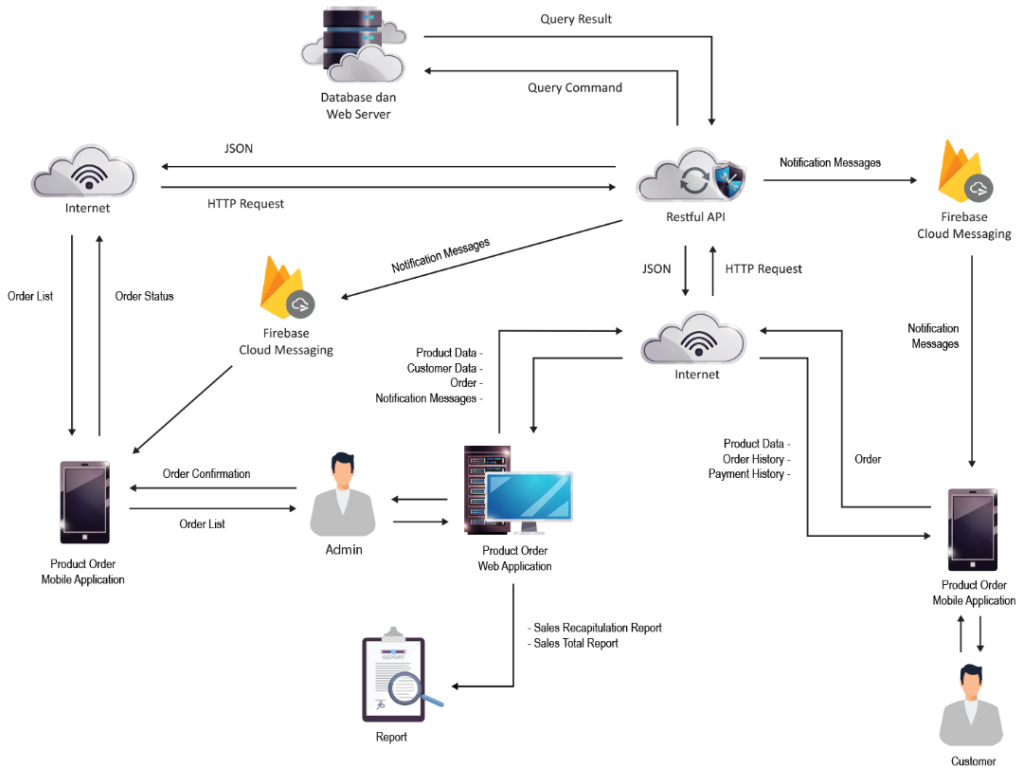
phase is the system evaluation for the designed system feature using the blackbox testing method.



Picture 1 The Waterfall Model of Customers Management System

2.1 System Overview



Picture 2 The System Overview

The customers management system in this article are built in two platform, namely website and mobile. Figure 2 shows the overview of the customers management system. The website application will be used by the admin to manage the data of the customer order data, customers data, and the items data of Ayunadi Supermarket. Meanwhile, the mobile application can be used by the admin and the customers. The customers can place an order through the

application, while the admin can confirm customer orders before processed. The data integration between the website and mobile application is conducted by utilizing RESTful API through the internet connection. The system will also be equipped with notification feature in which the mobile application installed by the customers will be able to receive the message notification sent by the admin of Ayunadi. The notification feature will use the Firebase Cloud Messaging service.

2.2 Literature Review

There are several studies that discussed about the online ordering. The first study conducted by [5]. This study described the problems faced by the Sumarno Jaya Depok Building Store in which the lack of promotional medium has resulted that the Sumarno Jaya Depok Building Store was not well known by the community. The solution given were applying a web-based online service and ordering system. The system was hoped to be able to help the Sumarno Jaya Depok Building Store so that it could improve the service and store order as well as the promotion medium to develop and advance the store in the future.

The next study was conducted by [6]. The study discussed about the production unit of SMK Grafika (Vocational School Grafika) that engaged in printing and their operational activities were still using a conventional system to place orders. It usually caused problems in which the customers sometimes felt difficulty in making an order since they have to come directly to the printing place. The solution given to solve the problems was by creating an android-based ordering application that could make the process of ordering transaction in the production unit of SMK Grafika become easier. In addition to simplify the transaction process, the existence of this application also hoped to help the production unit of SMK Grafika in conveying the information to the customers related with the item types and the price of the items produced by the production unit of SMK Grafika.

In this article, the system built was not only able to order items, but also record the member data including every transaction done by the member. The ordering application created in a mobile platform, meanwhile the system to manage the data in Ayunadi was built in website platform. The website will be devoted to the admins for managing various data in Ayunadi Swalayan. Furthermore, the mobile application is aimed to the customers or member of Ayunadi Swalayan. Through this mobile application, the customers can find the items they want to order, store items into the cart, as well as receive promotion through the notification send by Ayunadi. The communication between website platform and mobile application will use the RESTful API.

3. Findings

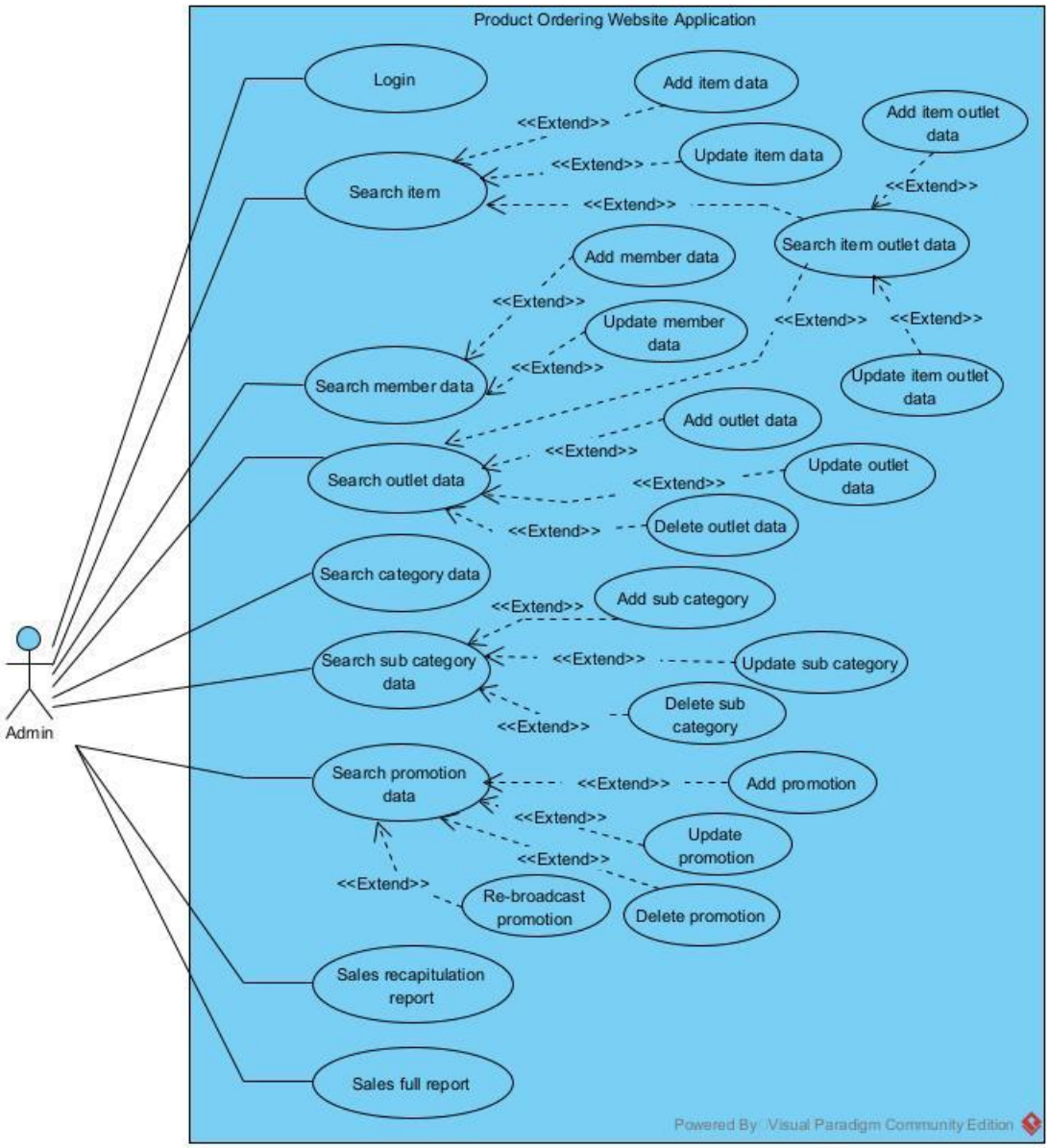
3.1 Problem

The ordering system consists of 2 ordering applications with different bases. First is website-based application and later is mobile-based application. The website-based application is fully used by Ayu Nadi, while the mobile-based application is intended for customers and Ayu Nadi. Using different bases requires an accessible API by both applications. This problem is solved by building an API based on Restful API.

In addition, problem were found in implementing Android-based mobile applications due to variations in Android devices screen size, device spesification, device configuration, and the differences in screen notch. For this reason, application testing and user interface adjustments were made on several Android devices so that the mobile application was comfortable to use and the screen notch did not interfere.

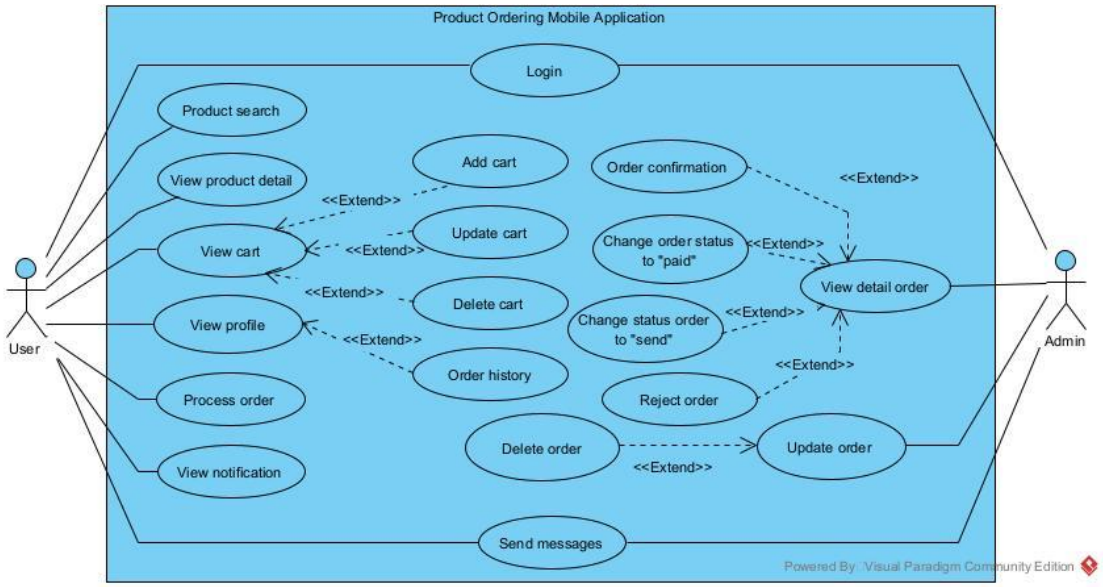
3.2 System Design

The use case diagram or use case is a modeling for information behavior system that will be made. Use case is used to find out what kind of functions included in the information system and who has the right to use these functions [7].



Picture 3 Use Case Diagram of Website Application

Picture 3 shows a use case diagram that explains about the interaction between the actor with the items ordering website application in which the admin has a role as an actor. What can be done by the admin are log-in into the website, searching item data, adding item data, changing item data, searching the outlet item data, adding the outlet item data, and changing the outlet item data. Moreover, the admin can also do searching for the member data, adding the member data, changing the member data, searching for outlet data, adding the outlet data, changing the outlet data, removing the outlet data, searching for category data. Furthermore, the admin can do searching for sub category data, adding the sub category data, changing the sub category data, removing the sub category data, searching about promotion data, adding the promotion data, changing the promotion data, removing the promotion data, as well as conducting rebroadcast promotion. In term of reports, the admin can achieve sales recapitulation reports and total sales reports.



Picture 4 Use Case Diagram of Mobile Application

There are two actors in the use case diagram shown in Picture 4, those are the user or the customers and the admin. In the ordering mobile application, the activities can be done by the users are log-in, searching goods or items even they can view the detail of the item from the application. The user can view the cart list, adding items to the cart, changing the order numbers of the items in the cart, removing items from the cart, viewing profile, viewing the order history that have been made, checking notification, as well as processing the orders and sending messages to the admins. Meanwhile, what can be done by the admin through mobile application are log-in, viewing the detail of the order, confirming the order, changing the order status into paid, changing the order status into sent, rejecting the order, changing the order, removing the ordered items, as well as sending the messages.

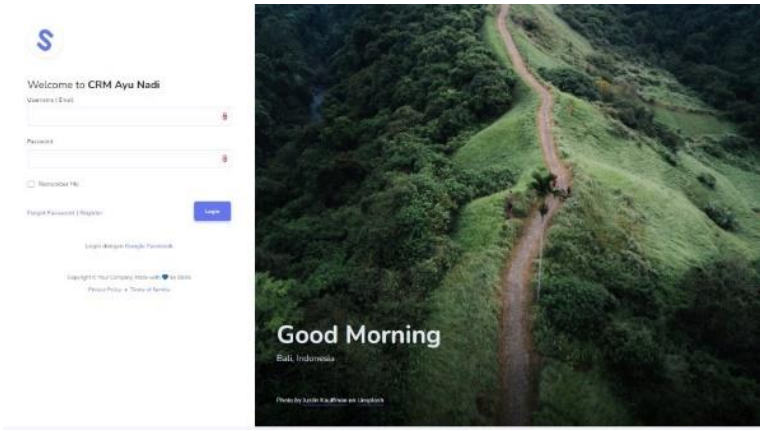
3.3 Research Implementation

At the implementation stage, the design or system design that have been made in the previous stage will be implemented into a complete system. The system implementation in this article were used Laravel framework to build the website application, and flutter framework to build the mobile application

3.3.1 Website Application

a.) Log-in Page

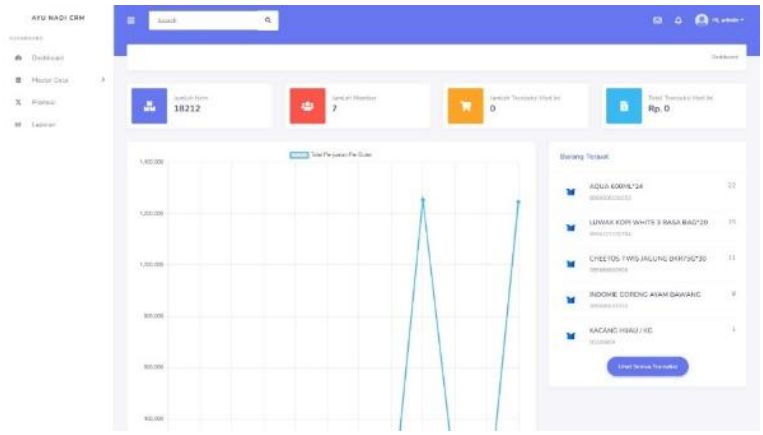
The log-in page (Picture 5) is the first page that appears when the admin opens the system. There is an input form to enter the username and password, as well as the log-in button on this page. When the username and password already filled with the information needed, use the log-in button to enter the system.



Picture 1 Log-in Page

b.) Dashboard Page

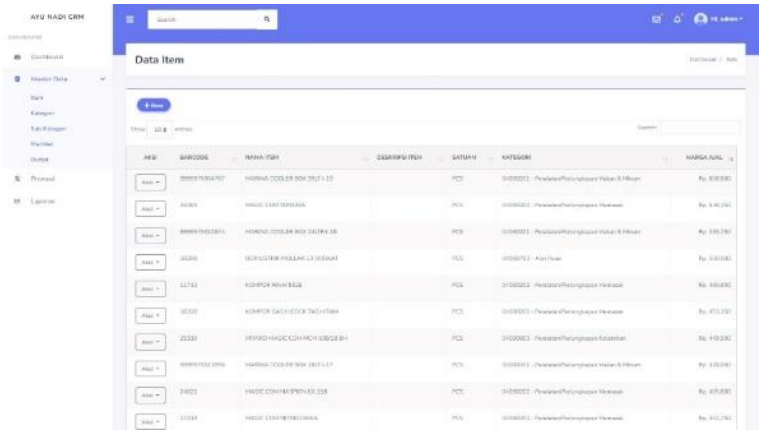
The first page that will be seen by the admin when they enter the system is called dashboard page (Picture 6). The dashboard page displays the information on the system such as the numbers of the item data in the system, the numbers of the member data, total transactions today, total transaction that occurred, as well as a graph that has function to show sales data per month. In addition, there is a section that shows the most purchased items.



Picture 2 Dashboard Page

c.) Item Data Page

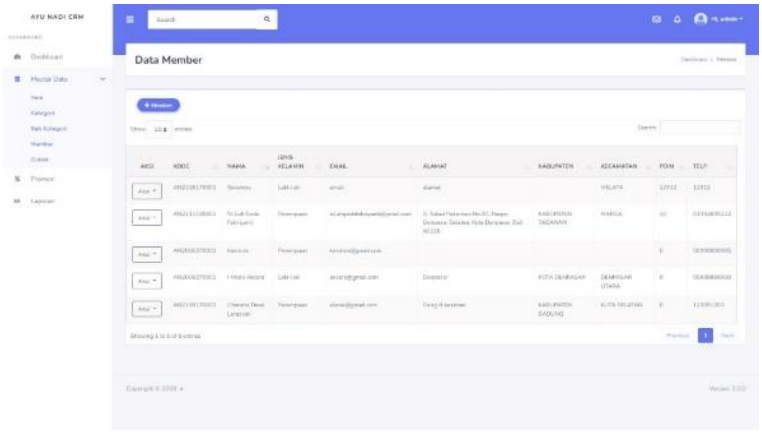
The data item page (Picture 7) displays the item data or the data of the goods on the system. There are some buttons on this page, namely the add item button to add a new data item, as well as the action button that consists of editing item data to change the selected item data, viewing item images to view the image of the selected item, and item outlets to add the selected items into the specified outlet. The admin can also find the item data by inputting the name of the item on the searching column of item data. The item data page can be accessed by clicking the Master Data menu and selecting the Item button.



Picture 3 The Item Data Page

d.) The Member Data Page

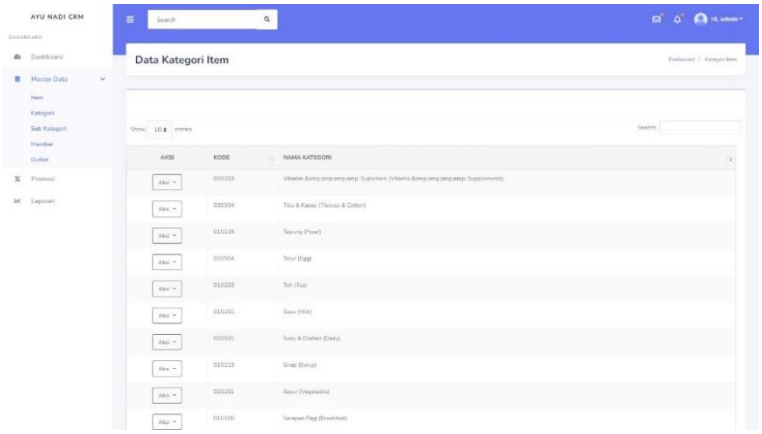
The member data page (Picture 8) displays the member data that has been registered in the system. On this page, there is an add member button to add a new member data, as well as the action button of editing member data to change the selected member data. The admin can also find the member data by inputting the name of the member in the member searching column. The data member page can be accessed by clicking the Master Data menu and selecting the Member button.



Picture 4 The Member Data Page

e.) Category Data Page

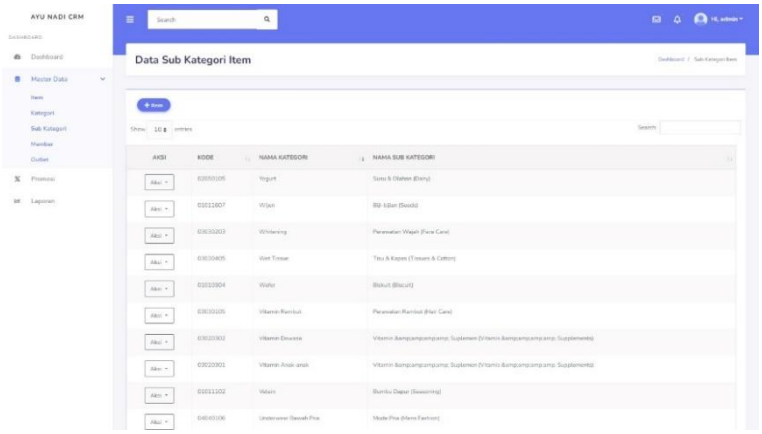
The category data page (Picture 9) shows the category data on the system. There is no adding or changing category data buttons on this page. The admin can only find the category data on the searching category data column placed on the top of the category data table.



Picture 5 The Category Data Page

f.) Sub Category Data Page

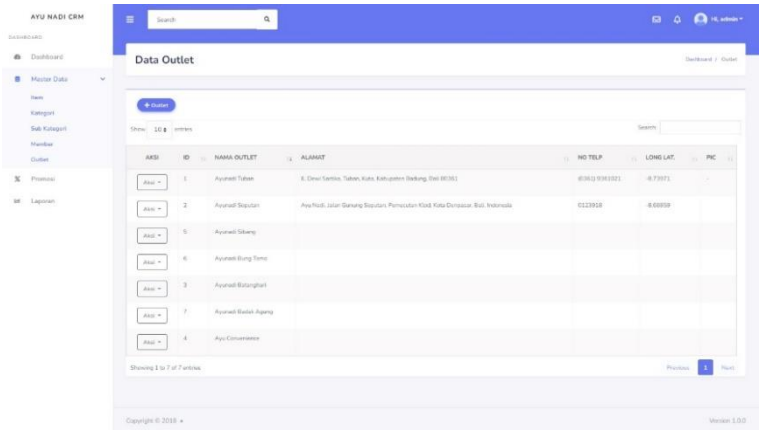
The sub category data (Picture 10) displays the sub category data on the system. On this page, there is an add sub category button to add the sub category data, as well as an edit sub category action button to change the selected sub category data. The admin can also find the sub category data by inputting the name of the sub category on the sub category searching column. The sub category data page can be accessed by clicking the Master Data menu and select the Sub Category button.



Picture 6 The Sub Category Data Page

g.) The Outlet Data Page

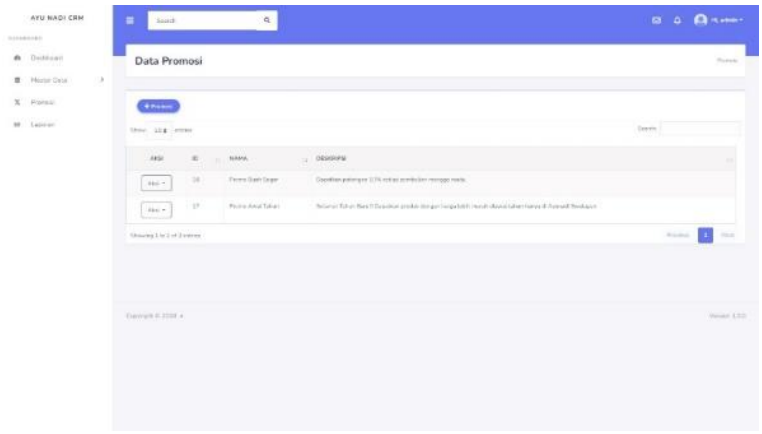
The outlet data (Picture 11) page shows the outlet data owned by Ayunadi. On this page, the admin can add new outlet data by clicking the add outlet button or changing the existed outlet data by clicking the change outlet data action button. There is also a search data outlet column to find the outlet data on this page. This page can be accessed by selecting the Master Data menu and selecting Outlet button.



Picture 7 The Outlet Data Page

h.) Promotion Page

The promotion page (Picture 12) displays the promotional data sent to the mobile application. There is an add promotion button on this page which has a function to add the promotional data which then will be sent directly to the mobile application, a promotion data edits action button to change the selected promotional data, a promotion data delete button to delete the selected promotional data, and a rebroadcast action button to resend the promotional messages to the mobile application. Furthermore, there is a searching column to search for the promotional data based on the title of the promotion.



Picture 8 The Promotion Page

i.) Report Page

The report page (Picture 13) will be displayed when the admin chooses the report menu. On this page, the admin can generate the report by clicking the generate button which will automatically download the generated report into Microsoft Excel format. There are two kind of reports that can be degenerated, those are the recapitulation of sales report and reports on total sales per selected outlet. Before generating reports can be done the admin needs to the admins have to fill the needed field. After filling the fields, the admin can press the generate button to download the reports.

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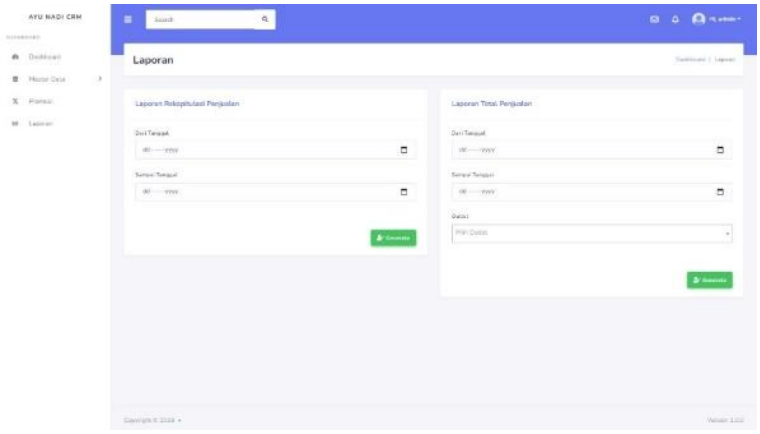

Picture 9 The Report Page

3.3.2 Mobile Customers Management System

a.) Mobile Log-in Page

The log-in page (Picture 14) will appear when the admin or the member opens the page for the first time. The log-in page mobile application displays the Ayunadi Swalayan logo and the input form to enter the email and password, there is also a log-in button to start the process of log-in. The admin and the member can log-in immediately after inputting the email and password, and clicking the log-in button. The member will be directed to the store selecting page if the log-in successfully done. Meanwhile, the admin will be directed to the page of the member order list.

Picture 10 The Mobile Log-in Page

b.) Home Page

The home page (Picture 15) will appear if the member has selected the store on the store selecting page. The home page shows the products of each store. At the top of this page can be found a searching column to access the searching page, notification icon to access the notification page, message icon to access message page and cart icon to access cart page in

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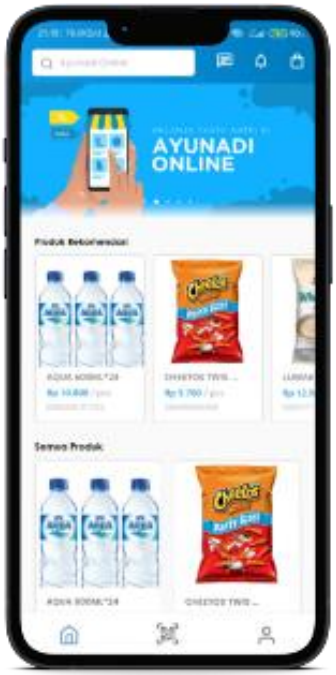
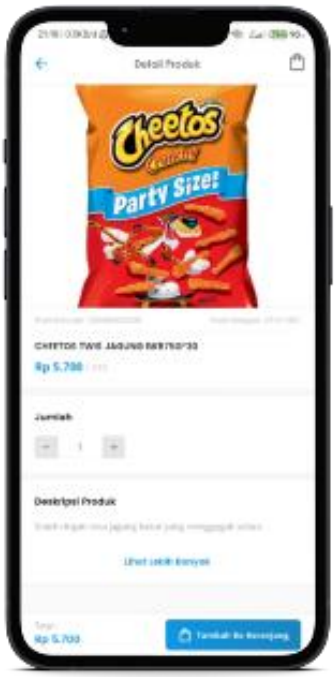
the selected store. Meanwhile in the middle page shows slide of images, recommended product for the members and every product in the selected store.



Picture 11 The Home Page

c.) Product Detail Product



Picture 12 The Product Detail Page

The product detail page (Picture 16) displays the detail information of each product or the selected items. This page shows the information such as item images, name of the items, price of the item, item unit, and the description of the item. On this page, there is a button to

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increase or decrease the number of the ordered items before being added to the cart. At the bottom of the page, there is a total price which can change according to the number of the entered order, as well as an add into the cart button to put the item into the cart.

d.) QR Code Page

The QR code page (Picture 17) shows the QR code of the member. The QR code page will be displayed when the member selects the QR code menu on the bottom navigation bar. There is a user name along with a registration menu on this page as well as a QR code on the middle part of the page. The QR code is used as the substitute of the member card and has a unique characteristic for each member. This QR code can be scanned when the member directly come to buy something at Ayunadi Swalayan.

Picture 13 The QR Code Page

e.) Profile Page

The profile page (Picture 18) consists of member identity. This page will be shown when the member selects the profile menu on the bottom navigation bar. This page displays the member photo, name of the member, registration number, email, telephone numbers, and the address. It also contains some menu that can be accessed by the member such as notification menu to access the notification page and order history menu to show the processed order of the member. There is also an exit button that has a function as a log-out button placed on the bottom of the page.

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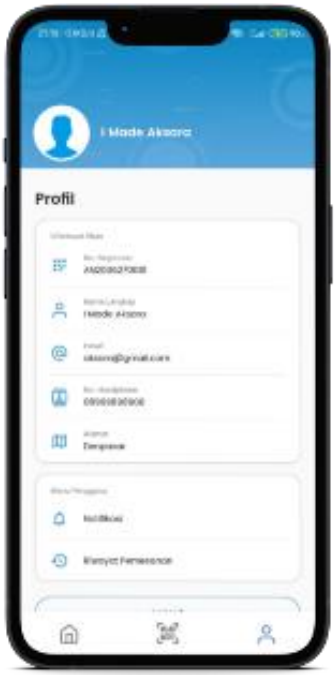

Picture 14 The Profile Page

3.5 System Testing

Measuring software quality is an essential step in the software development process. Conventional quality evaluations of software concentrate on specific quality characteristics [8]. Testing was caried out to assess the software quality. The testing system on the member system and mobile-based items ordering which was built by using testing methods, which were blackbox testing, compatibility testing, and portability testing. The blackbox testing method is a method that used to test a software without paying attention to the details of a software. The blackbox testing is used to detect several problems, such as functional errors, interface errors, data structure errors, function errors, termination and declaration errors [7][9]. Compatibility can be defined as how far a product, system or component can exchange information with the other product, system, or component, as well as being able to perform other required functions simultaneously especially when using the same hardware and hardware environment [10]. Meanwhile, portability can be described as the level of effectiveness and efficiency of a system, product, or component can be transferred from one hardware, software, or operational environment to others [10].

The blackbox testing was done to every page of the website and mobile application to test the functionality of the application. The compatibility testing was carried out on the mobile application in order to view the ability of the application in sharing the device resources with other applications. The portability testing was done on the mobile application to view whether the built mobile application is able to run on devices with different specifications.

3.5.1 Black Box Testing

According to the black box testing carried out on the system, it shown that every function in the website and mobile application could run well. The outputs produced when doing specific actions are in accordance with the expected results.

3.5.2 Compatibility Testing

The result of compatibility testing on the items ordering mobile application can be seen on the Table 1.

Table 1 The Results of Compatibility Testing

No	The Applications Run		The Results
1	The items ordering application	Whatsapp	both of the applications run well
2	The items ordering application	Chrome	both of the applications run well
3	The items ordering application	Play Store	both of the applications run well
4	The items ordering application	Youtube	both of the applications run well
5	The items ordering application	Facebook	both of the applications run well

According to the carried-out compatibility testing, it shown that the items ordering mobile application that has been built are able to share resources with the other application.

3.5.3 The Portability Testing

The result of portability testing on the items ordering mobile application can be seen on the following Table 2.

Table 2 The Results of Compatibility Testing

No	The Devices Name	Specification	The Results
1	Advan S5E	Screen: 5” (1280 x 720) RAM: 2 GB OS: Android 7.1	There are page components that displayed incorrectly
2	Samsung Galaxy J7 Prime	Screen: 5,5” (1920 x 1080) RAM: 3 GB OS: Android 8.1	The application can be installed and run well
3	Redmi Note 7	Screen: 6,3” (2340 x 1080) RAM: 4 GB OS: Android 9	Every function of the application run well

According to the portability testing carried out on some devices above, it can be seen that the items ordering mobile application can be displayed properly on devices with a screen size of 6.3”. Meanwhile, on the devices with the screen size of 5”, some components of a page displayed incorrectly. Regarding the performance, the items ordering mobile application can run properly on devices with Android 7.1 operating system and 2 GB RAM.

4. Conclusion

The stages in designing and creating a Member System and Mobile-Based Items Ordering System at Ayunadi Supermarkets are as follows: (1) The method used in data collection stage were the in-terview method, documentation method and literature review method. (2) The system designing stage used UML (Unified Modeling Language) starting from the usecase diagrams, narrative use-cases, activity diagrams, sequence diagrams, and class diagrams, as well as PDM (physical data model) for the design of the database. (3) The system implementation stage used the flutter frame-work to create the mobile applications and laravel to create the website applications. Meanwhile the push notifications were using firebase cloud messaging. The Communication between the mobile and website application used the Restful API which was built by using python. (4) The method used on the testing system stage were the

blackbox testing method, the compatibility method and the porta-bility method. The implementation of the Member System and Mobile-Based Items Ordering at Ayunadi Supermarkets for the members are including make items ordering transactions such as viewing item details, adding items to the cart, sending orders, and being able to communicate with admins through the application. Meanwhile, for the admin, they can process the member orders and can manage the existed data such as item data, category data, outlet data, sub-category data, member data, promo-tional data and reports via the website.

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