Applied Information Technology And Computer Science Vol. 2 No. 2 (2021) 1451-1462

AITCS

Homepage: http://publisher.uthm.edu.my/periodicals/index.php/aitcs
e-ISSN :2773-5141

A Mobile Application for Vegetables Retail Management

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DOI: https://doi.org/10.30880/aitcs.2021.02.02.092
Received 28 July 2021; Accepted 04 October 2021; Available online 30 November 2021

Abstract: The uses of smartphones in daily routine are playing a vital role and being widely used in this digital world. The rapid growth of the smartphone has increased the development of mobile applications. This trend became a significant factor for the transformation of the vegetables retail management procedures to be transformed from physical shop to online platform. The traditional way for vegetables retail management proceduresis highly time-consuming for transactions of selling vegetables to the customer and causes the difficulties to potential customers to get information about vegetables availability. The purpose of this study is to identify the limitations for the traditional way of vegetables retails management procedure without any mobile-based application and to develop a mobile application to manage vegetables retail management in a more systematic approach in order to resolve the existing problem. A mobile application for vegetables retail management is developed to be used on android-based smartphones. The android studio is used as the integrated development environment (IDE) in Java language with the integration of Firebase as the real-time database for Android development. The prototyping software process model is selected in the system development lifecycle for the development of mobile applications. By developing this mobile application, it allows the user to get access to important information without time-constraints and can purchase the desired vegetables. This technology helps to transform the existing vegetables retails management procedure to an online platform that could be conducted in a more efficient, effective and systematic way.

Keywords: Vegetables retail management, Mobile application, Android Studio

1. Introduction

The vegetables retail is known as one of the sectors for retail food items that normally the people will spend most of the expenditures to purchase the food items including vegetables in order to practices a healthy lifestyle [1]. Kotler and Armstrong [2] revealed that the conceptfor retailing is the process that includes all activities that involve selling goods or services to the final consumer for personal or non-business uses. Similarly, the process of retailing consists of those activities involved in selling directly to ultimate consumers is clarified [3]. From those definitions it is clear to be identified that vegetables retail management also includes those sequences of process that would help the ultimate customer to

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purchase desired vegetables and fulfil the buying needs. Meanwhile, the current practice for vegetables retail management for the owner of Soon's vegetables stall is applying traditional ways to sell the various kinds of vegetables to customers in the vegetables stall. They have provided various kinds of vegetables in order to let the customers to purchase or make an order directly from the physical stall. They pack the vegetables in packets per gram accordingly and sell them to the customers. The customer only can buy the desired vegetables within the operation hour of the stall. All the transaction information about the ordering and selling of vegetables are recorded manually in a file.Therefore, the existing process arises some problem such as there is no computer-based or mobile-based application to manage vegetables retail management procedures in a systematic way specifically for Soon's vegetables stall, the current practices cause difficulties to potential customers to get information about vegetables availability and making orders and the difficulties of owner to keep track transaction information about selling of vegetables.

This inconvenience triggers the idea about the development of a mobile application for vegetables retail management. The aim of this project is to develop a mobile application for vegetables retail management for the owner and staff of vegetables stall as well as a customer based on these three objectives which are identify the problem and limitation of retail management procedure without any computer-based or mobile-based application, design and develop a mobile application for vegetables retail management in order to solve the existed problem and evaluate proposed mobile application of vegetables retail management with the customer, staff and owner of Soon's vegetables stall.

The project is proposed in order to benefit the potential customer in many ways such that the customer can get access to important information about the vegetables 24/7. The customer can order and purchase vegetables easily. The customer can view the price and availability status of vegetables as well as make an order. The customer can search for information and price or product before they proceed for online purchasing or can gather the availability status of item and information prior to any purchase. It creates valuable time for customers and saves time and transportation as the customer does not need to go to stall physically. At the same time, the owner can manage the orders that are requested from the customer more effectively and efficiently in order to fulfil customer's demands as per needs.

2. Related Work

2.1 Mobile application

Mobile application is a software program designed to run and can be downloaded in smart devices. The convenience of using smart devices has resulted in the high growth of proliferation of mobile applications in recent years. The rich marketing data and ease of access to certain information on mobile devices help retailers get more sophisticated in reaching the potential customer [4]. The mobile applications in marketing create value for both the retailer and consumer as the transactions process or co-creation activities are accessible independent time and place [5]. The user of the mobile application can get the benefit of saving time and creating better shopping experiences derived from the ease of access using mobile applications anywhere.

2.2 Study of existing related system

The study of comparison in similar system with proposed system is carried out. Among system that has been selected are, Veggies.my, TM Farms and Fresh4u. Veggies.my [6] is an online store that available for the customer to place an order and purchase the vegetablesin the web-based platform. It also provides the delivery services for customer within the coverage area in Petaling Jaya. The customer can view the description and prices per gram about the vegetables. The availability status of vegetables is stated and the customer can select the items, add desired amount into the cart. The ease for online ordering and purchasing according to the customized categories of vegetables can let the customer to purchase the desired items convenience and fast.

TM Farms [7] which had been growing vegetables in Bukit Tinggi, Pahang since 2009 and offers several fresh deliveries to the customer and the deliveries are come in the form of boxes such as organic Asian Box, organic Western Box and original tropical fruits. They provide the delivery services mainly in Klang Valley on weekly basis. The customer can view the description about the several type of vegetables boxes and can select the items based on the size and add desired quantity into the cart. The customer can select specified delivery slot and zone and the customer needs to fill the contact information and delivery address for the process of shipping. The customer can make online payment through the method of credit card or bank transfer to the bank account.

Fresh4u [8] delivers fresh vegetables direct from farm to customer and provide the delivery service in coverage area Klang Valley only. They provide variety vegetables according to categories and family packages so the customer can select and choose the most desired items. The delivery service for ordered items is available on every Tuesday, Thursday and Saturday. The customer can select the items and add desired amount into the cart. The customer needs to fill the contact information and complete the shipping informationfor the confirmation of shipping details. The customer can make online payment through several method such as online bank transfer or credit, debit card.

Table 1 shows the comparison of existing systems with the proposed system which is a mobile application for vegetables retail management. The three related system are designed for websites platforms while the proposed system is going to be developed in mobile application which is portable and easy to access the information in anytime and anywhere.

Table 1: Comparison between existing system and proposed system

Features/System	Veggies.my	TM Farms	Fresh4u	Proposed system
Register account	Yes	Yes	Yes	Yes
Log into account	Yes	Yes	Yes	Yes
View the description about the item	Yes	Yes	Yes	Yes
View the availability status of items	Yes	Unable	Unable	Yes
Add desired item into cart	Yes	Yes	Yes	Yes
Delete desired item from cart	Yes	Yes	Yes	Yes
Search bar or filter for desired item searching	Yes	Unable	Unable	Yes
Schedule the delivery date and time slot	Can schedule	Can schedule	Unable	Can schedule
Method of payment	Online payment through payment gateway	Credit card, Online Bank transfer to particular account	Credit card, Debit card, online bank transfer	Cash on Delivery, Online banking
Mobile application platform	No	No	No	Yes

3. Methodology

Prototyping model is one of the project methodologies that can be used to structure or as a guide in a system development. The prototyping model allows the developer to perform the analysis, design, and implementation phase concurrently in order to develop the proposed system and provides a system for users to evaluate and give feedback. The process of iteration is carried out in order to refine the user requirements and the prototype produced enable it to satisfy the needs of the user. When the prototype is built, the errors for the previous unclearly requirement may be revealed. Thus, the system specification can be modified and refined in order to meet the user requirement. Figure 1 shows the phase of the prototyping model [9].

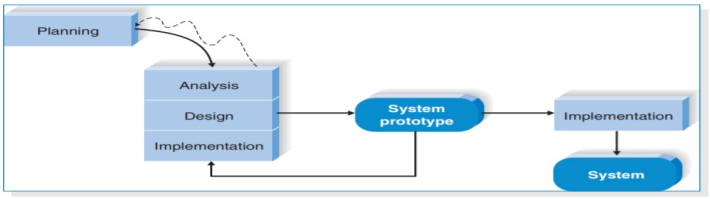

Figure 1: Prototyping Model

Each phase from the Prototype model is listed out based on the activities. Table 2 shows the summarize the software development activities of proposed system and their deliverables for each prototype phase.

Table 2: Software development activities of proposed system and their task

Phase	Activity	Deliverables
Planning	• Identify the existing problem for current procedures in vegetables retail management and project scope • Collect requirements from the interview, observation, propose a project proposal and project planning	• Project proposal of a mobile application for vegetables retail management • Gantt chart
Analysis	• Analyses the user requirements and information gathered • Discuss the activities for the proposed system	• User and system requirements are identified • Software and hardware requirements are listed • UML Diagram: Use case diagram, Sequence diagram and Class diagram
Design	• Design user interface and system database in the development process • Design wireframes	• Database dictionary • User interface • Wireframes
Implementation	• Implement the pieces of code in the integrated development environment (IDE) • Develop database	• Code program • Application developed using Android Studio • Develop database using Firebase
Testing	• Perform system testing • Perform user acceptance testing	• Test case

3.1 Analysis and design

This section discussesthe analysis and design for this project. All informationand data that have been collected will be analyzed in order to ensure that the system meets the objectives and user requirements. n. The system requirements need to identified clearly and it includes about the detailed descriptions of the system services which includefunctional requirements and non-functional requirements. The diagram such as use case diagram, class diagram and flow chart diagramare used in the system modelling to illustrate the activity structure and behavior of a mobile application for vegetables retail management.

3.2 Use case diagram

The use case diagram illustrates the functions of the system with the integration of interaction with the actor. By using the use diagram, the requirements of the system including internal and external influences of factors can be gathered and identified. The interaction among the requirements with actors for this project is shown in Figure 2.

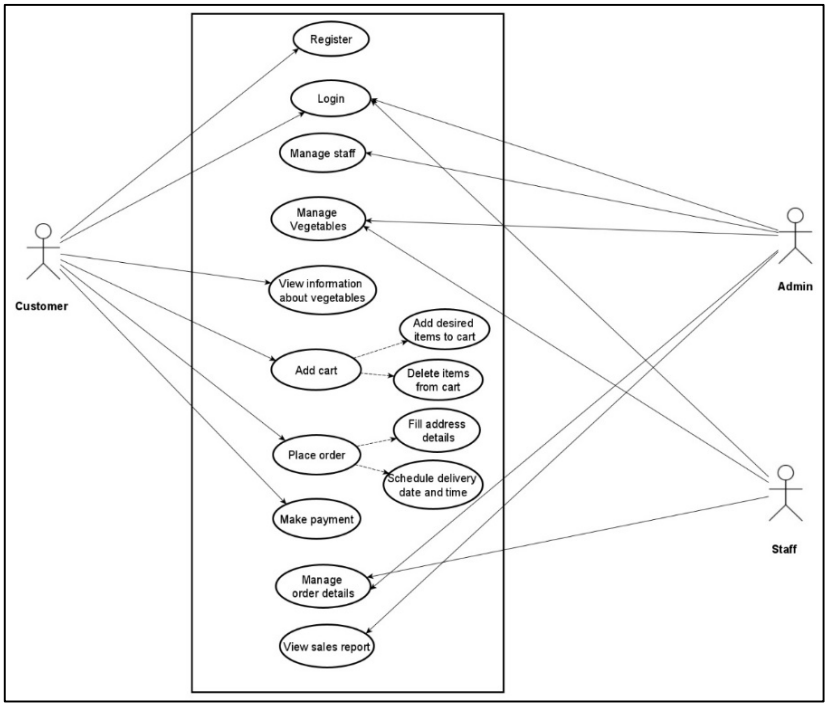

Figure 2: Use case diagram of a mobile application for vegetables retail management

3.3 Class diagram

Class diagram shows the classes, attributes, methods and relationships of the project for a mobile application for vegetables retail management. The class diagram illustrates the static model that supports the static visualization of the system. The class diagram for a mobile application for vegetables retail management is shown as Figure 3.

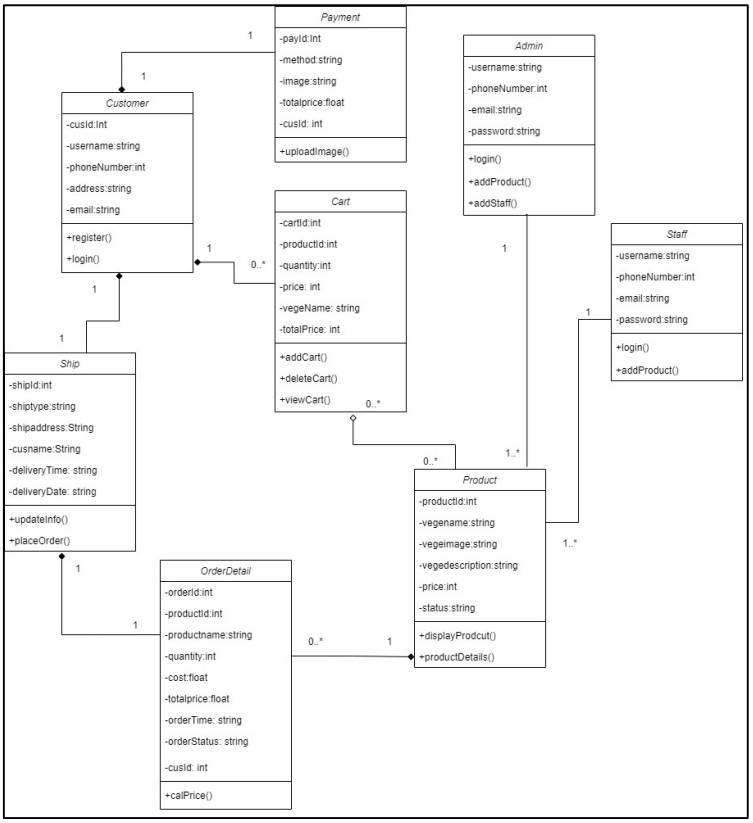

Figure 3: Class diagram of a mobile application for vegetables retail management

3.4 Flowchart diagram

The flowchart which illustrates the sequence process for a mobile application for vegetables retail management is shown as Appendix A. Before the customer can access successfully into the system, the customer will be asked to identify whether they already have a registered account or not. If the customer does not have a registered account, the customer needs to register for a new account while for the existing customer that has registered account, that customer can login into account. The customer can login into account by inserting the correct email and password for proceeding to the authentication process. The authorized customer with the correct email and password is allowed to enter the system. The login process for the user authentication is similar for the admin and staff. The admin and staff can only enter into the system by inserting the correct email and password.

The customer can direct to the dashboard page for the following activities. The customer is able to view the vegetables in detail. The customer can select the available vegetables and add it into the cart. The vegetables details in the cart will be displayed. The customer can add, delete the item in the cart. All the updated details about the vegetables in the cart will be shown and the subtotal of items are calculated. The customer can place an order and the delivery details such as address need to be filled and the specified date and time is selected. The customer needs to select the payment method in order to make the payment. The customer can view the ordered details once the order is successfully made. The admin can manage staff by adding new staff and delete the staff details. The admin and staff can manage product details such as adding new vegetables records, update the vegetables details and delete the vegetables records. The admin can manage the order from the customer. The admin and staff can either approve or update the status of the order. The admin is able to view the sales report about the vegetables.

3.5 Implementation

This section discussesthe implementation phase for this project.The pieces of code are integrated and the application is built. The implementation phase is carried out in order to make sure the application can be built compatibility with the functionalities and usability of the application based on the user requirements. A mobile application of vegetables retail management is developed using Android Studio IDE using Java programming language and extensive mark-up language (XML). Java programming language is used to code and execute the module while the XML is used to design the layout of user interface. Firebase is used as the database for the proposed application. Firebase real-time database need to configured and setup for the development of proposed application. Figure 4 shows the code segment for register user. Figure 5 shows the code segment for login by differentiating the role of user. Figure 6 shows the user interface of a mobile application for vegetables retail management.

```
private void createAccount() {
    progressDialog.setMessage("Creating Account...");
    progressDialog.show();

    //create account
    firebaseAuth.createUserWithEmailAndPassword(emailU, passwordU)
            .addOnSuccessListener(new OnSuccessListener<AuthResult>() {
                @Override
                public void onSuccess(AuthResult authResult) {
                    // account created
                    saveFirebaseData();
                }
            })
            .addOnFailureListener(new OnFailureListener() {
                @Override
                public void onFailure(@NonNull Exception e) {
                    //failed creating account
                    progressDialog.dismiss();
                    Toast.makeText( context: RegisterUser.this,  text: "" + e.getMessage(), Toast.LENGTH_SHORT).show();
                }
            });
}
```

Figure 4: Code segment for register user

```
private String email, password;
private void loginUser() {
    email = emailT.getText().toString().trim();
    password = passwordT.getText().toString().trim();

    progressDialog.setMessage("Logging In...");
    progressDialog.show();

    firebaseAuth.signInWithEmailAndPassword(email,password)
            .addOnSuccessListener(new OnSuccessListener<AuthResult>() {
                @Override
                public void onSuccess(AuthResult authResult) {
                    //login successfully
                    login();
                }
            })
            .addOnFailureListener((e) -> {
                    // failed logged in
                    progressDialog.dismiss();
                    Toast.makeText( context: login.this, text: ""+e.getMessage(),Toast.LENGTH_SHORT).show();
            });
```

```
if (accountType.equals("Admin"))
{
    progressDialog.dismiss();
    //user is admin
    startActivity(new Intent( packageContext: login.this, MainAdminActivity.class));
}
else if(accountType.equals("Staff"))
{
    progressDialog.dismiss();
    //user is staff
    startActivity(new Intent( packageContext: login.this, MainStaffActivity.class));
}
else{
    progressDialog.dismiss();
    //user is buyer
    startActivity(new Intent( packageContext: login.this, MainUserActivity.class));
}
```

Figure 5: Code segment for login by differentiating the role of user

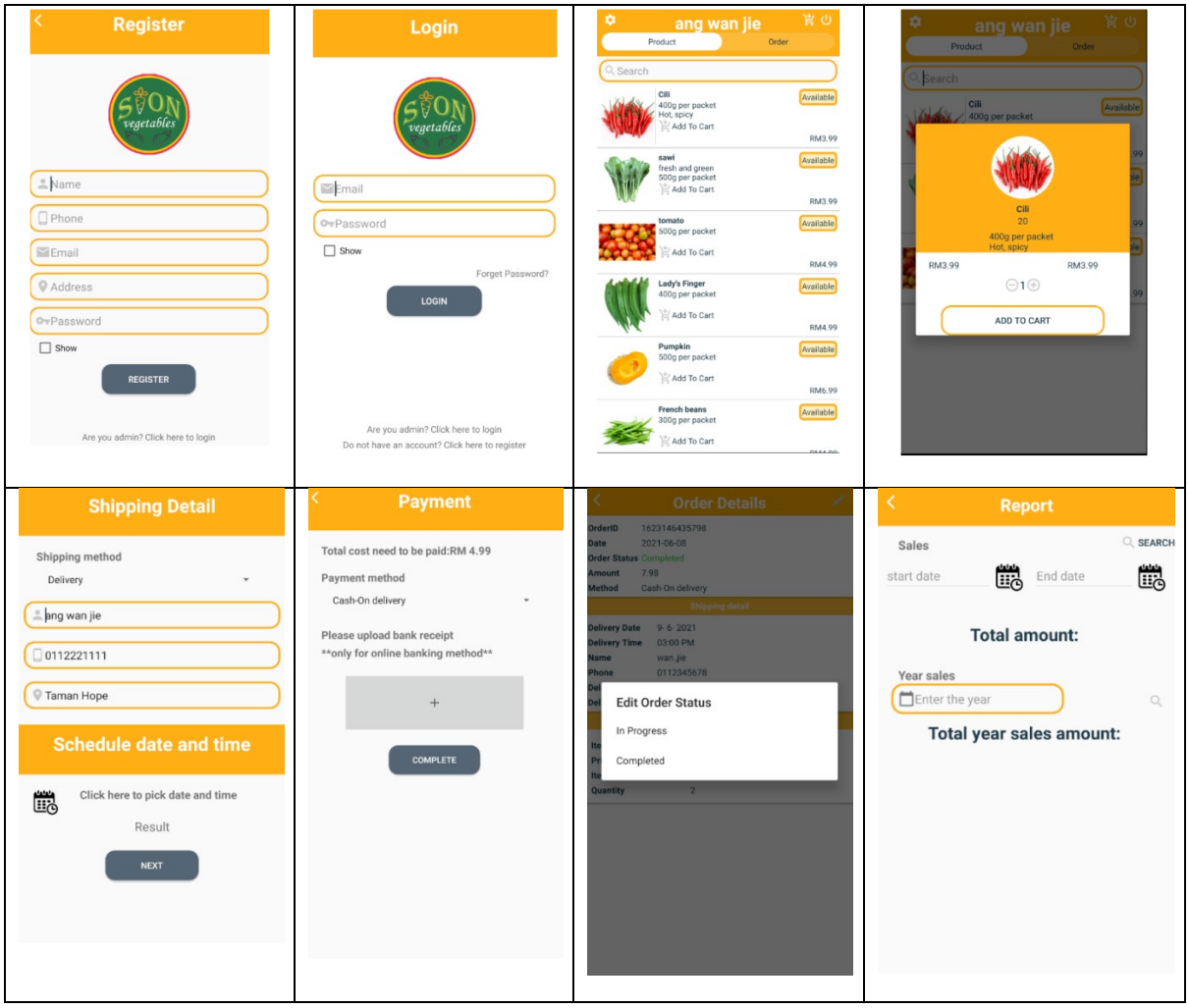

Figure 6: User interface of a mobile application for vegetables retail management

4. Results and Discussion

In this section, the result of the test plan is executed after the testing phase is carried out. The testing phase is the process of testing for functionality of a system whether it meets the functional and non-functional requirements once the implementation phase is completed. The process of checking for errors and bugs is carried out and the execution of the test case needs to be listed down in order to verify the system's functionalities can operate as expected or not.Table 3 shows the functional testing plan of a mobile application for vegetables retail management. The purpose of the test plan is to ensurethat each module functions well according to the expected results. Each of the modules has shown the pass result in the section of actual result of the test plan.

Table 3: Test plan of the system module and result

Module	Test case	Expected Result	Actual Result
Register	• Customers can register a new account in the application.	• The message of "Creating Account" is shown for successfully registering the account and it can direct to the login page.	Pass

Table 3: Cont.

Module	Test case	Expected Result	Actual Result
Login	• Users can input the correct email and password to login into the application.	• The message of "Login successful" will be displayed and direct users to their respective dashboard according to their roles.	Pass
View information of vegetables	• Customers are able to view the details of the vegetables such the description, price and the availability status of the vegetables. • Customers can view the status of the ordered items that have been updated from the owner.	• The available vegetable details are shown in a list. • The ordered vegetables details include the status of order detail and shipping details also can be displayed.	Pass
Add cart	• Customers are able to add desired vegetables into the cart and delete the items from the cart.	• The quantity of vegetables can be increased or decreased when the button of increasing or decreasing is clicked. • The undesired vegetables items can be removed from the cart. • The total price of the vegetables in the cart can be calculated.	Pass
Place order	• Customers are able to place orders for the vegetables. • Customers can schedule the specified delivery date and time once the customer has placed an order.	• The application is able to display the shipping details and the specified date and time that is selected by the customer and can direct to the following payment section.	Pass
Make payment	• Customers are able to make payment through the method of cash on delivery or online banking method by uploading proof of payment.	• The application is able to show the total price. • The application is able to display the payment method.	Pass
Manage vegetables	• Admin and staff can add, edit and delete the details of the vegetables such as the description, price and the availability status of the vegetables.	• The application displays new vegetable records or updated vegetable details. • The application is able to delete the vegetables records.	Pass

Table 3: Cont.

Module	Test case	Expected Result	Actual Result
Manage order details	• Admin and staff can view the order details. • Admin and staff can confirm or update the order status that requested from the customer.	• The application can display the order details of the customers. • The application can show the updated status of the order to the customer.	Pass
Manage staff	• Admin can add, delete the staff details.	• The application can display the staff details. • The application can remove the staff details.	Pass
View sales report	• Admin able to view the sale of the vegetables.	• The application can display the sales of the vegetables in specified range of date and the total year sales.	Pass

5. Conclusion

In the conclusion, a mobile application for vegetables retail management has been developed successfully based on the objective of the project. With this application, the customer can purchase the vegetables in a more convenient and effective way and the customer also can get access the information about the vegetables 24/7. The owner and staff can manage the order from the customer more easily and effectively and can keep track transaction information about ordering and selling of vegetables from the customer more efficiently and time saving. However, there also existed some limitations for this application. One of the limitations of this application is the application only can support in smart devices with Android platform. The application does not allow the user to do online banking via the payment gateway but just allow the user to upload the receipt as the proof for the payment. The quantity of each vegetable that have been sold is not displayed in the report sales. Therefore, the future improvements that can be done are the application is suggested to be able to support to other of the operating system. The features of online payment through the payment gateway are recommended to allow the payment process become more smoothly. The report sales should display the quantity of the vegetables that have been sold to the admin.

Acknowledgement

The authors would like to thank the Faculty of Computer Science and Information Technology, Universiti Tun Hussein Onn Malaysia for its support and encouragement throughout the process of conducting this study.

Appendix A

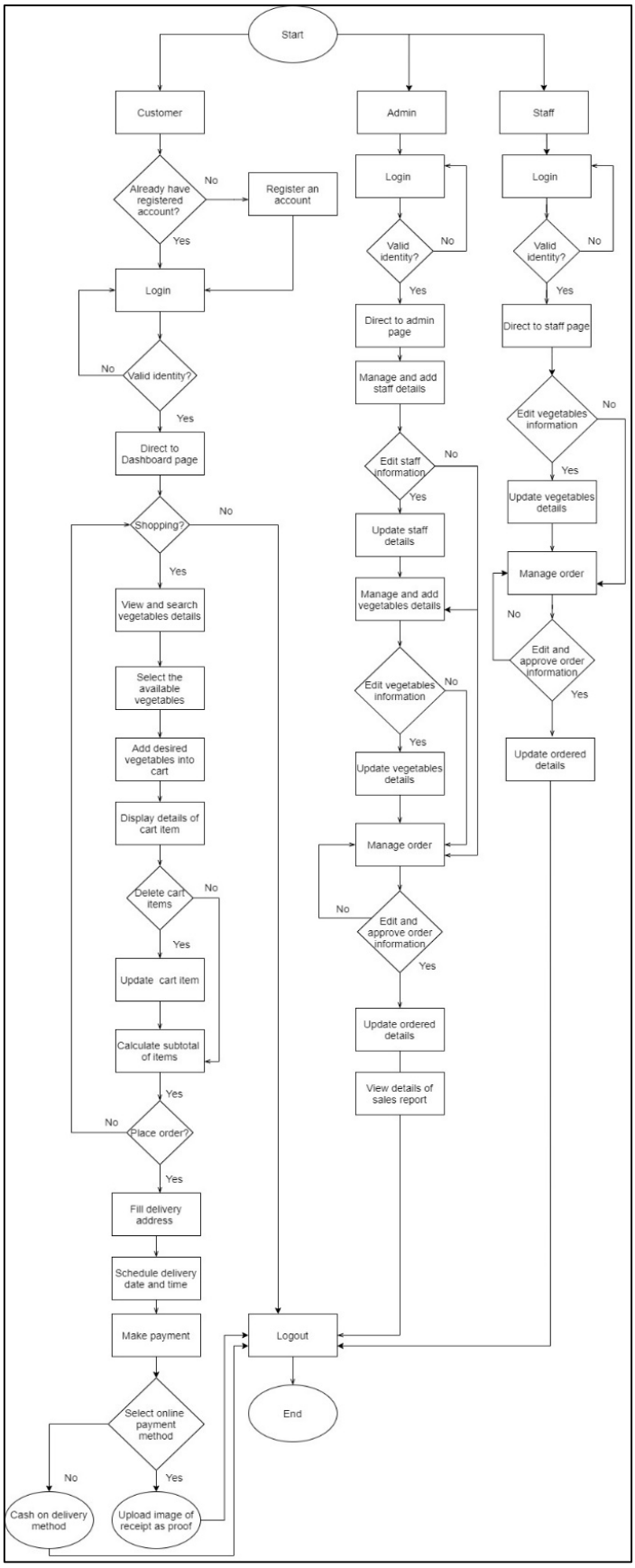

Figure 7: Flowchart diagram of a mobile application for vegetables retail

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