PROJECT No. ISNE P118-2/63

Bicycle Inventory Management Application (BIMA)

Jirapas Chuatrakul 600611004

A Project Submitted in Partial Fulfillment of Requirements
for the Degree of Bachelor of Engineering
Department of Computer Engineering
Faculty of Engineering
Chiang Mai University
2020

โครงงานเลขที่ วศ.สค. P118-2/63

เรื่อง

แอปพลิเคชันการจัดการรายการสินค้าของร้านจักรยาน

โดย

นาย จิรภาส ฉั่วตระกูล รหัส 600611004

โครงงานนี้
เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิศวกรรมศาสตรบัณฑิต
ภาควิชาวิศวกรรมคอมพิวเตอร์
คณะวิศวกรรมศาสตร์ มหาวิทยาลัยเชียงใหม่
ปีการศึกษา 2563

Project Title	: Bicycle Inventory Management Application (BIMA)
Name(s)	: Jirapas Chuatrakul 600611004
Department	: Computer Engineering
Project Advisor	: Asst. Prof. Kenneth Cosh, Ph.D.
Degree	: Bachelor of Engineering
Program	: Information Systems and Network Engineering
Academic Year	: 2020

Department of Computer Engineering, Faculty of Engineering, Chiang Mai University has approved this project to be part of the degree of Bachelor of Engineering (Information Systems and Network Engineering)

..... Head of the department

(Assoc. Prof. Sakgasit Ramingwong, Ph.D.)

Project examination committee:

..... Main Advisor/Chair

(Asst. Prof. Kenneth Cosh, Ph.D.)

..... Committee

(Assoc. Prof. Sakgasit Ramingwong, Ph.D.)

..... Committee

(Pruet Boonma, Ph.D.)

หัวข้อโครงงาน	: แอปพลิเคชันการจัดการรายการสินค้าของร้านจักรยาน
โดย	: นาย จิรภาส ฉั่วตระกูล รหัส 600611004
ภาควิชา	: วิศวกรรมคอมพิวเตอร์
อาจารย์ที่ปรึกษา	: ผศ.ดร.Kenneth Cosh
ปริญญา	: วิศวกรรมศาสตรบัณฑิต
สาขา	: วิศวกรรมระบบสารสนเทศและเครือข่าย
ปีการศึกษา	: 2563

บทคัดย่อ

รายงานนี้ได้นำเสนอเกี่ยวกับแอปพลิเคชันการจัดการรายการสินค้าของร้านจักรยาน ซึ่งการจัดการคลังสินค้านั้นเป็นสิ่งที่สำคัญและได้ใช้ในหลายๆธุรกิจ ตั้งแต่ธุรกิจเล็กๆ จนถึงธุรกิจใหญ่ เพื่อติดตามสินค้าแต่ละชนิดในคลังไม่ให้หมดจากสต๊อก เพื่อให้มีสินค้าให้ลูกค้าได้ตลอดเวลา หรือ เพื่อคำนวณรายรับ รายจ่าย จากสินค้าคงเหลือเพื่อทำการสั่งสินค้ามาเพิ่มต่อไป โดยเฉพาะในธุรกิจจักรยานนั้น สินค้ามีอยู่หลากหลายชนิดและยี่ห้อ ทำให้การจัดการคลังสินค้าที่ดีถือเป็นข้อสำคัญที่จะทำให้ธุรกิจสามารถดำเนินไปได้อย่างราบรื่น และมีประสิทธิภาพ อย่างไรก็ตามหากจะติดตามสินค้าด้วยวิธีการทั่วไปอย่างเช่น การใช้สมุดบัญชีบันทึกคลังสินค้า ก็อาจจะไม่มีประสิทธิภาพมากนักในยุคสมัยปัจจุบัน ดังนั้นในปัจจุบัน ธุรกิจต่างๆจึงเริ่มหันมาใช้แอปพลิเคชันเพื่อช่วยในการจัดการคลังสินค้าให้สะดวกและแม่นยำยิ่งขึ้น

Project Title	: Bicycle Inventory Management Application (BIMA)
Name(s)	: Jirapas Chuatrakul 600611004
Department	: Computer Engineering
Project Advisor	: Asst. Prof. Kenneth Cosh, Ph.D.
Degree	: Bachelor of Engineering
Program	: Information Systems and Network Engineering
Academic Year	: 2020

ABSTRACT

This report presents about the bicycle inventory management application. Inventory management is very important in many businesses from SME to Enterprise to keep tracking items in the inventory to not let them out of the stock to provide customers the items at all the time and also can calculate income from the remain items in the stock so the manager can know when to order more items. Eventually in bicycle business, there are various types and brands of items so making a good management is also important to keep the business running smoothly and efficiency. However, in nowadays inventory management such as account book may not solve the solution. So, in present more business started to use application to help them manage the inventory that is more conveniently and accurately.

Acknowledgement

First of all, I would like to give my special thanks to my advisor, Asst. Prof. Kenneth Cosh, who always give me a great advice that led me to the right direction and give me an opportunity to do this project. I am also thankful to Assoc. Prof. Sakgasit Ramingwong and Dr. Pruet Boonma who provided a great comment that help me improve the project to be better.

Also, supporting from many of my friends help me to solve many problems that occur, and they give me a good method for me to decide. I would like to thank all of them too.

Lastly, I would like to give my gratitude to my parents who always supported me and encourage me every time. They help me a lot to achieve my goal.

Jirapas Chuatrakul

10 March 2021

Table of Contents

List of Figures

Chapter 1
Introduction

1.1 Project Rationale

In nowadays, many business use applications to help them manage items in the inventory because they are more convenient and accurate. Such as convenient store, they use both inventory management and POS to help them to do the business easier like keep track of the items to know when they would order more.

Bicycle business could also use the application to help them manage the items that have many types and brands to be more in good order.

1.2 Objectives

1. To help the manager to keep track of items easier.
2. To help the manager to know the summarize data to use them to plan for a future what they should do.
3. To help the staff to use feature such as POS to checkout items from the store inventory easily.

1.3 Project Scope

This application which designs specific for bicycle business will help the user to plan and manage their bicycle inventory stock easier by listing them in the app and the application will come with the initial database of bicycle items so user can manage it as soon as they install the application and it also allow the user to added more item and category if they need it personally. The application will come up with POS function allow the staff or manager to checkout their items in the inventory when it going to be sold as well.

1.4 Expected outcomes

1. Application could use to store the data of the items in the inventory correctly.
2. Application's notification and alert are pop-up on the right time that has been setting by user.
3. POS feature is easy and fast for the users to use when they check out their items from inventory.

1.5 Technology and Tools

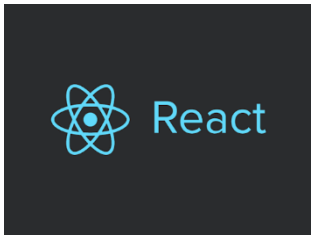
Mobile Application require mobile device to use. In this project, I decide to use iOS mobile device in develop and test the application.

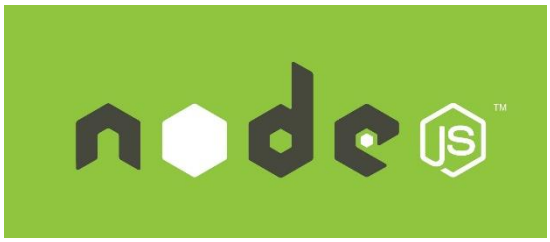
Language using

- React JS: for Front-End developed
- Node JS: for Back-End developed

Database using

- Firebase: for storing all the data in the cloud database





1.6 Project Plan

Research Schedule	2563				
	Nov	Dec	Jan	Feb	Mar
1. Working on Inventory Feature					
2. Working on POS Feature					
3. Working on History Feature					
4. Working on Summary Feature					
5. Working on Notification Feature					
6. Working on Staff Application (Alert Manager Feature)					
7. Survey for usability testing					
8. Making poster and writing report					

1.7 Roles and Responsibilities

First thing that is very important for develop the project is time management because we must do it right on the limit time so a good plan and good time management are the first responsibility that I must have.

For the role as I do this project individually, I should make sure that I have do all the important things and note it down to check it afterward since there is no one to back me up if I forgot something then it is also important for me to keep checking what I have missed or anything that should be done like survey, research and design I should write it down before and after I finish any tasks.

1.8 Impacts of this project on society, health, safety, legal and cultural issues

As far as this project can go, it could provide many benefits for a bicycle business or similar business as this application will help them manage the inventory stock for their business and can use as notification or alert to keep track on the inventory at all the time more than that the application also have POS function to use when the items are going to be sold to help the store to checkout items as well.

For impact of this project, it may change how a specific group business workflow be done but it would not change the society much since this application only provide a solution for a specific business and not the entire business can use this application efficiently like the specific group.

Chapter 2
Background Knowledge and Theory

For the background of this project, my family running a bicycle store and I want to help them with the technology that I can do. That is the first inspiration of this project.

Inventory management application is the application to help the user to plan and manage their inventory easily by listing them in the application most application provides inventory management and POS for the users to use it in their store.

As I know, Inventory management is a very important thing for a business that have a frequency stock change or many items in the inventory and our business is something like that, so I decide to do an application to help specific for this bicycle business.

Next thing I want to add here is about the background of language that I'm using for front-end development that is React (JS) and this language will likely to be the most that appear in the project, so It is a great opportunity to explain about it here.

[1]

2.1 What is React.js?

React.js (or React, React JS) is an open-source JavaScript library using specifically for front-end development with UIs building for applications. It is also allowing us to create reusable UI components.

React was first created by Jordan Walke, who worked at Facebook Ads team and he is a software engineer who developed Facebook's newsfeed (2011) and Instagram (2012).

React main advantage is its fast, scalable and simple. It can allow the developers to create their web applications that could change the data without needing to reload the page.

2.2 What are the React.js Features?

JSX

JSX is a simple JavaScript that using instead of regular JavaScript for templating (pure old JavaScript can also be write if needed). It allows HTML quoting and using the HTML tag syntax to render the subcomponents.

JSX logo

React Native

React-native is a framework that using only JavaScript but allows the developers to use it to build the native mobile application like iOS or Android. It is the same design as React which allows us to build a rich mobile UI include with library and declarative components. React-native also allows us to adopt components that written in Objective-C or Java.

Single-Way data flow

In React, the component cannot directly modify any properties but can pass a call back function with help of which we can do modifications so the data flow would-be one-way transfer.

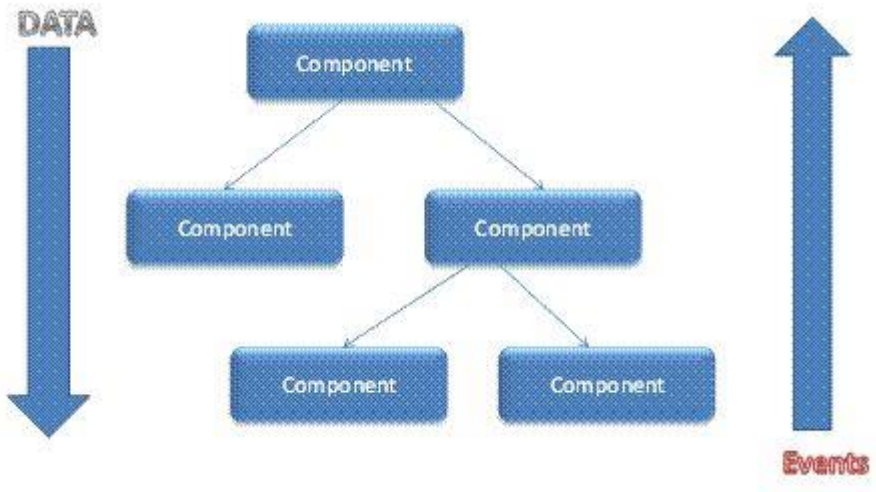


Figure 2.1 "properties flow down; actions flow up"

Virtual Document Object Model

React would allows a feature that enables the developers to code as if the whole page is rendered on each change because it creates an in-memory data structure cache which computes the changes to updates the browser.

2.3 Why React?

Even though there are many open-source platforms/frameworks that could be used to develop the front-end web application. The main reason why we should use React could be divide into 6 main parts.

1. Simplicity

React JS is simple to use. The component-based that use just plain JavaScript make it very simple to learn but also can build a professional web/mobile application. With JSX, it allows us to use both HTML and JavaScript.

2. Easy to learn

React is a basic programming language that can be understand by developers easily. Developers only need basic knowledge about HTML and CSS.

3. Native Approach

React have a React-native which can be used to create mobile application that also allows extensive code reusability supported then it means that we can make iOS, Android and Web applications at the same time.

4. Data Binding

Because React uses one-way data binding and an application architecture which is Flux, it could control the flow of data through one control point.

5. Performance

React can use Browserify, Require JS, EcmaScript 6 modules to use via Babel, ReactJS-di to include the dependencies to built-in container.

6. Testability

Applications that is develop by React JS are easy to test because React views can be treated as functions of the state that can be manipulate with the state we pass to it view and immediately take a look at the output of anything we tested.

2.4 ISNE knowledge used in the project and how are they integrated

The ISNE knowledge that I used in the project are mostly how to develop an application like structure or UI to be good and correct also how the workflow should be done to do the tasks in the limit time. NodeJS is one of the languages using that include in the ISNE course.

2.5 Outside curriculum knowledge used in this project

For my learning knowledge that come from outside the course would be other languages that using in the application that are React JS and Firebase DB because both are not in the course material and need to learn by myself which could be found by a tutorial and material on the internet [2]. This knowledge is very helpful since it is core of the application and it is also a good thing to find a new language to learn.

Chapter 3

Project Structure and Methodology

Before we move to the structure part, BIMA is a mobile application that would be use on the mobile phone so the structure would be focus on the mobile device which would not support web-browser from the PC or another device.

Then the next thing that I would like to introduce is a use-case diagram which could be used to see the overview of the application.

3.1 Use-case diagram

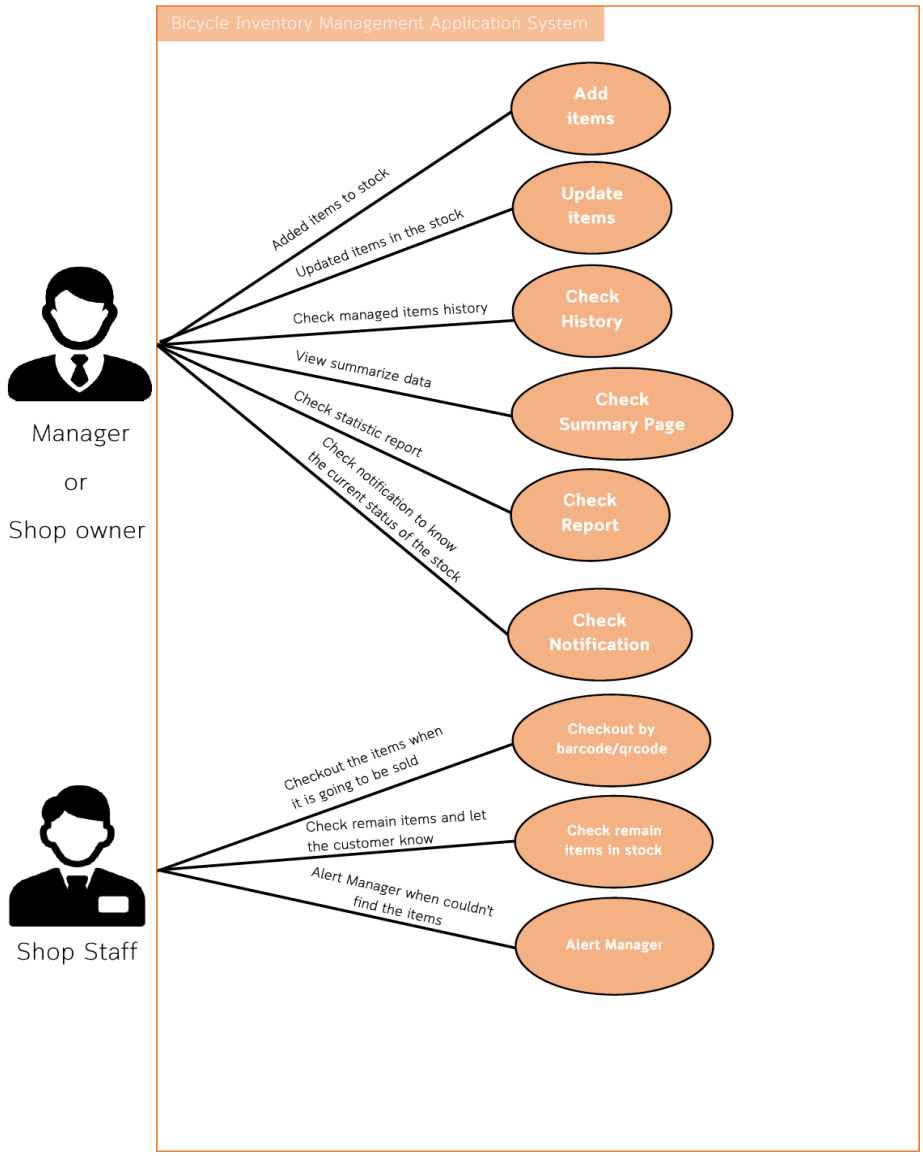


Figure 3.1 Use-case Diagram

As you could see from the diagram, we would know that the application focus on 2 main users that are manager and staff.

The manager will use this application focusing on management part. They can manage the items, check history, view summarizes data and view/edit notification.

The staff will use this application focusing on selling part. They can use the POS to checkout the items and be able to check remain items in the stock. If the item is out-of-stock, the staff can alert the manager to know.

Sequence Processing

3.2 Overall

Main processes of this application is divide to 5 parts included Manage items, History, Summary Page, Notification and POS.

The Figure 3.2 showing the overall workflow of the application. After any task done the workflow will cycle depend on whether there are still task left to do or done all the tasks and stop. Each features will be explain seperately by the figure below that follow after the Figure 3.2 .

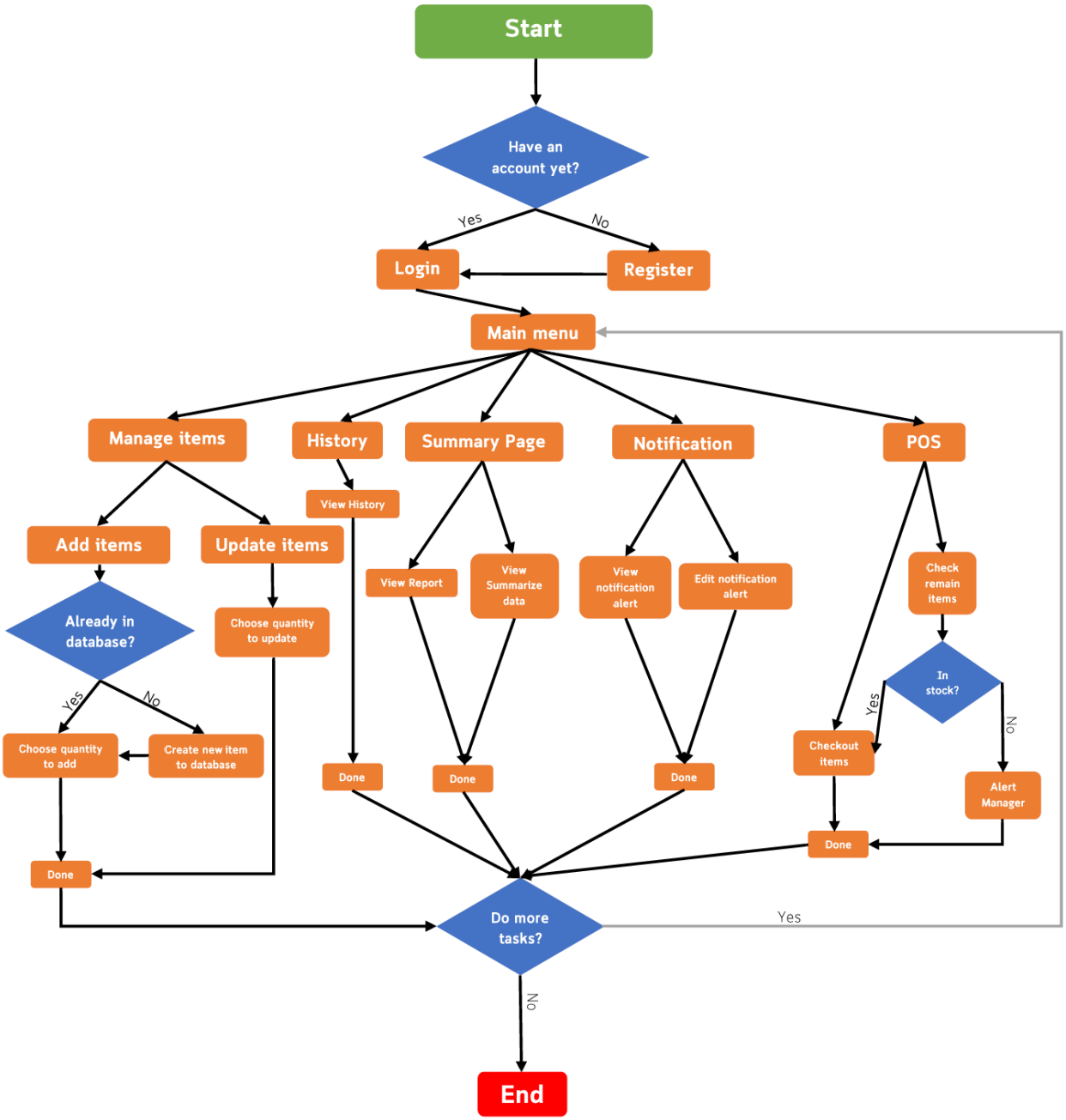


Figure 3.2 Overall processes of the application

3.3 Manage items

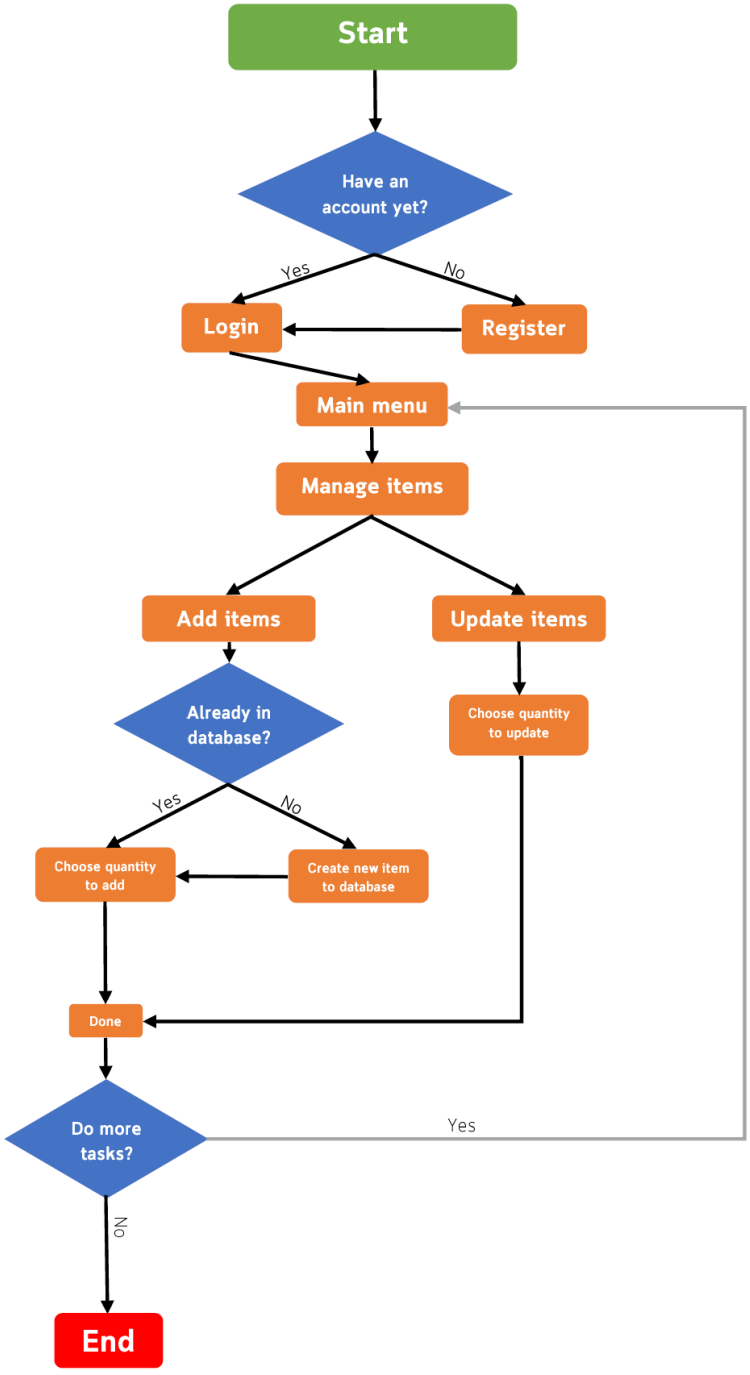


Figure 3.3 Manage Items Workflow

This is a feature to let the user manage their inventory.

It divides to 2 methods, Add and Update

Add items allows the user to add their specific items to the inventory stock if it is already in the database, they just choose the quantity to add else they have to create new item to the database.

Update items allows the user to change existing items in the inventory quantity by simply choose the quantity to update for that item.

3.4 History

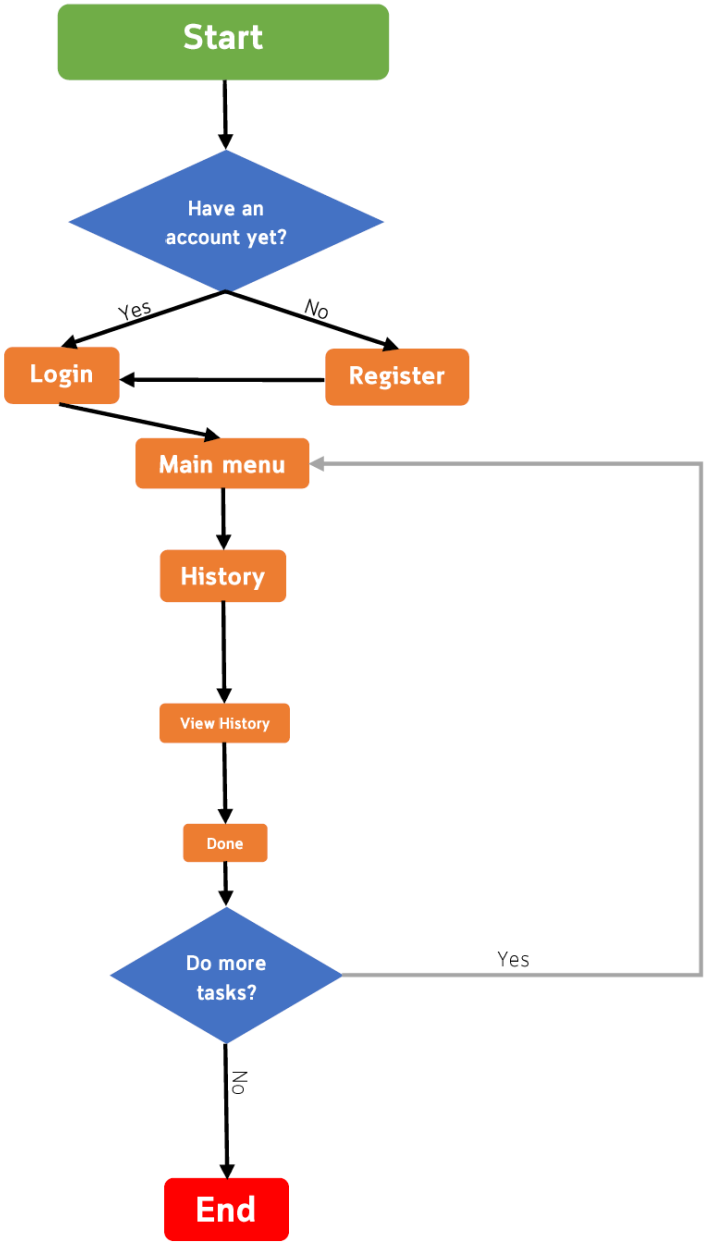


Figure 3.4 History Workflow

This is a feature to let the user check their inventory management history that which items have been add or update at which time.

The manager can access to history in the main menu to check how things are going on managing items.

3.5 Summary Page

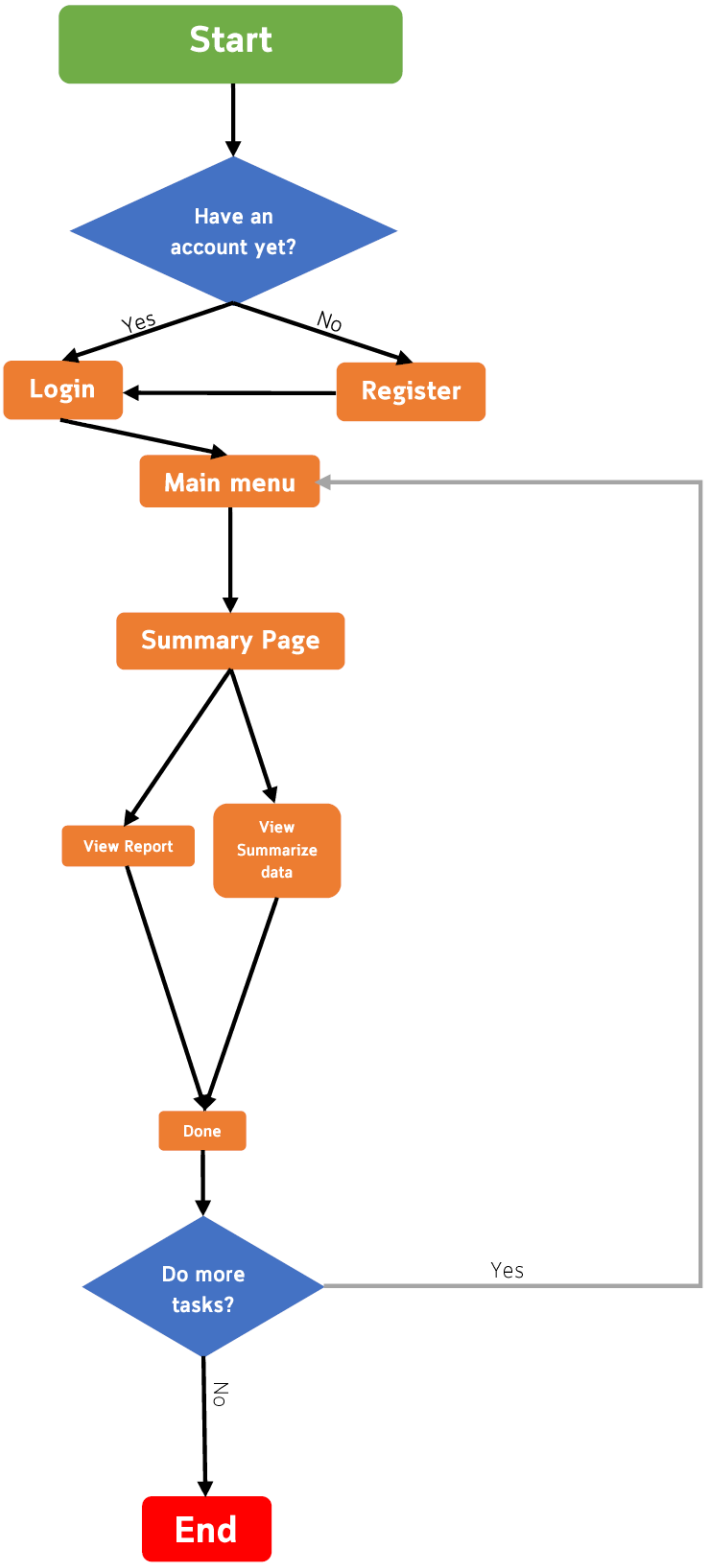


Figure 3.5 Summary Page Workflow

This is a feature to let the user see the important information to keep track of how the store going.

It divides to 2 parts that is report and summarize data.

Report allows the user to check statistic of the store it would be something that the manager need to know frequency such as today selling, running low items to plan for future order.

Summarize data allows the user to check important information such as recently selling items or most selling items these data could be used to determine what items should be order more or marketing planning.

3.6 Notification

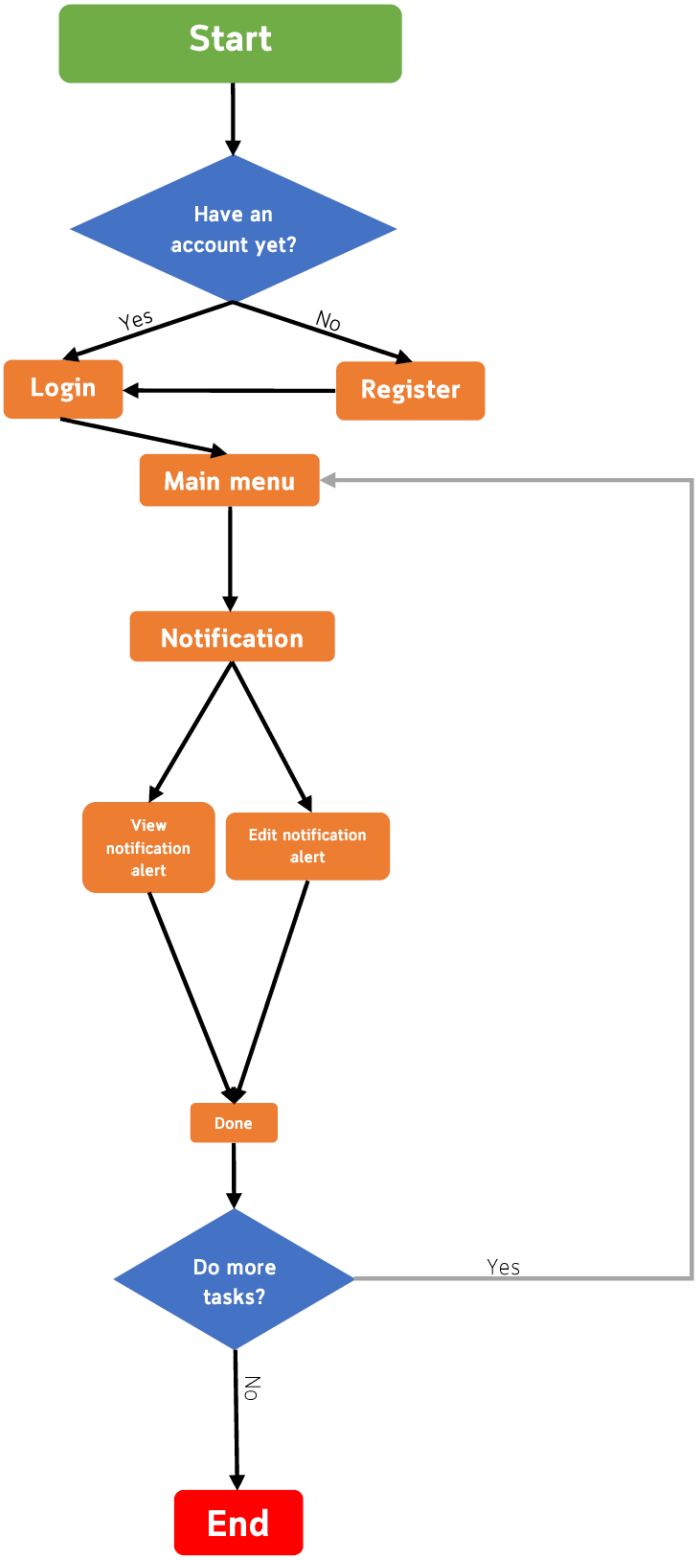


Figure 3.6 Notification Workflow

This is a feature to let the user see and manage their notification alert.

It divides to 2 parts that is view and edit.

View notification alert allows the user to view their inventory alert history that which items are running low so the manager could decide to order more.

Edit notification alert allows the user to edit their notification about when and how it will be alert like quantity to be alert for each item individually.

It would have default setting for each item at the start.

(For Example: 5 quantities to alert)

3.7 POS

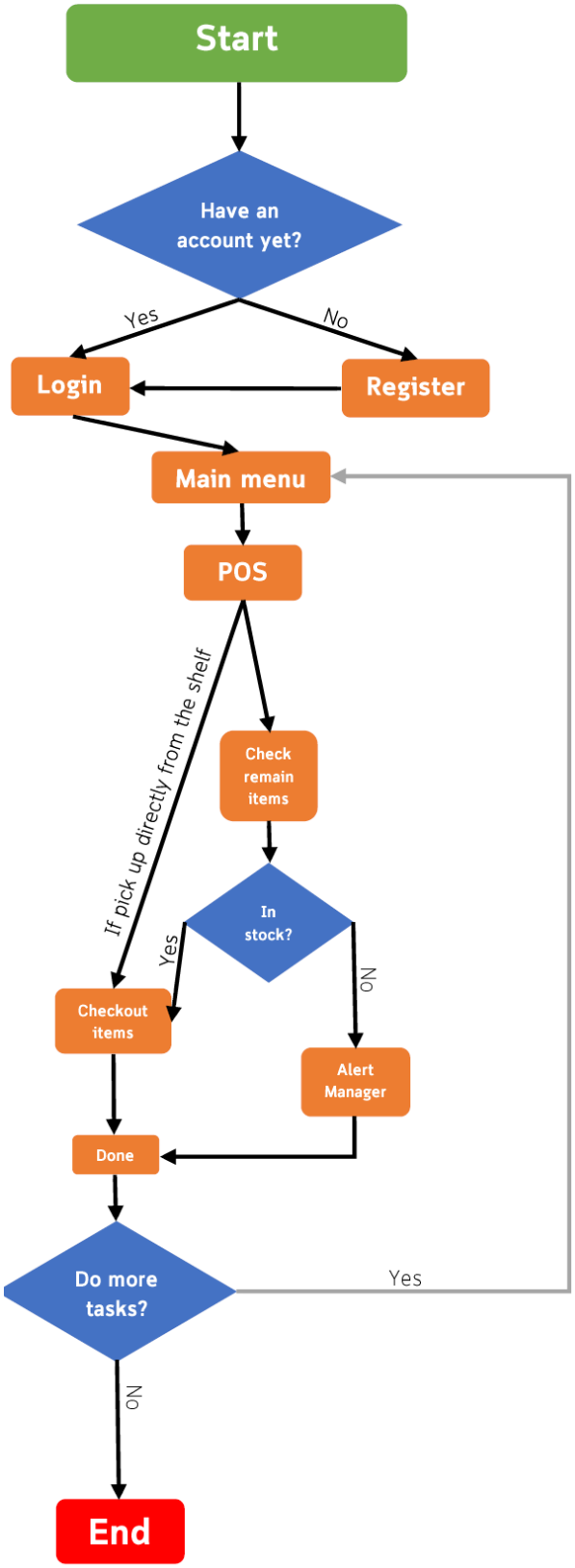


Figure 3.7 POS Workflow

This is a feature to let the user checkout their items from the inventory.

It divides to 2 cases that is when the items pick up directly from the shelf and when the staff need to check for remain items in the stock.

If the customer or staff pick up the items directly from the shelf in front of store, they can process to checkout immediately.

If the customer come to ask for the items, the staff have to check the remain items in the stock first.

If it is in stock, process to checkout like normal process.

Else if it is not in stock, alert the manager to let they know that the items that customer want are out-of-stock so they can order it for them.

Chapter 4

Experimentation and Results

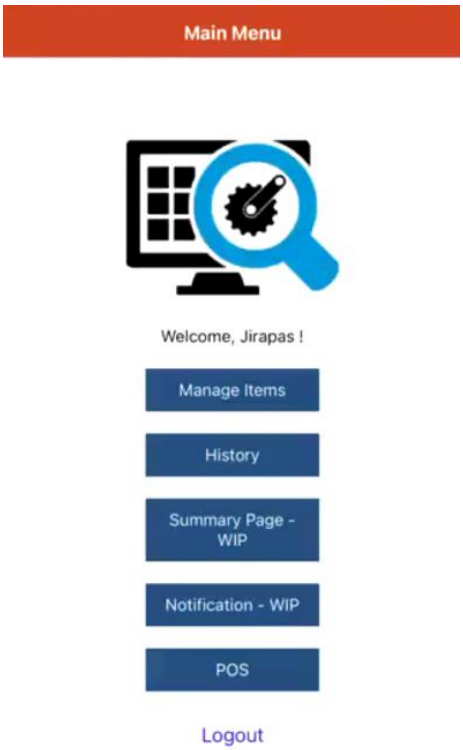
In this section about experimentation and results, I will be talking about how the application UI have change by each testing and how is the result by each experimentation.

4.1 Comparison of UIs

This testing is the experimentation to test how accessibility of each version of the application that it is better for the user to use and they understand how each of UI worked.

There are 2 versions of the UIs which is old version and current version that is use for usability testing and real demo.

Main Menu



Old Version

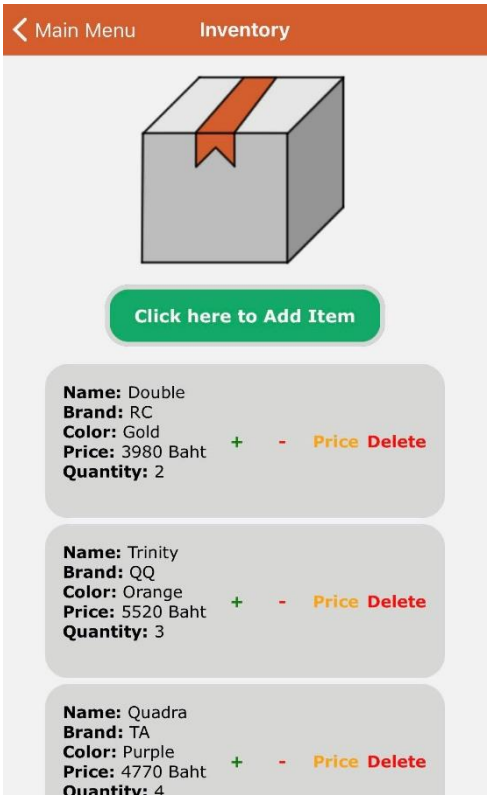
Current Version

These are the 2 screens of Main menu comparing to each other

The old version is a plain blue color button and font is almost invisible.

The new version changes to round blue button with gray border and the font is now visible and easy to read.

Inventory



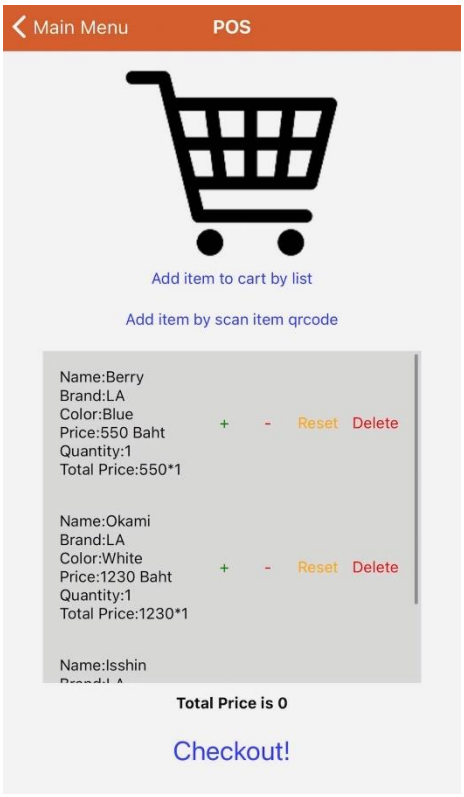
Old Version *Current Version*

These are the 2 screens of Inventory comparing to each other

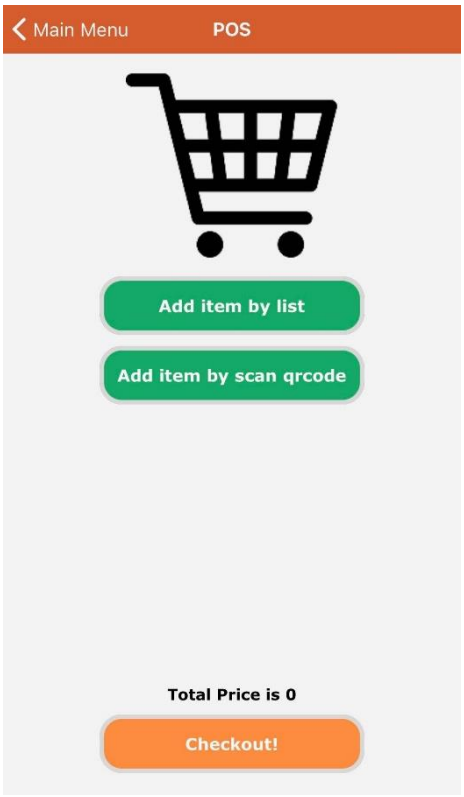
The old version is a plain gray color background without gap between each item and font is all the same weight.

The new version changes to round gray background with gap between each item and the font is now has a different weight for title and detail also other button font is improved to be more visible too.

POS



Old Version



Current Version

These are the 2 screens of Inventory comparing to each other

The old version all button is a plain blue color text.

The new version changes to round colorful button for the user to notice and the font is more visible.

4.2 Usability Testing

This is a testing to test the real experimentation with the user which is the application user target to get their feedback for future developed of the application.

All features have been tested by users which are Login/Register, Main Page, Inventory, POS, History, Summary, Notification and Alert Manager.

These are the overall comments/feedbacks of the application

- Input box may need to be bigger for easier touch between each input box.
- Easy and simple menu directory but can be square menu rather than drop down.
- POS work simply like a cart in shopping application.
- History show all transactions fine.
- Order detail is good to check each previous selling items.
- Summary has good overview of current store's items information.
- Push notification is good to get in-check with staff message.
- Alert manager allow communication between manager and staff.
- Color scheme for app is good
- All features are complete for using with current store needed
- Fixed some UI issues provide, and the app is looking fine since mostly user focus on how fast they could do the task

Chapter 5
Conclusions and Discussion

5.1 Conclusions

In this project, I have learned how to build an inventory application which is something new for me especially new language that I have started leaning from the beginning but with knowledge and experience from ISNE course, I can learn it faster and more understandable. Lastly, the application is finished all the features that I have planning from the project survey course included inventory, history, summary page, notification, alert manager, and POS also more thing that have been added is Staff Application which is the separate version from the Main Application using for staff individually.

5.2 Problem

From doing this project there are some problems which are

1. The application cannot save state if it is close, then state like “Login user” will disappear after closing so we need to login each time it has been open again which is not ideally the design of the real inventory application.
2. Because it is my new language that use to develop the application when some problem or error happen, I have to spend some time to re-check and learn it again until I can really understand it and fix it.
3. From physical technic problem, I got only one device to test as a time and when the staff application in developed, I need to swap between manager application and staff application to check if it is worked which spend quite some time.

5.3 Suggestions and further improvement

Suggestion for further develop this project are

1. The application should allow the user to remember the username and password, so they do not need to login each time they open the application.
2. UI can still be improving more to meet with the current generation (UI could change overtime)
3. The application could be upload to Appstore, so it does not need a PC to running the server.
4. More usability feature can be added in the future like color palette for color picking in add item or drop-down list to choose the item brand.

References

[1] Nitin Pandit. (2020). What and Why React.js. :Author https://www.c-sharpcorner.com/article/what-and-why-reactjs/

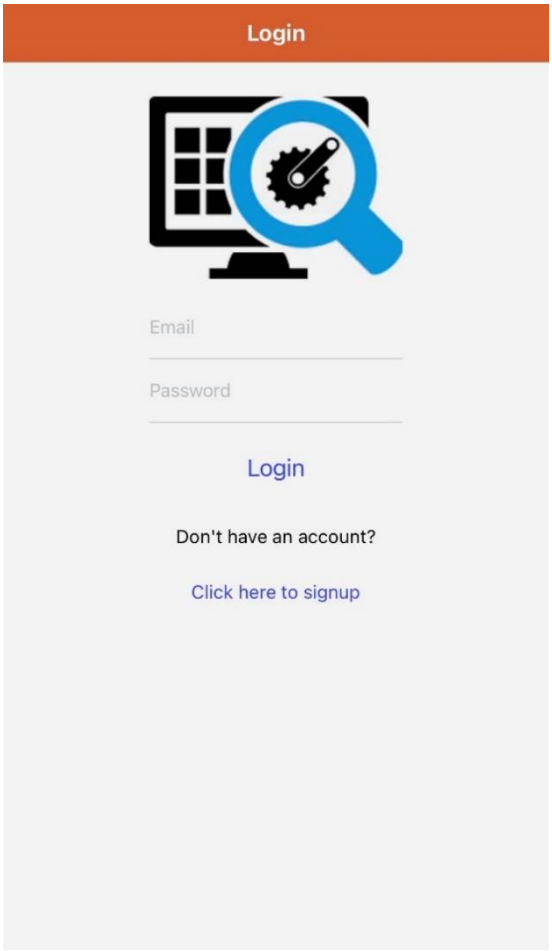
[2] React tutorial. (2020). Research on 12 October 2020 from https://reactjs.org/tutorial/tutorial.html

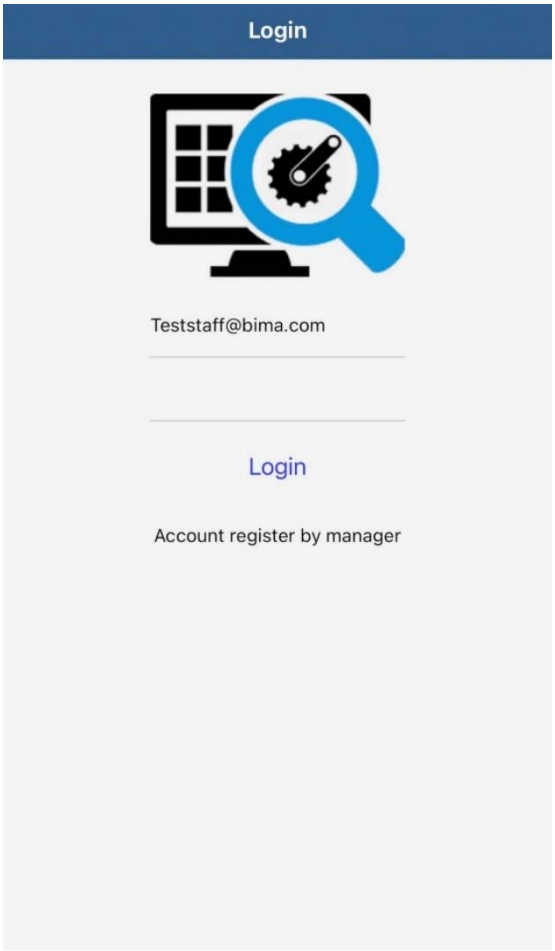
Appendix

Appendix A

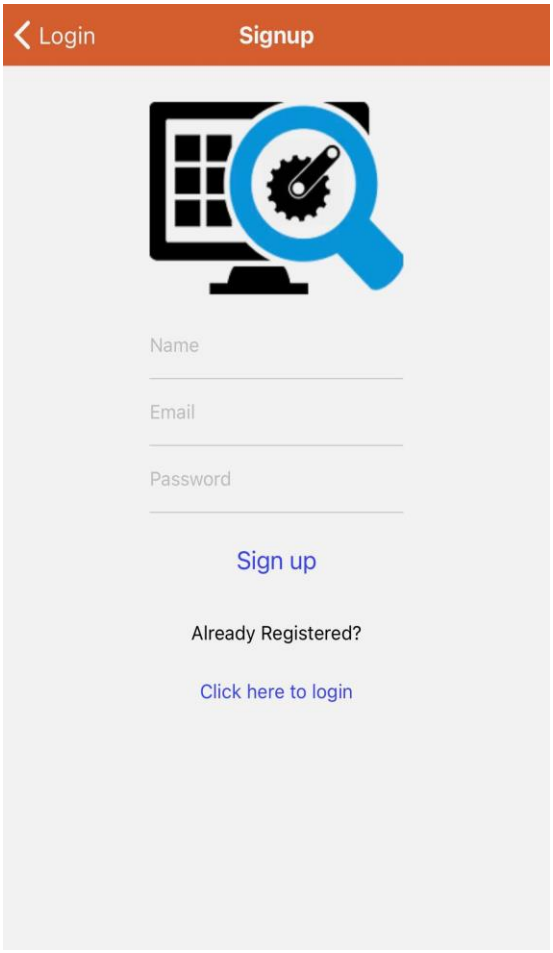
Application Screen

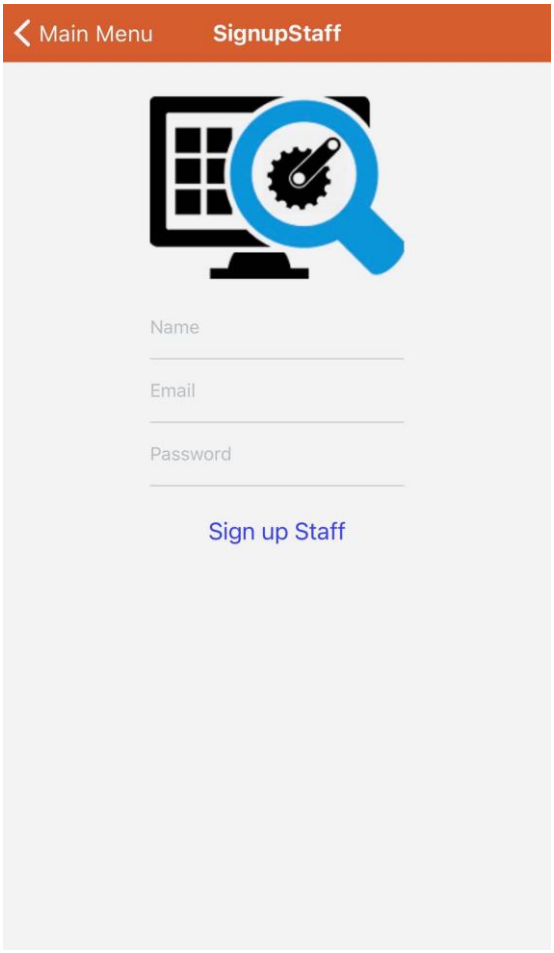
a. Login (Manager/Staff)



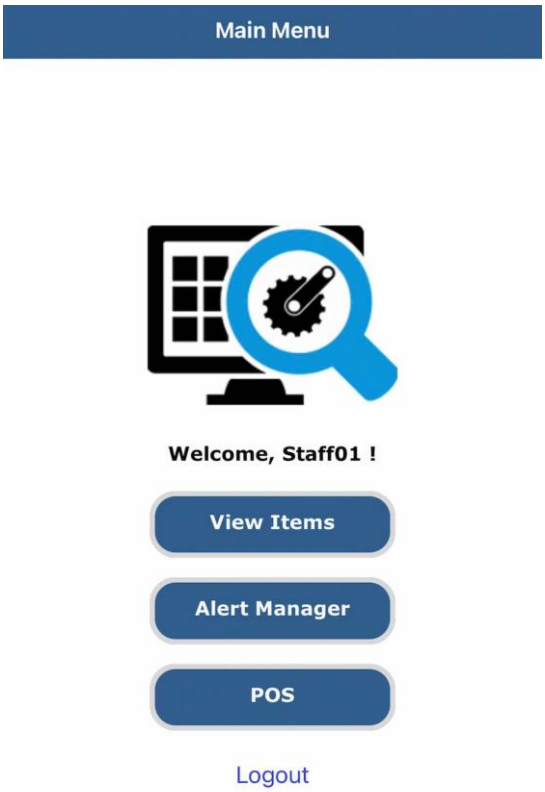


b. Register (Manager/Staff-in manager app)

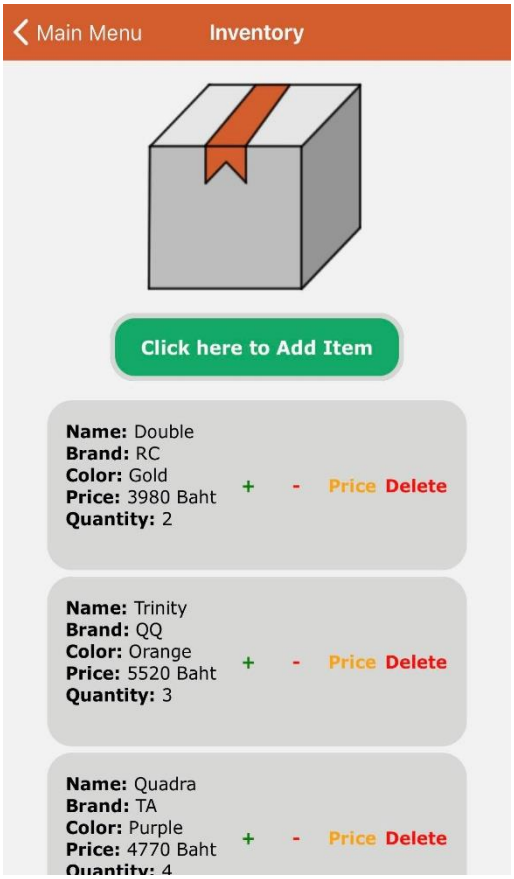


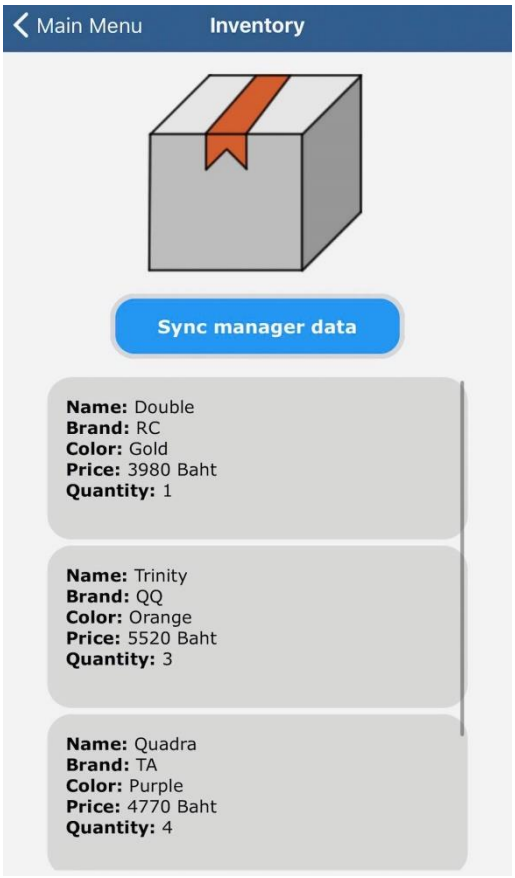


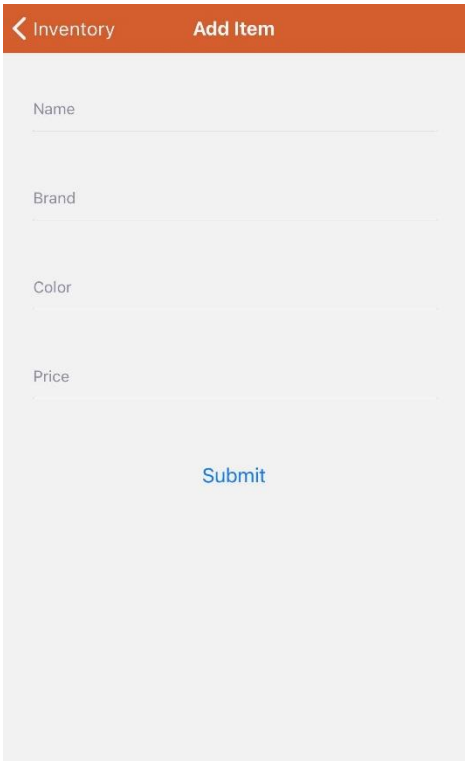
c. Main Page (Manager/Staff)



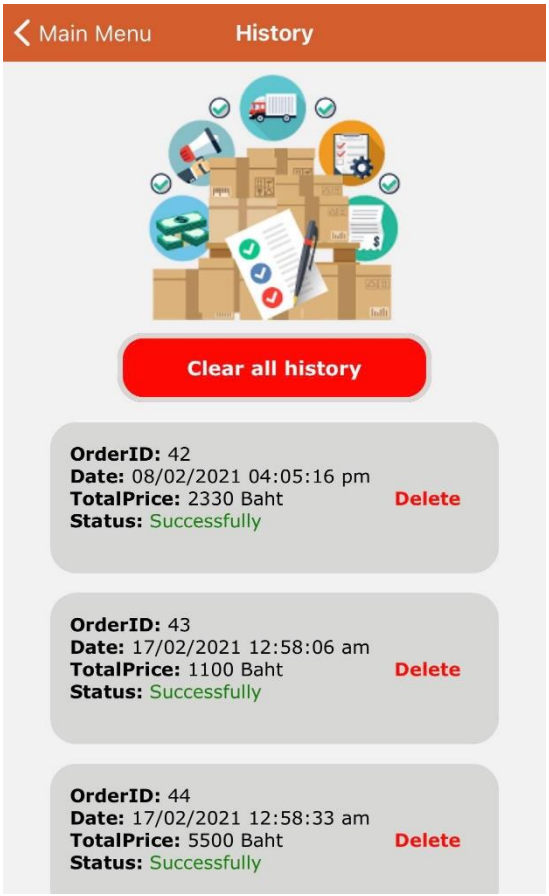
d. Inventory (Manager/Staff)

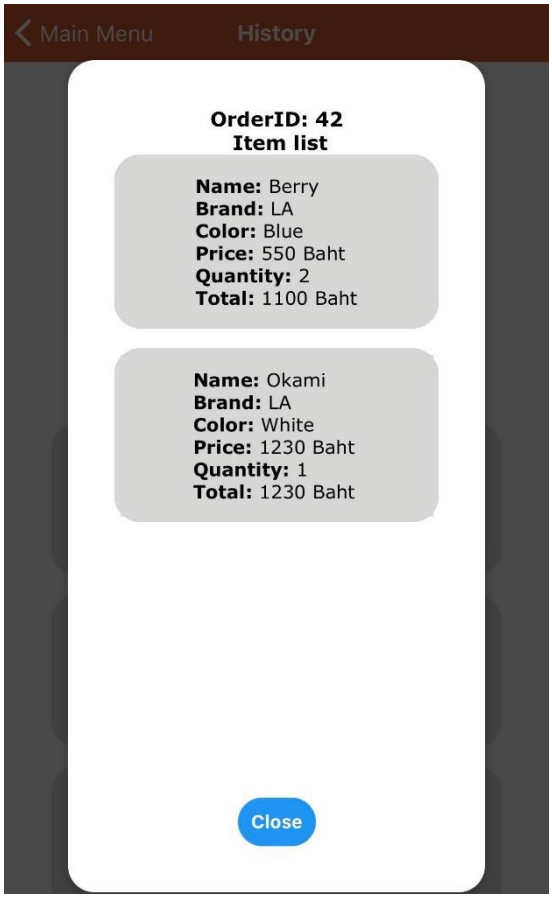




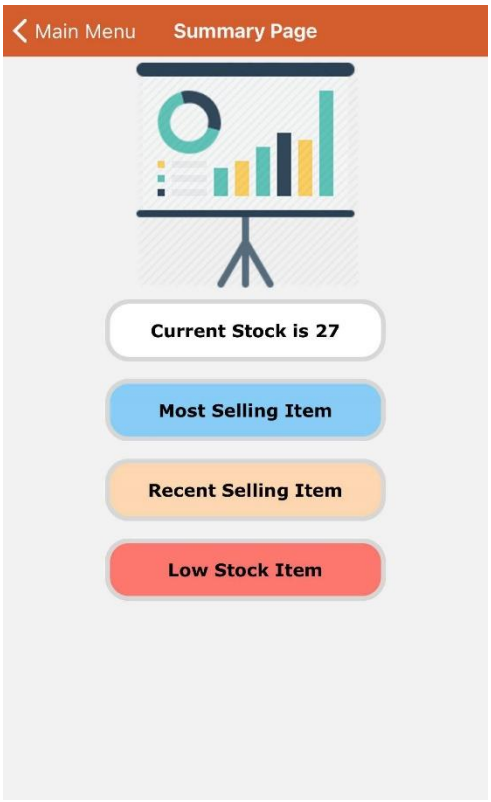


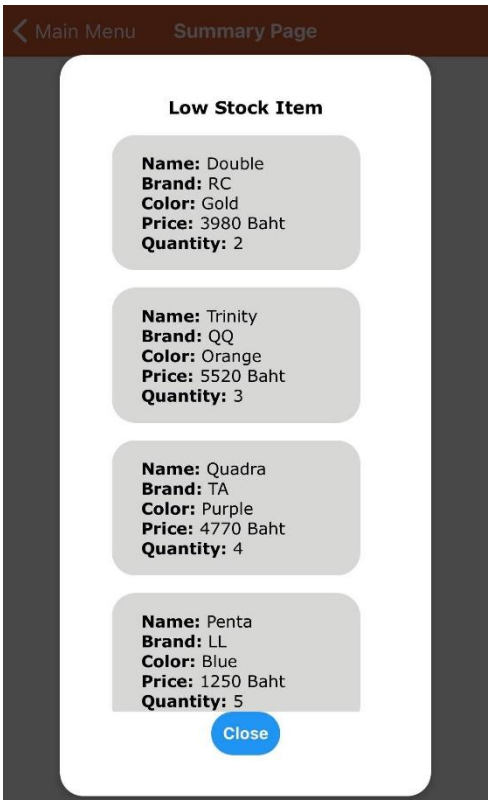
e. History


Main Menu
History
Clear all history
OrderID: 42
Date: 08/02/2021 04:05:16 pm
TotalPrice: 2330 Baht
Status: Successfully
Delete
OrderID: 43
Date: 17/02/2021 12:58:06 am
TotalPrice: 1100 Baht
Status: Successfully
Delete
OrderID: 44
Date: 17/02/2021 12:58:33 am
TotalPrice: 5500 Baht
Status: Successfully
Delete

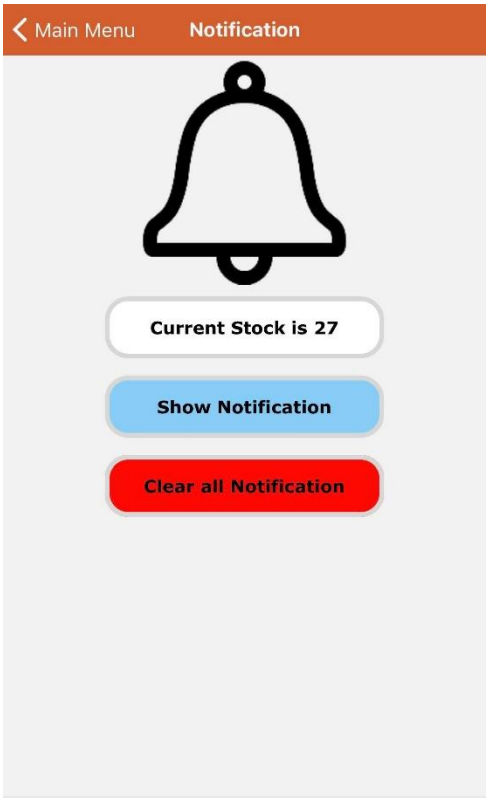

Main Menu
History
OrderID: 42
Item list
Name: Berry
Brand: LA
Color: Blue
Price: 550 Baht
Quantity: 2
Total: 1100 Baht
Name: Okami
Brand: LA
Color: White
Price: 1230 Baht
Quantity: 1
Total: 1230 Baht
Close

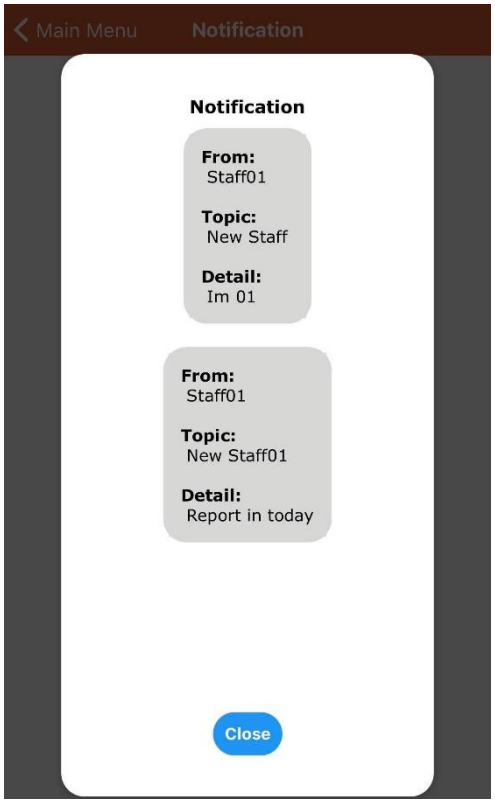
f. Summary Page



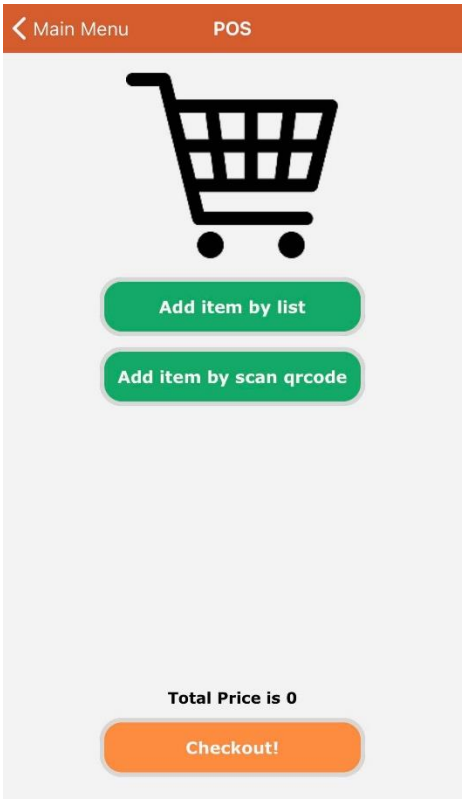


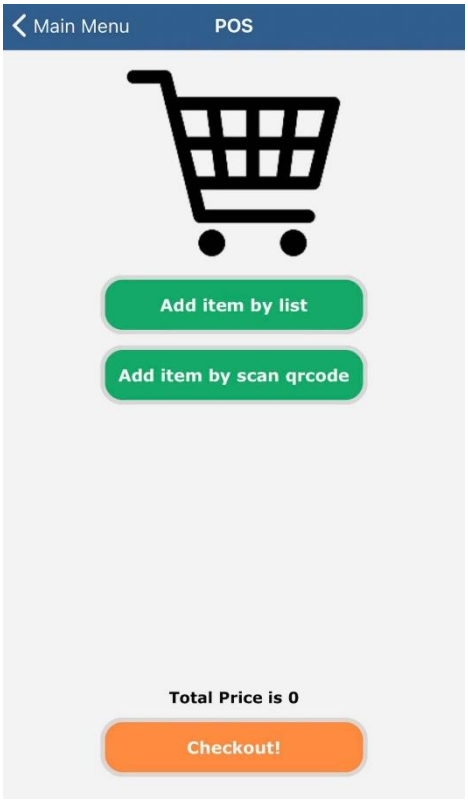
g. Notification



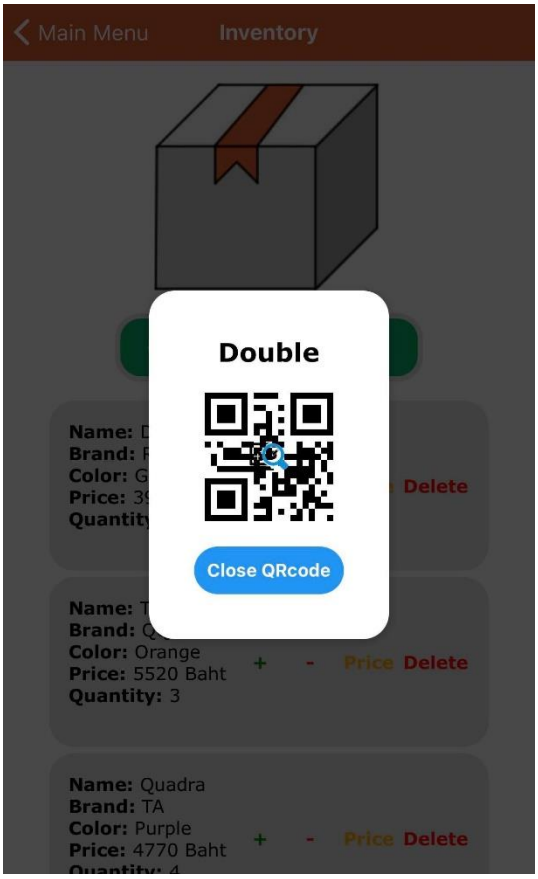


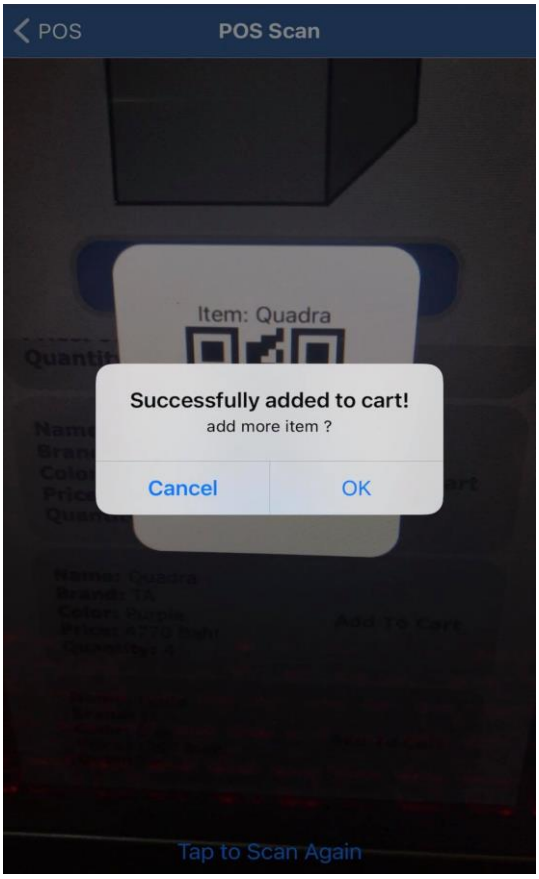
h. POS (Manager/Staff)





i. QR Code (Generator/Scanner)





About Author

Jirapas Chuatrakul born on 26 February 1999 At Chiang Mai and have graduate high school from Rangsee Vittaya School then enroll to Information System and Network Engineering major in Faculty of engineering, Chiang Mai University on 7 August 2017 which have special interested in programming and application development.

During study I have joined many activities to improve my skill from outside the course and to gain experience of thing outside the border to improve my visibility of real world more.