Sri Lanka Institute of Information Technology

CUSTOMER TRACKING SYSTEM FOR PROMOTIONS AND OFFERS

Project Id – 19-081

Software Requirement Specification

Comprehensive Design Analysis Project - 1

Declaration

I declare that this is my own work and this proposal does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other university or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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The supervisor/s should certify the proposal report with the following declaration.

The above candidates are carrying out research for the undergraduate Dissertation under my supervision.

Signature of the Supervisor: ----------

(Ms. Manori Gamage)

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1 Introduction

1.1 Purpose

The purpose of this Software Requirements Specification document is to provide a detailed description of the functionalities of the proposed location-based offer notification mobile application (cross platform). Furthermore, this will explain the features, the interfaces of the system and what will be done by this component of the system. The developers, users and testers could refer this document for their appropriate necessities. This document will support,

Developers: To make sure whether they are developing the correct software requirements and specifications proposed in the previous stages.

Testers: To get the overall idea about functionalities which will be helpful for testing purposes.

Users: To get confirm whether the mentioned, requirements are included in the software requirements and specifications. Also, this stands as a legal document between users and developers.

1.2 Scope

The main goal of this application is to send location-based notifications about offers to customers through a cross platform mobile application and to give suggestions and statistical data to Merchants to improve their business. As the main data source for the application, the offers published on the public Facebook pages will be extracted and will be saved in a local database.

To extract and collect offer details, public Facebook pages will be scraped, and the images of the pages will be identified. From the identified images text will we extracted. By considering the drawbacks and advantages of existing text extraction methods a modified algorithm will be created to text extraction and it will be the research component. With the use of a classification algorithm of Machine Learning, offers details will be identified from extracted details and will be saved.

Login functionality will be implemented. User can use application login or else user can use the Facebook login to sign in to the application. All the offers will be displayed in a particular UI by using an API. The API will retrieve the offer details from local database.

User will be notified with offers and promotions based on their location as well as the preferences of the user which will categorized based on the questions asked when getting registered for the application, by selecting the favorite shop using Select Favorite merchant interface and also by analyzing customer search history.

Through the merchant's dashboard recommendations will be given to the merchants for improvement of the shop. To give those recommendations customer reviews will be analyzed. Both positive and negative reviews should be analyzed to give suggestions. And also give statistical chart representing trending offers, less value offers and so on. Then also merchants can target those offers.

1.3 Definitions, Acronyms and Abbreviations

Acronym/Abbreviation	Definitions
SRS	Software Requirement Specification
API	Application Programmer Interface
UI	User Interface
ML	Machine Learning
User	Someone who gives the requirements of the system
Location-based Notification	User will notify once they are moving near shops
GPS	Global Positioning System
OS	Operating System
DB	Database
IDE	Integrated Development Environment
HTTP	Hyper Text Transfer Protocol

Table 1.1: Definitions, Acronyms and Abbreviations

1.4 Overview

This proposed cross platform mobile application for offers will mainly focused on sending location-based notifications about existing offers to customers to make customer work easy as well as to improve sales of merchants. For achieve that purpose the main components will be implemented.

- Analyze public Facebook pages of registered merchants to identify offer related images and extract offer related details.
- Prioritizing the collected offers using an algorithm and send only relevant location-based notifications to customers.
- Provide recommendations for users when searching for offers by considering offer validity, ratings of merchants and search history.
- Analyze customer reviews and create statistics by using data mining on monthly data and make aware merchants.

The main goal of this application is to send location-based notifications about offers of the registered merchants of the system. Mainly the proposed system will collect data from merchants' public Facebook pages. In more detail this proposed system is as below.

- System will go through the public Facebook pages of the registered merchants and will identify the offers among the uploaded content.
- Data related to offers fill be filtered out and all the identified offers will be displayed in a separate interface for customers.
- Customer will be notified with offers and promotions once they go near a shop based on different scenarios.
- Customers will be able to review products and give feedback about shops and their services.
- Customers will be able to find the best product that suits them.
- Supply recommendations and statistical data to merchants to improve business by analyzing customer reviews.

For achieve all the goals listed above, this mobile application will be implemented by achieving mentioned four major components.

2. Overall Description

In this modern world people do shopping every day in their lifestyle. People do shopping for various reasons. Likewise, shopping has now been evolved and now it's in the era of online shopping. Even though people do online they too do shopping by visiting the shops and find what they want in their choice of brand, price and quality. When it comes to shopping people waste hours and hours of time to find a shop which gives them good offer and best price for the goods they purchase. Likewise, people wants to get a reasonable value for what they want buy as they don't proper way to get updated with current offers and promotions due to various reasons such as lack of offer awareness or busy with other works. So this application will consists of four components to provide better opportunity to customers to get notify about the offers while they are moving near shops. All the main components will be implemented to provide a better cross platform mobile application to send location-based notifications for customers and to send statistical data and recommendations for merchants. When we consider about the main components all the main components will be featured with specific objectives to achieve the functionality of those functions.

- Analyze public Facebook pages of registered merchants to identify offer related images and extract offer related details.
    - Identify an efficient text recognition method.
    - Develop an algorithm by modifying existing algorithms to identify offers or promotions.
    - Go through public Facebook pages or websites of registered merchants and identifying offers.
    - Design an interface containing all offers.

- Prioritizing the collected offers using an algorithm and send only relevant location-based notifications to customers.
    - Develop offer and promotion notification functionality.
    - Develop a classification machine learning algorithm to categorize offers.
    - Develop a prediction machine learning algorithm to notify only the relevant offers and promotions to user.

- Provide recommendations for users when searching for offers by considering offer validity, ratings of merchants and search history.
    - Develop search functionality.
    - Develop an efficient algorithm to provide search predictions.
    - Gathering customer reviews about products and shops.
    - Analyze gathered data for predictions.

- Analyze customer reviews and create statistics by using data mining on monthly data and make aware merchants.

- Analyze customer reviews for each shop.
- According to customers reviews for month on offers create statistics and make aware the merchants.
- Based on the customer reviews and feedback for a shop give suggestions to merchants for improvement of the shop.

2.1 Product Perspective

There are some offer handling systems but most of them are not location-based systems and also, they don't collect offers from social medias. Optionally they are collecting data by providing another system to merchants to enter details of offers Most of the systems are just focusing on collect and display offers in the application and most of the tools don't send personalized location-based notifications. And also, they won't give facilities to get personalized search prediction results. Generating statistical charts and suggestions by analyzing customer reviews which will be useful to merchants won't be see in existing systems There are some commercialize offer handling systems available.

Here are some details about popular existing offer handling systems.

ODEL Smart Retail System [1]

A similar kind of project in ODEL Colombo. For that project they are using Beacons to track customer and send retail details once they are moving inside shop.

Groupon.com [2]

Groupon.com is another similar kind of website which is listing down offers.

WebEngage.com [3]

A similar kind of system but the offers should upload to their own web application which will be an extra effort to merchants.

In our proposed system we will overcome above problems. Following chart represent the comparison of each of the system and proposed system.

	Feature	Proposed System	ODEL	Groupon.com	Webengage.com
1	Location-based	Yes	Yes	No	No
2	Gather existing offers using public FB pages and shop's website	Yes	No	No	No
3	Prioritize offers according to customer's behavior	Yes	No	No	No

Table 2.1: Comparison of existing systems

2.1.1 System Interfaces

- Cross Platform Mobile Application – Cross platform application will be developed which can be used in any smartphone with GPS facility.
- Database Access – The proposed database is MongoDB which can be used to save, retrieve, update and handle the data input by the user and generated by the system itself.

2.1.2 User Interfaces

- Sign In Interface
- Sign Up Interface
- Detailed Offer List Interface
- Interface of Merchant Dashboard
- Interface to give Suggestions
- Select Favorite merchant interface
- Offers and Promotion notification interface

2.1.3 Hardware Interfaces

- A smart phone with GPS and internet facility

2.1.4 Software Interfaces

- Visual Studio Code
- WebStorm
- TensorFlow library
- mongoDB
- Python
- React Native

2.1.5 Communication Interfaces

- Network Router, dongle or mobile data to communicate with cloud as the database will be hosted in cloud.
- JavaScript will be used to communicate with frontend and backend.

2.1.6 Memory Constraints

- Our application is expected to use no more than 50MB of RAM and 40MB of external storage
- For the DB it will use around 2GB of space, which will increase with the time.

2.1.7 Operations

- Proposed Mobile Application will allow user to do the below mentioned operations.
    - Both users and merchants have to register for the mobile application.
    - Users, merchants can login to the application.
    - User can get personalized location-based offer notifications.

- User can view all kind of offers of registered merchants.
- User can search for different offers and the result output will be personalized.
- Merchants can view business suggestions.
- Merchants can get statistical data which will be given an overall idea about customer reviews.

2.1.8 Site Adaptation Requirements

- Since this is a mobile application, there should be an android or IOS device. The device should have a minimum of,
  - SDK version 4.1 or above for android
  - SDK version 7 or above for IOS

2.2 Product Functions

This location-based offer notification system is mainly consist with four major components. Those main functionalities are,

- Filter out offers and promotions
- Offers and promotion notifier
- Search predictions
- Review analysis

Filter out offers and promotions

The main functionality of this functions is to identify and filter out offers and promotions from merchants' websites or public Facebook pages.

Images will be identified using a tool like Web Scraper.

Data will be extracted from identified images by modifying existing text extraction methods with machine learning algorithms.

A data model will be trained to identify offer related details from extracted data.

Offers and promotion notifier

The main functionality of this research component is to notify user with offers and promotion once they are near a shop in a shopping complex based on the seasons and their interest.

This predictor will be trained by using data extracted by following ways

- when user get registered with the app the user have to fill an form with some basic questions and some question related to their interest.
- through user recent search history

Search predictions

The main responsibility of this functions is to provide personalized search suggestions for users by analyzing search history, purchasing patterns of this particular user and users which share similar interests.

Data extracted in following ways will be used to improve predictions;

- When registering, users will be provided with a small questionnaire which will help to get an idea about the interests of the user.
- With the permission of the user, search history data will be collected and will be used with the algorithm for making search predictions.
- Users will be given the option to share reviews and experiences with shops and products with other users.

According to the analyzed data users will be put into target groups for each product category. When searching this will be helpful to give more personalized search result for users.

User feedback and ratings also will be considered when providing search results. Search results will be prioritized according to user interest as well as user feedback using ranking algorithms.

Review Handling

Main objective of this function is to provide users to provide a platform which enables to share their experience with products and shops with other users. This will be helpful to users which they can use this information to make purchase decisions. Also, shops can identify their flaws through this information and they can take necessary actions.

Also, this information will be used to provide users personalized suggestions when they are using the app in the future.

Review analysis

The main functionality of this function is to analyze customer reviews and give recommendations to merchants for improvement of the shop.

Review will be analyzed using suitable NLP and machine learning algorithm.

2.2.1 System Overview diagram

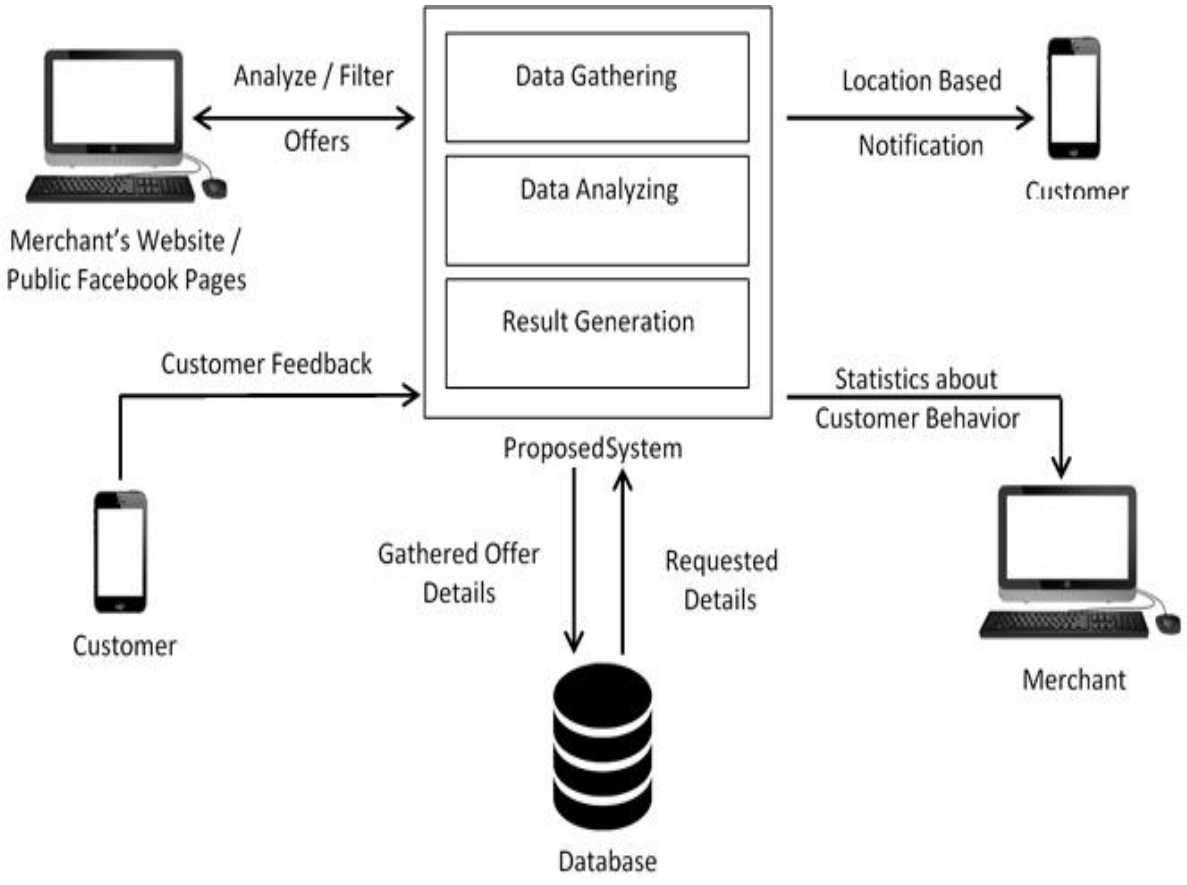

Figure 2.1 : System Overview diagram for System

2.2.2 Use Case diagram

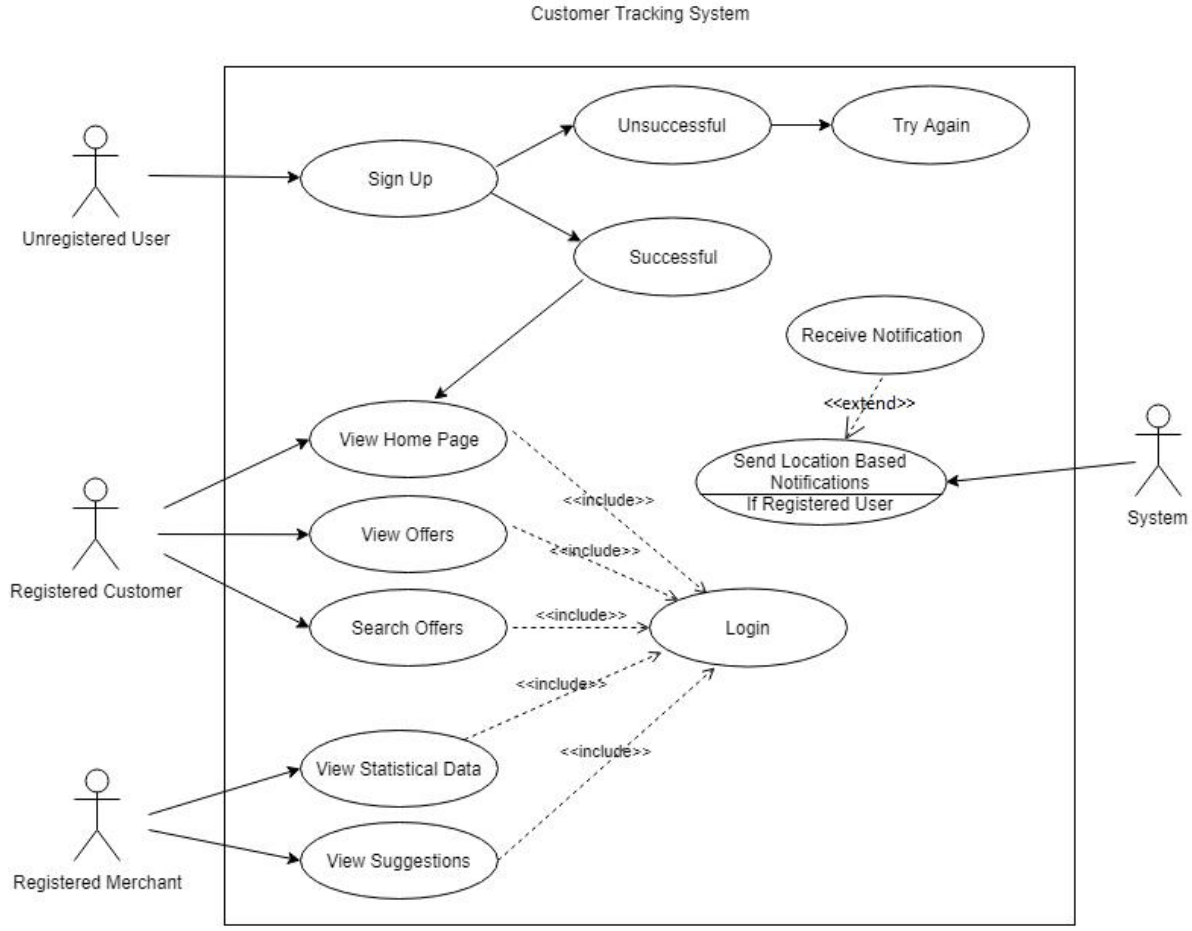

Figure 2.2 : Use Case diagram for System

Use case scenarios

Use case number	01
Use case name	Login
Actors	User
Pre-conditions	User must exist in the database.
Flow of event	1. System displays the Login interface. 2. User enter credentials. 3. System redirect the user to Dashboard.
Post Conditions	User can access the system.

Table 2.2: Use Case Scenario for Login

Use case number	02
Use case name	View Offers
Actors	User
Pre-conditions	User should sign in to the application.
Flow of event	1. Clicks on ‘View Offers’ button in Dashboard. 2. Scroll down the offers card views.
Post Conditions	Different offers will be displayed in the application.

Table 2.3: Use Case Scenario for View Offers

Use case number	03
Use case name	View Statistical Data
Actors	Registered Merchant
Pre-conditions	User need to login to the system as a merchant
Flow of event	1. View Statistical data on statistical charts related to merchant
Extensions	1.a.1 Merchant doesn’t have an active internet connection.
Post Conditions	Successfully load Statistical data on a statistical chart

Table 2.4: Use Case Scenario for View Statistical Data

Use case number	04
Use case name	View Suggestions
Actors	Registered Merchant
Pre-conditions	User need to login to the system as a merchant
Flow of event	1. View Suggestions with new business ideas.
Extensions	1.a.1 Merchant not clicked on view Suggestions link 1.a.2 Merchant doesn't have an active internet connection
Post Conditions	Successfully load the Suggestions page with new business ideas.

Table 2.5: Use Case Scenario for View Suggestions

Use case number	05
Use case name	Search
Actors	Registered Users Unregistered Users
Pre-conditions	Must have an active internet connection
Flow of event	1. Search for orders and offers 2. View most relevant results

Table 2.6: Use Case Scenario for Search

Use case number	06
Use case name	Review
Actors	Registered Users
Pre-conditions	Must have an active internet connection
Flow of event	1.Add reviews for products and offers

Table 2.7: Use Case Scenario for Review

Use case number	07
Use case name	Select Favorite Merchant add to preferences
Actors	Registered Users
Pre-conditions	Must have an active internet connection User should sign in to the application.
Flow of event	1. Clicks on ‘User Profile’ button in Dashboard. 2. Click on Merchants and add to favorite

Table 2.8: Use Case Scenario for Select Merchant

Use case number	08
Use case name	Notification
Actors	Registered Users
Pre-conditions	Must have an active internet connection GPS must be enabled
Flow of event	1. Track user location and locate shop in the radius 2. Notify User with offers and promotions based on user preferences

Table 2.9: Use Case Scenario for Receive Notification

2.2.3 Activity diagrams

View Offers

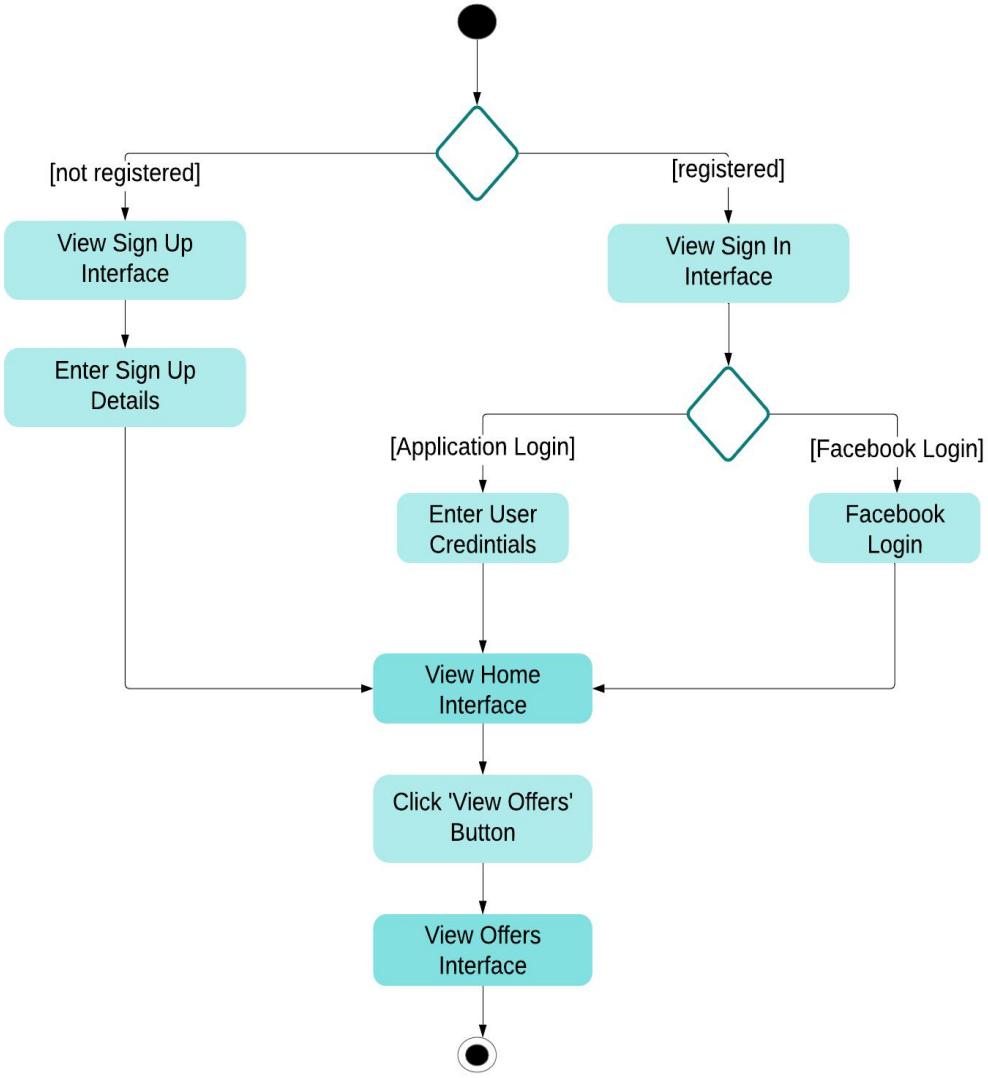

Figure 2.3 : Activity diagram for View Offers

Collect Offers from Merchants Public Facebook Pages

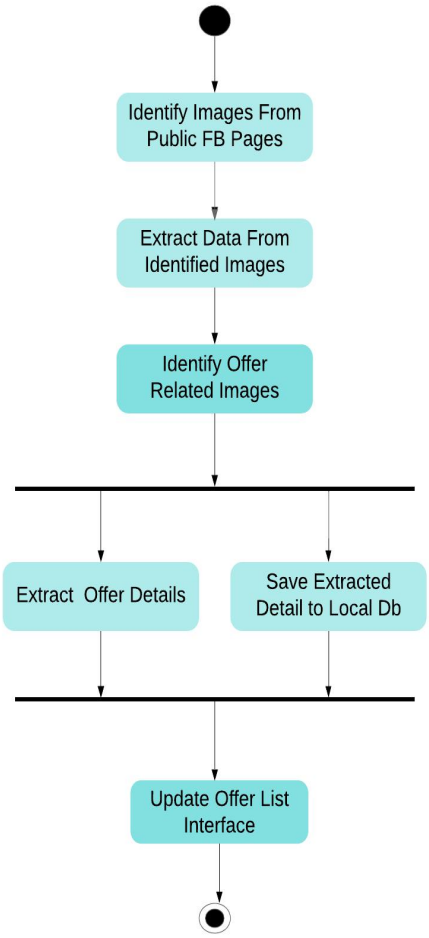

Figure 2.4 : Activity diagram for Collect Offers from Merchants

View Merchants Dashboard

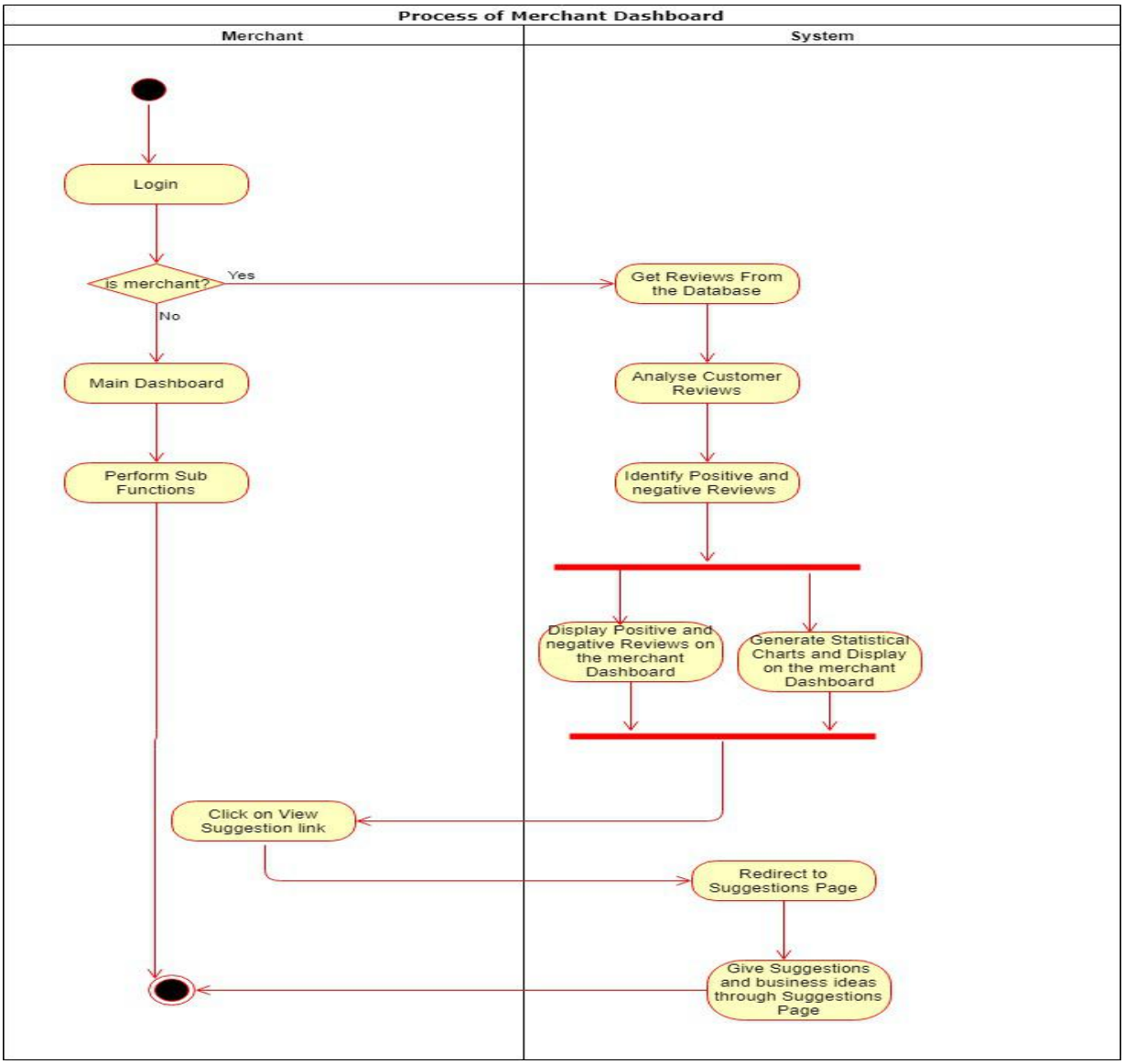

Figure 2.5 : Activity diagram for Merchant Dashboard

Search products

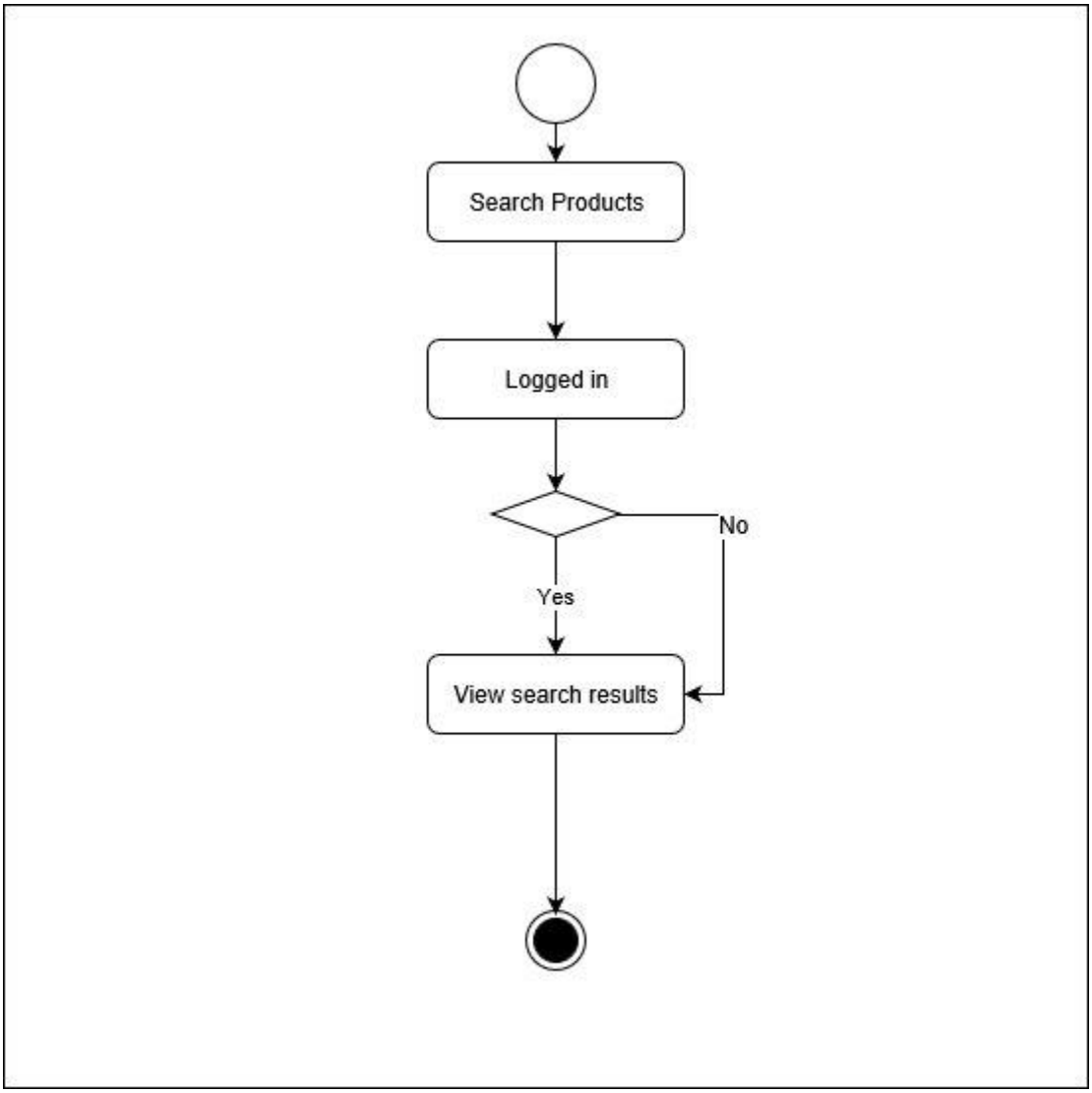

Figure 2.6 : Activity diagram for Search Function

Review Products

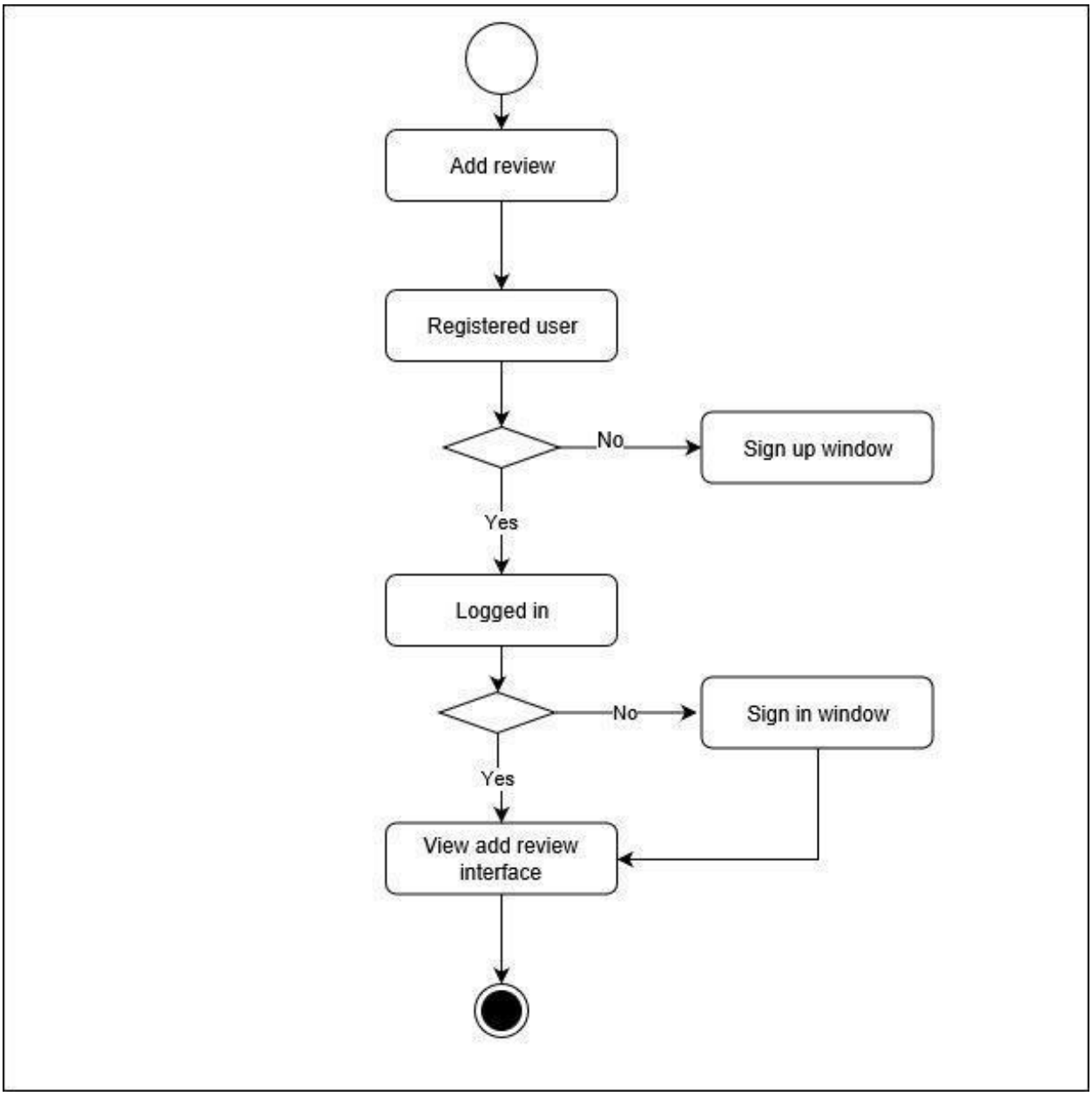

Figure 2.7 : Activity diagram for Review Function

Select Favorite Merchants

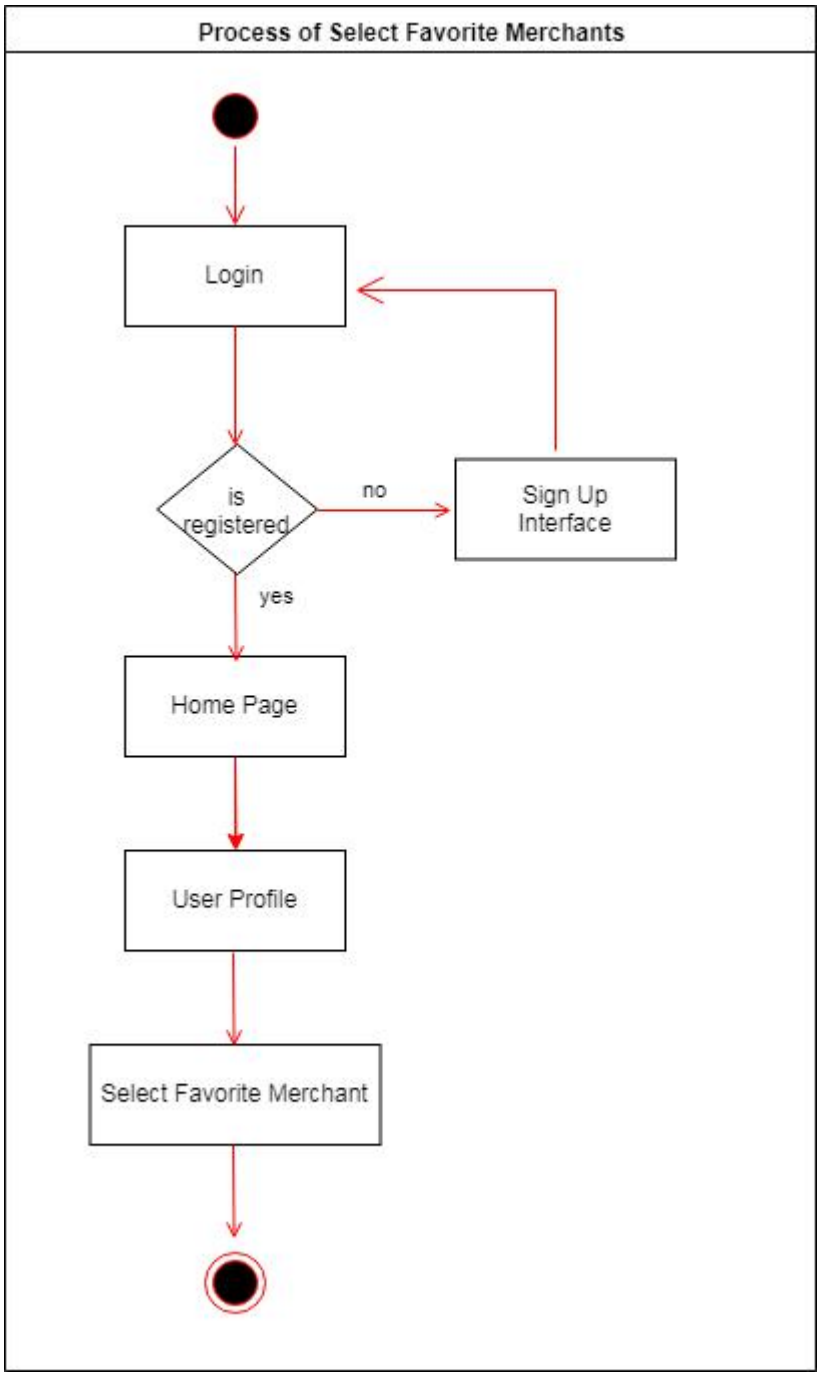

Figure 2.8: Activity diagram for Select Favorite Merchants

2.2.4 Sequence diagrams

User - Customer

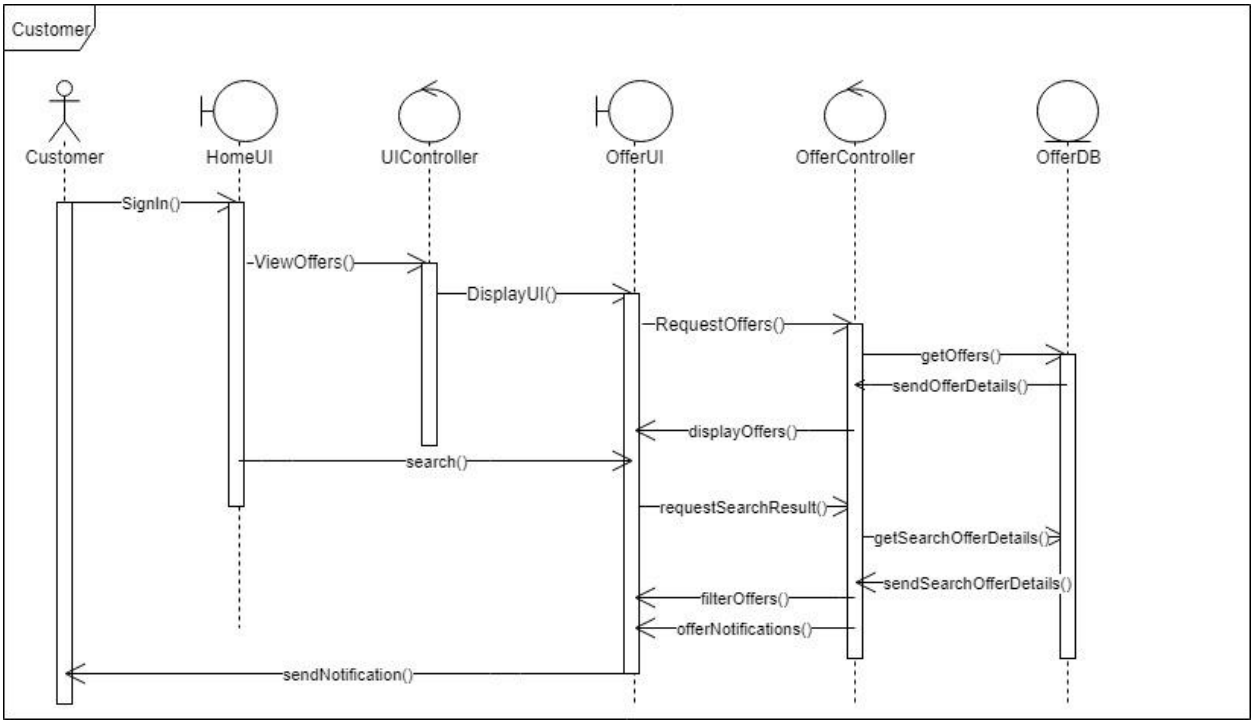

Figure 2.9 : Sequence diagram for Customer Related Sequence

User - Merchant

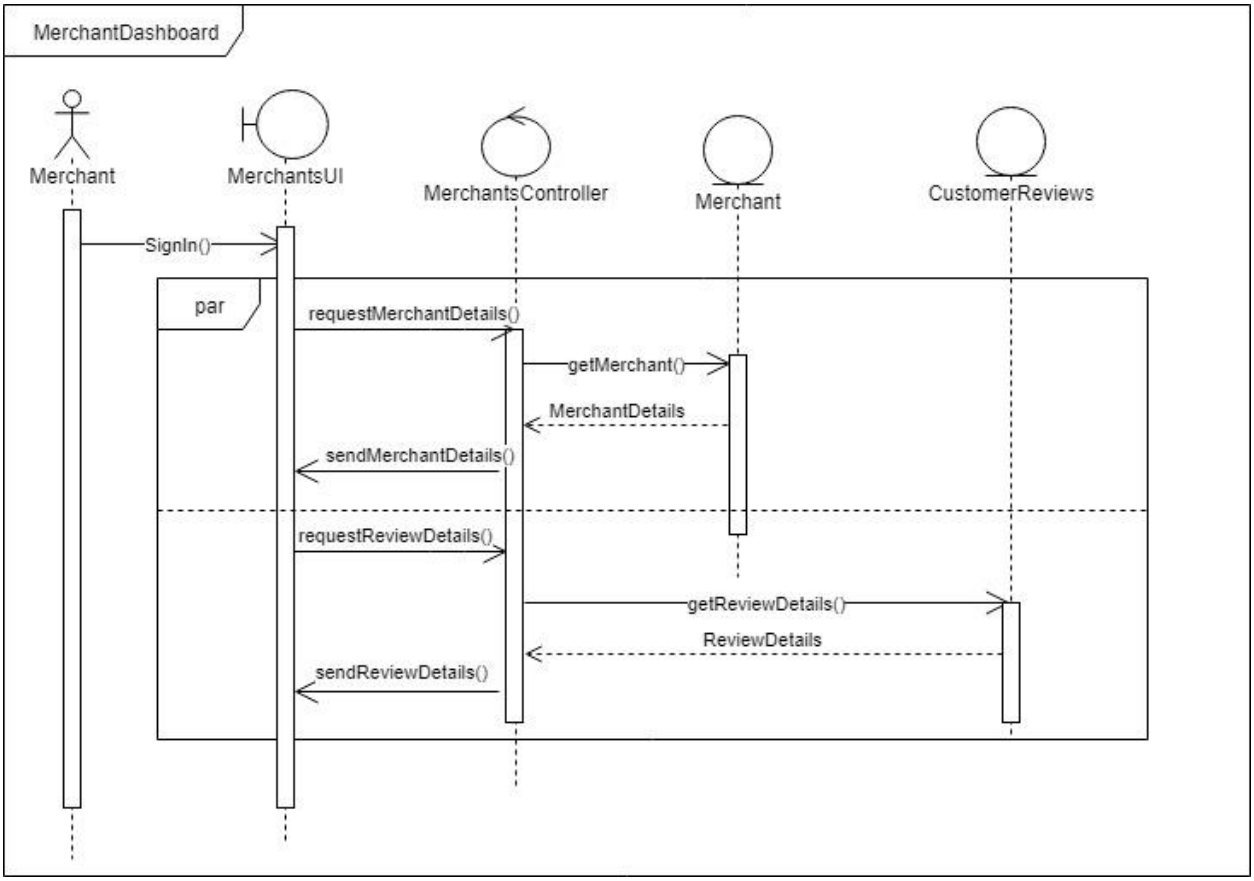

Figure 2.10 : Sequence diagram for Merchant Related Sequence

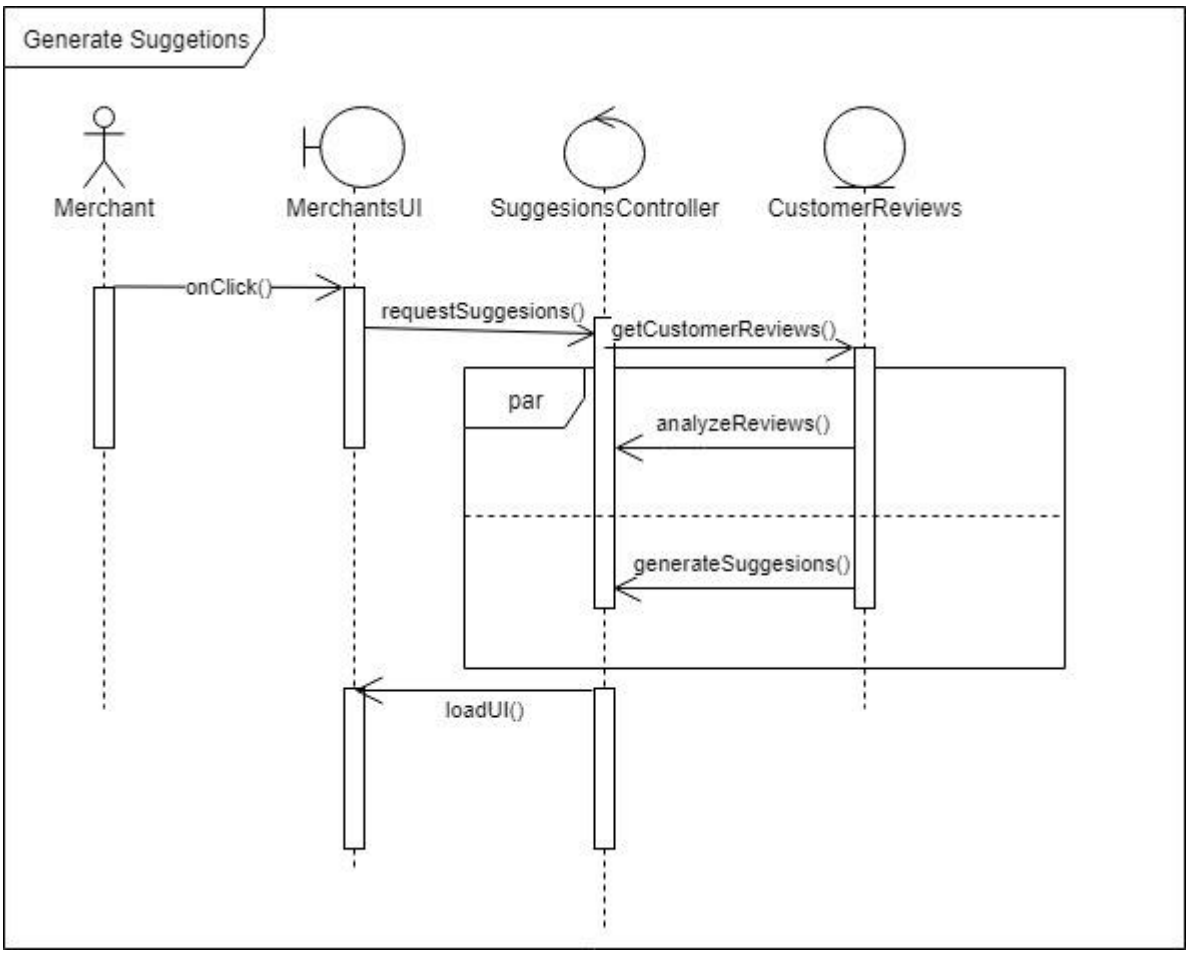

Figure 2.11 : Sequence Diagram for Generate Suggestions

2.3 User Characteristics

The intended users of this application will be customers who are doing day-to-day shopping and the merchants who are willing to give offers to improve their sales. Also, anyone who interested about different offers can use this application. Every user of this application can get personalized and location-based offers. Also, they can search or look for offers through this application. Merchants can get statistical data related to review analysis and new suggestions to improve business.

2.4 Constraints

- Location-based notifications will depend on internet connection and the type of the mobile device.
- User has to give reviews, feedbacks to get more relevant personalized offers.
- Merchants should have an updated public Facebook page which contains offers details.

2.5 Assumptions and dependencies

- This mobile application will be compatible with both android and IOS devices as this is a cross platform mobile application.
- User will enable mobile data and GPS when they need to get location-based notifications in background.
- Android API level should be 16 or higher, android version should be 4.1 (Jelly Bean) or higher and the IOS SDK should be IOS 7.

2.6 Apportioning of requirements

The requirements specified in first and second phase of this report are represented as primary specifications; the requirements in third section are represented as functional specifications. In the event that a requirement is stated within both primary and functional specifications, functional specifications will be used to build the application as they are more detailed specifications. When considering the third section the Essential requirements are to be

implemented for 1.1 version of the mobile application. In the Release state Desirable requirements will be planned and implemented. It can be expected in the future release. Developers will decide about the implementation of Optional requirements of the system. The interfaces described in the third section might have alterations, and some of the requirements will be change according to client requests and feasibility. Other than that, this application will only have slight changes in the development process of this application.

3. Specific requirements

3.1 External interface requirements

3.1.1 User Interfaces

Offer List Interface

Figure 3.1 : Offers List UI

User can view listed down offers in the system in a proper categorization manner. Once user clicks on the search button search feature will be enabled.

Sign Up Interfaces

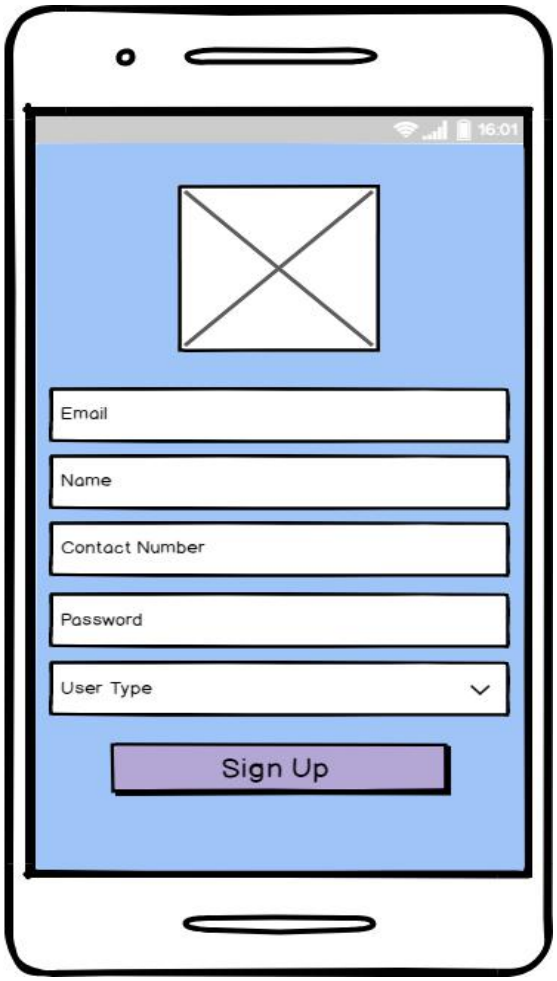

Figure 3.2 : Sign Up UI

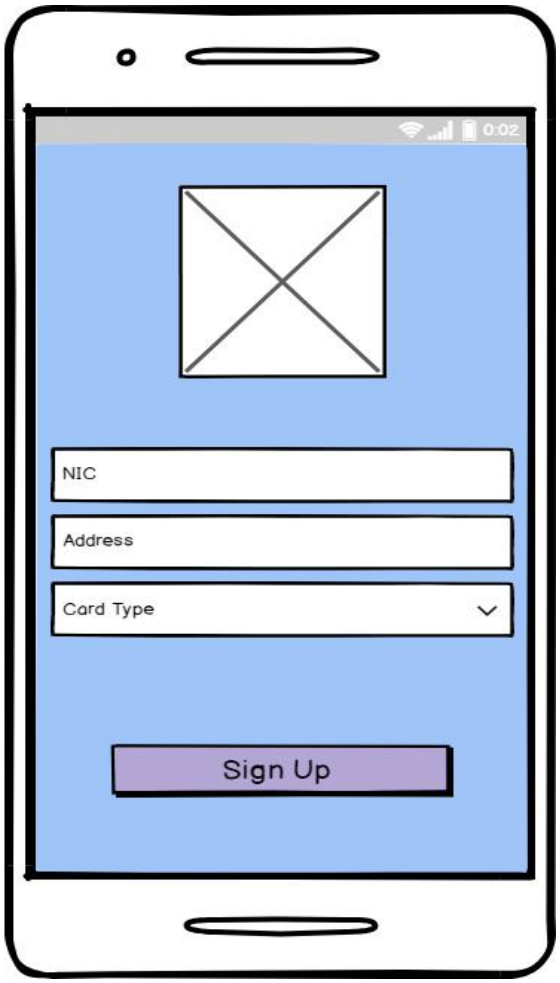

Figure 3.3 : Sign Up UI 1

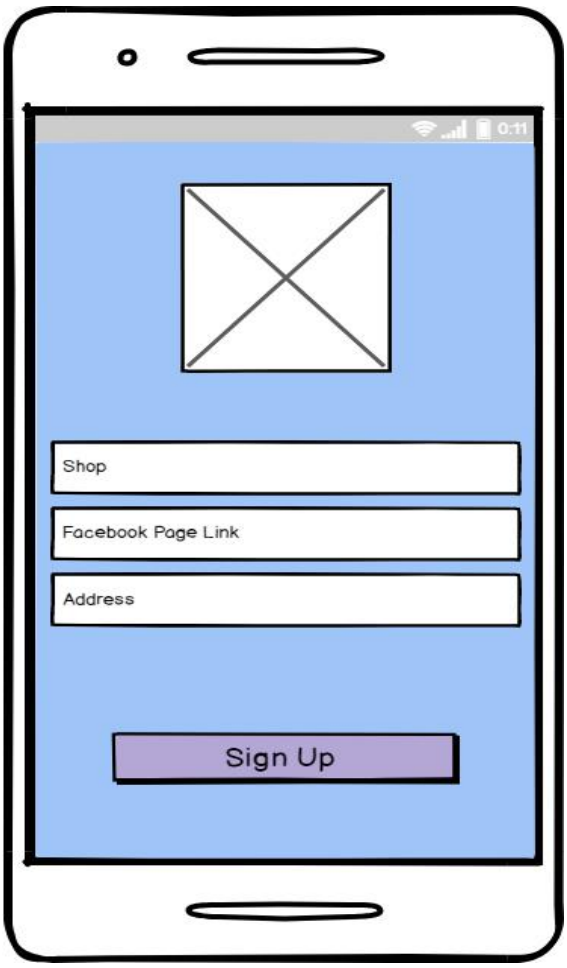

Figure 3.4 : Sign Up UI 2

User who is installing the application for the first time can use this interface and sign up to the application to get the benefit of receiving offer notifications.

Sign in Interface

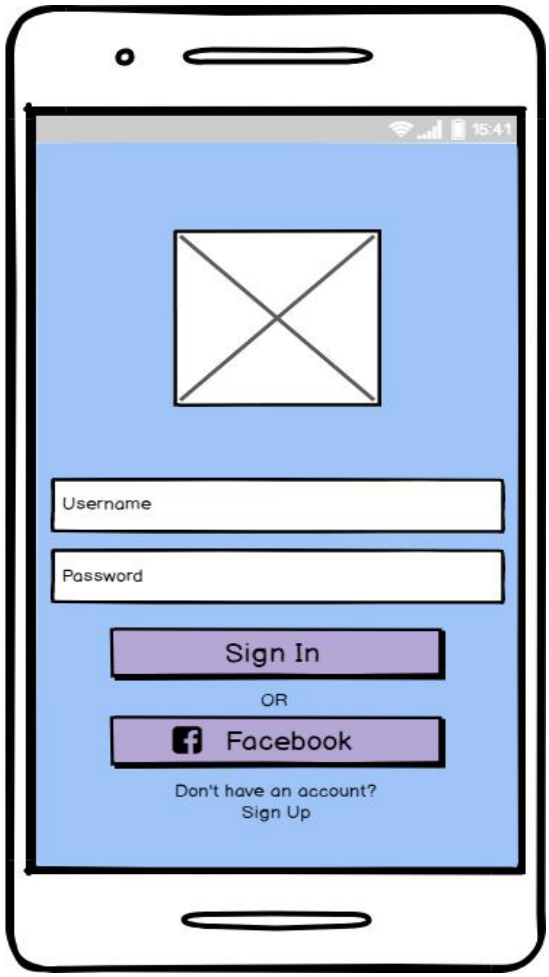

Figure 3.5 : Sign In UI

Registered users can sign in to the application to get the benefits of the application by using this interface.

Home Page Interface

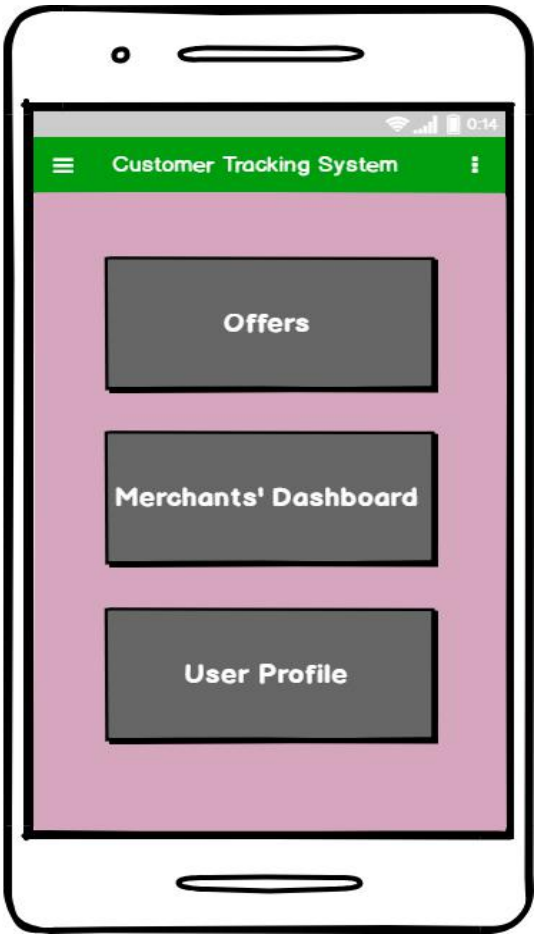

Figure 3.6 : Home Page UI

All registered users will be directed to this interface. Users can navigate to offers UI or profile UI and merchants can direct to merchants' dashboard.

Merchant Dashboard

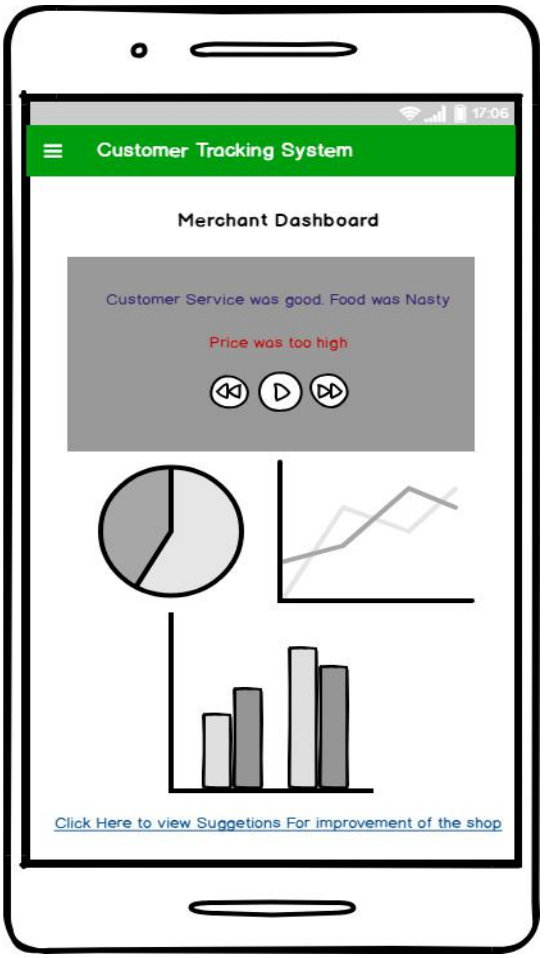

Figure 3.7 : Merchant Dashboard

When merchants signed in to the application they will be directed to the Merchant Dashboard. They can statistical charts which is generated by analyzing customer reviews. By clicking on suggestions link Merchant can view the Suggestions interface.

Suggestions Interface

Figure 3.8 : Give Suggestions page

Merchants can view suggestions which are generated by the system. This UI content will help merchants to improve their business.

Search Interface

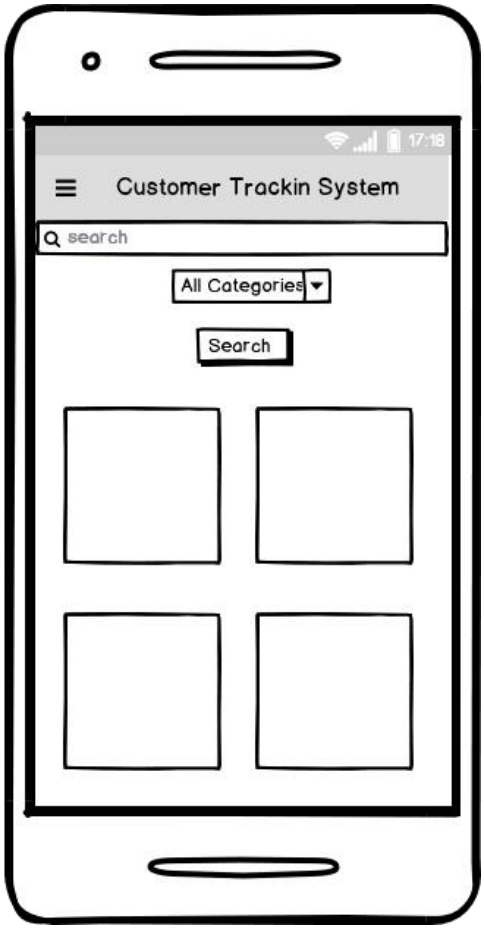

Figure 3.9: Search interface

Users will be able to search products through this interface. If users want to narrow the search, they can select a category from the dropdown. Then the search results will be shown from that category only. Search results will be displayed in the same interface.

Review Interface

Figure 3.10: Review interface

Users will be able to products that they have been purchased through this interface. Through this, users will be able to share their experience with products and shops with other users.

Customer Favorite Merchants Selection Interface

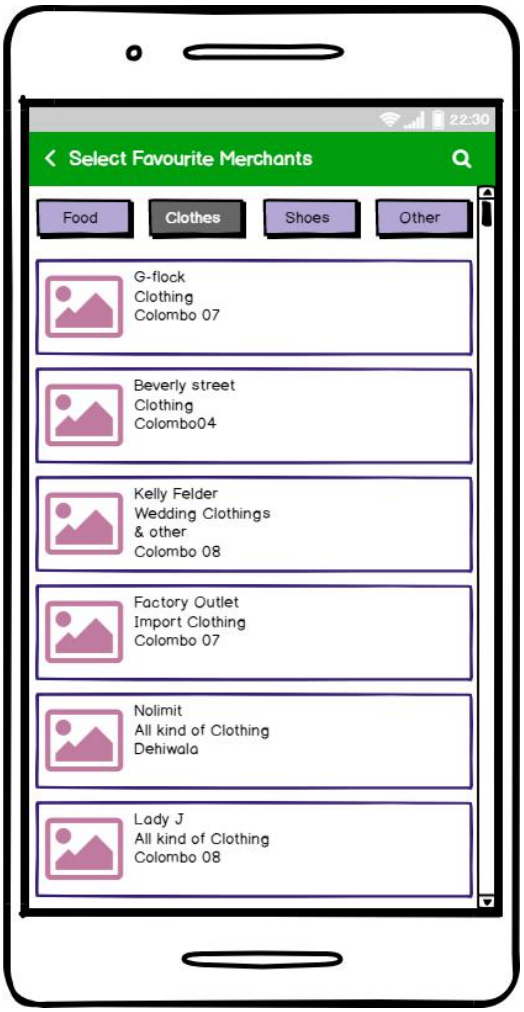

Figure 3.11: Select Favorite merchant interface

Users will be able to select their favorite merchants to their preferences using this interface where this will be used as a filter when sending notifications to the User.

Offers and Promotion notification Interface

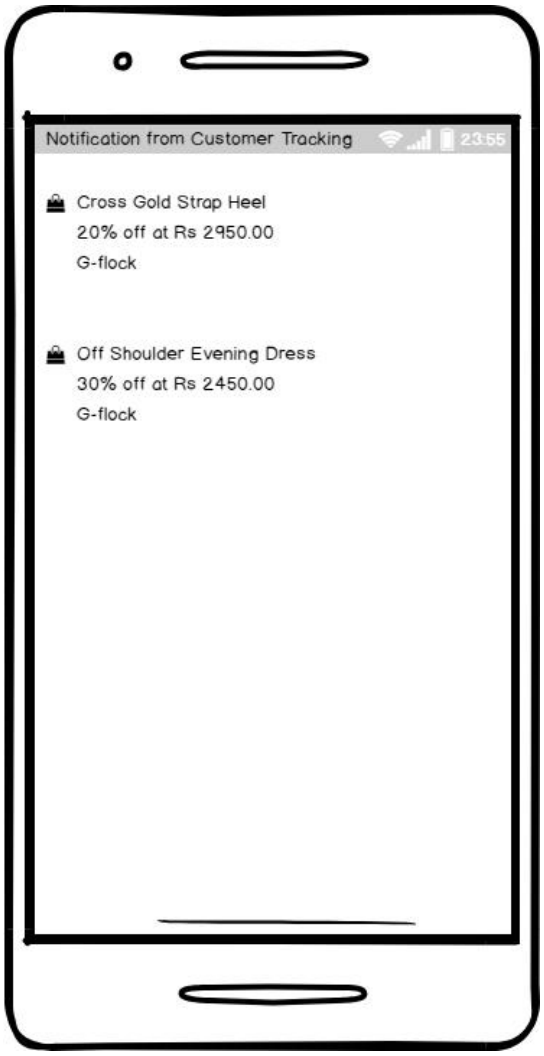

Figure 3.12: Offers and Promotion notification interface

Users will be able to view the offers and promotions notification of the shops near to user using this notification panel interface.

3.1.2 Hardware Interfaces

- Android or IOS smartphone – A smartphone will be needed to install the application and to get background notifications.

3.1.3 Software Interfaces

- Visual Studio Code IDE will be used as the frontend developing platform.
- MongoDB uses as a database management system. By using MongoDB offer details will be saved. Data documents of MongoDB can be used to retrieve offer details for different functionalities in the application. Mainly MongoDB is a NoSQL database and it is cross platform. And also, it is an open source database.
- GitHub will be use as a code hosting platform. Basically, it is considered as a version control system. Team members will work as collaborators. Collaborators can commit their changes to the GitHub and others can get those modifications. And also, finally all collaborators can access full source code easily.
- Draw.io, Creately.com is used to create different UML diagrams such as Activity diagrams, Use Case diagrams, Sequence diagrams, Class diagram.
- All the UI wireframes designed using balsamiq cloud.

3.1.4 Communication interfaces

- This application shall use the HTTP protocol for communication over the internet and TCP/IP protocol will be suite for the intranet communication.
- In this proposed system cloud will be used to host the database, therefore internet facility will be needed to get the benefit of this application.

3.2 Classes/Objects

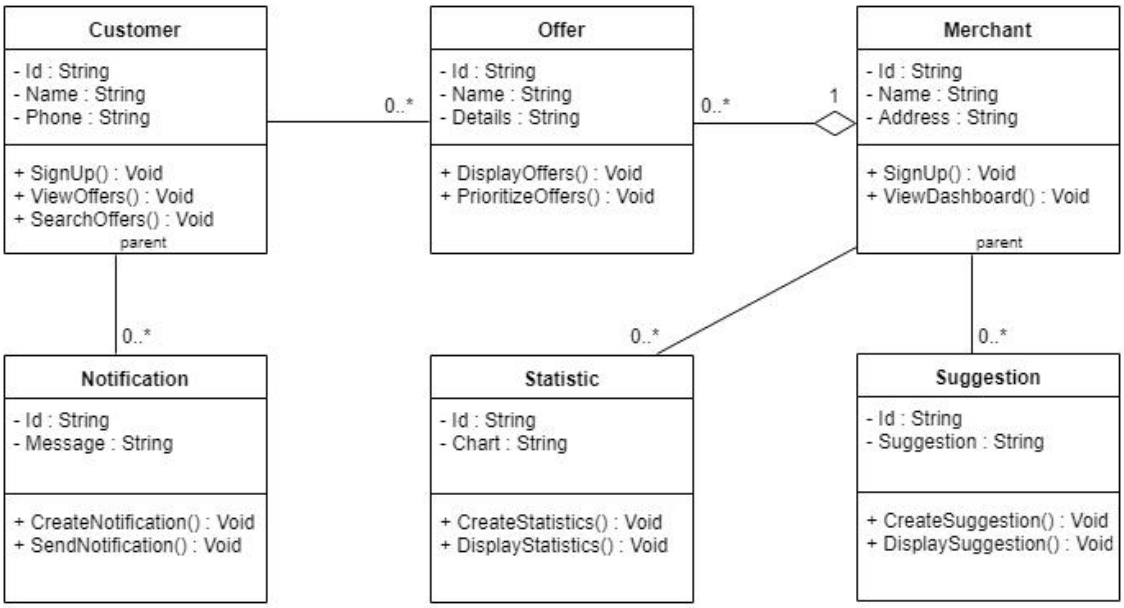

Figure 3.13 : Class Diagram for the System

3.3 Performance requirements

- Notifications should receive when connected to the internet and enabled GPS.
- Notifications should be received from shops within 100 meters.

3.4 Design constraints

- Cloud should be purchased by the development team for hosting purposes.
- User interfaces should be attractive and clear as user should get correct details without much effort.

3.5 Software system attributes

3.5.1 Reliability

System need to be capable of carry out all meant operations and functions without experiencing failure (device crash). That manner all functionalities have to perform without crashing. Reliability is an important attribute in the system. When many users login to system all users should receive personalized location-based notifications without crashing.

3.5.2 Security

This application assumes that only the registered user could have get right of entry to his/her phone. Merchants' Dashboard is access denied for customers. A verification process will be done while authentication process which will help to control access permissions on Merchants' Dashboard.

3.5.3 Maintainability

Maintainability is described because the chance of performing a success restore action within a given time. In other words, maintainability measures the speed and ease with which an application can be restored to operational repute after a failure occurs. We might be specializing in retaining a good maintainability by following,

- Clean and documented code.
- Simple mistakes additionally may be corrected within the time they occur.
- Make modifications to help tools, operating systems and new environments.
- Limit the quantity of outside libraries.

3.5.4 Availability

Whenever the users want to get entry to the application it should to be to be enable for the users. Every function should to be available.

3.6 Other Requirements

3.6.1 Accessibility

The front end of the system must be developed in a way that it attracts more users and it will be developed in an easily reachable manner because users are finding for various offers an also they are expecting notifications for worthy offers.

3.6.2 Extensibility

The application should be capable of be given extensions or modifications. It may be including the capabilities of editing existing features or adding new features.

4 Supporting Information

4.1 References

[1]"Dialog and Odel pioneer revolutionary smart retail with D-Beacon" [Online]. Available: http://www.ft.lk/article/425697/Dialog-and-Odel-pioneer-revolutionary-smart-retail-with-D-Beacon

[2] “Groupon.com” [Online]. Available: https://www.groupon.com/

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