LONDON METROPOLITAN UNIVERSITY

CS6PO5NI, Final Year Project Proposal – 2019/20

Anti-Waste Mobile and Web Application

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I would also like to thank Islington College for providing necessary resources for the continuous progress of this project. I am thankful and fortunate enough to get constant encouragement, support and guidance from all the teaching staffs of computing who helped me in successfully completing this report section.

Summary:

This report provides the overview in the progress of the final year project of **Waste Management System** based on mobile and web. This is a react-native based mobile application that allows users to reduce their wastes which include plastic, metal & steel waste, and organic waste by selling them. This app also helps users to find and purchase recycled items and waste containers.

This report includes the detail description of the progress of the project. This project is divided into five different chapters which are Introduction, Background/Literature review, Development to date, Analysis of progress, and Future work. Introduction section has the brief information of the topic whereas background/literature review has detail information of which technology and methodology used and it also includes the review and analysis of similar projects.

Development to date include the progress of the development of the project. Analysis of progress includes the progress analysis to obtain the information on the state of the project and how it is developing. This section helps to determine the actual project progress values, and to compare with the Gantt chart. Future work includes the remaining work of the project.

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1. Introduction:

This is react-native based mobile application which has admin panel in web. A web application is an application program that runs in an internet browser. Similar to desktop computer software and or a mobile app, a web application provides a user interface, offers utility or entertainment, and the ability to access, create, store, or modify data (Computer Hope, 2020). Mobile application is a program developed for smartphones or tablets running on mobile application system, such as Android and iOS (Computer Hope, 2020).

I prefer mobile application because nowadays everyone has smartphone in their hands. Many people don't use desktop computers in today. Mobile phones are easily accessible to the people. That's why I thought that mobile application would be the better option for this project.

1.1. Problem Scenario:

Today, the world produces about 300 million metric tons of plastics every year and this is a lot of numbers. It is still growing every year because we keep producing more new plastics. These plastics wind up negatively affecting wildlife habitat, and humans by affecting lands, oceans, and waterways (Opsomer & Pennington, 2020). Marine plastic litter pollution is already affecting more than 800 marine species through ingestion, entanglement, and habitat change. Current estimates show that at last 8 million pieces of plastic are entering the oceans every single day. With 1 in 3 fish caught for human consumption now containing plastic, the question is no longer are we eating plastic but how bad for us is that. In fact, researchers say that less than 10 percent of our plastics actually get recycled, so all the new plastics we make a lot of it ends up in the wrong place. If we still don't think about plastic. Then, by 2050, the oceans will contain more plastic than fish by weight (Mwamba, 2020).

Sadly, to say that food waste is one of the biggest problems facing mankind today. Between 33 – 80% of all food produced is never eaten, and the value of this wasted food is worth over $1 trillion. This is not only an economic problem, but it is also an environmental problem (WASTE WISE PRODUCTS INC., 2020). It takes a landmass larger than China to grow the food each year that is ultimately never eaten, land that has been deforested, species that have been driven to extinction, indigenous population that has been moved, soil that has been degraded, all to produce food that we then just thrown away. The food in landfills decomposes and emits methane, a poisonous greenhouse gas. Globally, methane gas from food waste makes up seven percent of total greenhouse emissions (WASTE WISE PRODUCTS INC., 2020).

Metals and Steels have been also a big problem in an environment and to human beings. Scrap metal in the landfill is a wasted resource. It is estimated that we consume about 200 billion of beer and soda can every year. Throwing away a single aluminum can waste energy equivalent to the same can filled with gasoline.

Walk around Kathmandu and you will be amazed by its cultural beauty. Unfortunately, this journey is littered with more than just remarkable artifacts and diverse lifestyles. The city streets are covered with piles of plastics and organic waste alike. Even the sacred Bagmati River is polluted by trash pilling upon rocks and aside from the ritualistic cremation of bodies at UNESCO World Heritage Site, Pashupatinath Temple, an important ceremony for Hindus saying final goodbyes to their loved ones. The current situation in Nepal is unpleasant. It is estimated that between 800 and 1000 tons of plastics are produced in the Kathmandu Valley each day and tons of recyclable waste still ends up in the Landfills every year (Azoulay, 2020).

1.2. Project as a solution:

Recycling plastic helps reduce landfill space, helps protect animals, decreased pollution, reduced greenhouse gas emissions, and helps conserve natural resources and energy. Although, almost every kind of metal can be recycled again and again without degradation of properties, currently, only 30 percent of metal is recycled. Recycling metals can help save up to 75% of the energy. Air pollution is also reduced by almost 90% (Leblanc, 2020). Food waste is composed of organic matter which can be used for composting to make fertilizer. It is an effective and eco-friendly way of disposing of food waste. By using leftovers and other food waste, we can convert these smelly items into a highly organic product rich in nutrients that we can use to grow vegetables or flowers with it.

I have decided to create a mobile application that allows the user to sell their household waste which are plastic, metal, and organic waste. We provide three kinds of the dustbin to the user who wants to sell their waste – green for organic waste, red for plastic, and blue for metals and steels. A mobile application also helps users to find and purchase plastic and metal products that are recycled and reused.

1.3. Aims and Objectives:

The main goal of this project is to solve environmental problems with the power of technology. This project will not only help in recycling but also in managing the waste. The project primarily focused on developing a mobile application for people to manage and recycle waste. One can easily sale their waste through a mobile application
and get paid.

Objectives of this project are pointed out below:

a) Try to solve the global environmental problem with the power of technology.

b) To make the waste management system process more efficient.

c) To do the right thing for the customers, reduce their waste and help them to earn money out of trash, and save their time, and help them meet sustainable goals by keeping more trash out of landfills and oceans.

d) To create a more efficient and effective society.

1.4. Mobile application features:

React native is a framework for building native apps using react for both android and iOS. Mobile application has three users: customers, waste collectors and delivery person. The mobile application features are pointed out below:

1. Customers:

a. Customers can register into the system.

b. Customers can log in to the system. He/she can also reset his/her password incase he/she forgot the password.

c. It helps customers to find and purchase recycle products. Customers can also cancel their orders. They can also view their shopping history.

d. Customers can check their waste collection date and time directly from mobile application. They can also view the timeline of their waste collection.

e. Customers can view their rewards points. Rewards points are calculated in the basis of waste collection. They can also share their rewards in social media.

f. Customers can read the articles and blogs related to waste management system recycling.

g. Push notification helps to directly alert the users about new update, and reminders. Waste collection notifications are given in the basis of area.

h. Customers can view their own profile.

2. Waste collectors and Delivery person:

a. Waste collectors can log in to the system. The username and password for waste collectors and delivery person are generated from web.

b. Both waste collectors and delivery persons get push notifications from web. Waste collectors gets notified when it's time to collect waste whereas delivery person gets notified when it's time to deliver the products.

c. Both waste collectors and delivery person have their own profile.

d. Waste collectors can view the list of customers only those which were assigned by superhero.

e. Delivery person can view the list of recycled only those which were assigned by superhero.

f. Both waste collectors and delivery person can use map to locate the customer's home location.

1.5. Web application features:

The web application is based on Laravel which includes the admin panel. Laravel is a web application framework with expressive, elegant syntax. Web application has only one user which is superhero. The web application features are pointed out below:

1. Superhero can login from web application. He/she can also reset his/her password incase he/she forgot the password.
2. In dashboard, superhero can view the summary of recent order list, notifications from mobile app users and can also view the statistics of total products sold, total revenue collected, total earning, and total waste collected.
3. Superhero can add, edit, and delete recycled products, waste containers and waste types from web. He/she can also view the list of recycled products, waste containers and waste type.
4. Superhero can view the list the customers. He/she can also add, edit, and delivery person and waste collector. He/she can view the list of delivery person and waste collectors.
5. Superhero assign the recycled products to the delivery person when orders come out and he/she also assign area to the waste collectors to collect the waste.

1.6. Report structure:

This section consists of the structure of the remainder of the report.

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- Blade Templating
- CRUD operation

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4. Future work
5. References
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a. Appendices A (Gantt chart)

b. Appendices B (Database migration)

2. Background/Literature review:

2.1. Technology Used:

This application helps to manage waste and recycling efficiently and meet the sustainability goals. This application is primarily designed for the local people of Kathmandu where the city is polluted by the trash.

This application is built in the react-native based program which uses Expo as a platform to create native apps for Android, and iOS with JavaScript and React. For sending notifications to the users it uses Expo push notifications service. For API implementation it uses react native axios management library. To test the mobile application, it uses Jest which helps to use unit testing on both iOS and Android. The main reason for using react native to build mobile application is, it offers faster mobile development, and more efficient code sharing across iOS, Android, and Web, without sacrificing the end user's experience and or application quality.

For the development of web application, it uses Laravel as a web application framework of PHP. The reason I choose Laravel as a backend development is, it supports MVC architecture which helps in improving the performance, allows better documentation, and has multiple built-in functionalities. The database I used is MySQL database because it easy to connect and manipulate MySQL database with PHP.

2.2. Methodology:

In order to achieve the expected outcome, the methodology to be used in this project is the Agile Kanban methodology. The agile methodology is an incremental and iterative mobile application development approach, where the complete app development process is divided into multiple sub-modules, considered as mini projects (Packt Publishing Ltd, 2020).

I've chosen the Agile Kanban methodology because, in the case of the agile development model, the complete mobile app project is divided into smaller modules that are treated like independent sub-projects. Kanban doesn't come with the size limitations whereas scrum recommends the development team to have at least 3 to 9 members. This methodology fosters testing of every single module at the primitive level. This reduces the risk of encountering a bug at the time of quality testing of the complete project.

2.3. Review of similar projects:

This section is divided into two different parts: review on similar mobile application projects and review on similar web application projects.

2.3.1. Mobile application:

1. Recycle Coach:

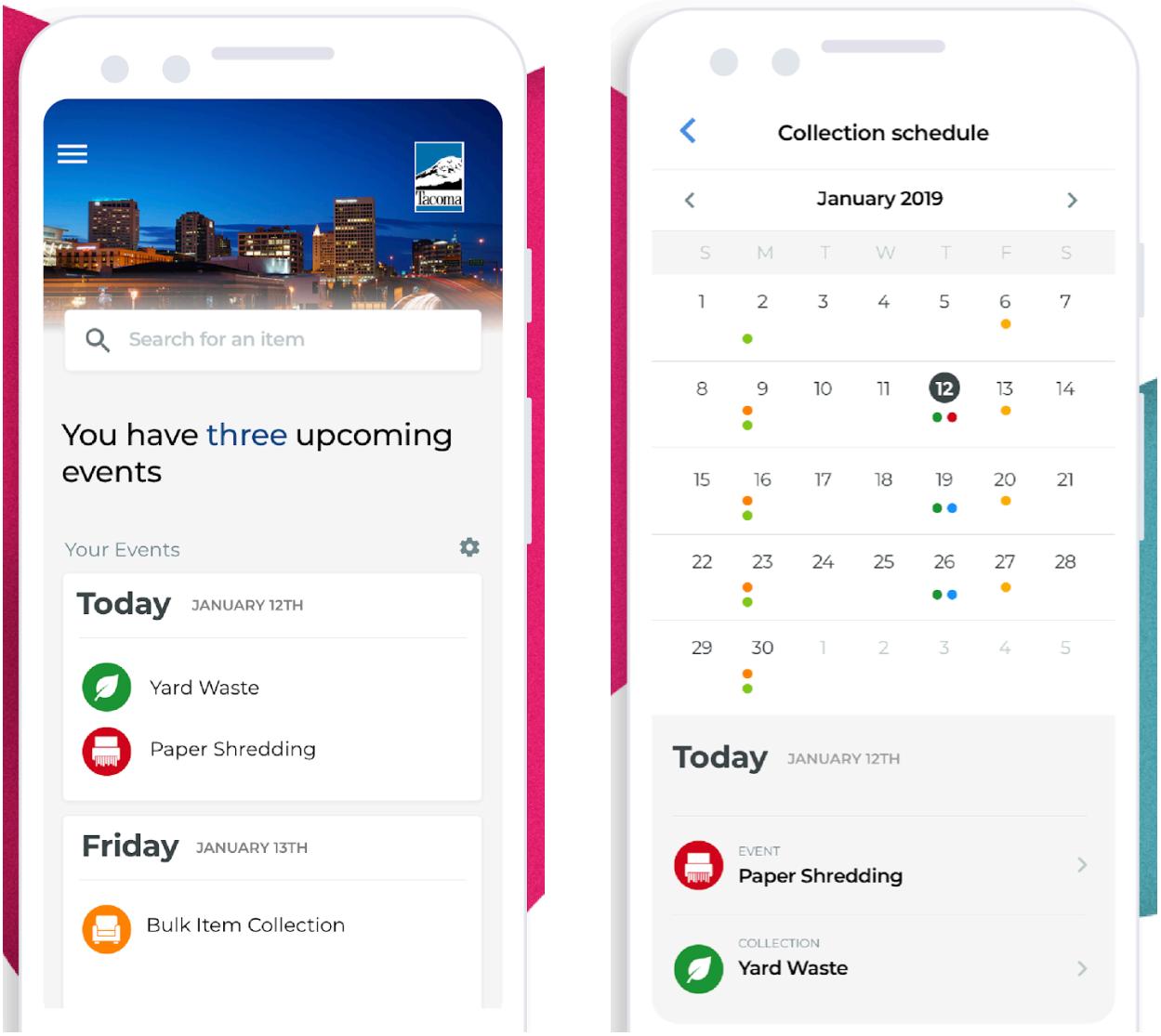

Figure 1 - Review on recycling coach mobile app - events and collection schedule (Google Play, 2020)

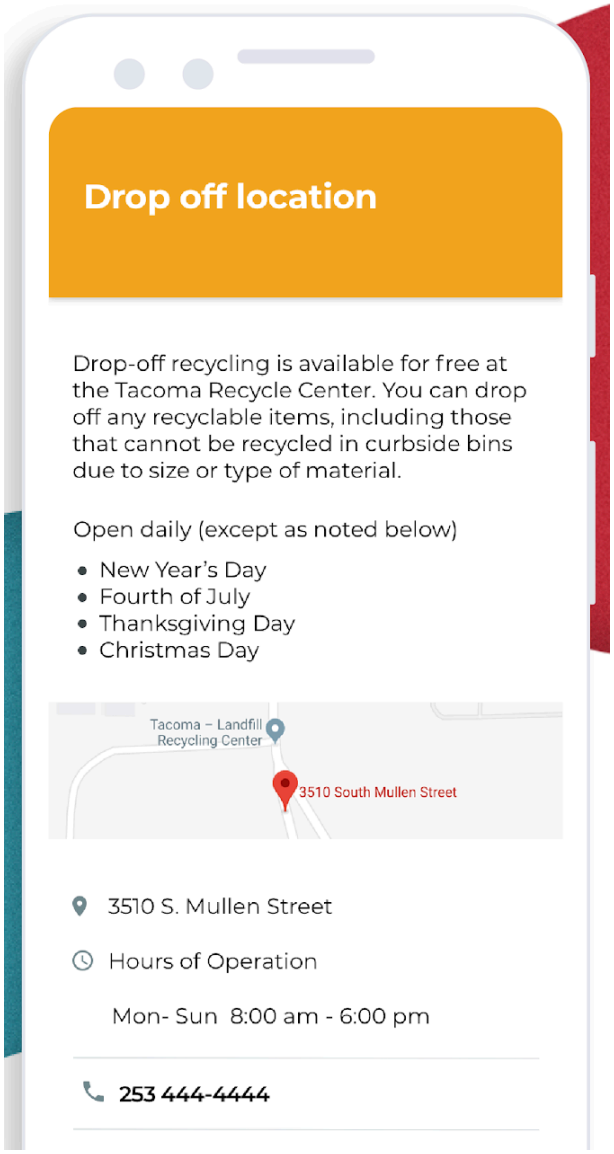

Figure 2 - Review on recycling coach mobile app - drop off location (Google Play, 2020)

Recycle coach is a Central Okanagan's based mobile application where we can get instant access to all waste disposal information for our community. This application is available for both iOS and Android. This application has simplified communication with real-time reporting of missed collections, graffiti, illegal dumping and more. We can get recycling tips and as well as collection updates. We get personalized calendars and reminders through mobile device. This application also helps to get accurate recycling and disposal information for thousands of household items. This application also helps to know about the local waste and recycling events (Recycle Coach, 2020).

2.3.2. Web application:

1. eBay:

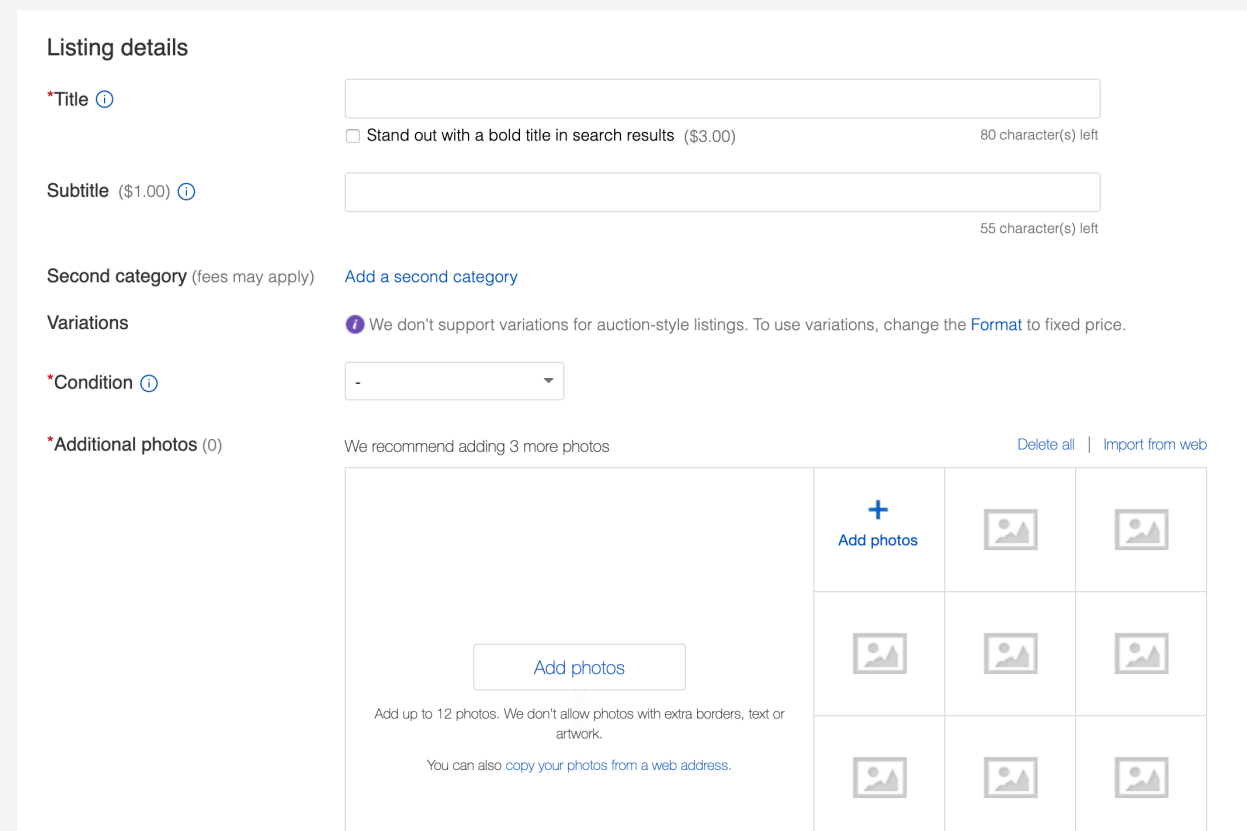

Figure 3 - Review on eBay - add product (eBay, 2020)

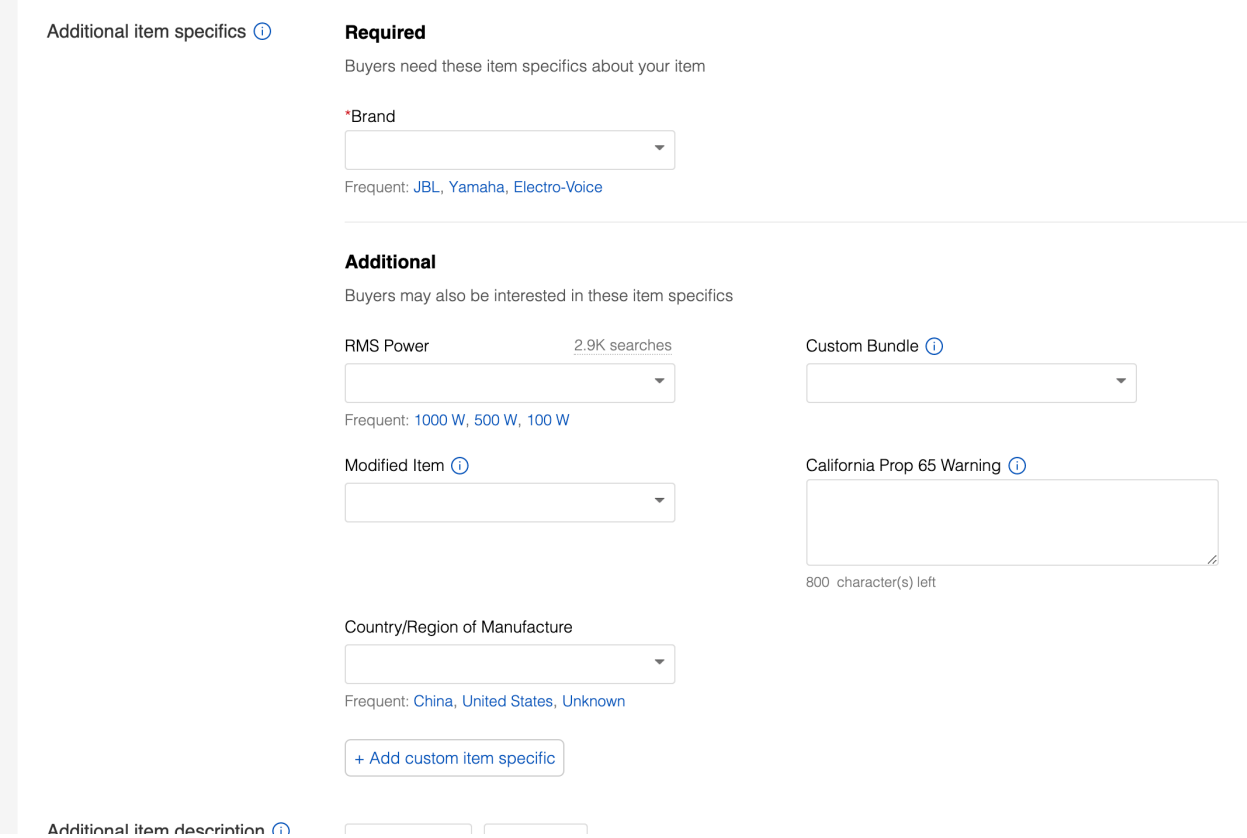

Figure 4 - Review on eBay - add product details (eBay, 2020)

eBay Inc. is an American multinational ecommerce corporation based in San Jose, California, that facilities consumer-to-consumer and business-to-consumer sales through its website (eBay Inc., 2020). This is a very big company and has many more features regarding ecommerce. From this application, I have known about the number of fields required while adding products.

2. X-Cart:

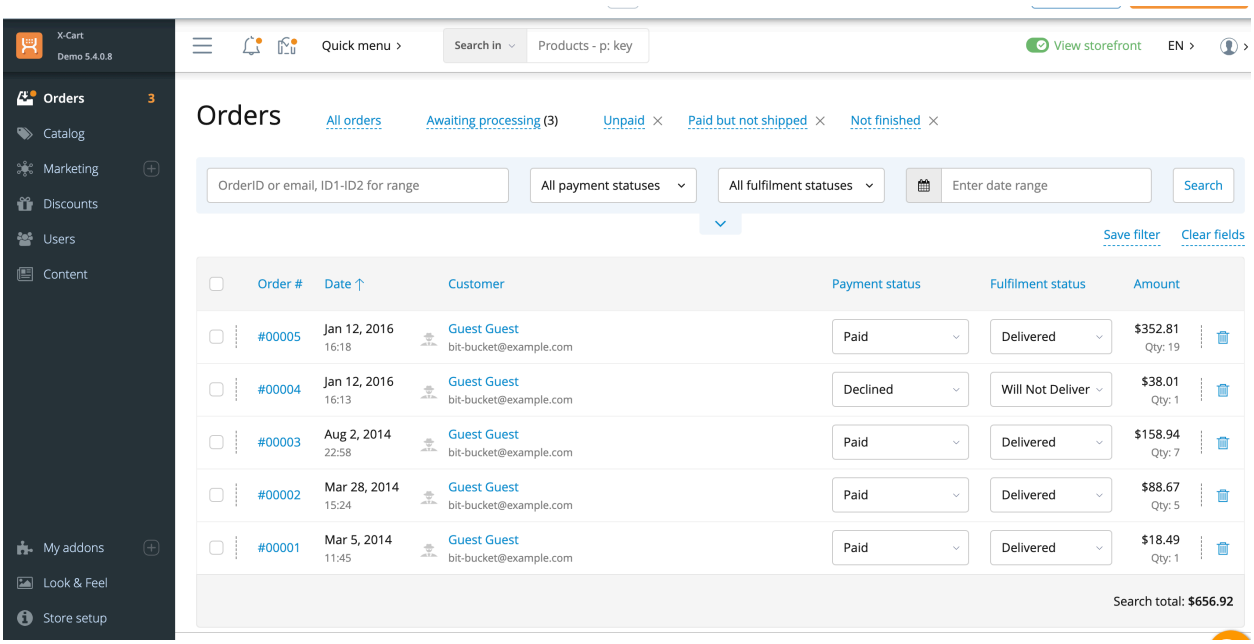

Figure 5 - Review on x-cart - dashboard and all (X-Cart , 2020)

X-Cart is an open-source shopping cart demo software. It is an ecommerce website builder that give the full control over every element for online store. This software allows us to view the details of products, customers, and orders. This software helps us in tracking and managing orders and also manage multiple orders at once. From this software, we can also add unlimited products with ease. This software also helps in tracking product inventory one at a time or manage multiple products at once. This is the complete ecommerce application which has almost every feature that should be in the ecommerce application.

2.4. Analysis of similar projects with my project:

Recycle coach is a Central Okanagan's based mobile application where we can get instant access to all waste disposal information for our community. We can get recycling tips and as well as collection updates. We get personalized calendars and reminders through mobile device. This application also helps to get accurate recycling and disposal information for thousands of household items.

The application that I am building is primarily designed for the local people of Kathmandu where the city is polluted by the trash. This application is not only helping in recycling, but it also manages wastes. The main unique feature this application has is, it sends notifications in the basis of different locations. I've not heard any application regarding waste management and recycling in Nepal but there are some companies: Khalisisi, Doko recycle who are working. From this application, people can earn money by selling their waste. They can also buy recycle products directly from mobile application. This mobile application has two more users which are waste collectors and delivery person.

X-Cart is an open-source shopping cart demo software. This software helps us in tracking and managing orders and also manage multiple orders at once. From this software, we can also add unlimited products with ease. This software also helps in tracking product inventory one at a time or manage multiple products at once. This is the complete ecommerce application which has almost every feature that should be in the ecommerce application.

The web application that I'm building is an admin panel that allows admin to add products from web. It also helps to view the details of customers, waste collectors, and delivery persons. We can also view the list of recycle products, waste containers and waste type from this application. The system automatically sent notifications to the mobile users from web.

3. Development to date:

This project is based on mobile application which has a web-based admin panel. This section includes the progress of development of application on both mobile and web.

3.1. Mobile Application:

3.1.1. Use case diagram:

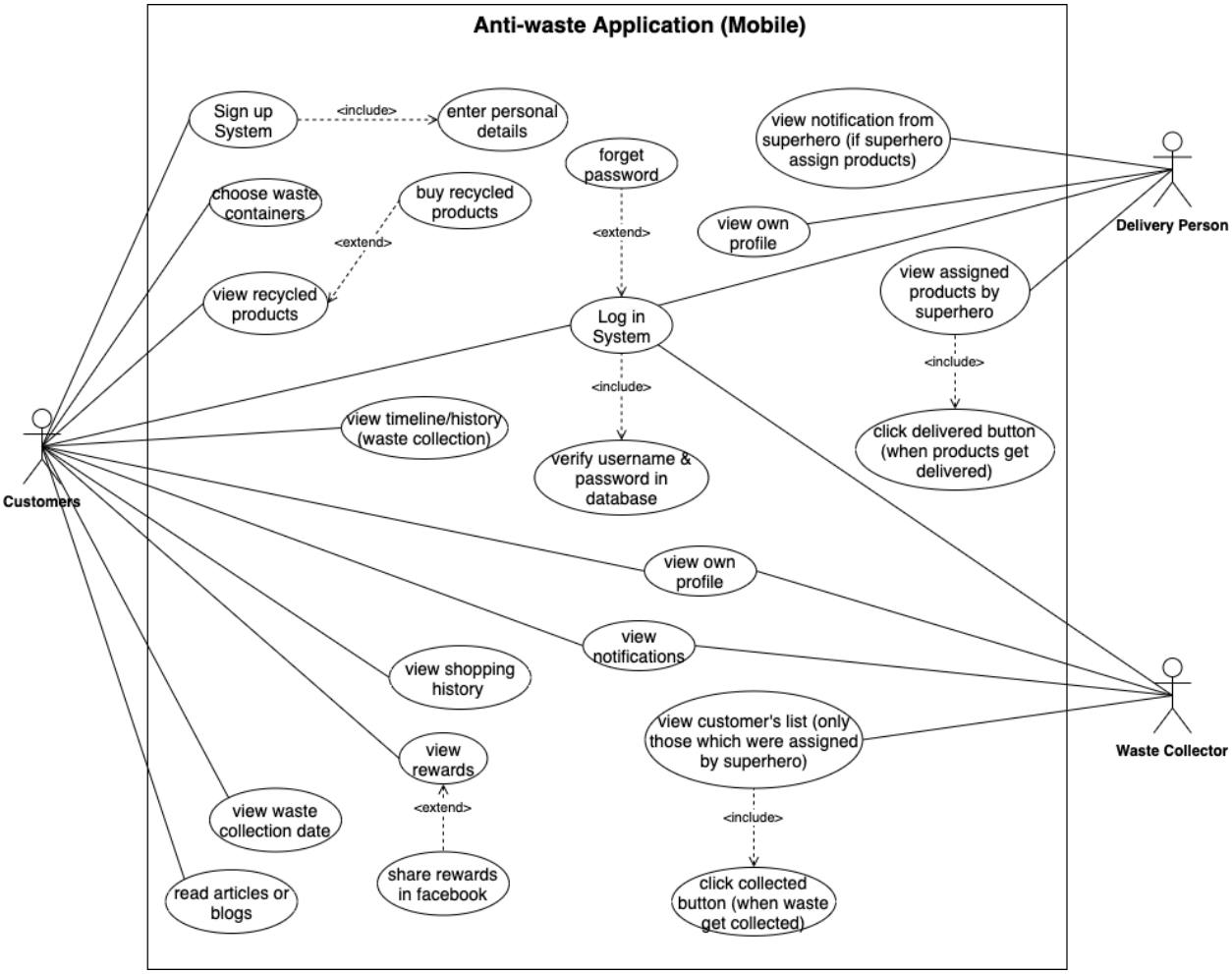

Figure 6 - Use case diagram - mobile

3.1.2. High level use case description:

1. Sign up in the system:

Use Case: Log in the system

Actors: Customers

Descriptions: Customers need to sign up in the system in order to use the application. He/she needs to enter their personal details before signing up in the system.

2. Choose waste containers:

Use Case: Choose waste containers

Actors: Customers

Descriptions: If customers want to sell their waste then they need to choose waste containers.

3. Log in to the system:

Use Case: Log in to the system

Actors: Customers, Waste collectors, and Delivery person

Descriptions: In order to access the system all customer, waste collectors and delivery person have to login to the system. A login generally requires username and password to access the system. If user forget the password, email is required to verify the user. Then a mail with temporary verification code will be sent to the user email account.

4. View recycled products

Use Case: View recycled products

Actors: Customers

Descriptions: Customers can view recycled products in the dashboard. He/she can also buy recycled products.

5. View waste collection timeline:

Use Case: View waste collection timeline

Actors: Customers

Descriptions: Customers can view their waste collection timeline.

6. View own profile:

Use Case: View own profile

Actors: Customers, Waste collectors and Delivery person

Descriptions: All customers, waste collectors and delivery person can see their profile.

7. View notifications:

Use Case: View notifications

Actors: Customers, Waste collectors and Delivery person

Descriptions: All customers, waste collectors and delivery person can see notification from superhero.

8. View shopping history:

Use Case: View shopping history

Actors: Customers

Descriptions: Customers can see their shopping history directly from their profile.

9. View rewards:

Use Case: View rewards

Actors: Customers

Descriptions: Customers can see their rewards points in their specific profile. Rewards are calculated in the basis of waste collection history. He/she can also share their reward points in the social media.

10. View waste collection date:

Use Case: View waste collection date **Actors:** Customers **Descriptions:** Customers can check their waste collection date of their area.

11. Read articles and blogs:

Use Case: Read articles and blogs **Actors:** Customers **Descriptions:** Customers can also read articles and blogs related to waste management system from their mobile application.

12. View customer's list (only those which were assigned by superhero)

Use Case: View customer's list (only those which were assigned by superhero) **Actors:** Waste collectors **Descriptions:** When it's time to collect the waste, he/she can view the customer's list (only those which were assigned by superhero) in the mobile dashboard. He/she must click collected but when waste gets collected.

13. View recycle products list (only those which were assigned by superhero)

Use Case: View recycle product list (only those which were assigned by superhero) **Actors:** Delivery person **Descriptions:** When it's time to deliver the products, he/she can view the recycle product list (only those which were assigned by superhero) in the mobile dashboard. He/she must click delivered button when product gets delivered.

3.1.4. Wireframes:

1. Customers:

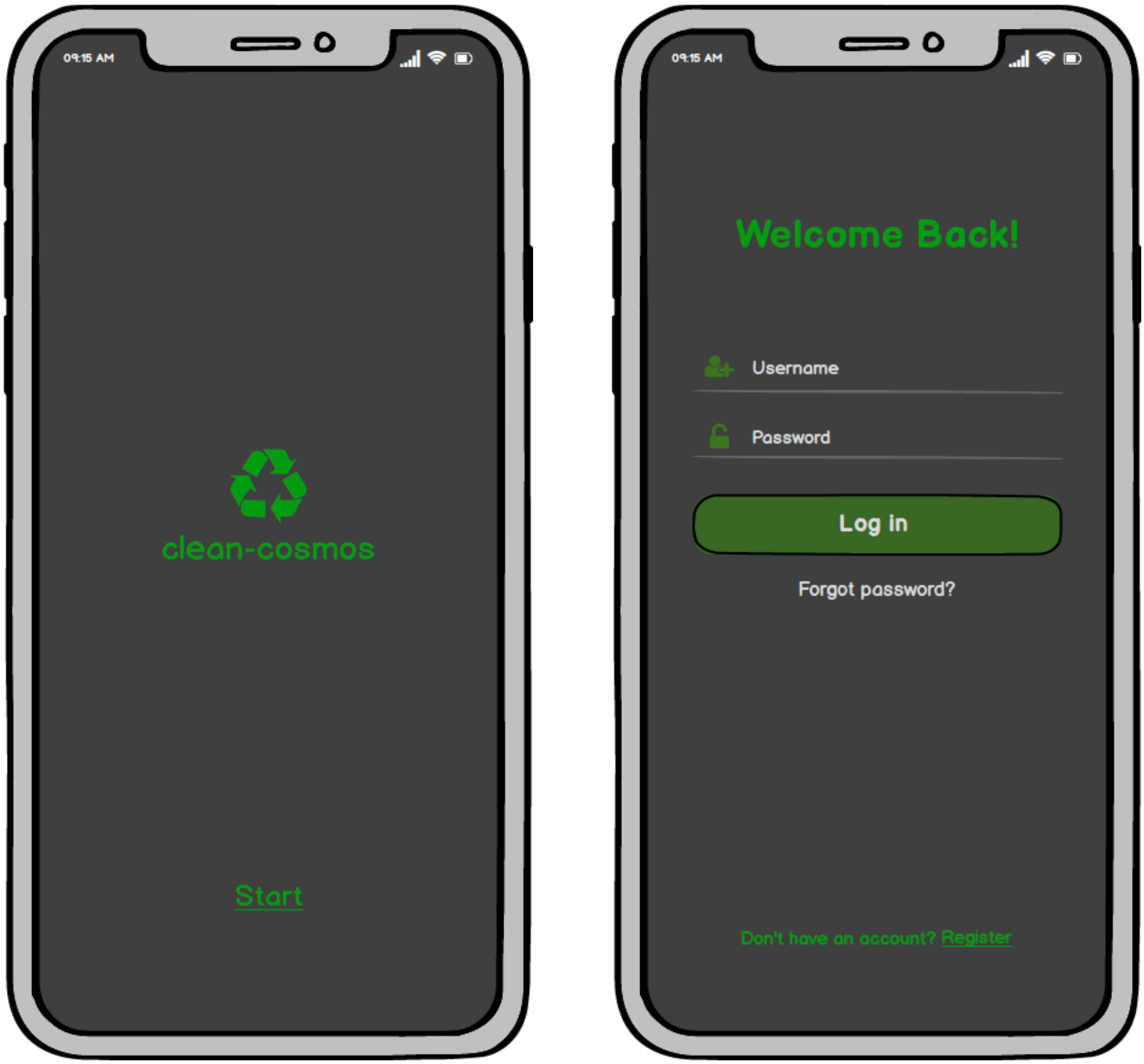

Figure 7 - Loading and Login page for customers

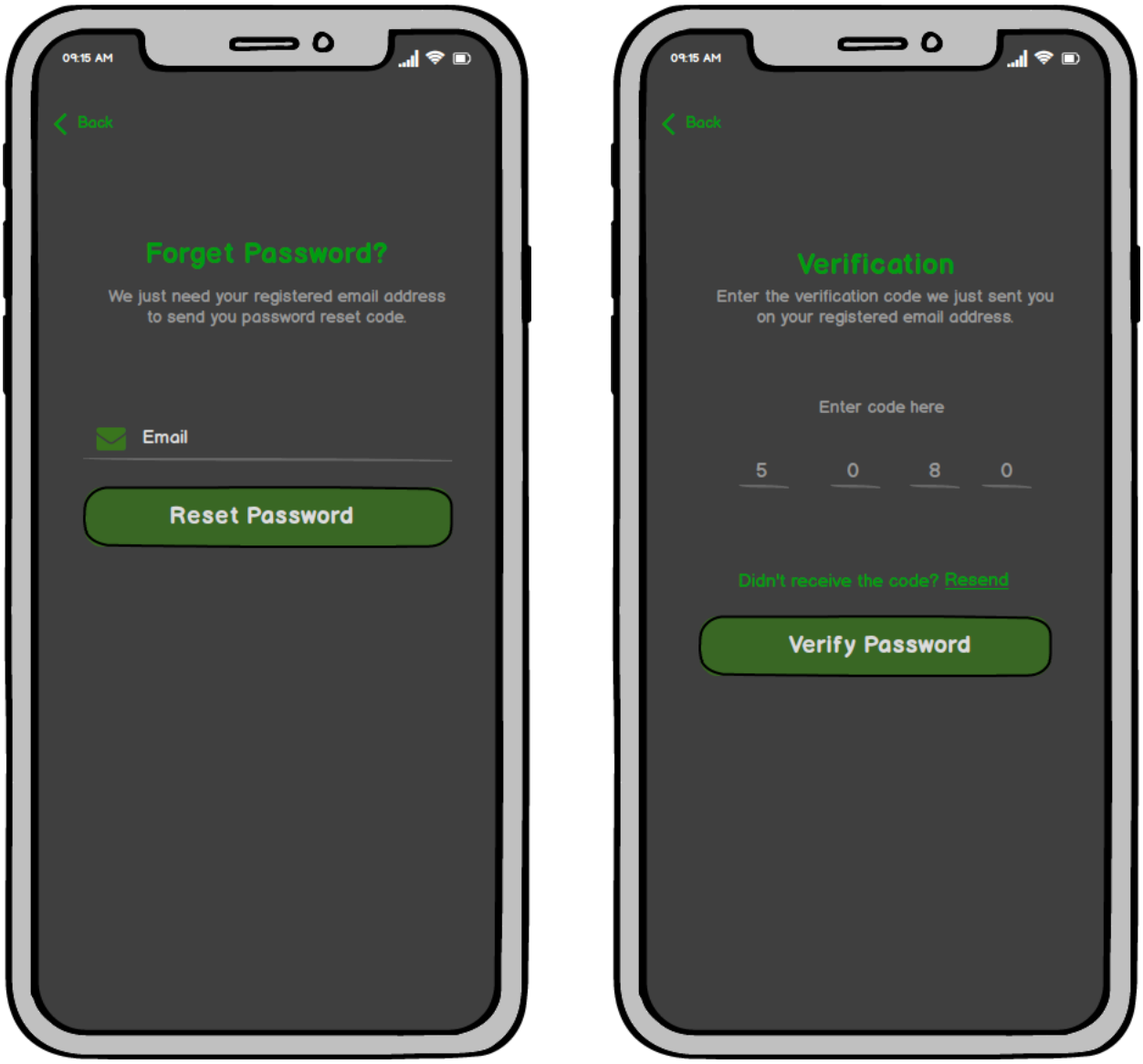

Figure 8 - Forget password page for customers

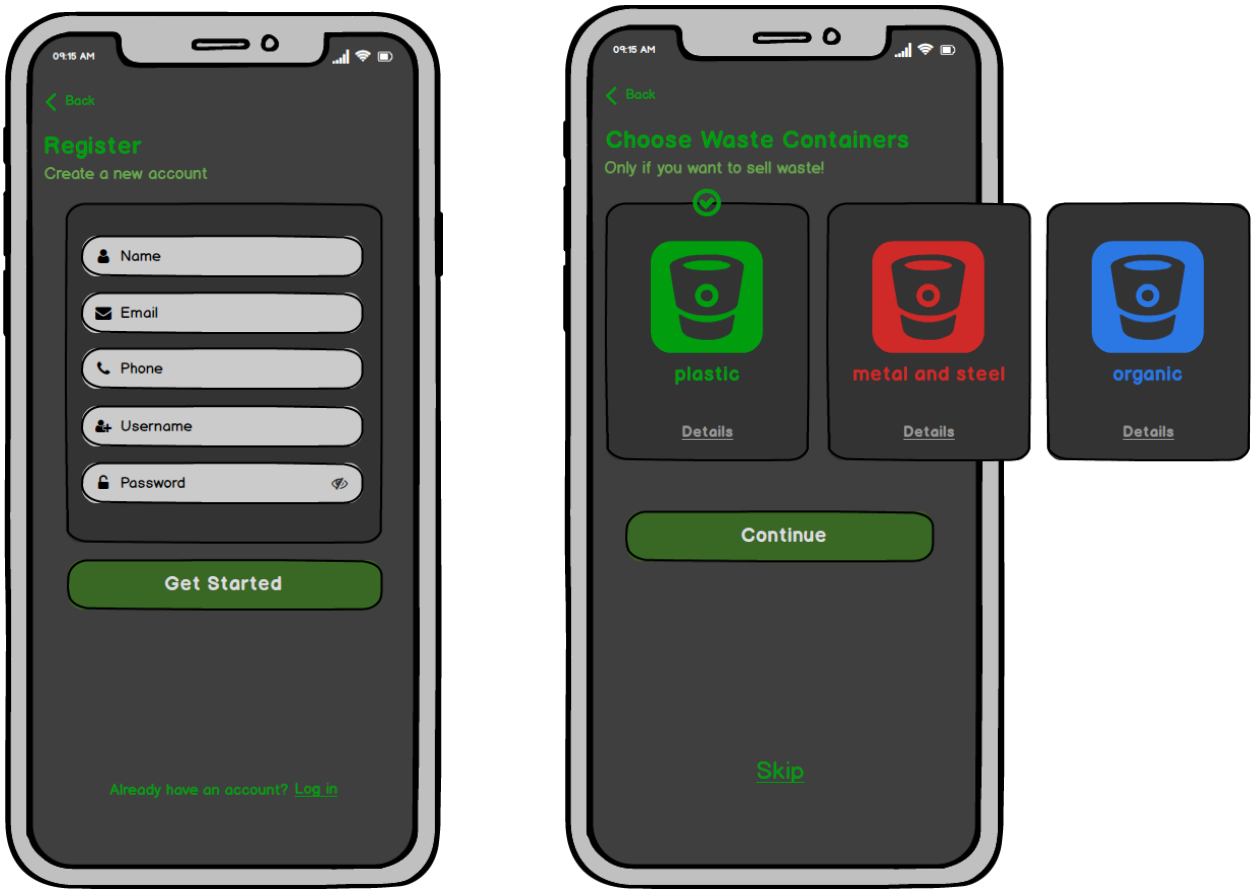

Figure 9 - Register and Choose waste containers page for customers

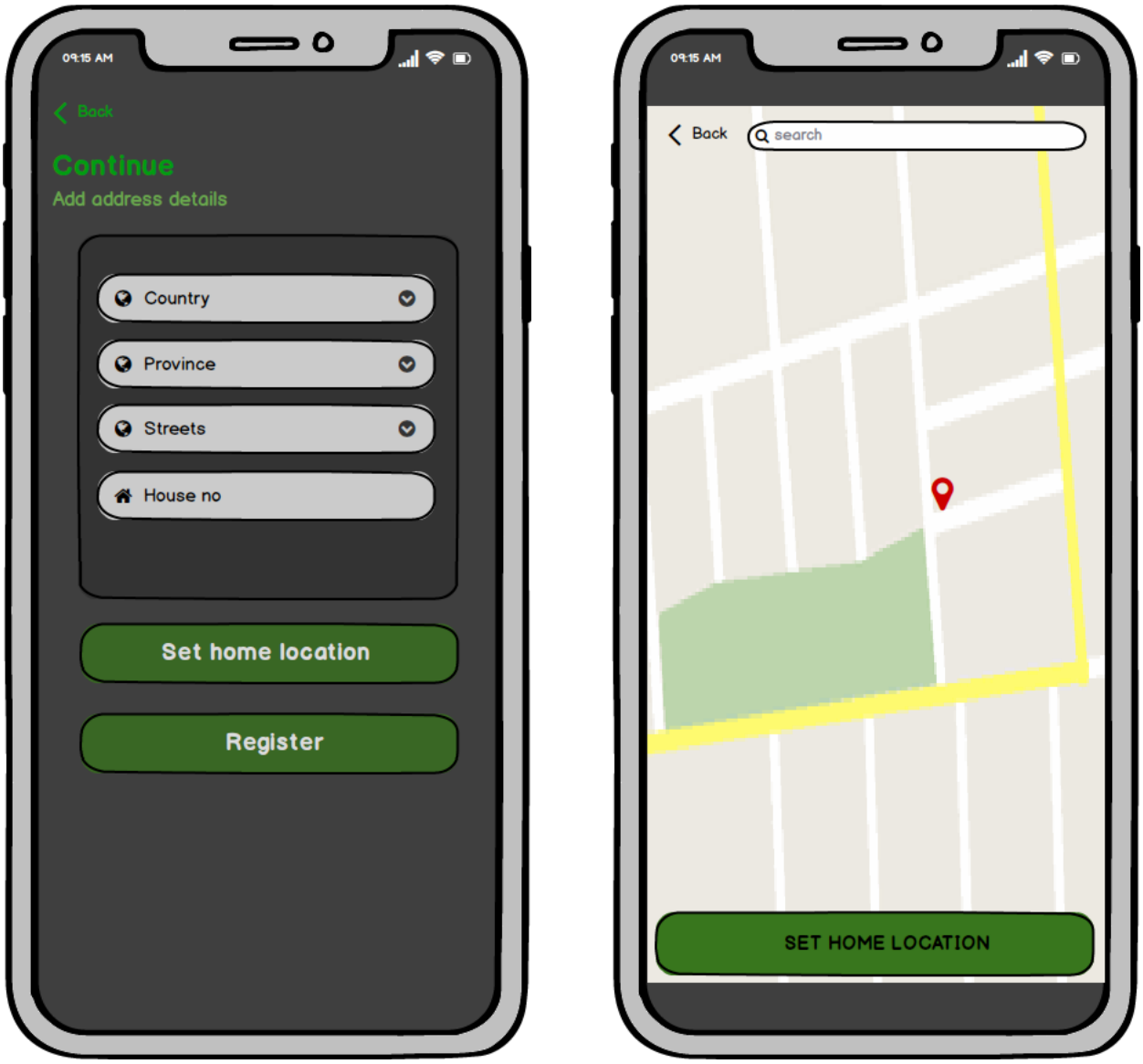

Figure 10 - Register address details and set home location page for customers

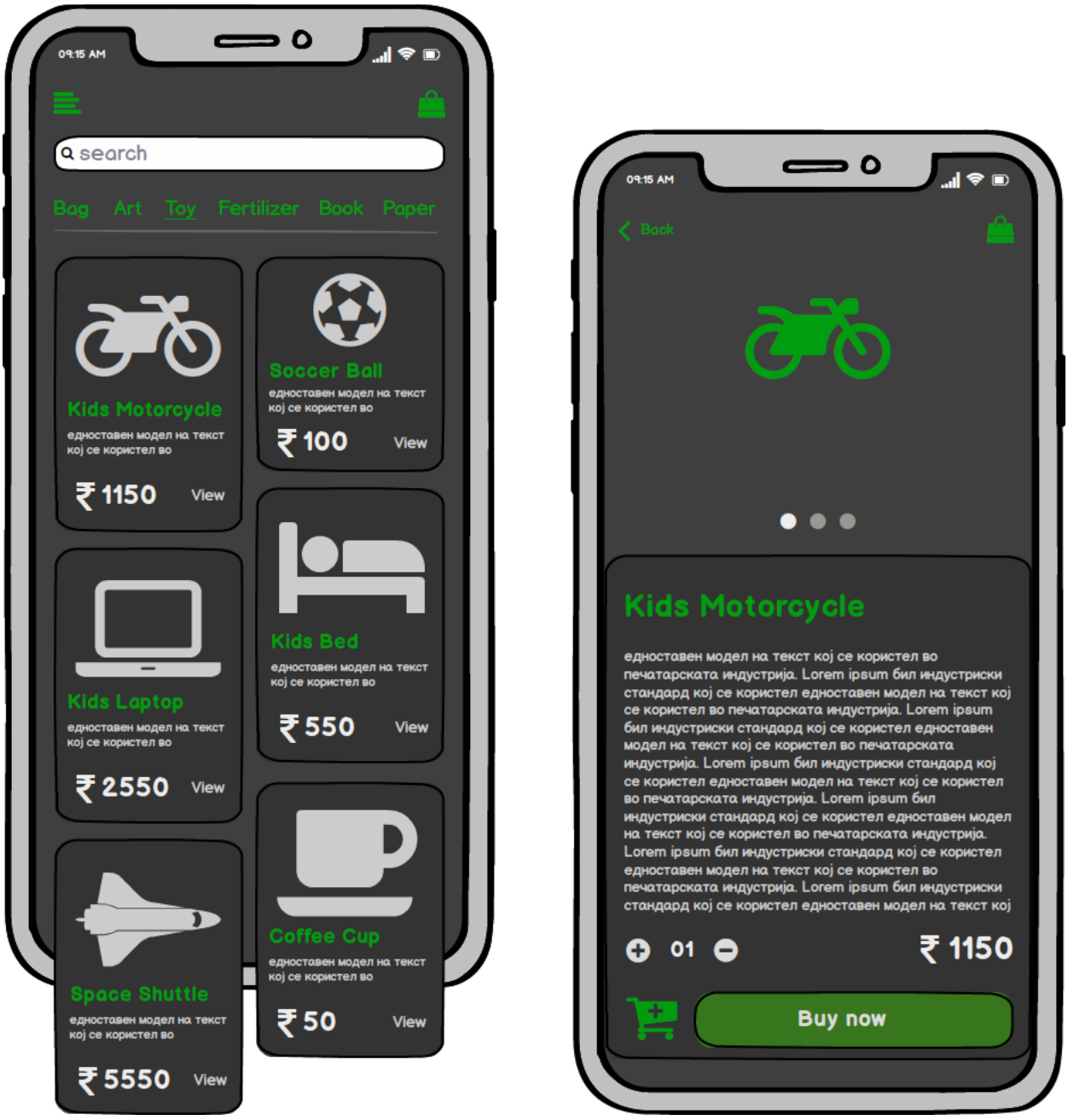

Figure 11 - Dashboard and product details page for customers

Figure 12 - Shopping cart and waste collection time for customers

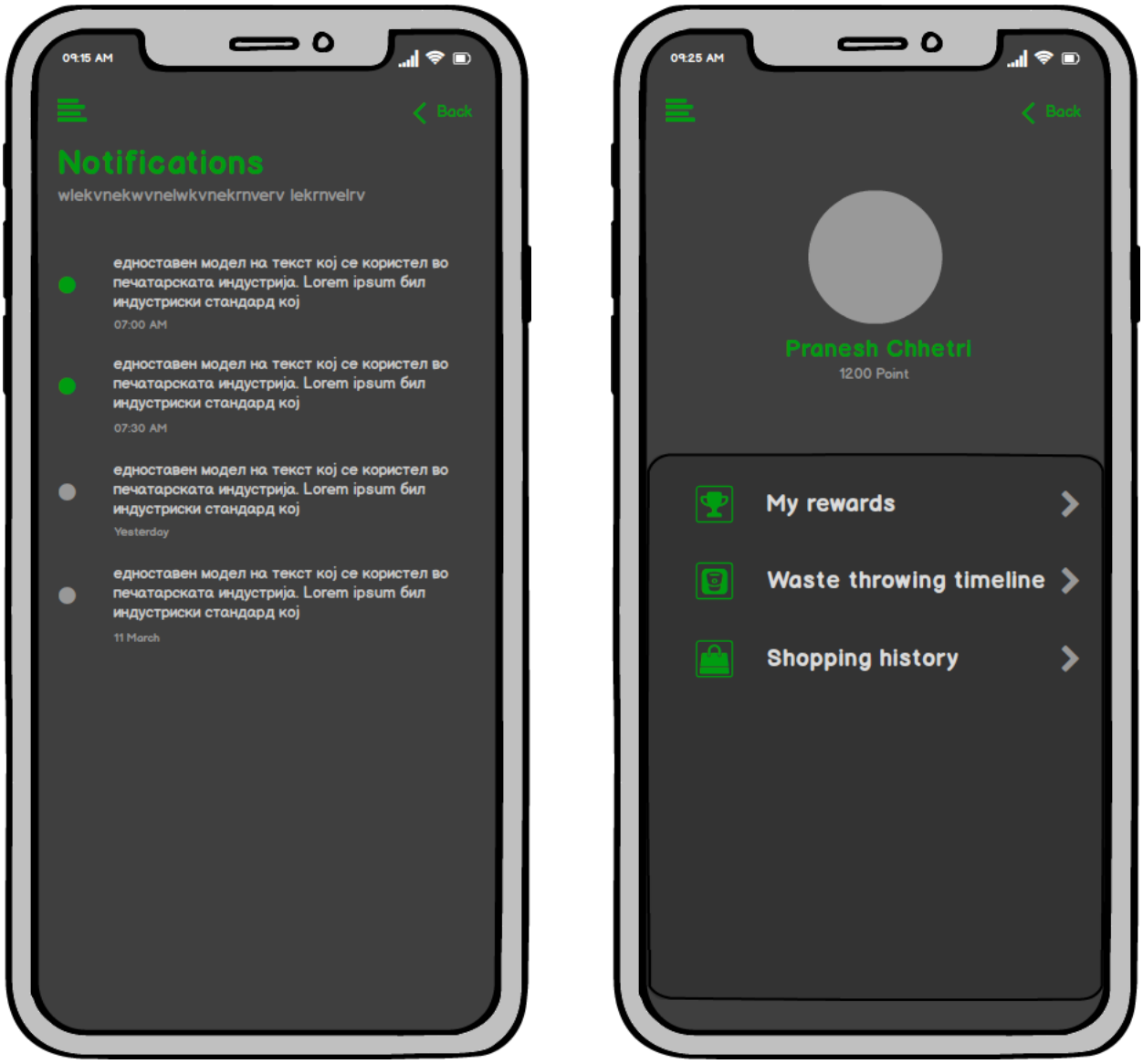

Figure 13 - Notifications and user profile page for customers

Figure 14 - Blogs and Articles page for customers

2. Waste collectors:

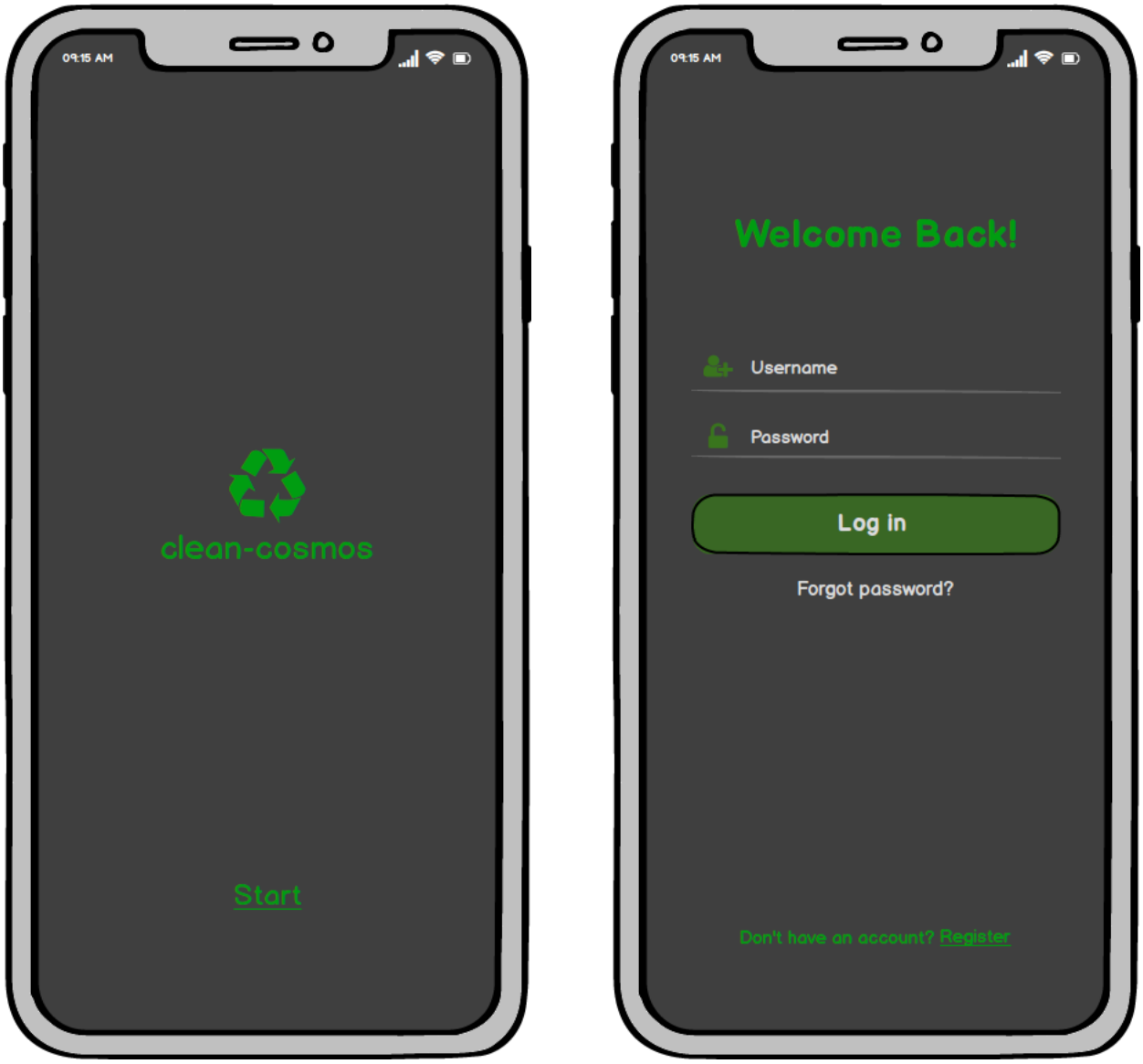

Figure 15 - Loading and log in page for waste collectors

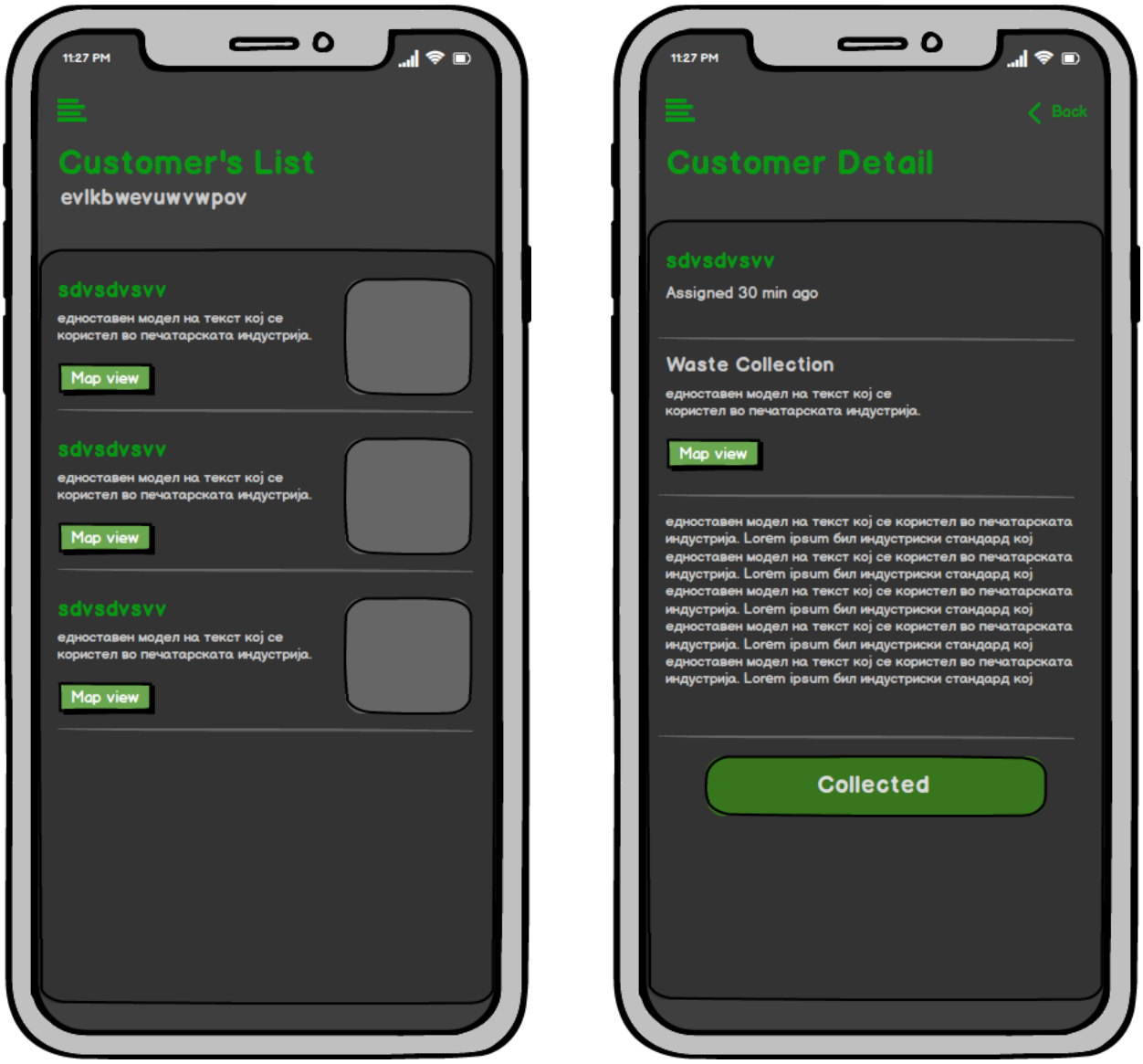

Figure 16 - Customer list and customer detail page for waste collectors

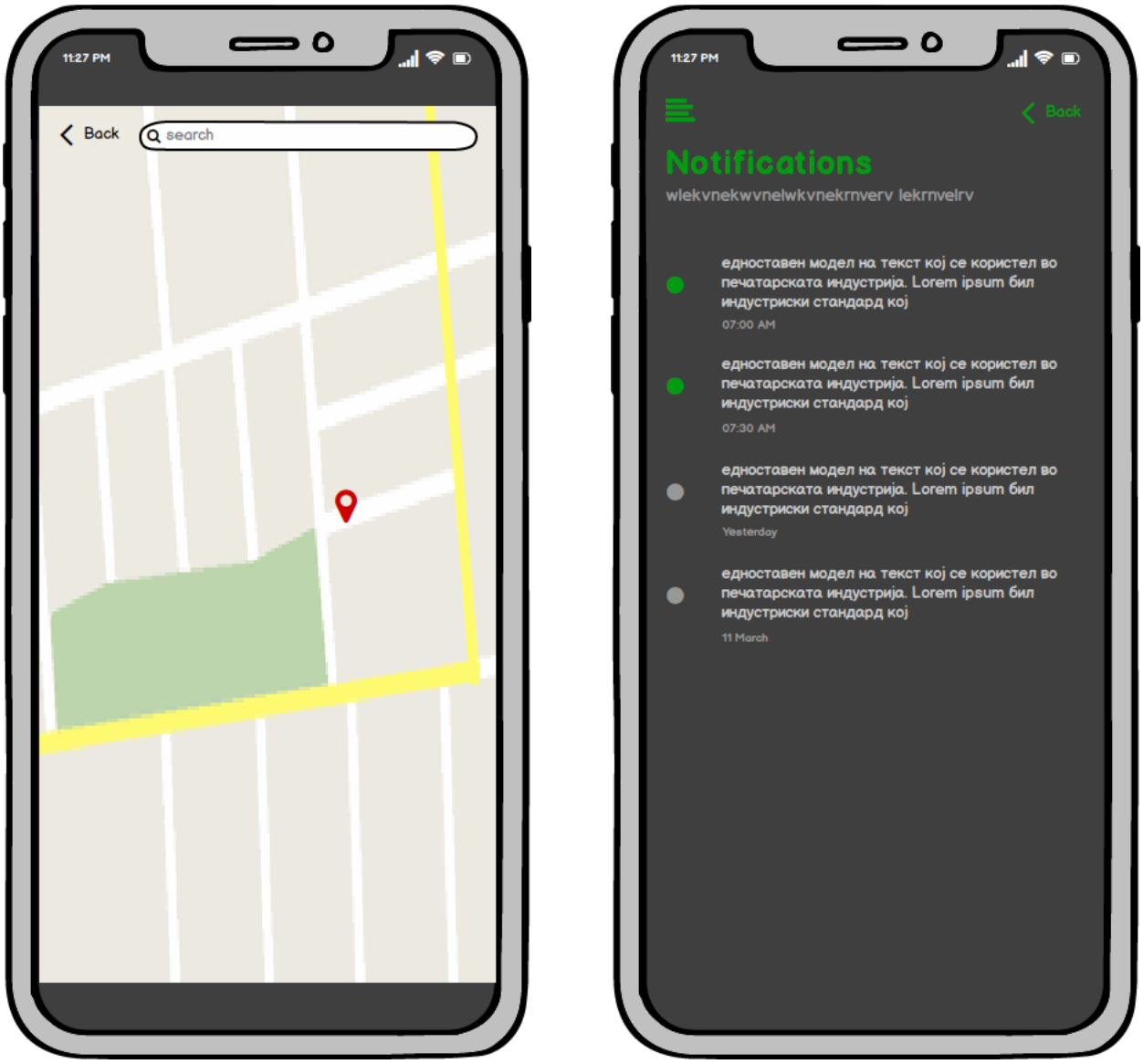

Figure 17 - Map view and notification page for waste collectors

Figure 18 - Waste collector profile

3. Delivery person:

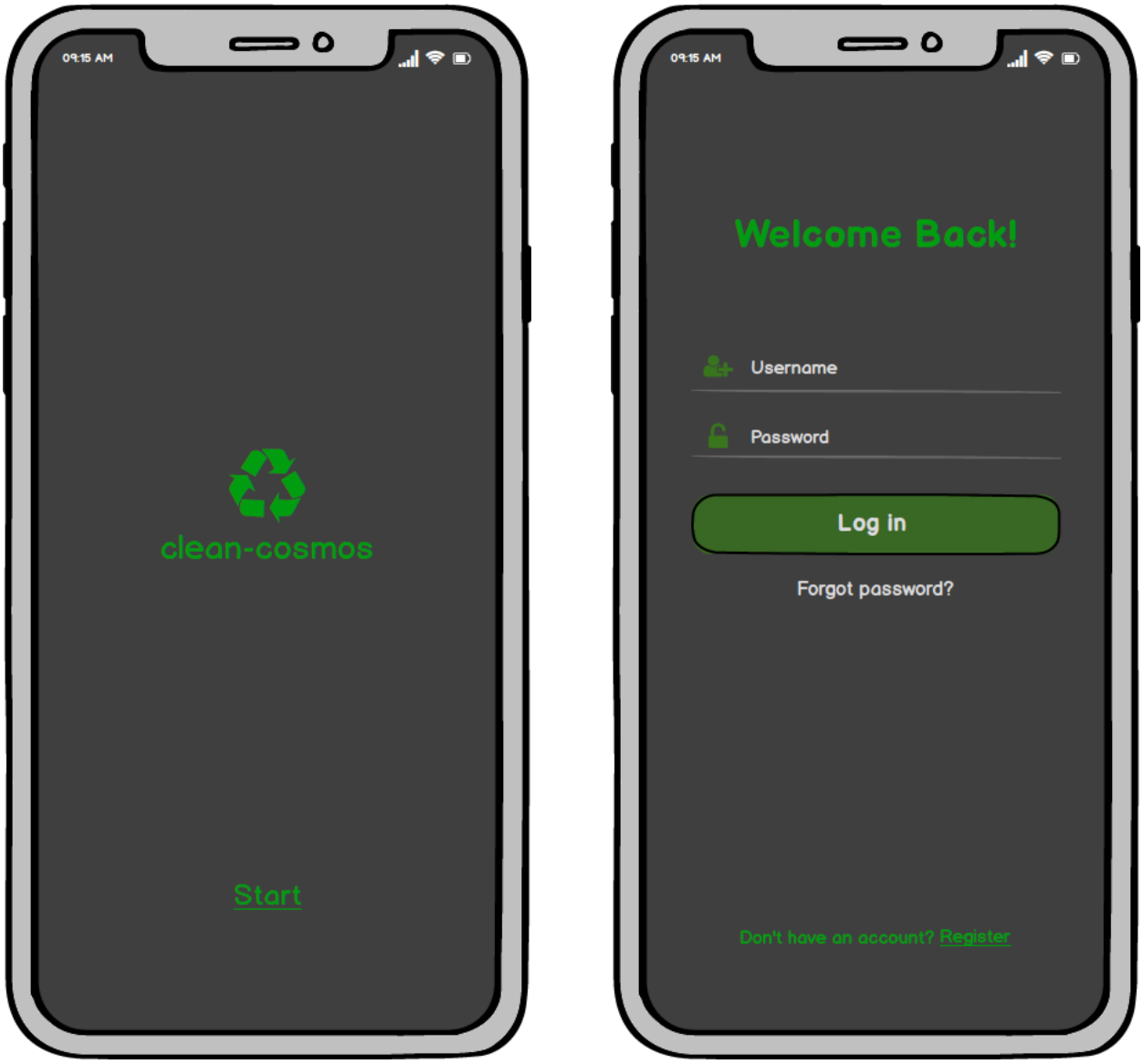

Figure 19 - Loading and log in page for delivery person

Figure 20 - Dashboard and order detail page for delivery persons

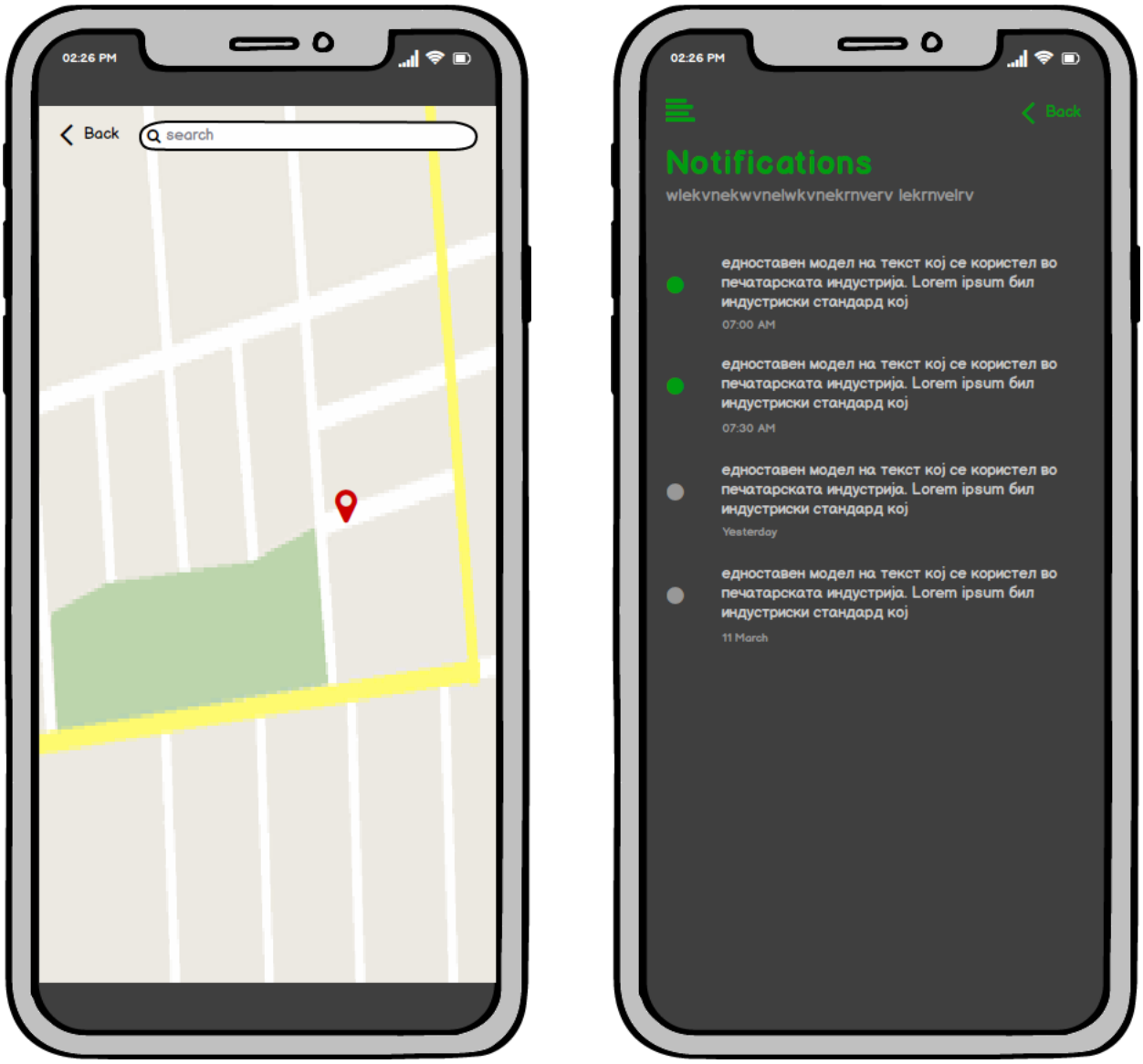

Figure 21 - Map view and notifications page for delivery persons

Figure 22 - Delivery boy profile

3.2. Web Application:

3.2.1. Use case diagram:

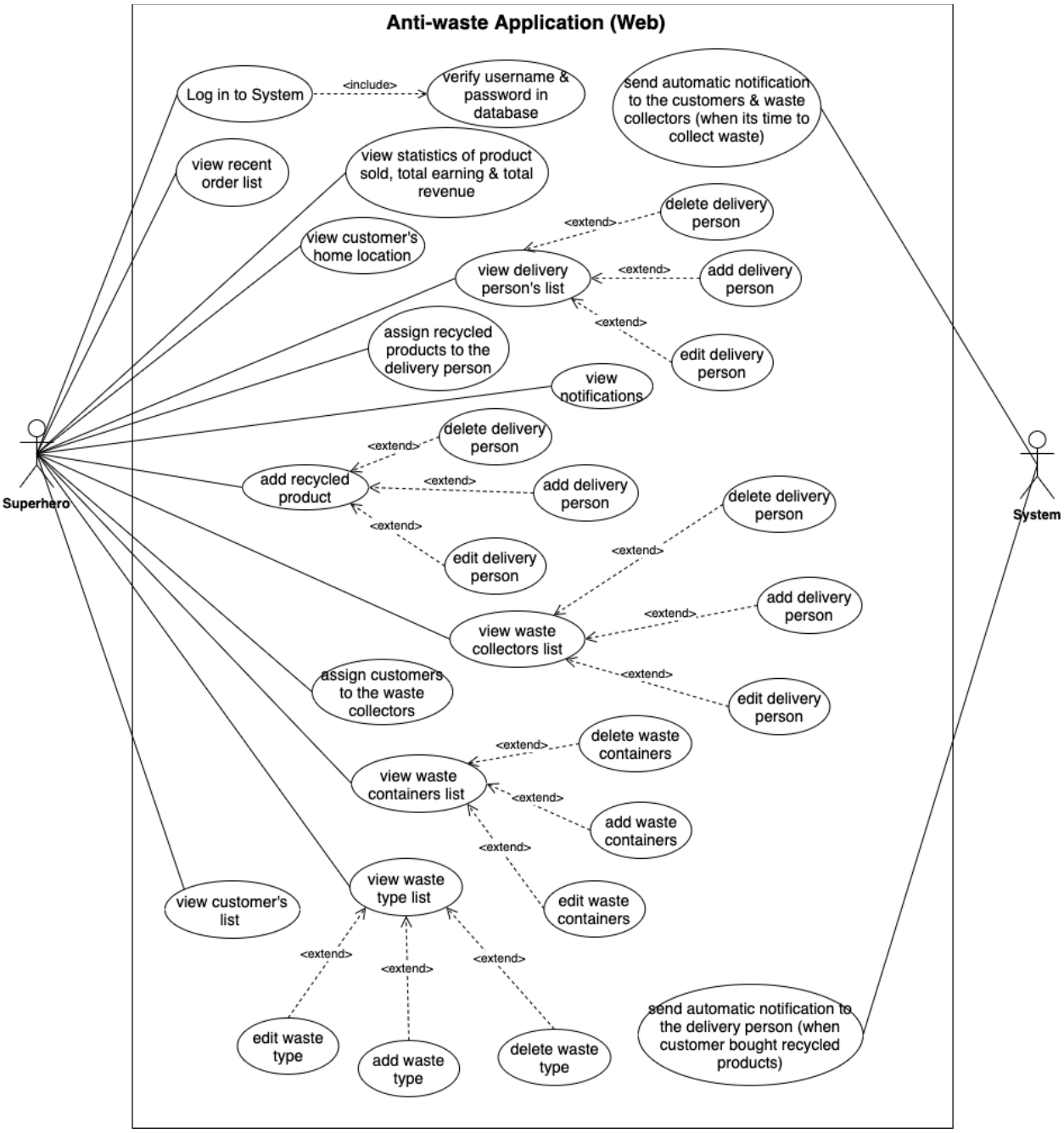

Figure 23 - Use case diagram - web

3.2.2. High level use case description:

1. Log in the System:

Use Case: Log in the system **Actors:** Superhero **Descriptions:** In order to access the system, superhero have to log in to the system. A log in generally requires username and password and need to verify with database.

2. View recent order list:

Use Case: View recent order list **Actors:** Superhero **Descriptions:** Superhero can view recent order list.

3. View statistics of product sold, total earning & total revenue:

Use Case: View statistics of product sold, total earning & total revenue **Actors:** Superhero **Descriptions:** Superhero can view the total number of products sold that includes recycled products and dustbin. He can also view total earning or profit and total revenue of the company.

4. View customer's home location:

Use Case: View customer's home location **Actors:** Superhero **Descriptions:** Superhero can view the home location of each customers.

5. View customer's list:

Use Case: View customer's list **Actors:** Superhero **Descriptions:** Superhero can view the list of customers according to location.

6. View delivery person's list:

Use Case: View delivery person's list.
Actors: Superhero
Descriptions: Superhero can view the list of delivery persons. He can also add, edit and delete delivery person.

7. View recycle product list:

Use Case: View recycle product list.
Actors: Superhero
Descriptions: Superhero can view the list of recycle product. He can also add, edit and delete recycle products.

8. Assign recycled products to the delivery person:

Use Case: Assign recycled products to the delivery persons
Actors: Superhero
Descriptions: When customer bought the products. Superhero can assign products to the delivery persons.

9. View waste collector's list:

Use Case: View waste collector's list
Actors: Superhero
Descriptions: Superhero can view the list of waste collectors. He can also add, edit and delete waste collectors.

10. View waste container's list:

Use Case: View waste container's list
Actors: Superhero
Descriptions: Superhero can view the list of waste containers. He can also add, edit and delete waste containers.

11. View waste type list:

Use Case: View waste type list
Actors: Superhero
Descriptions: Superhero can view the list of waste collectors. He can also add, edit and delete waste type.

12. Assign customers to the waste collectors:

Use Case: Assign customers to the waste collectors
Actors: Superhero
Descriptions: Superhero can assign customers and their location to the waste collectors when it's time to collect waste.

13. View notifications:

Use Case: View notifications
Actors: Superhero
Descriptions: Superhero can view notifications from customers, delivery persons and waste collectors.

14. Send automatic notifications to the customers:

Use Case: Send automatic notifications to the customers **Actors:** System **Descriptions:** System sends automatic notification to the customers when it's time to collect waste.

15. Send automatic notifications to the delivery persons:

Use Case: Send automatic notifications to the delivery persons **Actors:** System **Descriptions:** System sends automatic notifications to the delivery persons when bought products.

3.2.5. Web app development:

1. Database migration:

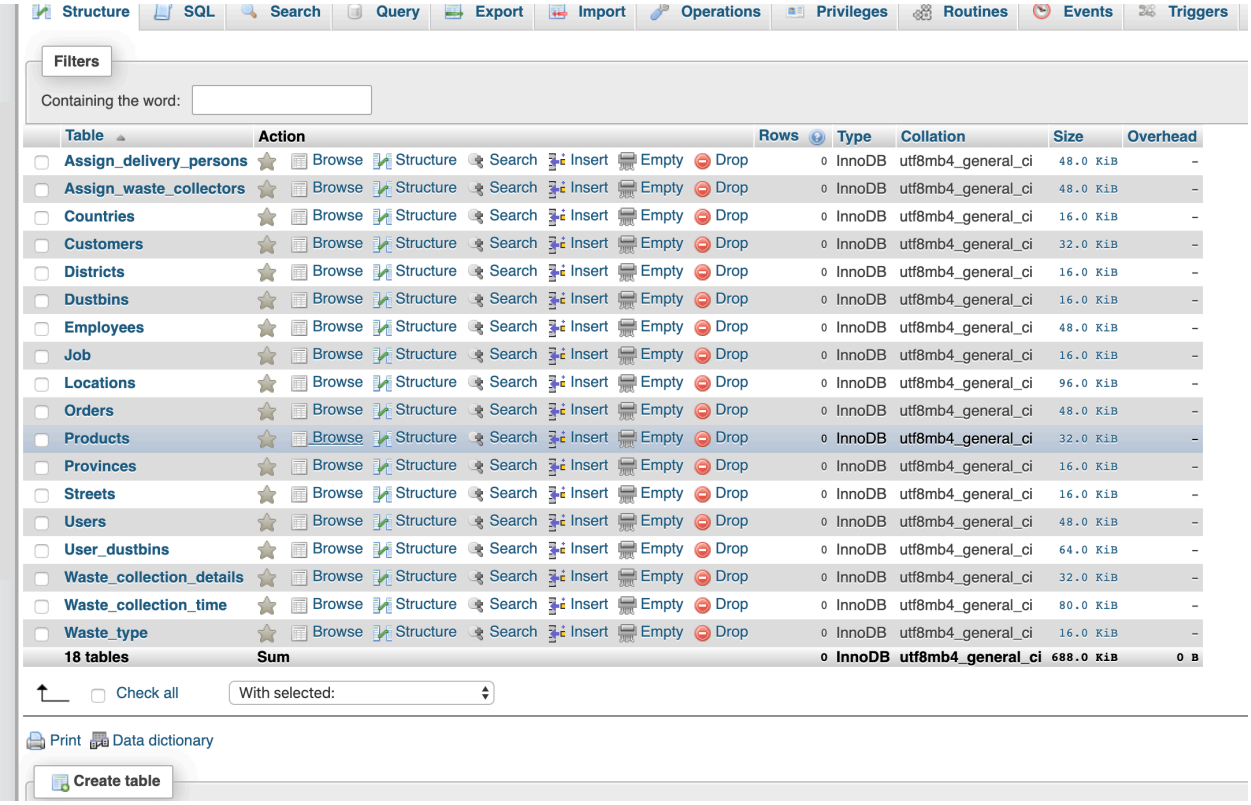

Figure 24 - Database migration using Laravel

2. Blade templating:

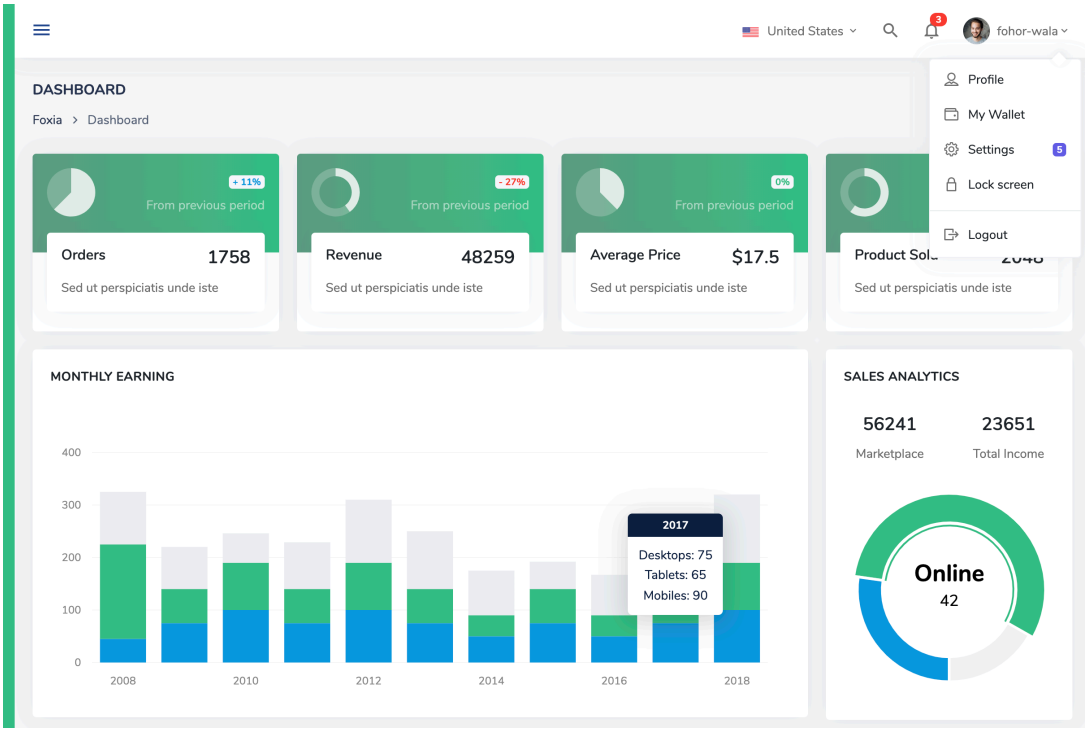

Figure 25 - Blade templating for Dashboard

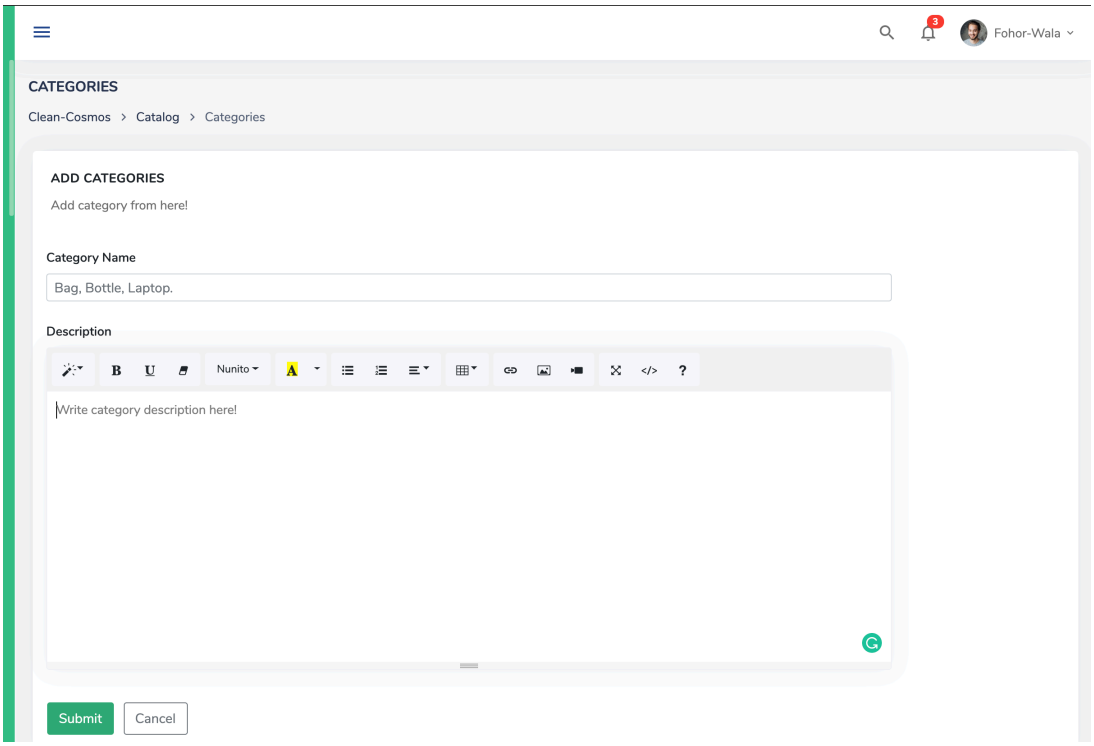

Figure 26 - Blade templating for Add categories

3. CRUD operation:

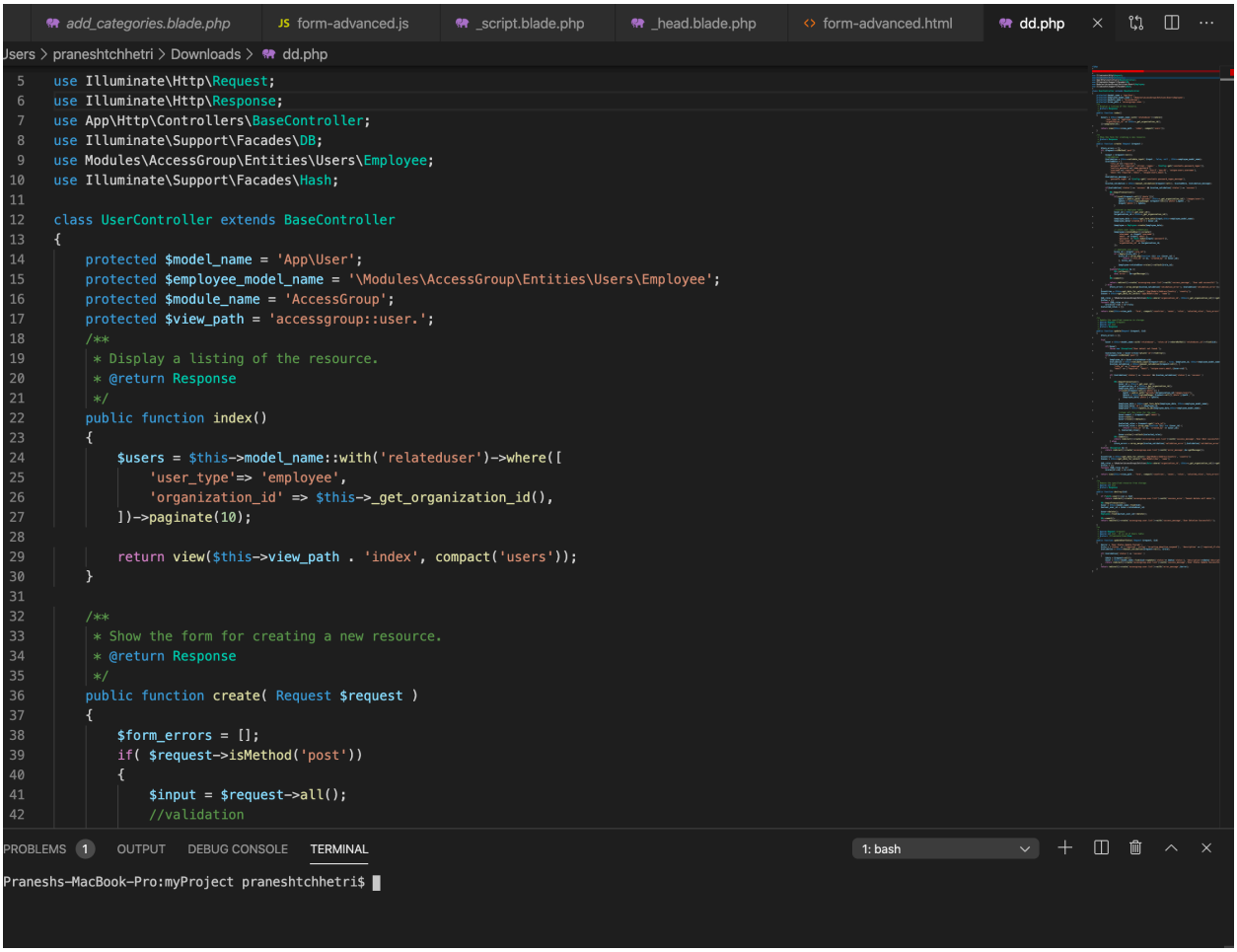

Figure 27 - CRUD operations of User and roles

3.3. ER diagram:

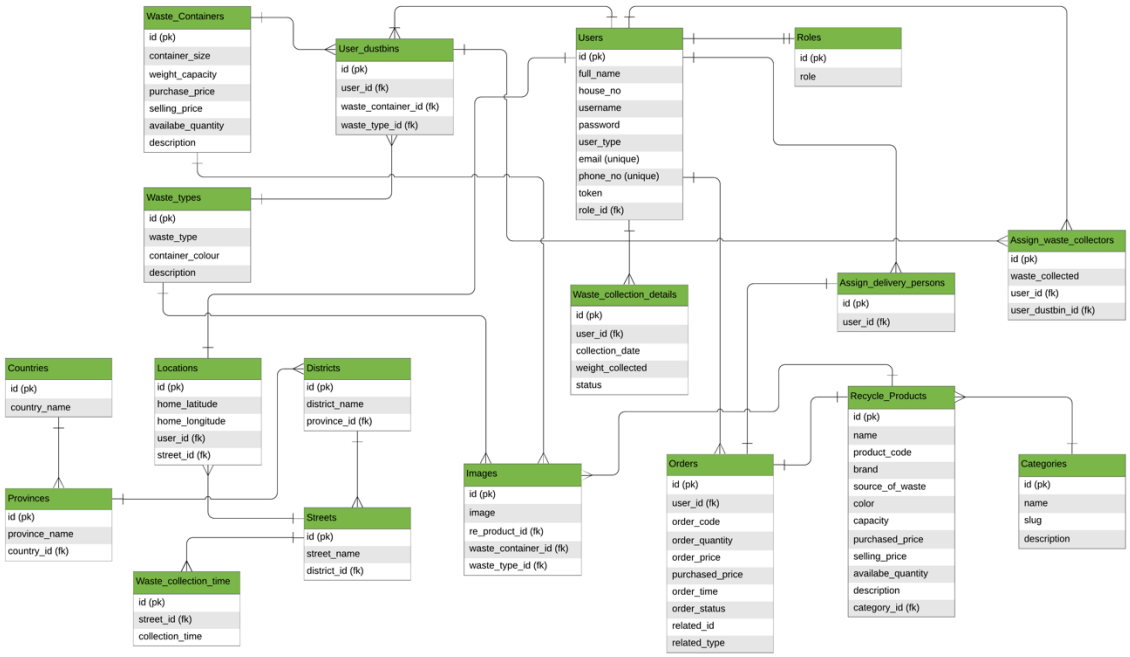

Figure 28 - ER Diagram

4. Analysis of progress:

This section includes the progress analysis to obtain the information on the state of the project and how it is developing. This section helps to determine the actual project progress values, and to compare with the Gantt chart. I've started doing the system architecture of the project. Then, I've completed the use case diagram and high-level use case description for both mobile and web app. After that, I have started designing the database of the system. Then, I designed the ER Diagram of the system. In the past days what I've completed are as below:

1. Research and planning on similar projects
2. Requirement gathering
3. Proposal making
4. Web application design – wireframes and mockup design
5. Mobile application design – wireframes design
6. Use case diagram, High level description for web and mobile both
7. Database designing – ER Diagram
8. Database migration
9. Blade templating for web
10. CRUD operation for users and role
11. CRUD operation for categories and products

According to the Gantt chart, I am not able to complete my work. It shows that, I have to complete the web application, but I can't able to build it. I will give more time to the Final Year Project and finish it in a time.

(Reference – Appendix A)

5. Future work:

This section includes the remaining work of the project. According to Gantt chart, following tasks were remaining to complete:

1. UML Diagrams
2. API development
3. Complete web application
4. Start developing mobile application
5. Google map integration on mobile application
6. Push notifications
7. QA and testing for both mobile and web application
8. Final documentation of the project

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Appendices:

Appendix A (Gantt chart):

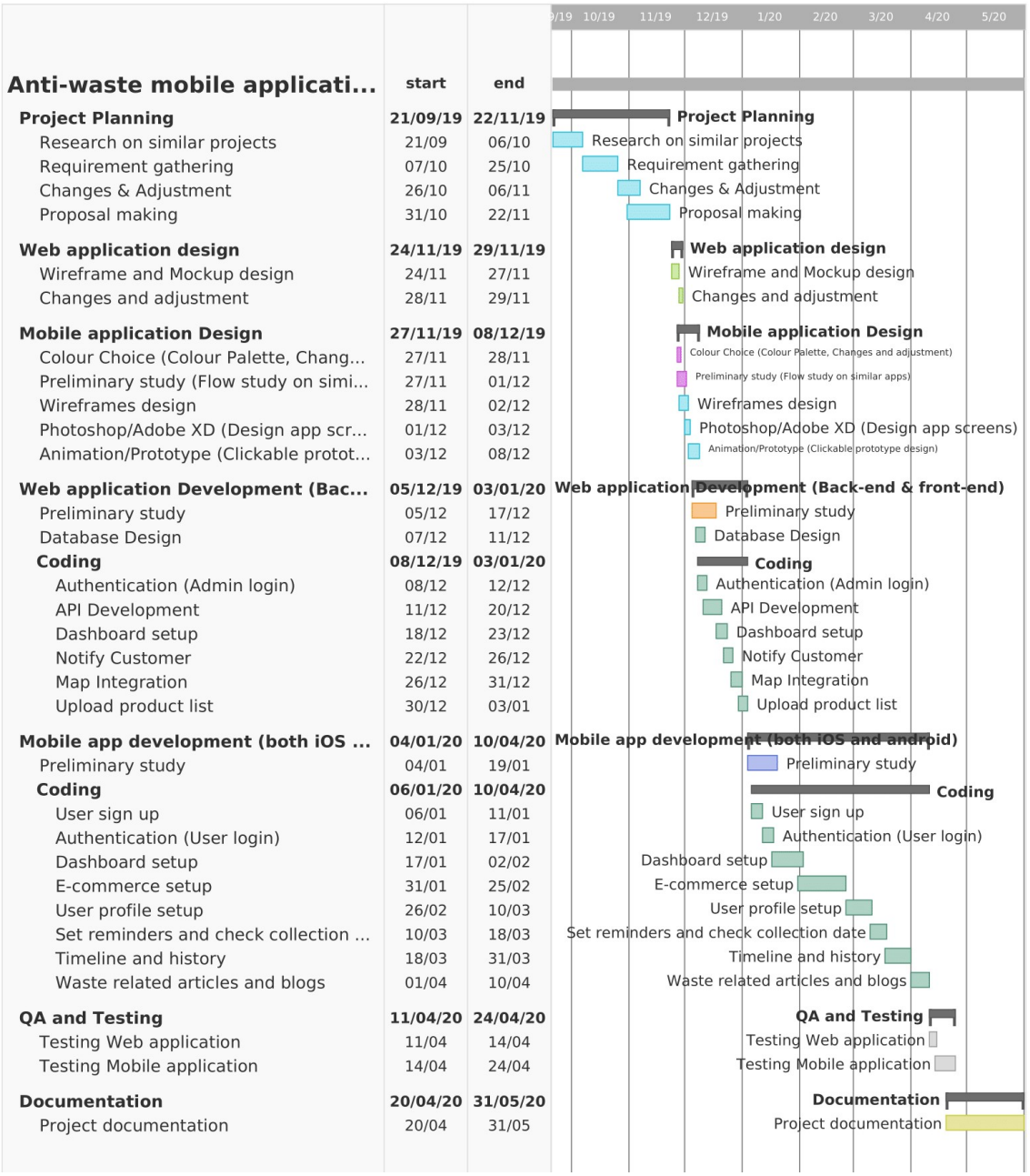

Figure 29 - Gantt of the project

Appendix B (Database migration)

database > migrations > 2020_01_03_083611_create_users_table.php

```php
<?php

use Illuminate\Support\Facades\Schema;
use Illuminate\Database\Schema\Blueprint;
use Illuminate\Database\Migrations\Migration;

class CreateUsersTable extends Migration
{
    /**
     * Run the migrations.
     *
     * @return void
     */
    public function up()
    {
        Schema::create('users', function (Blueprint $table) {
            $table->increments('id');
            $table->string('full_name', 100);
            $table->string('house_no', 50);
            $table->string('username', 50);
            $table->string('password', 50);
            $table->string('user_type', 50);
            $table->string('email')->unique();
            $table->string('phone_no')->unique();
            $table->unsignedBigInteger('role_id');
            $table->foreign('role_id')->references('id')->on('roles')->onDelete('cascade');
            $table->rememberToken();
            $table->timestamps();
            $table->integer('created_by');
            $table->integer('updated_by');
        });
    }

```

Figure 30 - Users table database

database > migrations > 2020_01_05_071310_create_categories_table.php

```php
<?php

use Illuminate\Support\Facades\Schema;
use Illuminate\Database\Schema\Blueprint;
use Illuminate\Database\Migrations\Migration;

class CreateCategoriesTable extends Migration
{
    /**
     * Run the migrations.
     *
     * @return void
     */
    public function up()
    {
        Schema::create('categories', function (Blueprint $table) {
            $table->increments('id');
            $table->string('name', 100);
            $table->string('slug', 150);
            $table->longText('description');
            $table->timestamps();
            $table->integer('created_by');
            $table->integer('updated_by');
        });
    }

    /**
     * Reverse the migrations.
     *
     * @return void
     */
    public function down()
```

Figure 31 - Categories table database