Project Deliverable D: **Conceptual Design**

GNG 1103 – Engineering Design

Group: 7

Team Members:

Alina Danilova - 300103877

Ogooluwa Olafusi - 300111081

Zachary Georgitsos - 300132584

Hasin Zaman - 300148066

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Faculty of Engineering - University of Ottawa

Abstract

The objective of this Deliverable is to conceptualize the design based on group's problem statement and design criteria. Each group member developed an individual design, and all four design are listed in the following report. The individual designs were analyzed and compared, and the final design was developed by the group. The final design takes into an account all of the advantages and disadvantages of each individual design as well as the client's needs.

Table of Contents

List of Figures

List of Tables

1 Introduction

Previously, a set of design criteria was established in order to guide the design process for our potential solutions to the client's recycling problem. In this deliverable, four conceptual designs created by the four members of the group will be elaborated on. Each design will be evaluated with respect to design criteria and specifications in order to judge and determine the best features and the drawbacks of each design. Upon analysis of each of the four designs, the best aspects of each design will be combined, and the drawbacks will be minimized. This will allow for the creation of the best possible design that will meet all the required criteria and specifications that were previously decided.

2 Group Design

The following sections demonstrates the individual product designs of each group member. Prior to sharing individual design, the main concept and functionality of the application were agreed on. The team shared all of the designs to come up with a final product that would satisfy all the group members and most importantly the client. Each individual design is listed below, and some advantages and disadvantages are described for it. Based on pros and cons of each sketch, the group was able to identify what the ideal design would look like.

2.1 Alina's Design

The following design demonstrates what the product would look like when used by a customer. Figure 1 demonstrated the main menu page or the first thing a person would see when opening the app. It has only three buttons that include "settings", "Begin to Recycle", and "Map". The settings section is designed in case some additional features will be added to the app. For example, once additional languages will be added, the person would be able to change the language in the settings menu. The button "Begin to Recycle" will take you straight to the camera view as shown in Figure 2. Finally, the "Map" will take you to the map that includes all of the recycling facilities as shown in Figure 4. Figure 2 demonstrates the camera view that allows to identify the recycling symbol. In order to do that, the person will need to find the symbol on the product that's being recycled and move it closer to the camera, or simply zoom in on it. One of the disadvantages of identifying the recycling subject this way is that the symbols are usually small, and sometimes the camera is out of focus when brough close to the product. However, this allows for a more precise identification of what is being scanned for recycling. Finally, once the app identifies the symbol, it takes you to the next page that tells you what that symbol means and how to recycle it (Figure 3). From this page the user can either go back to the main page or access the maps to find the closest recycling facility.

Some of the advantages of this design is that it has simple interface and is easy for everyday use. The colours chosen are pleasant to the eye and leave a positive experience after use. The app is allowing for relatively easy transition between the pages and can be used by the majority of people. One of the disadvantages of this design is that it does not include any game-like features. Moreover, the app is not customizable in terms of switching colours or adding any additional features to it. Lastly, the app only works with products that contain the recycling symbol.

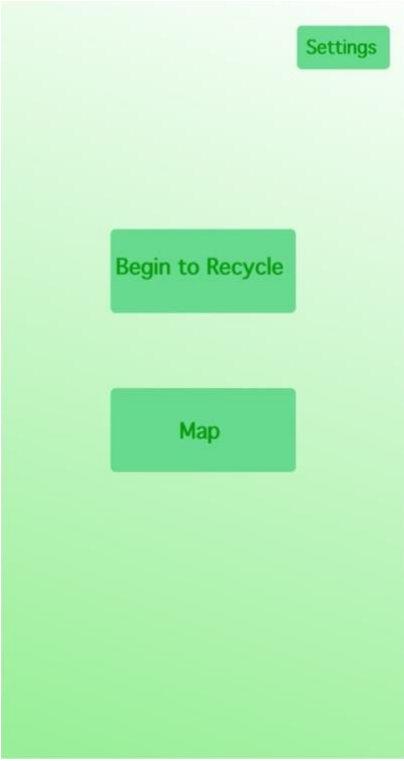

Figure 1. Main Page

Figure 2. Camera View

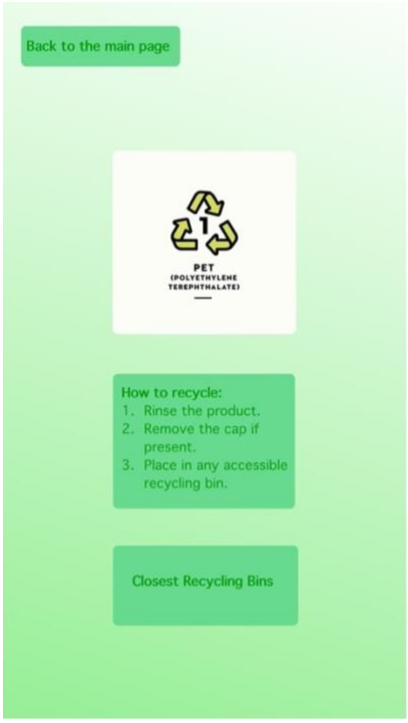

Figure 3. Recycling Information

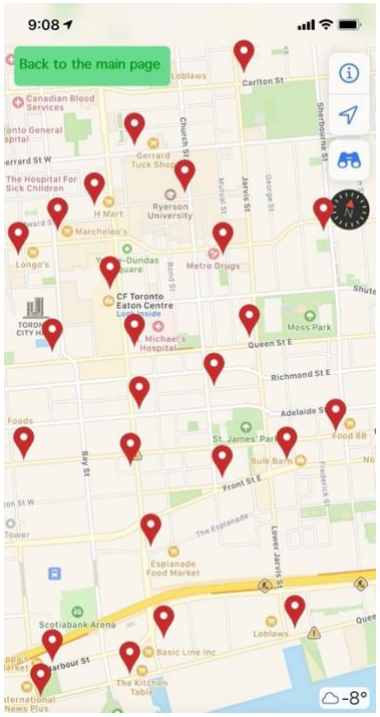

Figure 4. Map

2.2 Zach's Design

Design 2, as seen in Figure 5, is an AR app that uses reverse image searching to identify and classify recyclables. The design is a very simplistic; it focusses on functionality and ease of use rather than aesthetics and customizability. The design is comprised of four integral components: the map, view finder, profile and list of items. Each of these items aims to meet the previously established design criteria from the previous deliverable.

The first main component, the map, is found at the top left corner of the user interface. The map would be implemented using a button. Upon pressing the map button, a basic map of the user's city/area would reveal itself, and, on this map, many different recycling locations would be highlighted to aid the user to locate places to deposit their recyclables.

The second main component, the view finder, would take up most of the user's display. The view finder would utilize the user's smartphone's camera to allow the app to scan recyclables and perform reverse image searching. When the app successfully scans a recyclable, it would highlight the given item in the view finder with a colour and display what type of recycling the item falls under.

The third main component, the profile, is found at the bottom right corner of the user interface. The profile would display different stats to the user based on their recycling habits. For example, a points system was planned to help add a fun/game aspect to the design. Every time the user scans a recyclable, they would receive points, or a value would be added to their score. Adding this aspect to the design would help encourage the user to continue and increase their recycling, as trying to have the highest score could become a competition among different users of the app.

The fourth main component, the list of items, is found at the bottom left corner of the user interface. This component would simply save previous scans performed by the user and create a list of items and their recycling classification. This component would serve as a data base that the user can refer to when trying to determine if a given item is recyclable.

This design meets many of the product's needs, such as ease of use, having game features, locating places to recycle, accessibility, and recognizing a diverse range of objects. However, this design has shortcomings like its unattractive user interface and inability to recognize contaminants.

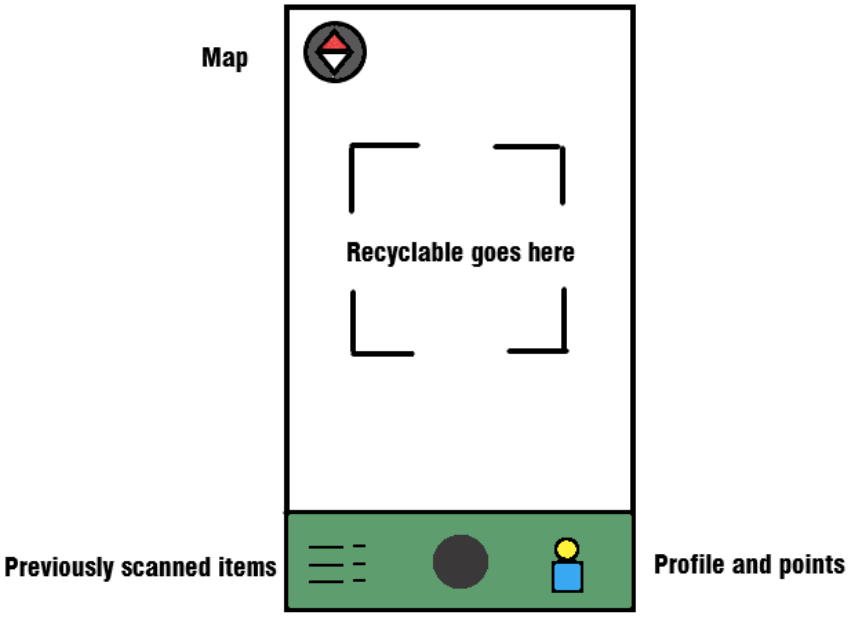

Figure 5. Design 2

2.3 Hasin's Design

Design 3 as seen in figures 6 – 9 was thought of with User Interface in mind. The first thing the user sees whenever they would use the app would be the loading screen; as result, it is essential to begin the design phase with the loading screen in mind. This can be seen in **Figure 6**, where the user would be introduced to the application with a smoothly animated loading screen, in which the app would connect to the server and loading assets. This would set the precedent for quality page transitions, aesthetically pleasing user interfaces, and quality animations. Afterward, the user would be taken to a home page similar to **Figure 8**. In which, the user would be capable of scanning objects in looking for recycling and provide disposal information. The user will also be introduced to the rotating menu on the current page; in which swipes on the wheel or screen would transition to the other pages. When swiped to the left on the home page, the user will be provided with the map page. The map page would resemble **Figure 7**, with a map that would provide a user with disposal information of various recyclable goods. If the user was directed from the home page, the map screen filter would be set up to locate the nearest disposal facility. When swiped to the right on the home page, the user will be provided with a library of recycling information about numerous objects.

There are many advantages and disadvantages to the current design. For instance, the round menu would be quite user-friendly and pleasing to use. However, the system becomes less user-friendly as the number of pages increases. The given issue could be mitigated by using buttons. Another issue with the current design is the lack of gamification and local customization settings. One of the final issues of the design feature comes in the limitations of the AR page. In which, only objects with certain recycling symbols can be scanned. However, these given issues can be slightly mitigated with a recycling information library.

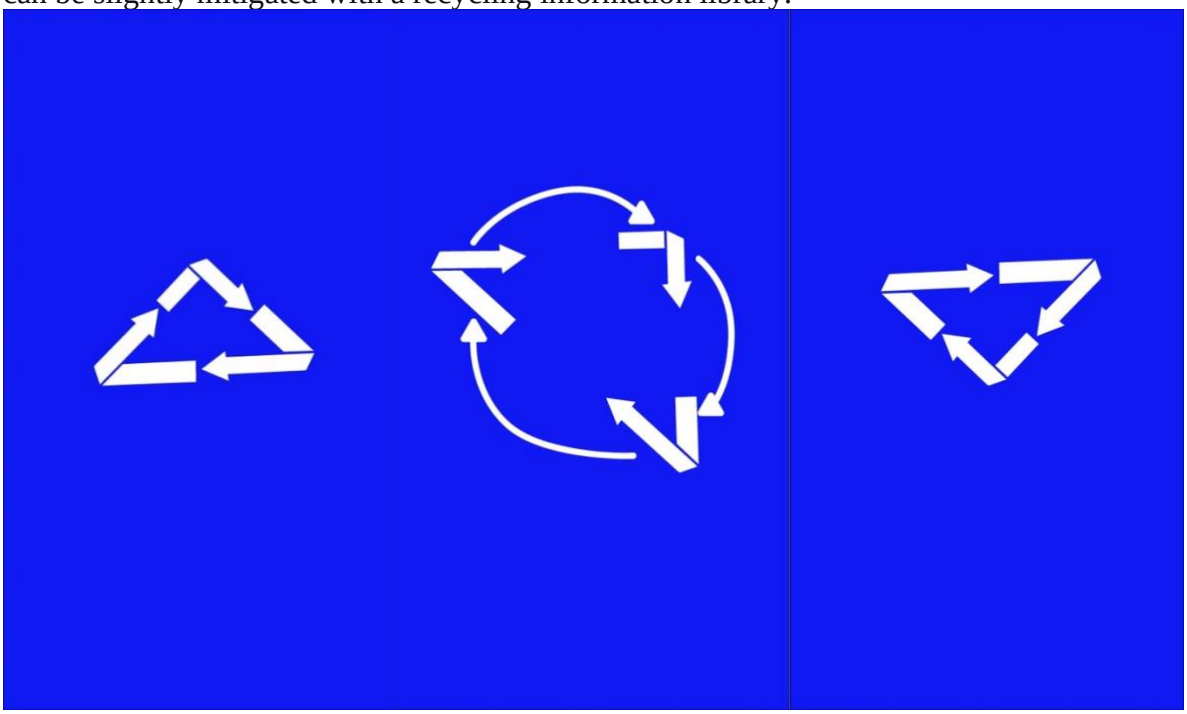

Figure 6: Loading screen for design 3

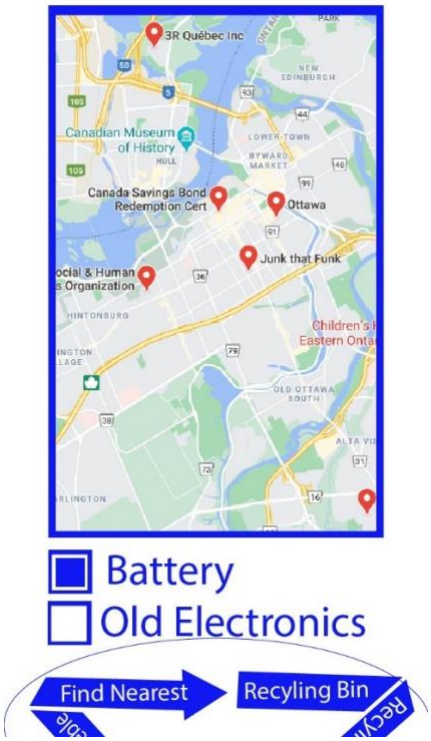

Figure 7: Map screen for Design 3

Figure 8: AR screen for Design 3

Figure 9: Information screen Design 3

2.4 Olafusi's Design

The design below is an AR application that allows user to be able to recycle items with little to no skill required to operate. This application was made to be very accessible and easy for the average person to operate. The design is a very simple but yet engaging application that provides users with different but informative approach to recycling. Figure 6 shows what the user will first see when the application is opened. It gives two options that the user can pick or choose from. If the user already has an account created prior to opening the application. The user can pick the "log in" option, this will take the user directly to figure 7. However, if the user doesn't have an account the user can use the "sign in as guest ". Although, this will limit the available options that can be accessible by the user. Users with no account registered will only be able to scan items and find out nearest possible recyclable bins around. Figure 7 shows the user to enter log in details. Users that choose to create an account can pick the option "sign up?". After user logs into the application, the user is brought to figure 8. The main screen is figure 8. Users can scan items on this page, other options of this application are accessible from the home screen. Settings option is located on the bottom right of the home screen, the map option is also located on the bottom left of the screen. User can choose to pick whatever option they require to access at that

point. Figure 9 shows the user how to access more options while using the application. User can set up notification option to receive alerts when dates to recycle items are approaching. Users can also use the account option in figure 9 to change their information. The locations option in figure 9 helps user to find available recyclable bins. Advantages of this application design is the notification reminder that allows users to remember when to recycle. This design is very simple to use and access.

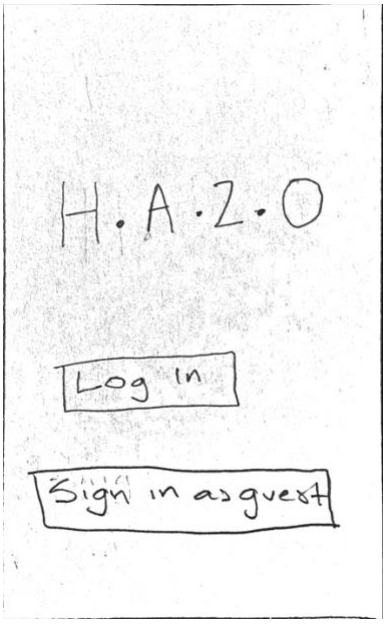

Figure 10. Olafusi's Design

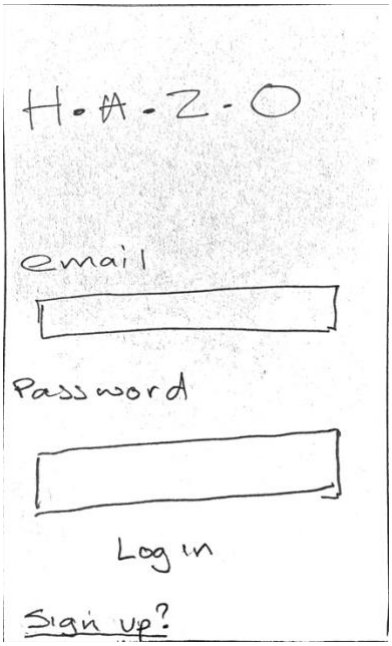

Figure 11.Olafusi's Design

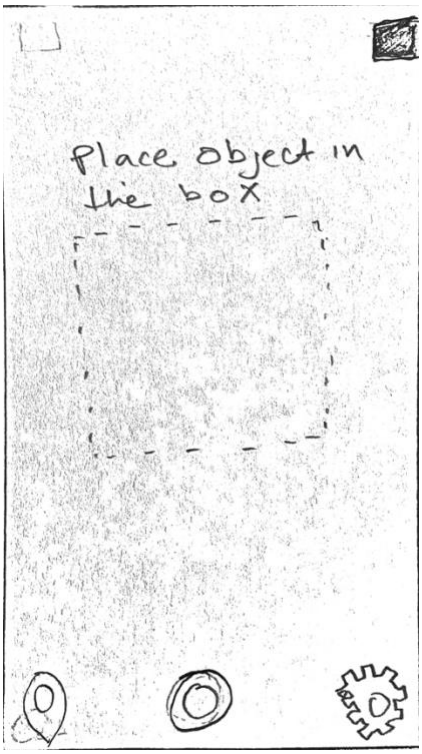

Figure 12.Olafusi's Design

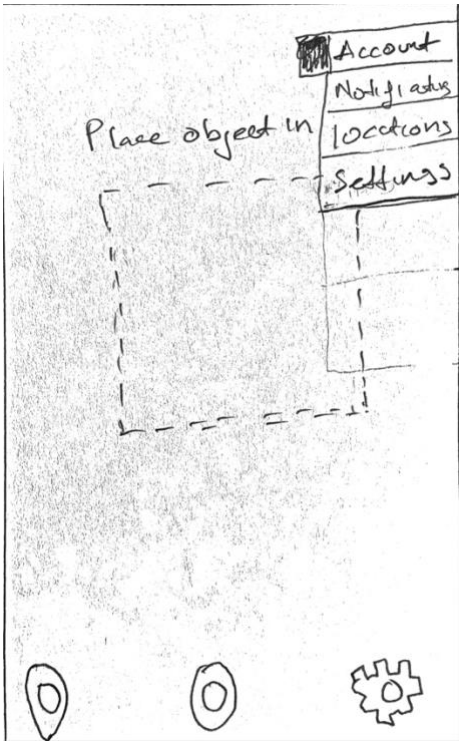

Figure 13.Olafusi's Design

3 Benchmarking

The following section compares each group member design that was created according to the client's need and specifications. The four design are compared in Table 1 based on different criteria that were identified in earlier Deliverables. Furthermore, Table 2 provides a comparison of each based on the importance factor.

Table 1. Metrics and benchmarking properties

#	Criteria	Alina's Design	Zach's Design	Olafusi's design	Hasin's Design
1	Cost (user)	Free	Free	Free	Free
2	Accessibility[1]	Can be available in App Store and Google Play	Available on App Store and Google Play	Available to download Appstore and Play store	App store and Play store
3	Design (User Interface & User Experience)	Simple and easy to use, not the most aesthetically pleasing, needs some improvements	Very minimalistic and easy to use, but lacks attractiveness	Simple to use, needs a more design to make it look more inviting to users	Build with animation and transition in mind Colour and UI needs to be improved
4	Reliability[2]	N/A	N/A	N/A	N/A
5	Customizability[4] / Localization (recycling settings)	None	Has an integrated map that displays recycling locations		None
6	Performance (Program Speed)	N/A	N/A	N/A	N/A
7	Download size	N/A	N/A	N/A	N/A
8	Language	English, another language can be added in further developments	English with more languages available in the future	English	English
9	Augmented Reality[3] (AR)	Yes	Yes	Yes	Yes

Table 2.Comparison of importance factor for each competitive product

#	Metric	Importance (1-10)	Alina's Design	Zach's Design	Olafusi's Design	Hasin's Design
1	Cost	5	3	3	3	3
2	Accessibility[1]	10	2	2	2	2
3	Design	10	2	1	2	2
4	Reliability	10	N/A	N/A	N/A	N/A
5	Customizability[4] / Localization (recycling settings)	8	1	1	2	1
6	Performance (Program Speed)	8	N/A	N/A	N/A	N/A
7	Download size	5	N/A	N/A	N/A	N/A
8	Language	3	2	1	2	1
9	Augmented Reality (AR)	6	3	3	3	3
	Total		87	74	95	84

4 Definitions

The following definitions explain the meaning of certain criteria within the tables above.

1 **Accessibility**: The ability to use the app on different operating systems with minimal bugs.
2 **Reliability**: The ability to accurately and precisely predict the recycling classification of objects.
3 **Augmented Reality**: The capacity to offer augmented reality services
4 **Customizability:** The ability to modify setting relating to recycling to local standards

5 Final Design Decision

The final design was created with the best ideas from every induvial. The design begins with the loading screen; in which the user would be introduced to a rotating recycling logo and a pastel green colour pallet. Afterwards, the user would be moved to the main page. In which

the user be introduced to main/home page. The page would be used to scan objects and provide disposal information. Finally, the user will be allowed to access the map that can provide location of the recycling facilities.

Figure 14: Loading screen for Final Design

Figure 15: Home/AR screen for Final design

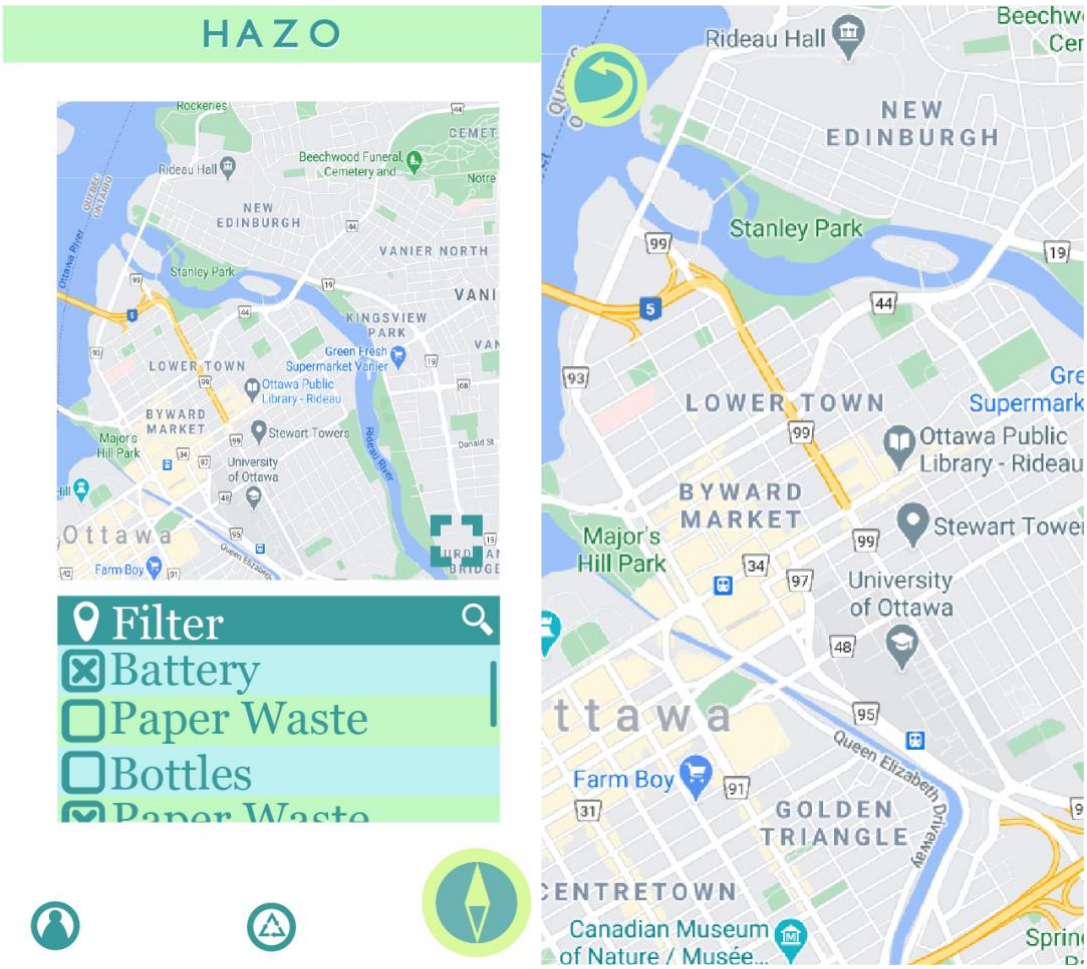

Figure 16: Map Screen for Final design

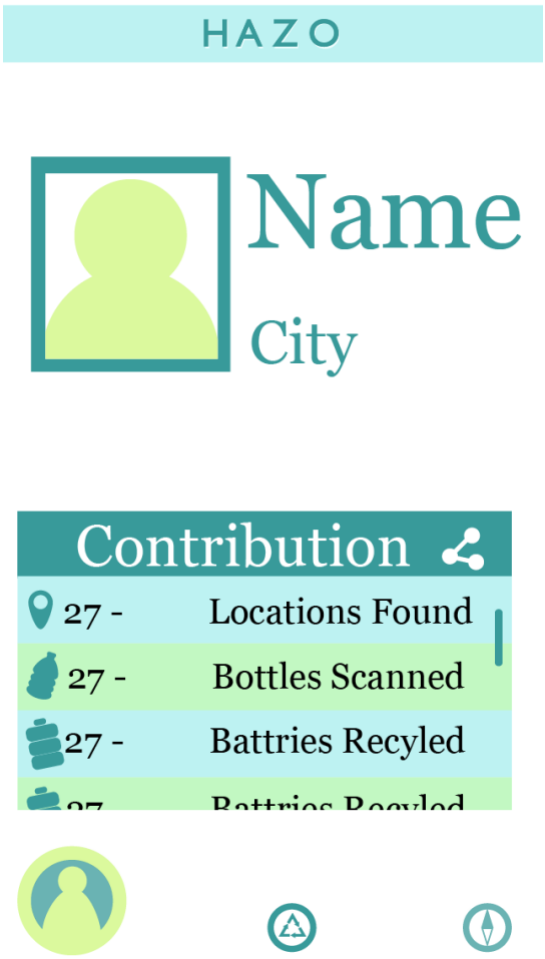

Figure 17: Profile screen for final design

6 Conclusion

In this deliverable the team had to come up with their own ideas of an application that would help users recycle properly. By comparing this concept, we were able to understand each other's ideas. With this information we were able to understand the type of design we were going for. The next plan is to plan the project and estimate cost.