

Deliverable H – Prototype III and Customer Feedback



Group 5

Khadij, John (6400290)
Nicoll, Sebastian (300187458)
Senathirajah, Abera (300187714)
Shouldice, Michael (8589011)
Todd, David (300194033)

Report presented to Dr. Muslim Majeed
For the Engineering Design Course
GNG 1103

University of Ottawa
Department of Engineering
Ottawa, Ontario

Table of Contents

Introduction	3
Project Risks and Contingency	3
Project Costs	3
Description of Prototype III.....	4
Testing.....	17
User Experience and Feedback.....	18
Future Objectives.....	19
Conclusion.....	19
Appendix A.....	20

Introduction

After creating previous prototypes as well as discussing a contingency plan and the means that will be used to accomplish the app, a final prototype has been created. The final model incorporates features and ideas from the previous prototypes. The chosen criteria were tested against the prototype to determine whether the app exceeded, matched or fell below expectations. This information will be used to make adjustments in the future with the expansion of the app. The project risks and contingency describe the risks associated with proceeding with this idea and putting it onto the market. The model presented in this deliverable is a fully functional app that allows the user to scan an item and determine its fate, while fulfilling the original goal of reducing recycling waste.

Project Risks and Contingency

An obvious risk is the app failing to function as intended. Subsections of this risk are limited to the database of images being insufficient, the code not working as we want it to, as well as the UI being broken. All these risks have relatively simple fixes. The database can be improved by adding more images, the code can be debugged, and the interface can be modified if need be.

Another risk to consider is the potential for prices of services changing. Services include software engines like Unity and Vuforia, as well as the listing for the Apple/Samsung store, which rests at \$100/year. For the time being, Unity and Vuforia are free, for what we are using them for. However, if the software used to code and implement this project begins to cost money, then the overall cost of development will increase. In this case, it may be necessary to find some other medium through which to code the app or create the UI, as any money used on Unity or Vuforia will exceed the cost limit.

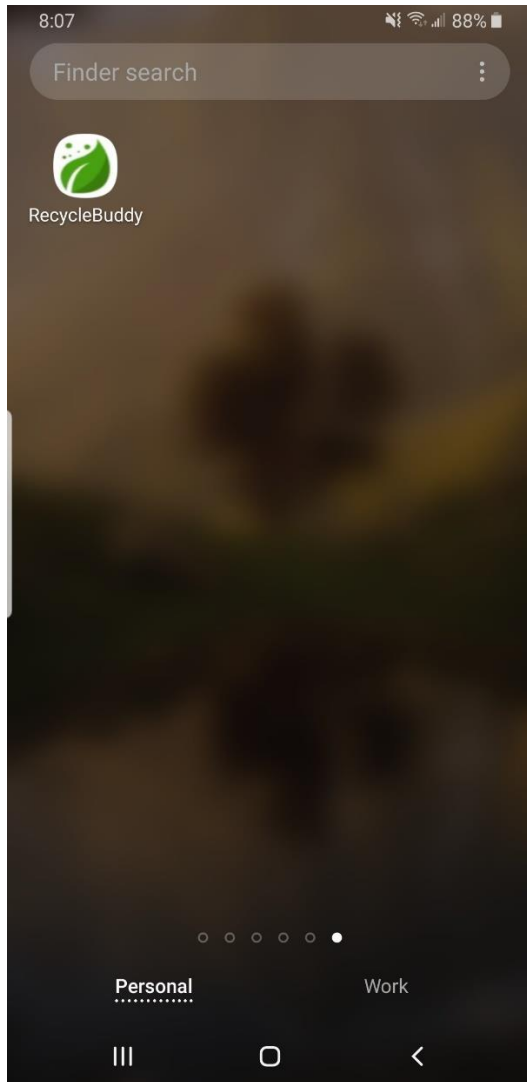
In terms of scheduling risks, everything stated above, if it were to happen, would require time to fix. So, any risk to the project's success invariably affects the schedule laid out.

Project Costs

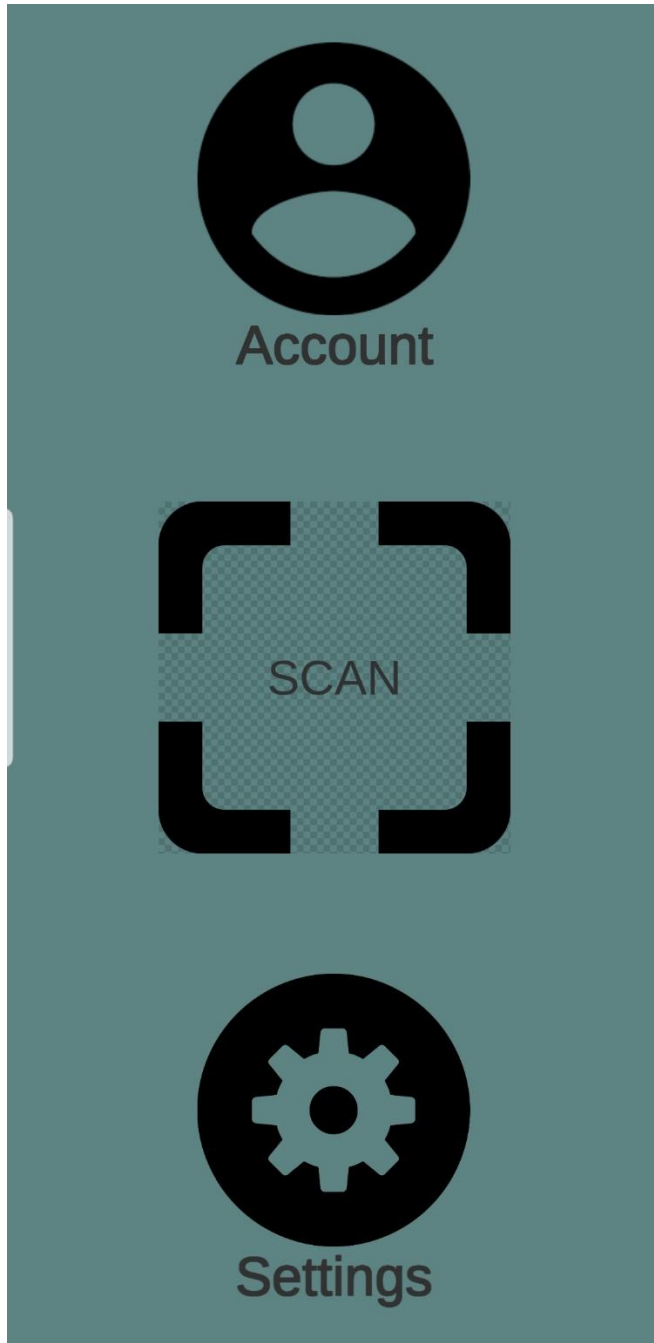
Material/Tool	Cost
Programmer/ developer	Free
Unity	Free
AR Tool (Vuforia)	Free
Recycling material for testing	Free
Total	0\$

Since the project is still in the prototyping phase, there are no costs associated with it. Once the project is finalized, the only legitimate cost to be considered will be to put the application up to be downloaded. Additionally, if the project needs outsourcing for its completion, another cost can be added. However, in its current state the total cost of the project remains at a sum of zero.

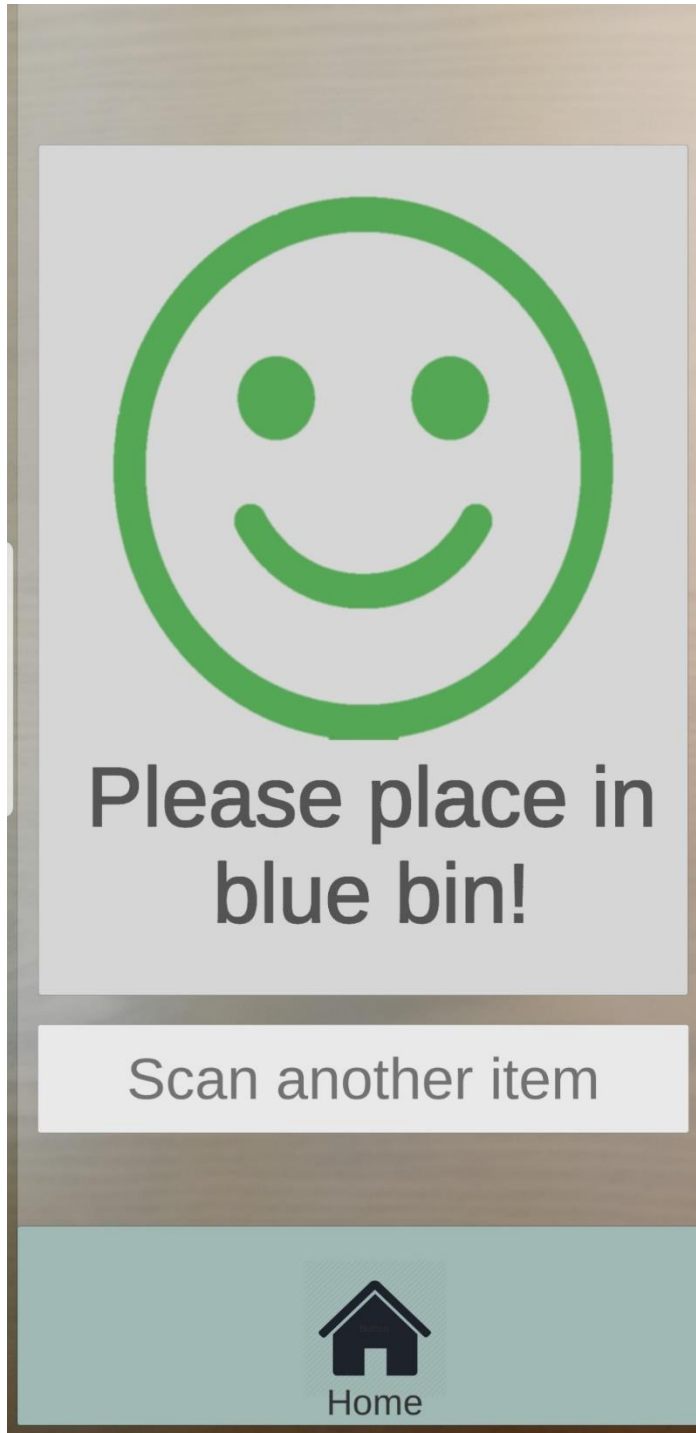
Description of Prototype III



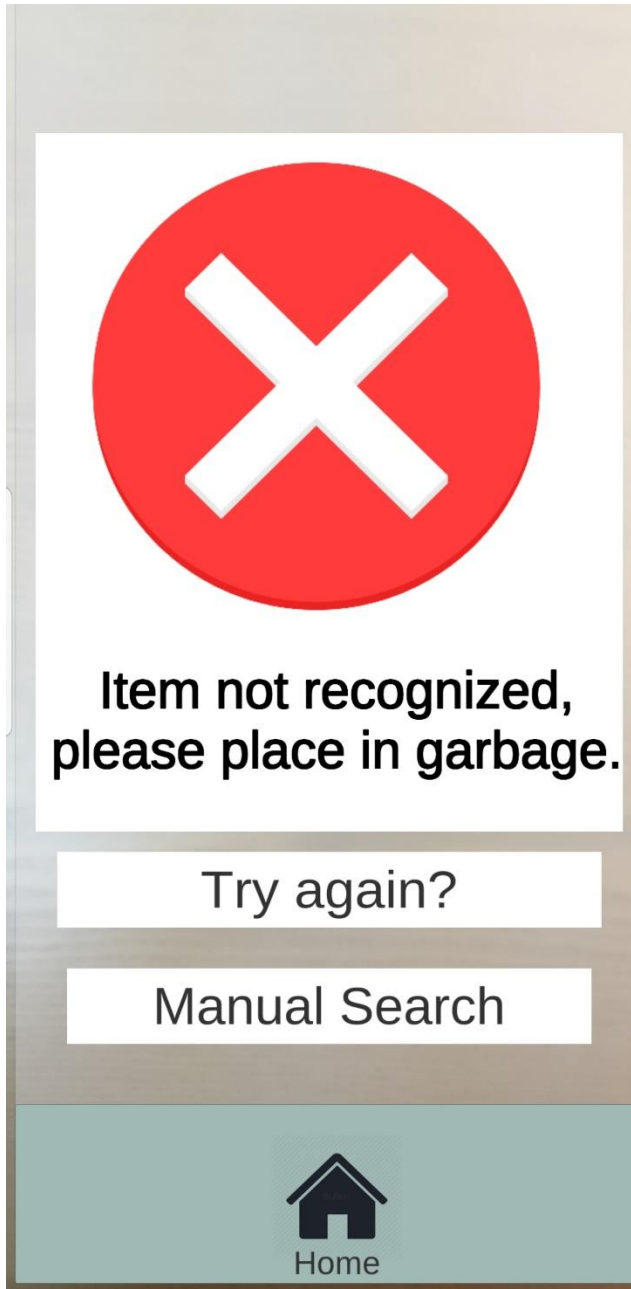
The app icon appears with the leaf logo as well as the app name “RecycleBuddy”. This is what the user would see if the app were to be put onto the various app stores. In this case the app icon is presented on the Android interface.



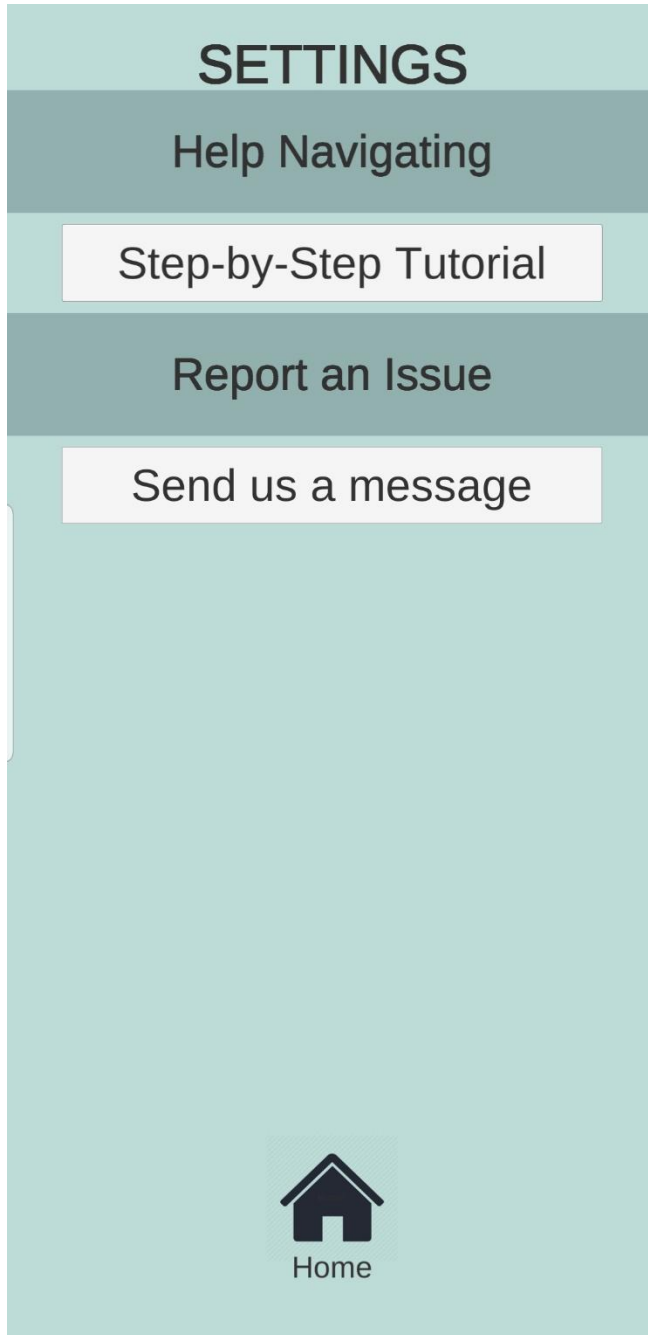
The opening screen's purpose is to direct the user to the appropriate function. The opening screen contains the account, scan, and settings buttons which each serve a purpose. The opening page is referred to as the "Home" page on the other pages. When the user clicks the scan button, the app will take them directly to a scanning screen. The screen is largely empty, only with the home button at the bottom. The settings button takes the user to its page with its various functions. Similarly, the account button takes the user to the corresponding page. The opening screen was made with simplicity in mind. The scan button was centred since it is the most prominent feature and thus by being in the middle it attracts the user's visual attention. It is also the most easily clicked button since it is slightly larger than the others, because the scanning feature is the primary purpose of the app.



In the case that the item is recyclable, a large green smiley face will appear on the screen. Below the green smiley face, a message will appear determining the item's fate. In this example the item is recyclable and is to be placed in the blue bin. The app will also prompt the user to scan another item. The smiley face and the message appear on the scanning page after the app has scanned the app and determined its fate. At the bottom of the page there is the home button if the user wishes to go back to the main screen.



In the case that the item is not recyclable, a large red "X" will appear on the screen. Below the red "X", a message will appear determining the item's fate. In this example the item is not recyclable and is therefore to be placed in the garbage. The app will also prompt the user to scan another item. The red "X" and the message appear on the scanning page after the app has scanned the app and determined its fate. At the bottom of the page there is the home button if the user wishes to go back to the main screen.



From the main/home screen which is also the opening screen, the user can go to the settings page. It is here that the user can receive help navigating the app. To receive help the user can access the step-by-step tutorial of how the app functions. The tutorial includes in-depth explanations. The user can also report an issue with the app. The issue can be regarding the app itself and bugs or glitches or any other issues the user encounters or it can be about the scanning process. From this page the user can go back to the home screen.

The screenshot shows a mobile application interface with a teal background. At the top, the word "SETTINGS" is displayed in large, bold, black capital letters. Below it, a dark teal bar contains the text "Send us a message" in white. The main content area is divided into sections for user input: "Name:" with a text field containing the placeholder "Name.."; "Email:" with a text field containing "Email address.."; "Phone Number:" with a text field containing "Phone number.."; and "Describe the Issue:" with a larger text area containing "Describe issue here..". A light gray "Send" button is positioned below the text area. At the bottom center, there is a dark blue house icon with the word "Home" written below it.

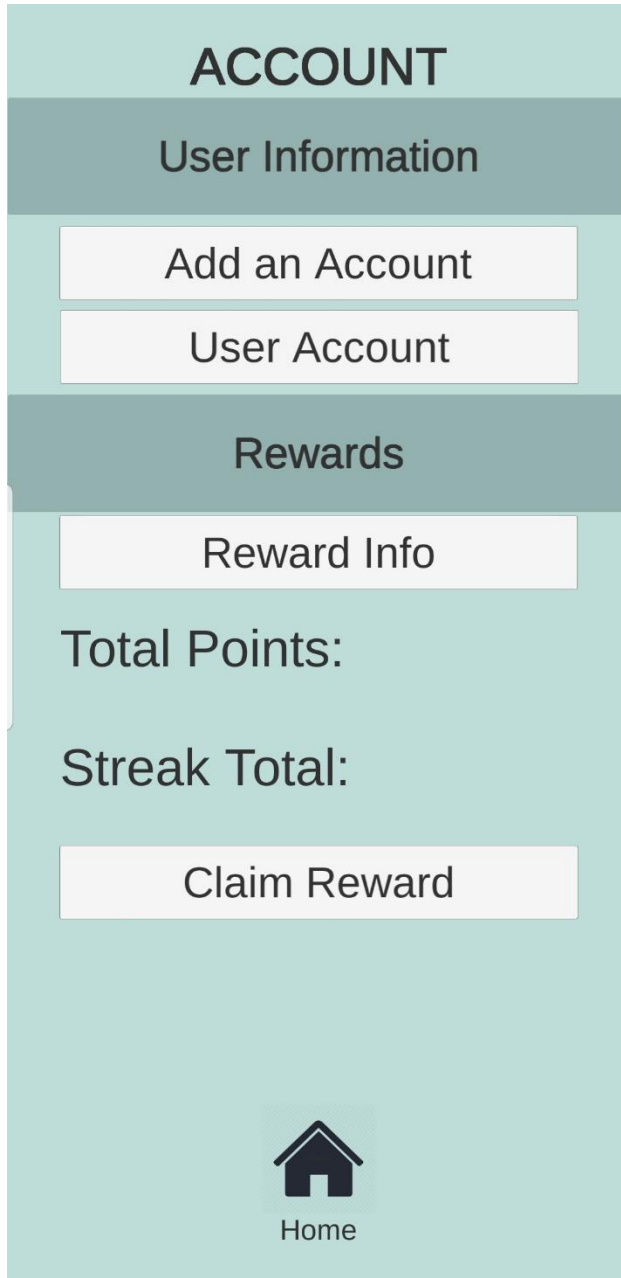
In the case that an issue occurs the user can use the reporting function. To report the issue the user must go to the settings page (the page is indicated at the top of the current page) and click on the “Send us a message” button which is also indicated at the top of the page. The user must fill out the required fields for the team to reach out and discuss the issue with the user. This page prompts the user for their name, email and phone number. The user can then describe the issue in the appropriate text field. There is a 280 character limit in the text field, based on the number of characters Twitter allows. The user can also decide to send an anonymous message by describing the issue and sending the message. In the case of an anonymous message the team will do their best to solve the issue however the user will not receive a response. Issues can be about the app itself or the scanning function in the case the user believes the app has incorrectly determined an item’s fate.

TUTORIAL

Coming
soon!



The tutorial page will include a step-by-step tutorial of how the app functions. The tutorial will include in-depth explanations and pictures to help the user understand how the app functions and how to use it most effectively. The tutorial page is currently under construction and a feature that the app would include in the future with more adjustments.



From the home page the user can access the account page. The account page is shown at the top of the screen. It is here that the user can add an account and view their account information. The account allows the user to start a streak and collect points to then collect rewards in the future. The account will also allow the app to send the user information via email for example about promotional events with points and rewards. On the account page the user can also access the reward info page and they can claim their reward.

ACCOUNT


Add an Account

Name:

Email Address:

Phone Number:

Create Account


Home

To create an account the user simply needs to fill in the required text fields and click the “create account” button to create an account. The app asks the user for their name, email address and phone number. The account allows the user to start a streak and collect points for rewards. The account will also allow the team to contact the user with more information and promotional events as described under the account page description.

ACCOUNT


User Account

Name:
John Doe

Email Address:
john.doedoe@gmail.com

Phone Number:
613-123-4567

Sign out


Home

To view their account the user needs to go the account page and then click on the user account button. The subpage and main page are indicated at the top of the screen. It is on this page that the user can see what they answered in the account text fields. The user can make changes in the case that their phone number or email address change. The user can also sign out so that another user can use the app to increase their streak and point total.

ACCOUNT

Rewards Info

The rewards system works on a streak based system. The longer you keep your streak the more points you accumulate.

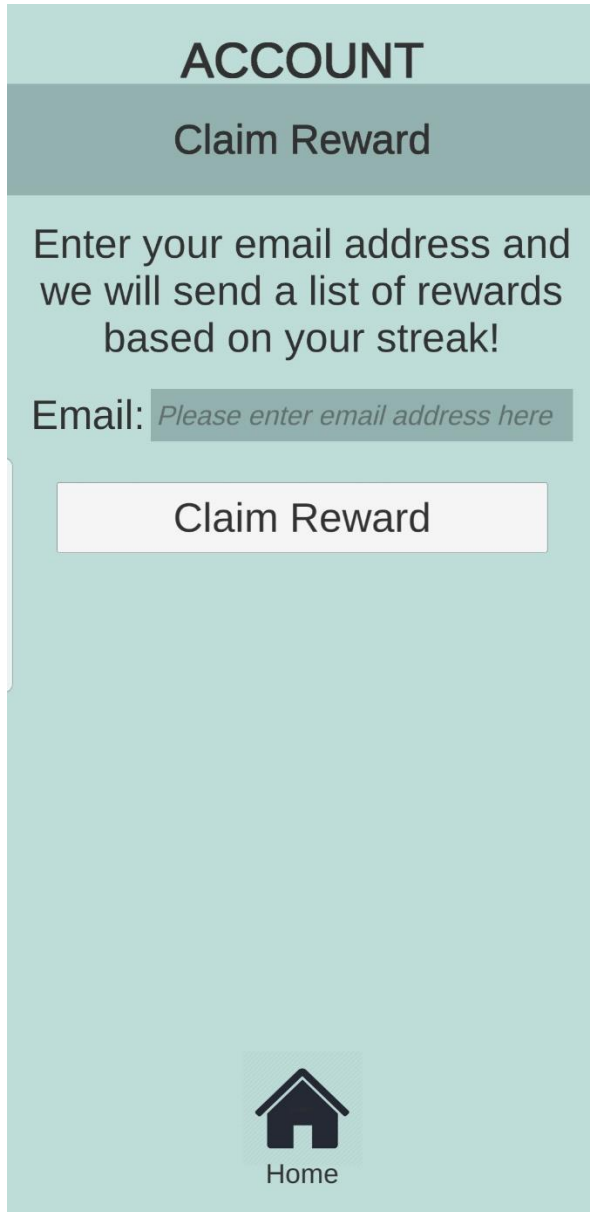
A streak lower than ten days earns you a point per day. Any additional day past ten days earns you two points per day.

If you lose the streak you will not lose your points. However your streak will restart.

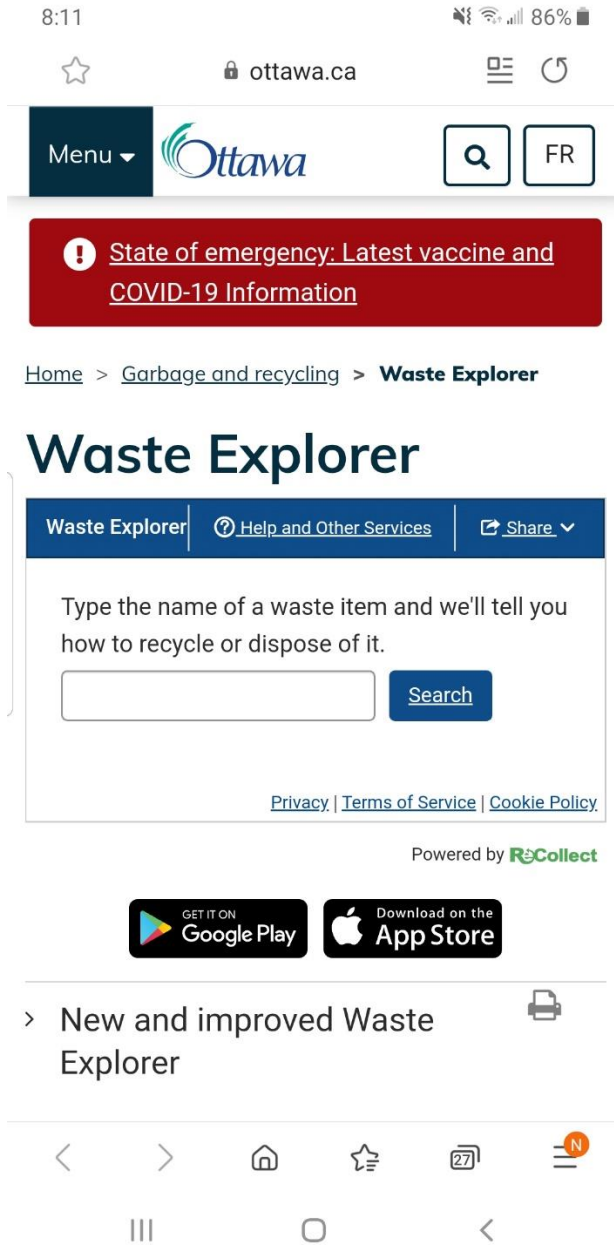


Home

From the account page the user can access the rewards info subpage. The rewards info page describes how one can collect points and how the point system works. This page is exclusively informational text.



The user can claim their rewards by going to the claim reward page from the account page. The user simply needs to input their email address into the text field and click the claim reward button. The app system will send a list of rewards based on the user's streak/point total.



In the event that the item is not recyclable/the system does not recognize the item, the large red “X” will appear on the screen with the message telling the user to place the item into the garbage. If the user believes that a mistake has occurred, the user can press the manual search button. The manual search button is found under the message on the non-recyclable screen. The button takes the user online to the waste explorer page for the city of Ottawa. This way the user can type in the name of the item and determine its fate from an alternative source. The manual search button is a backup to the scanning feature so that the item can still end up in the appropriate place, ultimately reducing recycling waste and solving the waste management issue.

Testing

The prototype was tested based on the chosen criterion that were set in the initial stages of the project. The prototype was tested based on size/dimension, efficiency, performance time and complexity. Based on the criterion the prototype was measured against the specific goals to determine whether the application in its current iteration exceeded, matched, or fell below the goal.

Size and Dimension

In the case of a phone application, the size criterion is measured by the size of the app. The app in its current form is 31.7 megabytes, which is well below the ideal metric set of 100 megabytes. However, since the images in the database are part of the app and are not cloud based, as the database expands it is highly likely the size of the application will be beyond 100 megabytes. In the future, cloud storage will have to be explored, and if that is not possible using Vuforia, then it might be necessary to use a different image targeting system.

Efficiency

As stated previously, effectiveness of the product can be determined based on its performance. The user also should not be inconvenienced in any way. The product can be considered effective if the process is efficient; the app should recognize the item being scanned at ease and should provide the correct bin without any hesitation. The app can be considered ineffective if the image library does not recognize the item. A metric that can be utilized to measure the product's efficiency is its accuracy. The client has stated that the product should reach at least a 90% score for accuracy. However, due to the variety of recyclable materials that cannot be accounted for because of time constraints, an accuracy rate of 70-80% is a more reasonable goal.

When comparing the product to the metric, it can be rated as 75% effective. This score was achieved after conducting 20 tests on the app. Out of the 20 tests, the Vuforia Image Library could only successfully identify 15 of the 20 items. The items that were not identified had 3-4 star ratings, which could be why the Vuforia Image Library could not recognize the item. An item with 3 star ratings means that the item is too generic and that there is nothing distinct about it. Another reason for the unrecognizable items could be the angle at which the item was scanned. Vuforia Image Library only recognizes an item if it is in the same position as that of the item in the photo, so any small variation could result in an error. To make the app more accurate, the Vuforia Image Library can include higher quality images, and items that are less generic. The library can also be expanded to have images of items from different angles.

Performance Time

To evaluate this metric test runs must be done with multiple recyclable items and with an array of different users ranging in age. An average run time will be calculated. Time starts the moment the user takes their phone out of their pocket and ends when a result is generated by the application. If the run time exceeds one minute, the tool should be modified to improve its efficiency. Although 1 minute is the time limit, the ideal time would be for the app to generate a result by 30 seconds. This is so the user is not reluctant to use the app multiple times per day because it takes too long to produce a result. The testing was done by having three separate age groups test the app on the same items. As a result, the average time to complete the process is 17 seconds. The average time for the teenager age group was

15 seconds. The average time for the teenager age group was 21 seconds. The average time for the elderly age group was 28 seconds. After analysing these results, the metric has been met for all age groups and the average time performed significantly better than expected. Therefore, no changes are needed to improve this metric.

Complexity

The client specified that one of the most important elements of a potential solution is its simplicity of use since a lot of emphasis was placed on ease of use and user friendliness. As such, any solution must be very simple for users to use. It should have a low learning curve, it should be intuitive to use, and it should not require a lot of energy to use. Since recycling items (i.e., sorting items in their respective recycling bins) can happen multiple times a day for individual households, a complicated-to-use system would discourage potential users from utilizing this system to help them recycle better. To evaluate this, two metrics will be used: number of decisions required, and number of interactions required. For this project, an acceptable range would be 5 decisions and 8 interactions required, while the ideal would be below 3 decisions and 5 interactions. 3 scenarios were tested for this metric. Scenario 1 is when the tool recognizes the recyclable item right away with no error messages. In this instance the required steps amount to 3 (taking phone out, opening app and pressing scan button). Scenario 2 is when the app does not recognize the item and prompts the user to try again or to search online and the user elects to try again. For this scenario, 4 steps are required as they are the same steps as scenario 1 with the added interaction and pressing try again. For the final scenario, the app does not recognize the item and prompts the user to try again or to search online, but this time the user searches for the item online. This scenario requires 6 steps as a search must be executed and then the desired item must be chosen. To conclude, scenario 1 and 2 meet the ideal standards of this metric. However, Scenario 3 is still acceptable, but an improvement can be made to reduce the steps to the desired number. In order to reduce the steps, if the user tries to scan multiple times and fails the app should prompt the user to the search page automatically.

User Experience and Feedback

The application was tested by a few people to provide feedback as well as help grade the tool by testing it and the metrics that were put in place. Overall, the users enjoyed the application as it was easy to use and understand. There was little to no learning curve as the users were able to figure out the application without any instruction. Feedback from them was useful to bring a different perspective on the tool and help identify issues that were not initially perceived as a problem. The main feedback received is that the scanner needs to be able to identify more items. This is a simple yet important problem to solve. If the end user cannot use the application for most items, then the app will soon be forgotten and therefore be rendered useless. To fix this issue, the picture library needs to be much bigger as the scanner needs to recognize items of all brands and shapes. The application received much more positive than negative feedback. The users enjoyed the simplicity and the quickness of the app. The result was clear and precise. They also enjoyed the fact that if the item could not be recognized, they had the option to be taken to the proper website to get a result.

Future Objectives

While this prototype represents the final model for the time being/for the given deadline, there still exists future objectives. Adjustments and improvements will be made in the future. The app interface can be modified to resemble the initial sketches more closely and incorporate those design elements more heavily. The opening screen is an example of where the model deviated from the initial sketches. This current model does not directly open to the scanning screen but rather opens to a home page with access to the account, settings, and scanning page. While this means the user must press a button to get to the scanning page, the scanning feature does not require the user to focus the camera as previously thought in previous prototypes. Essentially this deviation affects aesthetics and not functionality and efficiency. Additionally, the tutorial page is under construction and was not completed at the time of this deliverable. An in-depth tutorial will be added in the future to help the user truly navigate the app and use it to its full potential. Lastly, the Vuforia database can be expanded to include more images and more items to increase the app's ability to scan items. The app will be refined in future objectives.

Conclusion

In conclusion, this prototype represents the final product and app. Continuing to assess risks to the project ensures that a successful solution will be achieved. Testing helps the app maintain its goals and compare itself against the original criterion that formed the foundation for the prototyping that proceeded. The testing allows for future adjustments to be made based on the results. The RecycleBuddy app is a functional app that can scan an item and determine its fate while providing the user with additional features. RecycleBuddy provides a sophisticated solution to the waste management problem and to the client's needs.

GNG 1103 PROJECT DELIVERABLE H

Appendix A

