

# GNG 1103

**Deliverable F: Prototype I and Customer Feedback**

## **Group 13**

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<b>Introduction</b>	<b>3</b>
<b>Prototype</b>	<b>3</b>
Test Objectives Description – the ‘why’	3
What are the specific test objectives?	3
What exactly is being learned or communicated with the prototype?	3
What are the possible types of results?	3
How will these results be used to make decisions or select concepts?	4
What are the criteria for test success or failure?	4
<b>The ‘what’ and ‘how’ Aspects</b>	<b>4</b>
Describe the prototype (e.g. focused or comprehensive) and the reason for the selection of this type of prototype.	4
Describe the testing process in enough detail to allow someone else to build and test the prototype instead of you.	4
What information is being measured?	5
What is being observed and how is it being recorded?	5
What materials are required and what is the approximate estimated cost?	5
What work (e.g. test software or construction or modeling work or research) needs to be done?	5
How long will the test take and what are the dependencies (i.e. what needs to happen before the testing can occur)?	5
When are the results required (i.e. what depends on the results of this test in the project plan)?	6
Scanner:	<b>6</b>
Table 1: Image Targeting Results	6
UI:	<b>9</b>
Leaderboard:	<b>9</b>
<b>Prototype Schedule, Testing and Analysis:</b>	<b>10</b>
Table 2: Timeline and Testing	10
<b>Feedback:</b>	<b>12</b>
Ebin’s Feedback:	12
Farough’s Feedback:	12
Pop’s Feedback:	12
Motion’s Feedback:	12
<b>Conclusion:</b>	<b>12</b>
<b>REFERENCES:</b>	<b>12</b>

## **Introduction**

Last deliverable, the group decided on a final concept for the recycling application and proposed a schedule, a project cost estimate and risk assessment. This deliverable details the decisions and results of the first prototype. The first prototype is meant to lay the groundwork for the app by establishing the functioning of its main subsystems: the scanner, the UI, and the leaderboard. Our group conducted prototyping tests with our own pre-determined methods to develop and maintain these subsystems. Afterwards, we obtained feedback from close friends and family in order to determine how the current state of the app could be improved. Overall, progress is well-underway for these subsystems with varying levels of success. However, after developing the app for a week and collecting feedback on it the group has a more realistic idea of what can be accomplished under the short timeframes assigned to us.

## **Prototype**

### **Test Objectives Description – the ‘why’**

What are the **specific** test objectives?

The main objective of prototype testing is to ensure that the needs of the client will be fulfilled. This specific prototype test is required to verify that the main function of the application, the scanner, and the app navigation are functioning properly in order to continue developing the application. For the scanner, our objective is to verify how feasible the scanner was for identifying recycling symbols such as barcodes, recycling arrows and objects based on their cylindrical shape. For the UI, we want our user to navigate through the interface easily and find the UI attractive. Finally, we want to make sure implementing the leaderboard is possible and understanding how it could be implemented into the final design.

What **exactly** is being learned or communicated with the prototype?

Our prototype focuses on what could be possible for our app in terms of functionality. This prototype demonstrates how well the basic subsystems of the app could be implemented into the final product.

What are the possible types of results?

There is a certain range of possible outcomes that can be encountered during the prototype testing, from a subsystem working completely fine to a function not working at all. Before starting the project, we expect somewhat pessimistic results and progress on our application due to our lack of experience and its overall difficulty.

How will these results be used to make decisions or select concepts?

The final results from this deliverable will determine which concepts could be feasible moving forward, which ones need more research and which concepts should be dropped. If a portion of a subsystem is causing too much trouble, we will first arrange a meeting with the TA to help fix the issue. Only the TA cannot find a solution nor could a solution be found online, then our group will decide whether an alternative could be found or if the subsystem should be dropped entirely.

What are the criteria for test success or failure?

Our criteria for success for each subsystem is based on a range of outcomes. For all subsystems, the bare minimum for success is that each subsystem is implementable into the final product. However, each subsystem has ideal criteria to meet. Ideally, in the first prototype we'd want our scanner to be able recognize that a recycling symbol or cylindrical object is on the screen. We're not expecting our scanner to recognize the object at this stage of the prototype. A failure is if the scanner is not able to pick up certain types of common recycling symbols or shapes. For the UI, our ideal success would simply be if the user can navigate through the interface easily and if they find it appealing. A complete failure would be if the UI isn't even set up yet for a majority of the scenes. For the leaderboard, we expect the leaderboard to be implementable with an idea of how to store profiles and scores. A complete failure would be if the leaderboard is not possible at all.

## **The 'what' and 'how' Aspects**

*Describe the prototype (e.g. focused or comprehensive) and the reason for the selection of this type of prototype.*

Prototype 1 involves members of the group individually developing focused prototypes of different subsystems. Focused prototypes were chosen over a comprehensive prototype to ensure that the fundamental subsystems were feasible and functional. The focused prototypes also facilitate the identification of issues early in the development process.

Describe the testing process in enough detail to allow someone else to build and test the prototype instead of you.

The testing process involves assessing if each focused prototype fulfills its relevant design metrics. To test the focused prototypes, the tester must open unity and create individual scenes for each of the following subsystems: user interface, AR camera and leaderboard subsystems. The scenes then are to be assessed against the design metrics to determine if they meet the standards outlined in deliverable D.

What information is being measured?

*The information being measured through testing is mostly qualitative or a yes/no answers.*

What is being observed and how is it being recorded?

*The tests are mainly to observe if a subsystem is functional and how well it caters to the client's needs. The results for each focused prototype are to be recorded in a table comparing the prototype's performance to the design metrics it is intended to fulfill.*

What materials are required and what is the approximate estimated cost?

This prototype has no costs or physical materials associated with it. A functioning personal computer and unity engine are the only necessary materials.

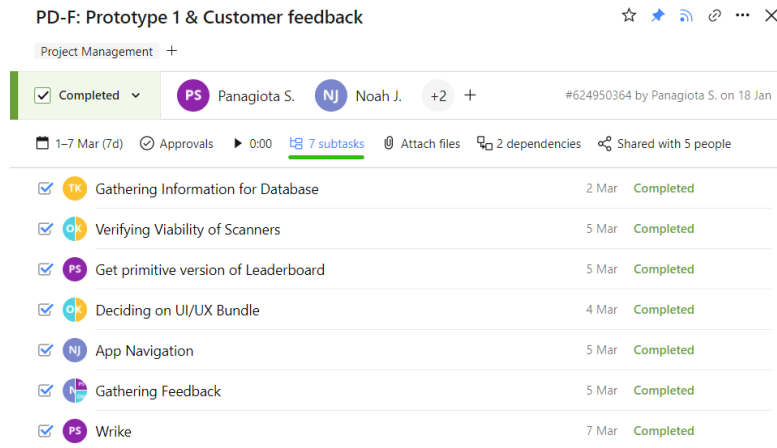
What work (e.g. test software or construction or modeling work or research) needs to be done?

This prototype will require team members to research how to use Unity to develop the focused prototypes.

How long will the test take and what are the dependencies (i.e. what needs to happen before the testing can occur)?

The tests will be performed during the meeting of the team. Before the testing occurs, each member should have completed their part of the application. When the tests have been performed, the second prototype can be developed. In Deliverable E, a Gantt chart for Deliverable F was created specifically for the prototype testing.





When are the results required (i.e. what depends on the results of this test in the project plan)?

The results are required by March 7th, before this Deliverable F is due. The development of the second prototype depends on the results of the first prototype. If the results of the first prototype were not obtained, the development of the application would be more difficult and take more time.



This prototype was a focused prototype on a few subsystems and serves as a basic proof-of-concept. The upcoming prototypes will be more comprehensive in their function and experience



## **Scanner:**

Through the use of vuforia and unity, we conducted many trials on the scannability of certain items and recycling symbols to assess their viability in the final application. The following table shows a few of the images to test the scanner and reveal interesting results about the strengths and limitations of the scanner.

Table 1: Image Targeting Results

Target Used (Augmentation Rating 1-5)	Width (m)	Distance it Tracked from (m)	Comments
ESS Handbook (5)	3	0.07 - 1	

			
	4	0.13 - 1.22	Best results. Can detect if an object is tilted 45 degrees to the camera and requires minimal stabilization.
	5	0.13 - 1.22	Can detect target tilted much easier
<p data-bbox="201 1050 467 1125">Straight Water Bottle Barcode (3)</p> 	3	None	Vuforia cannot track barcodes well at all. This is because the image has very few distinct features according to Vuforia. It could only track the numbers at the bottom with some accuracy.
	4	0.3 - 0.5 m	This works better, but requires the image to be centered well and very stable.
	5	None	
<p data-bbox="201 1759 474 1871">President's Choice Recycling Symbol (5)</p>	3	0.1 - 1.4 m	Very easily discernible logo, but not very

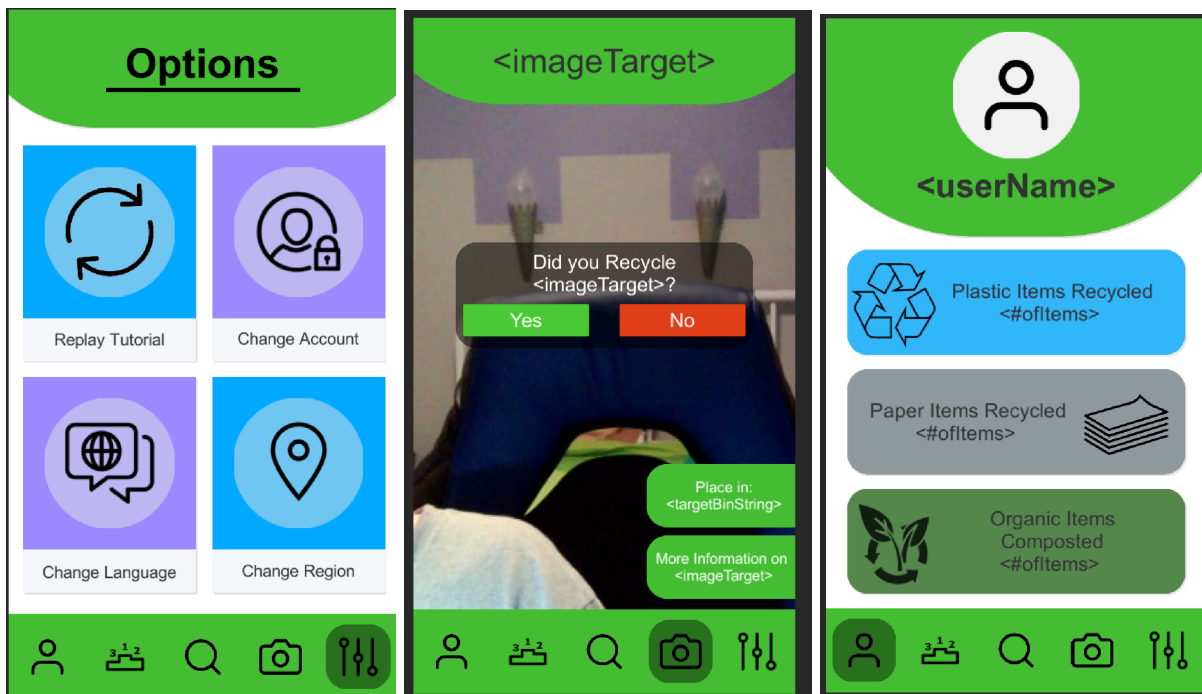
			common on most recycling packaging.
	3	0.07 - 1	
	4	0.23 - 1.32	
	5	0.23 - 1.32	

The tests revealed that our scanner has many limitations when it comes to what recycling symbols it could actually pick up. Any non-obvious recycling symbols had very few features that could be picked up by Vuforia and had a very low augmentation rating (0-2%). On the other hand, large symbols or elaborate designs could be much more easily. Additionally, it seemed like the less augmentable the image was, the more perfect the object had to be placed in order for the scanner to pick it up. The augmentability of an image poses a serious constraint on our design and for the next prototype, we need to find recycling symbols that can easily be augmented by the scanner.



## **UI:**

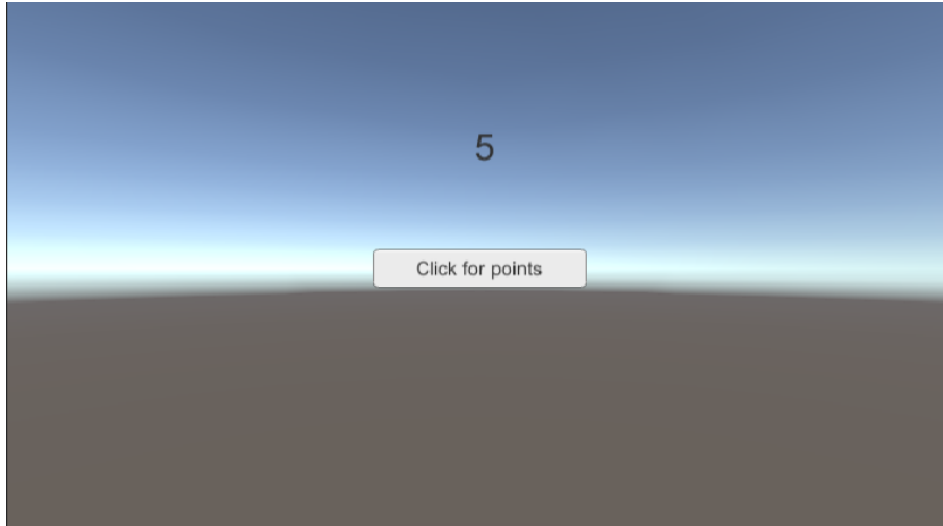
The user interface focused prototype encompasses the main scenes of the app and all the associated text, image, and button components. The primary focus when creating this prototype was compatibility with mobile devices and user friendliness. A navigation bar was created to switch between the five main scenes with the pressing of buttons. Some of the interface elements created are simply placeholders to be updated based on information specific to the current user or recyclable item. The header on the scan scene for example is to display the name of the image target string currently being viewed. Other interface features yet to be implemented include the ability to switch language, the tutorial, and a functioning manual search input field. This subsystem will be necessary in the near future to combine subsystems and scenes into a single comprehensive prototype.



## **Leaderboard:**

In order to develop the leaderboard, a basic project was created where the user has to click the button 'Click for points' to receive a number of points. Each time the user presses the button,

the user obtains one point and the number of points received is displayed on the screen.



Currently, the only on-going maintenance costs will be the cost of running the server for the leaderboard. It has not been established if this server will only run community-wide or go all the way up to international. For the development of the leaderboard, CloudOnce will be used.

## **Prototype Schedule, Testing and Analysis:**

The following table outlines the timeline, and methods of testing for each subsystem modelled in this prototype.

Table 2: Timeline and Testing

Test ID	Subsystem	Description of Prototype used and of Basic Test Method	Description of the Results to be Recorded and how these Results will be used	Estimated Test Duration and Planned Start Date
1	Scanner (Single Image)	Testing if the single image target scan on vuforia can target barcodes and/or recycling information contained on the packaging of the material. Various recycling symbols include: Barcode Recycling Arrows Large Text	Optimize the inputted length of the object  What could be scanned easily or not	March 4-6
	Scanner	Testing if the cylindrical	Most efficient	March 4-6

	(Cylindrical)	image target scan on vuforia can target different cylindrical objects such as different water bottles.	distance of scan  Constantly grabbing the image	
2	Leaderboard	Testing if the score number increases by one when the user presses the button.	The score increased and was displayed on the screen.  This will be built on for the development of the leaderboard.	March 4-6
3	User Interface	Construction of main app scenes and navigation bar to switch between them. Creating buttons and pop-ups to be used later for implementing search, scan and leaderboard features.	Does the UI function and scale appropriately to mobile devices?  Use these results to adjust scene sizes and scaling options.  Is the UI visually appealing and easy to navigate?  Use this feedback to alter and improve the look of the UI.	March 4-7

## **Benchmarking**

The following tables compare what our current prototype is capable of to the relevant specifications created in deliverable C.

Table 3: Scanner Specifications and Test Results

#	Specification	Target Value	Test Result
1	Uses camera features to facilitate recycling	Yes	Yes

2	Ability to accurately identify waste items	95% of the time	N/A
3	Device Requirements	IOS 12.0+ Android 5.0+	Android 7.0+ IOS 11.0+
4	Compatible with common operating systems (IOS & Android)	Yes	Android Yes IOS not tested

Table 4: UI Specifications and Test Results

#	Specification	Target Value	Test Result
1	Display Size	5.7-6.7 in	Adjusts to screen size
2	User-friendly navigation and interface	Yes	Could use modifications
3	Clear and concise tutorial	Yes	Not yet

Table 4: Leaderboard Specifications and Test Results

#	Specification	Target Value	Test Result
1	Tracks how much user is recycling	Yes	Yes
2	Cost	0\$	Will have to buy Google Play Console (\$25)

## **Feedback:**

### **Ebin's Feedback:**

"I like the scanning area, but it is a bit useless if it stays in one location. Once the scanner identifies an object, you could have the user click a button that says 'scan this item'".

“Also make Noah take the image you have and split it into a real interface of panels and buttons. Make sure you upscale those items so they don’t look blurry on high resolutions”.

### **Farough’s Feedback:**

Its scanning really well, the design is very appealing. It does what it is supposed to do. He thinks the graphics could use a touchup.

### **Pop’s Feedback:**

Scanner: Not very responsive. Otherwise it looks pretty good.

### **Motion’s Feedback:**

Leaderboarded: It does what it’s supposed to. It should have a more interesting format.

### **Conclusion:**

In this deliverable, the first prototype was developed by following the prototype plan that was previously created in Deliverable E. For this deliverable, tests were performed for the main functionalities of the first prototype in order to meet the client’s needs. The results of the tests were obtained and it was concluded that the prototype functioned properly, and therefore, the second prototype can be proceeded. The feedback that was received for each functionality will be taken into consideration to implement the future prototypes.

### **REFERENCES:**

Previous Deliverables