Project Deliverable C: **Design Criteria and Target Specifications**

GNG 1103 – Engineering Design

Group: 7

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1.0 Introduction

In the previous deliverable, a set of needs was established to meet the client's requirements for a system which can easily verify and indicate to a user if their waste is recyclable or not. In this deliverable, design criteria will be set to convert the client's needs into requirements which will later be used when designing prototypes. The different design criteria will be classified as either functional criteria, non-functional criteria, or constraints. With the different design criteria established, other competing designs will be benchmarked to determine exact requirements for possible solutions.

2.0 Needs and Design Criteria

This section identifies the needs of the client and provides a design criteria for those specific needs.

Table 1. Needs statements and design criterion

Number	Need	Design Criteria
1	User Interface & User Experience	- Attractive - Easy to use
2	Recognizing contaminants	- System which can identify can identify contaminants on a recyclable
3	Recognizing a diverse range of objects	- System can differentiate between different objects
4	Reliably recognizing an object	- The app recognizes a wide variety of materials and objects by their symbols and other classifiers, in order to provide correct disposal information
5	Having Game features	- Interactive feature - Game system which entices the user
6	Locating places to recycle	- Built-in Map with the nearest recycling facilities
7	Accessibility[1]	- The app is free - Easily accessible on most platforms

3.0 Benchmarking

The following section compares different projects that are targeted to improve the recycling process. The three projects that are being compared are mobile apps called GoGreen, Waste Classifier and Recycle Academy. While the first two apps use augmented reality to identify whether the project can be recycled, the Recycle Academy focuses on providing educational information on different types of plastic and how to recycle them. The three apps are compared in Table 2 based on different criterias.

Table 2. Metrics and benchmarking properties

#	Criteria	GoGreen [1]	Waste Classifier [2]	Recycle Academy [3]
1	Cost (user)	Free	Free	Free
2	Accessibility[1]	Only available in App Store	Only available in App Store	Only available in App Store
3	Design (User Interface & User Experience)	Simple and easy design	Simple design, but app does not explain how to recycle	Design is not fully easy to use, finding the proper recycling symbol takes time and you can only swipe them, viewing one symbol at a time
4	Reliability[2]	Low	Tolerable	High
5	Customizability[4] / Localization (recycling settings)	None	Some parameters can be customizable (Ex, toggle for cardboard and paper can be in the same cart)	None
6	Performance (Program Speed)	Slow	Feels quick	Medium, takes time to identify the recycling symbol
7	Download size	28.8 MB	23.1 MB	3.1 MB
8	Language	English	Available in 18 languages including English and French	English
9	Augmented Reality[3] (AR)	Yes	Yes	No

Table 3. Comparison of importance factor for each competitive product

#	Metric	Importance (1-10)	GoGreen [1]	Waste Classifier [2]	Recycle Academy [3]
1	Cost	5	3	3	3
2	Accessibility[1]	10	1	1	1
3	Design	10	3	2	1
4	Reliability	10	1	2	3
5	Customizability[4] / Localization (recycling settings)	8	1	2	1
6	Performance (Program Speed)	8	1	3	2
7	Download size	5	2	2	3
8	Language	3	1	3	1
9	Augmented Reality (AR)	6	3	3	1
	Total		112	142	113

Based on the comparison of the importance of each metric, the best product is Waste Classifier. The ideal product should take into consideration all of the advantages and disadvantages of this app and use them to improve the existing product while also bringing new features.

4.0 Design Specifications

Table 4. Functional Requirements

#	Design Specifications	Relation (=, < or >)	Value	Units	Verification Method
Functional Requirements					
1	Performance (Program Speed)	<	Smaller the better	ms	Measuring loading time of pages and startup
2	Accessibility[1]		IOS, Android	N/A	The ability to compile and run on different devices and operating systems
3	Reliability	>=	95%	N/A	Testing the app against objects that have already been

					pre-sorted
4	Download size	<	Smaller the better	MB	
Constraints					
5	Cost (users)	=	$0	$(CAD)	
6	Cost (Buyer)	<	$0 (less is ideal)	$(CAD)	
Non-Functional Requirements					
6	User Interface & User Experience		N/A	N/A	Peer review by multiple users
7	Customizability[4] / Localization (recycling settings)	>	The options to customize to setting to local recycling regulations the better	N/A	
8	Language	>	N/A	N/A	

5.0 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

6.0 Conclusion

The information provided by the client helped to better understand the problem. The information helped to determine different design requirements of potential solutions. After establishing the needed design criteria which will be implemented into future designs, GoGreen, Waste Classifier, and Recyclable, three competing products, were benchmarked to determine which competitor is best suited for reference when creating a new design. Through this evaluation, the best app was identified and its advantages and disadvantages were noted. It was concluded that Waste Classifier is the superior competitor, as it scored the highest with a score of 142.

References

[1] Barzyczak, R., 2020. *GoGreen*.
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[3] Gladis, M., 2018. *Recycle Academy*. Constant Click, LLC.
https://apps.apple.com/ca/app/recycle-academy/id1413748789