Group C15

Deliverable B – Needs Identification

Engineering Design – GNG 1103 – Section C

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Abstract

This document summarizes the needs provided by the client, laying out a detailed problem statement and approach to solve the problem. The chosen product to solve this issue will be discussed in upcoming deliverables, but the scope and overall approach will be chosen. The following will be discussed in detail: an introduction to the client's issue, identified needs and solutions, introductory benchmarking of existing solutions addressing this same issue, and a summary of the chosen scope / approach.

1. Introduction

Over the years, it has been recognized that pollution is a genuinely concerning matter which threatens the environment as well as people's health. Recycling has been encouraged to reduce pollution; however, it is not properly carried out. In July 2018, Environment and Climate Change Canada (ECCC) completed the study *"Economic Study of the Canadian Plastic Industry, Markets and Waste"* which concluded that in 2016 only 9% of plastics were recycled. Of the remaining 91%, 4% was incinerated with energy recovery, 86% was landfilled, and 1% was released into the environment. [1]

The client, Mitch Bouchard, is not directly involved in waste recycling; however, his business serves the recycling companies and thus he is aware of the shortcomings of recycling in Canada. He has identified that the recycling method at the user level must be easy (user friendly), scalable (widely applied), and must satisfy a minimum accuracy level of 95% (less than 5% foreign matter in the recycle bin of a specific group of recyclable waste).

This report states the recycling problem, identifies, and prioritizes the client's needs (which are the causes of the problem), carries out user benchmarking, and explores ways to address the client's needs to achieve the goal of increasing the recycling of household products at the user level.

2. Needs Identification

The client is looking to solve a problem plaguing the recycling industry: recycling sortation before it arrives at the sort-facility causes quality problems and potential damage to the facility itself. Though the facility is tasked with sorting, it was shown how vital it is that presorting is done properly. To address this, the client wants a solution that can improve this pre-facility sorting. For the solution to be effective, it must be seamless to adopt, general purpose to increase usage across demographics/countries/etc., and fully accurate. It should assist in consumers understanding which bins certain items go into. The solution can take any form with suggestions including but not limited to AR (Augmented Reality) image recognition apps, or electronic systems used to assist consumer-side sortation. The table on the following page explicitly states each desire given by the client and the interpreted needs.

Table 1: The Cient's Needs and their Importance.

Group	Client Statement	Interpreted Needs	Importance (out of 5)
Main focus	Anything to help better sort recycling.	1. AR app to detect a material type posted in front of a camera. 2. Any other electronics piece that helps the recycling process.	5
Accessibility	Ease of use/low effort (for user level), so there is no confusion.	No complicated instructions and procedures.	5
	Targets all people based on their technical skills.	Consideration of people who do not use or do not know how to use smartphones or any electronic devices.	4
	Low cost/free to access, so there is more use of the product.	Low cost or preferably free.	5
	Scalable (widely applied)	No region limitation for access.	4
	Attract as many people as possible.	Develop for platform with the most users.	4
Functionality	95% accurate bales of recycled materials can sell for more money, improving profitability.	Detects with 95% accuracy for any included category of recycling.	5
	Materials do not need to be sorted as heavily at the facility. (more work done on the consumers end)	Detects a wide variety of materials across all recycling categories.	3
	Obvious and exact recycling locations.	Include editable local map to choose and/or notify the locations of recycling bins.	4

3. Problem Statement

The client is looking for an easily accessible system to guide different variant of customers to better identify type of garbage in order to recycle more efficiently and accurately. This is to improve the quality of recycling coming into recycling sort facilities, potentially increasing value of recycled materials sold.

4. User Benchmarking

To get an idea of what else is already trying to address this broad issue, we did some cursory research on existing solutions. There were some options such as the City of Ottawa Recycling app, as well as the general recycling system we have here. We also found a general AR recycling app, used to simply tell you if something is potentially recyclable (although no information that pertains to any specific countries recycling system) and another region locked AR app that is only useable in new south whales. While some of these do their advertised capabilities decently well, none of them seemed to be good as general-purpose solutions, they were either region specific and useful, or region agnostic and not capable of giving much guidance on if something is recyclable in their area of the world. To beat these existing solutions, our product will need to address the issue these have not: solve the problem of sorting without region locking.

Table 2: Product Benchmarking of Current Solutions in Market.

Service Name	Description:1) How it solves problem, 2) Who it's targeting, 3) Is it good?	Benchmark (out of 5)
Black/Blue/Green bins by City of Ottawa [2]	1. Service provides households with blue, green, and black bins to promote uniform color coding and ensure recycling. 2. City of Ottawa Households. 3. Narrow customer scope, and lack of adoption of the same colour designations.	3
Ottawa Recycling Collection App [3]	1. Allows you to keep track of your at-home recycling schedule, provides info on what can be put in each bin through webpage links. 2. City of Ottawa Households. 3. It is fairly good, but not frequently used and requires effort on the users end to find out what goes where.	4
Recycle Nation Website/App [4]	1. Web App with iOS and Android support, focused on showing recycling locations for a chosen item, using a search tool. 2. U.S. and Canadian businesses and consumers. 3. It's quite easy to use and shows a map of the recycling locations, but it recognizes only U.S. recycling locations.	3
Recyclinator App [5]	1. AR recycling app used to detect objects and tell you if you can recycle them. 2. General public, no specific region.	3

	3. It is good at recognizing objects, but the issue is that it will only say what would “probably” be recyclable, which is not in any way related to what is recyclable in your country / city / etc.	
Recycle Mate App [6]	1. AR app that detects objects and tell you if you can recycle them. 2. New South Whales citizens. 3. Seems like a good service, but again this is region locked so does not help Ottawa.	3

5. Conclusion

The overall requirements are open ended, with any solution that addresses improving recycling sortation being permitted. Though there were many other issues brought up spanning the entire recycling process chain, the chosen focus is on solving this by creating something consumers will directly use, either bought / downloaded by them, or something sold to companies that have consumer facing recycling (stores, municipalities, etc.) recycling infrastructure. This will address the issue before it starts, reduce costs along the recycling process, and ideally increase profits on recycled material sold by recycling facilities by increasing a particular recycling type’s purity.

6. References

[1] "Economic Study of the CANADIAN PLASTIC INDUSTRY, MARKETS AND WASTE," 2019. [Online]. Available: http://publications.gc.ca/collections/collection_2019/eccc/En4-366-1-2019-eng.pdf. [Accessed: 31-Jan-2021].

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[3] Public Works and Environmental Services Dept., "Garbage / Recycling App," *City of Ottawa*, 27-Nov-2020. [Online]. Available: https://ottawa.ca/en/garbage-and-recycling/garbage. [Accessed: 31-Jan-2021].

[4] RecycleNation, *RecycleNation*. [Online]. Available: https://recyclenation.com/find/?materials=&zip=. [Accessed: 31-Jan-2021].

[5] V. Satija, "Recyclinator - See if you can recycle something or not," *Product Hunt*, 27-Jan-2021. [Online]. Available: https://www.producthunt.com/posts/recyclinator. [Accessed: 31-Jan-2021].

[6] J. Cheng, "Recycle Mate - AI Recycling App," *DreamWalk*, 19-Nov-2019. [Online]. Available: https://dreamwalk.com.au/project/recycle-mate#:~:text=Find%20out%20with%20Recycle%20Mate,helping%20you%20reduce%20recycling%20contamination. [Accessed: 31-Jan-2021].