Group C15

Deliverable C – Design Criteria

Engineering Design – GNG 1103 – Section C

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Abstract

This report lays out design criteria developed from the client needs, discussed primarily in deliverable B. Included below is a reiteration of the client needs in condensed form, design criteria based on the needs, more in depth technical benchmarking, and highlighting currently existing products that best fit the requirements. We have determined that if our product takes the form of an AR app, the three winning solutions are Intellibins, BC Recyclepedia, and iRecycle.

Introduction

In the last report, our group expounded the client needs and determined the priority of client needs. We also summarized the problems existing in the project and put forward some general plans to solve the problems. In addition, after group discussions in recent weeks, we have initially formed an idea to design an application to help people with garbage sorting and recycling.

In this report, based on the last report and further discussion, our group defined the prioritized design criteria. We formulated detailed design criteria according to client needs and priority degree of client needs, aiming to achieve customer needs. We also break down design criteria into functional and non-functional categories to help customers understand our design criteria. In addition, we will present technical benchmarking in tabular form。

Design criteria can help us to determine the goal, and narrow the range of our design, so that the design goal is detailed and clear. Moreover, technical benchmarking helps us to compare our products and methods with those of some successful companies in their fields in order to try to improve our own performance. Therefore, Design criteria and technical benchmarking are significant for defining our targets and refining our project.

Client Needs

The central idea of this deliverable is to define design criteria and target specification for the project, Design criteria should directly address client needs therefore it is important to summarize previously identified needs prior:

Needs of the client	Importance
Simplified solution of recycling process	5
Effortless UX (no instructions or manuals required)	5
Low cost or free if possible	5
Scalable (attract many people and have no regional limitation)	4
Decrease sorting burden for recycling facilities	3

Design Criteria

Based on the client needs summary, design criteria can be attached to each need. Design criteria will define what parts of the solution will be the most critical from both functional and non-functional perspective. Following is the table of design criteria attached to each client need, as well as the table that sorts design criteria into functional and non-functional categories:

Needs of the client	Design Criteria
Simplified solution of recycling process	- Identify appropriate recycling bin (color, shape) - Assist user with finding appropriate recycling bin (location)
Effortless UX (no instructions or manuals required)	- Readable and intuitive UI - Accessibility (visual impairment, any age, etc.)
Low cost or free if possible	- No subscription or registration required - Open source under permissive license (such as MIT or BSD) - No cost for users - Small cost for organization that sets the system up ($4 variable cost per million requests, and maximum $100 fixed cost for storage)
Scalable (attract many people and have no regional limitation)	- Can handle at least 10 million requests per day - Server side should be capable of decentralization and containerization - Open, reusable APIs
Decrease sorting burden for recycling facilities	- Decrease errors made during recycling by at least 40%

Functional Design Criteria	Non-Functional Design Criteria
- Identify appropriate recycling bin (color, shape) - Assist user with finding appropriate recycling bin (location) - Readable and intuitive UI - Accessibility (visual impairment, any age, etc.) - Can handle at least 10 million requests per day - Server side capable of decentralization and containerization	- No cost for users - Small cost for organization that sets the system up ($4 variable cost per million requests, and maximum $100 fixed cost for storage) - Decrease errors made during recycling by at least 40% - Open source under permissive license (such as MIT or BSD)

Listed design criteria impose certain contains on the design. Most of them are listen in the following table. It is important to note that more constrains can be added after developing conceptual prototype

Type	Constrain
Functional	- Decrease errors made during recycling by at least 40% - Handle at least 10 million request per day
Financial	- Free for users - For organizations $4 variable cost per million requests, and maximum $100 fixed cost for storage -

Technical Benchmarking

With some research, additional products (apps) with similar features were found that can help in the collection process of recycling: Intellibins, BC Recyclepedia, and iRecycle. The following tables include the new apps as well as those from the previous deliverable (Recycle Nation, Recyclinator, Recycle Mate). Furthermore, they were all compared to each other in order to identify the best solution, which will influence this project. From all of these options, it is obvious that there is not only one best solution to follow. The best solution is that with the most points, but in this case, there are 3 apps that scored the same number of points (61 points): Intellibins, BC Recyclepedia, and iRecycle.

Specifications	**Recycle Nation** [4]	**Recyclinator [5]**	**Recycle Mate [6]**	**Intellibins** [2]	**BC Recyclepedia** [3]	**iRecycle** [1]
Assists with recycling	Yes	Yes	Yes	Yes	Yes	Yes
Cost	Free to the **public**	Free	Free	Free	Free	Free
Scalable (platform, region, etc.) *	- Website, Android, and iOS - U.S.	- Web application - N/A	- Android and iOS - Currently available in New South Whales only	- Android and iOS - The five boroughs of New York City	- Android and iOS - British Colombia	- Android and iOS - U.S.
View of recycling locations (i.e., map etc.)	Yes	No	No	Yes	Yes	Yes

UI/UX	API tools (buttons and search engine, no use of camera)	It is supposed to use camera for identification, but it does not work	Use of camera for identification	Selection from drop-down menu (no use of camera)	Selection from drop-down menu (no use of camera)	Buttons and drop-down menu (no use of camera)

Specifications	**Importance**	**Recycle Nation** [4]	**Recyclinator** [5]	**Recycle Mate [6]**	**Intellibins** [2]	**BC Recyclepedia** [3]	**iRecycle** [1]
Assists with recycling	5	3	3	3	3	3	3
Cost	5	2	3	3	3	3	3
Scalable (platform) *	4	3	1	3	3	3	3
View of recycling locations (i.e., map etc.)	3	3	1	1	3	3	3
UI/UX	5	2	1	3	2	2	2
Total		56	42	60	**61**	**61**	**61**

*Region is not included in rating because it does not represent the scalability of this project (region = Canada)

Conclusion

In this deliverable, our group translate customers' general needs into detailed design criteria and target specification for this project. Essentially, the project will be designed to be a mobile application that is low-cost, user-friendly and easy-accessible. This app will be able to guide users through garbage recycling process accurately and efficiently. We even include functional and non-functional design criteria in this deliverable. This allows us to analyze the entire task with specific design requests. From benchmarking, we compared multiple garbage recycling applications in the market with their own features and functionality. This demonstrates us a clear view of what market competitors are doing, and showed Intellibins, BC Recyclepedia, and iRecycle were clear winners within the AR app category.

References

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

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