Lab 1 – Refill.Me Product Description

Abdullah Pathan

Old Dominion University

CS411

Professor Sarah Hosni

12/12/2022

Draft 1

Table of Contents

1. Introduction……....3
2. Product Description……4
3. Identification of Case Study……...5
4. Refill.Me Prototype Description……6
5. Glossary……10
6. References……12

List of Figures

1. Refill.Me MFCD (Major Functional Component Diagram)……..4
2. Prototype Major Functional Component Design of Refill.Me application……7
3. Prototype features for Shoppers Pt. 1……8
4. Prototype features for Shoppers Pt. 2……8
5. Prototype features for Store owners……9

1. Introduction

Environmental pollution is one of the major concerns we face, throughout the decades there has been an increase in the amount of use of plastics, paper, and glass materials. Because of a burgeoning concern for the danger to the environment that is posed by these materials, a focus on recyclable and bio-degradable materials has increased as well. It has been stated that by 2023 the total packaging business can reach $1 trillion; companies are taking responsibility for the processing of packaging and interest has increased for more environmentally friendly packaging. (Abejón et al., 2020) In order to be more environmentally friendly, we have come up with other alternative solutions such as recycling.

The consensus is that if we can re-use the same packaging materials, we can assist in the effort of becoming more environmentally friendly. Unfortunately based on statistics and data, the answer is not so simple. According to Electronic Recycling & IT Asset Disposition (ITAD) Services(ERI) , various recyclable goods can only be recycled so much before they are downcycled (recycled into a lesser value than original material). Metal and glass materials are different in that they can be recycled numerous times without risk of degradation, but plastic and paper have limited number of times that they can be recycled.

Plastics, even though recyclable, can be an unfriendly alternative choice of packaging. Because of various plastic packaging being equipped with many polymers, additives, adhesives, and coatings, it may be detrimental to the environment because of how toxic these materials are when broken down. (Hoover, A., 2022) A problem we are facing is how grocery markets are utilizing the same packaging materials in the goods they are selling.

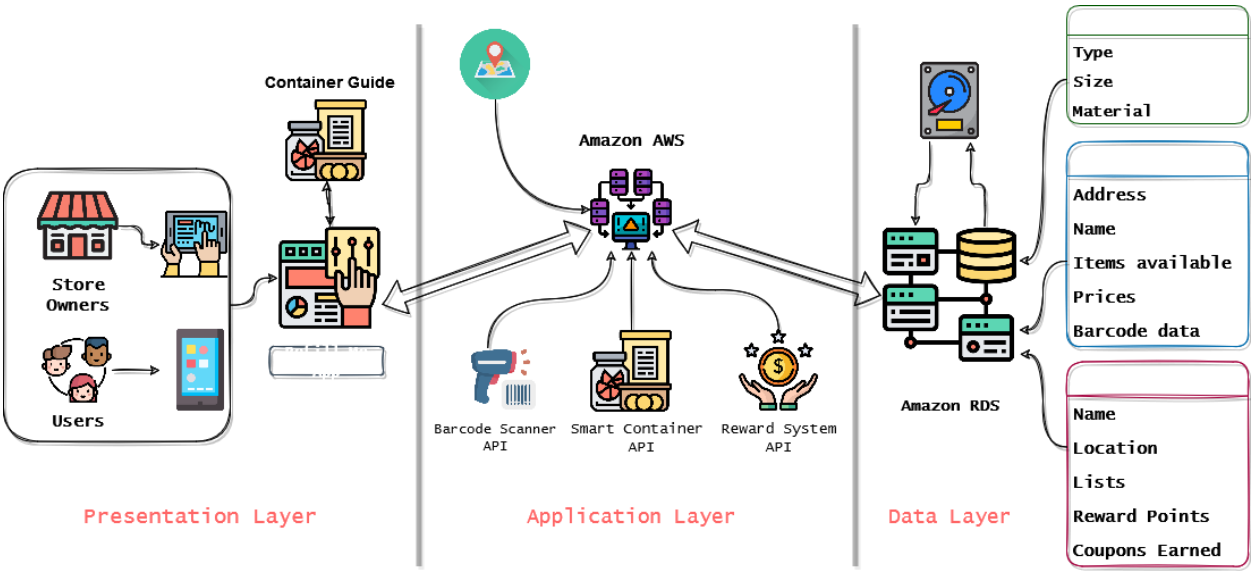
In order to store product and to be as environmentally friendly as possible the same materials are used to store the goods. Considering the amount and type of packaging being used, a more sustainable way of doing things is needed for the future. An ideal solution would be to ultimately re-use the materials we already own. If we are able to limit the usage of packaging, then a lot less harm will come to the environment.

2. Product Description

For the problem, we are introducing a solution called ReFill.Me. Refill.Me is an application that serves as an information-hub that allows users to find package-free shopping stores, guides them in usage of containers, and promotes the usage of package-free shopping. It will be a convenient solution that carries plenty of information, ease in product/store searching, guiding in container recommendation and even a reward system to boost motivation in this style of shopping. Key features include the Container Guide, Reward.Me system, Store search, product search, shopping-list creation, crowdsourcing and the ability to connect shoppers to advocacy and petition sites for package-free shopping.

The application will use the popular React Native and Expo framework to consolidate the solution to a singular codebase, whilst allowing the distribution to several platforms such as Android, iOS and web application. Because of the nature of a singular codebase, features, the user interface and all functionalities will correspond to each available platform (with minor tweaking for device specific capabilities). In order to house user, product, store and container data, a MySQL database will be utilized alongside Amazon Relational Database Service (RDS). The solution is broken down into three layers: the Presentation Layer, the Application Layer, and the Data Layer. As stated before, React Native/Expo will be responsible for the UI/UX presentation layer. The Data Layer will be comprised of MySQL

and AWS RDS, with routing from Express. And the Application Layer will utilize several Application Programming Interfaces (API) to enable key functionalities such as the Amazon Maps API, Amazon Data Kinesis, Scrapy, Tesseract 4, Barcode Detection API and Optical Character Recognition.



3. Identification of Case Study

This product is designed for shoppers who would like to reduce their packaging waste, transportation emissions and consume with consciousness. Based on a study, in the USA 87% of Generation Boomers, 79% Generation X, 83% Generation Millennials, and 85% of Generation Z are all concerning with package waste. Refill.Me is geared to these target groups, specifically to the women in these groups. The ideal target are users between the ages of 18 to 65, who reside on the east and west coast, come from diverse income levels, are educated and/or are passionate when it comes to environmental change.

4. Prototype Description

Refill.Me is a mobile application that serves as an information hub and gives users features which would help to guide them in doing package-free shopping. The prototype of Refill.Me will display the core functionalities, along with additional functionalities that enrich the user experience.

4.1 Prototype Architecture

Figure 1 below demonstrates the MFCD of Refill.Me and the three layers: presentation layer, application layer, and data layer. The front-end will be built using the React Native and Expo framework. Since the Refill.Me solution will require deployment to different platforms of Android, iOS and web browsers, React Native and Expo will be used to satisfy this requirement. Furthermore, the application will be in a singular codebase, making development more efficient and reducing build errors. React Native is a modern web framework that also provides access to node package libraries and third-party API's such as Amazon Maps and BootStrap. The back-end layer will use a virtual machine provided by ODU and will be containerized using Docker. Docker provides containers as services/technologies that can be spun up for use. MySQL will be used for storing Refill.Me data in multiple datatables such as Store Data, Product Data, User Data and Container Data.

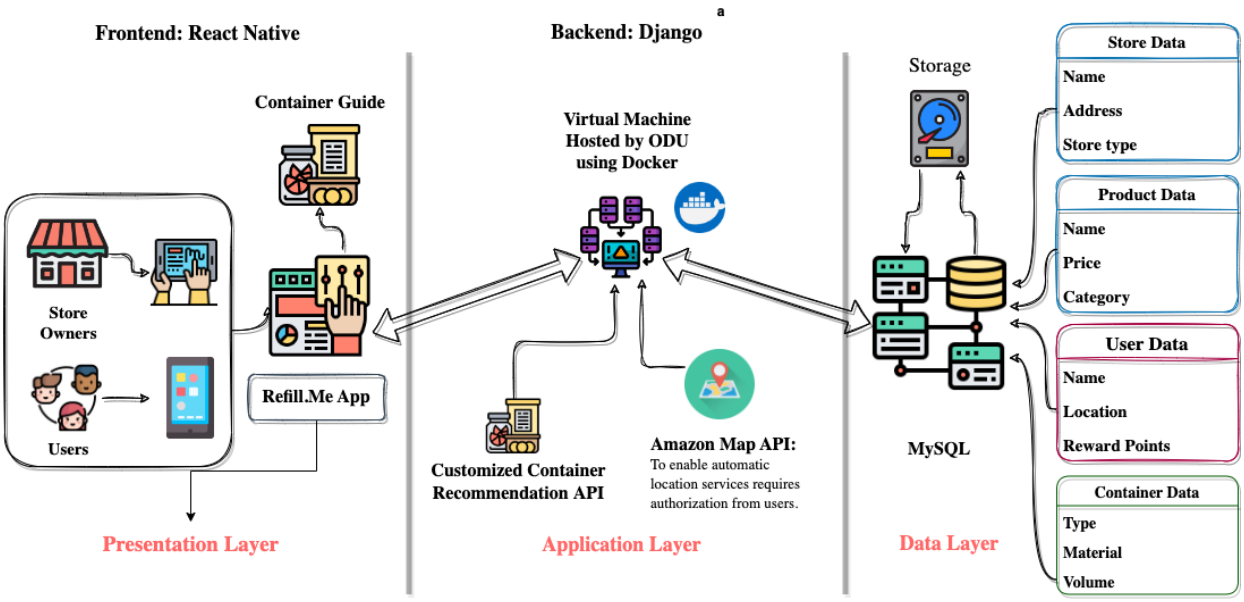
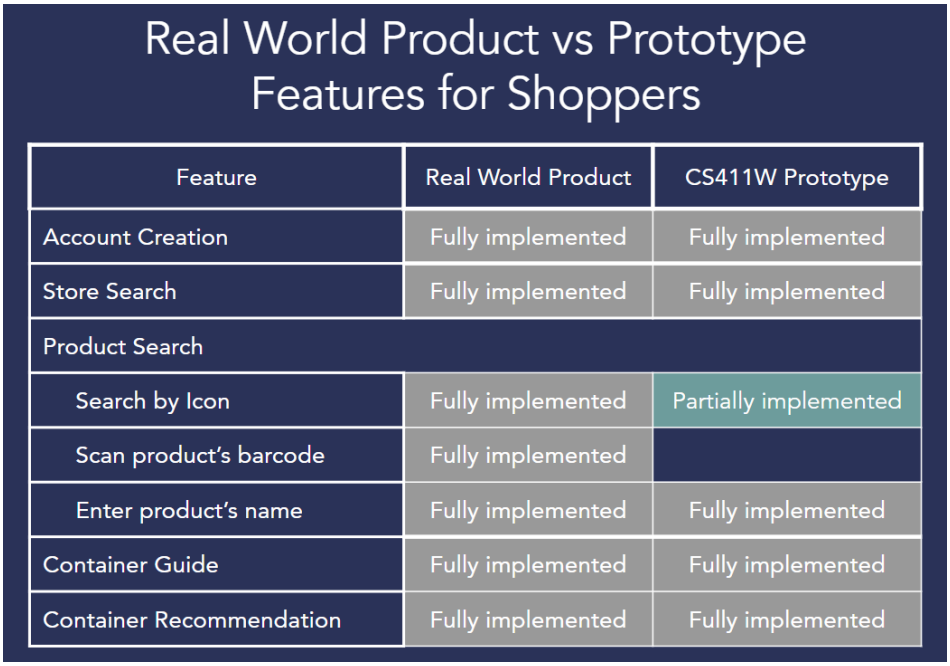


Figure 1. Major Functional Component Design of Refill.Me application

4.2 Prototype Features and Capabilities

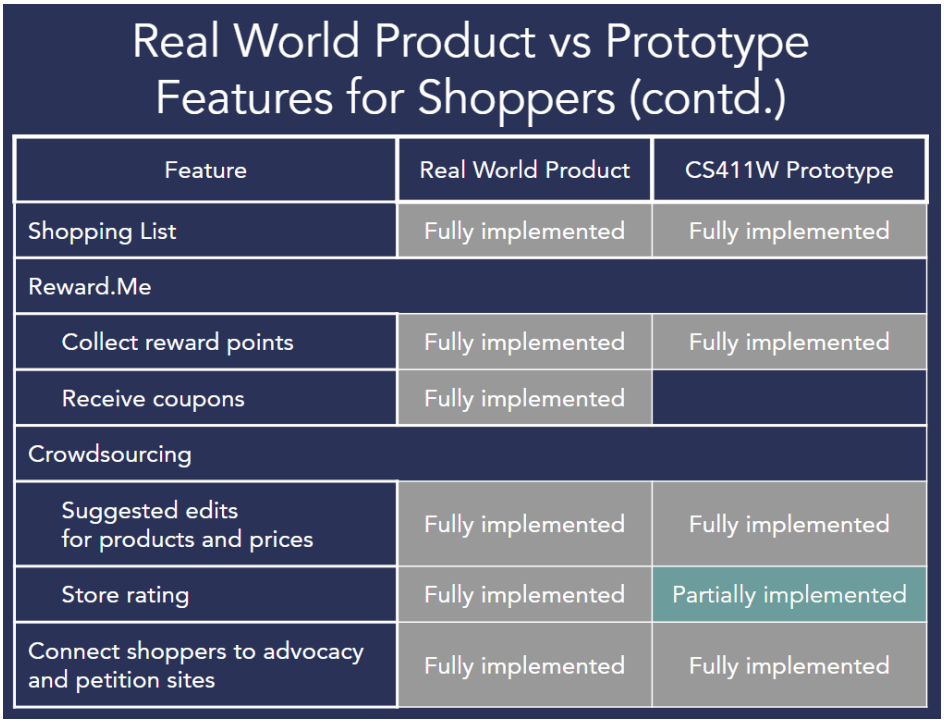
The features and capabilities of the Refill.Me solution are targeted towards shoppers and store owners. The following features that the prototype will fully implement for shoppers will be the ability of account creation, store searching, product search by name, the Container Guide, Container Recommendations, the ability to have shopping list within the application, ability to collect points towards the Reward.Me system. Partial implementation of product search by icon will also be available to shopper users. The following tables list the specific features for each user type.



Real World Product vs Prototype Features for Shoppers

Feature	Real World Product	CS411W Prototype
Account Creation	Fully implemented	Fully implemented
Store Search	Fully implemented	Fully implemented
Product Search		
Search by Icon	Fully implemented	Partially implemented
Scan product's barcode	Fully implemented	
Enter product's name	Fully implemented	Fully implemented
Container Guide	Fully implemented	Fully implemented
Container Recommendation	Fully implemented	Fully implemented

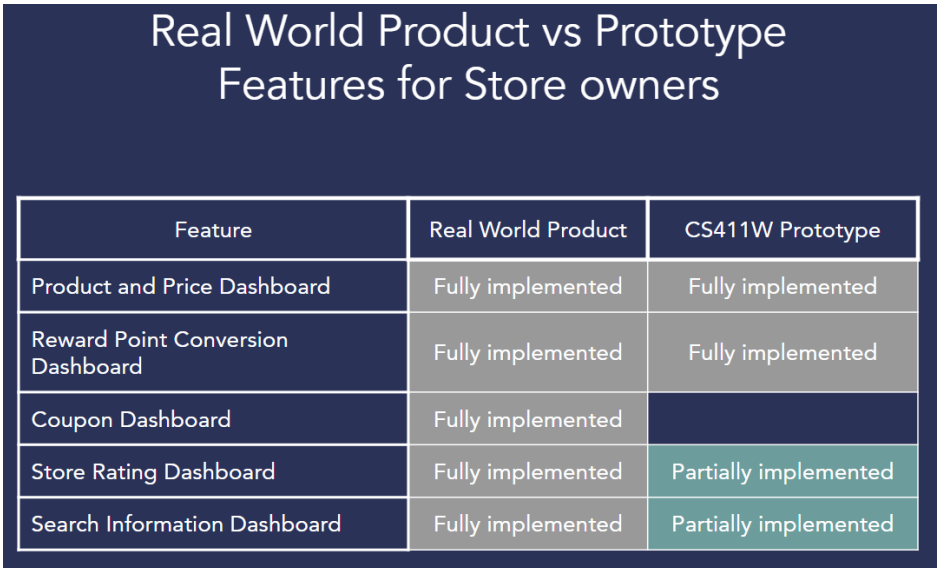
Table 1. Prototype features for Shoppers Pt. 1



Real World Product vs Prototype Features for Shoppers (contd.)

Feature	Real World Product	CS411W Prototype
Shopping List	Fully implemented	Fully implemented
Reward.Me		
Collect reward points	Fully implemented	Fully implemented
Receive coupons	Fully implemented	
Crowdsourcing		
Suggested edits for products and prices	Fully implemented	Fully implemented
Store rating	Fully implemented	Partially implemented
Connect shoppers to advocacy and petition sites	Fully implemented	Fully implemented

Table 2. Prototype features for Shoppers Pt 2



Feature	Real World Product	CS411W Prototype
Product and Price Dashboard	Fully implemented	Fully implemented
Reward Point Conversion Dashboard	Fully implemented	Fully implemented
Coupon Dashboard	Fully implemented	
Store Rating Dashboard	Fully implemented	Partially implemented
Search Information Dashboard	Fully implemented	Partially implemented

Table 3. Prototype features for Store owners

4.3 Prototype Development Challenges

Some challenges that may arise during development of the prototype include: the setup of the initial framework, the connecting of the three tiers (front-end, back-end, database), and the implementation of third-party API's for our diverse feature-set. When it comes to the first sprints of development, learning any software platforms such as Docker will require the team to learn quickly and to adapt the technology for each layer of Refill.Me. There are risks when it comes to implementing third-party libraries such as Amazon Maps, Bootstrap, Expo, and the barcode-scanning API. This is because we will be reliant on the library's feature set and documentation for successful implementation. With third-party libraries, the team will need to understand how to build off of them in order to benefit the design of Refill.Me. We have a good number of features planned for the Refill.Me prototype, but a huge development challenge for the team will be implementing the features in an efficient and timely fashion.

5. Glossary

Biodegrade: to decompose and become incorporated back into the environment

Bulk section: an aisle where products are available in dispensers or bins, and the shoppers can buy the exact amount they desire

BYOC (Bring Your Own Container): an initiative to encourage shoppers to bring their own containers with them to the store in order to avoid creating packaging waste

Compostable: breaks down into organic matter and does not produce any chemicals during that process

Container: tote bags, produce bags, glass or plastic jars, glass or plastic boxes, glass or plastic bottles that can be used for package-free shopping

Container Guide: a small lexicon providing an overview of different types of containers and the types of products that could be stored in them

Container Recommendation Feature: a feature of Refill.Me that suggests specific containers for products based on the type of product such as liquid or solid.

Experienced package-free shopper: a shopper who has experience, and thus, knowledge of package-free shopping

Farmers' market: a market where local farmers sell their products directly to consumers.

Greenhouse gas emissions: gasses that trap heat in the earth's atmosphere such as carbon dioxide and methane, and thus directly contributing to climate change, predominantly emitted through human activities

Loose product: product sold without any packaging

Mainstream grocery shopping: grocery shopping that does not follow sustainable practices, thus, it entails buying packaged items, using plastic, not considering environmental aspects

Microplastics: tiny plastic particles that are less than five millimeters long and are created when larger plastic pieces breaks down

Novice package-free shopper: a shopper who has no experience, and thus, no knowledge of package-free shopping

Package-free: without any packaging materials such as plastic, paper, cardboard, aluminum, or glass

Package-free store (in the context of our application): supermarkets with a bulk section, stores exclusively selling loose products, and vendors at farmers' markets.

Package-free shopper: a shopper who prefers to buy loose products by filling them into their own containers

Package-free shopping: shopping using one's own containers, thus, shopping without creating packaging waste

Packaging: material used to protect a product from any damage during transportation

Produce bag: a reusable bag usually with a window and tare weight label that is used for buying fruits / vegetables

Single-use: designed to be used only once, and then to be discarded

Tare weight: the weight of an empty container that should not be included when the price of the product is calculated

Tote bag: a large bag, often made of cotton, used to carry many items

6. References

Carvalho, J. S, et al. (2022). Consumers' knowledge, practices, and perceptions about conventional and sustainable food packaging, Food Science and Technology, https://www.scielo.br/j/cta/a/RcjxMbZXFTTtgfjrpCvjvtB/?format=pdf&lang=en

Denis, K. (2021, August 7). The Future Is Bright for American Recycling, Consumer Brands Association, https://consumerbrandsassociation.org/blog/the-future-is-bright-for-american-recycling/

EPA. (2022, March 8). Containers and packaging: Product-Specific Data, United States Environmental Protection Agency, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/containers-and-packaging-product-specific#:~:text=Containers%20and%20packaging%20make%20up,beverages%2C%20medications%20and%20cosmetic%20products

EPA. (2022, July 31). National Overview: Facts and Figures on Materials, Wastes and Recycling, United States Environmental Protection Agency, https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#NationalPicture

Groh, K. J. et al. (2019, February 15). Overview of known plastic packaging-associated chemicals and their hazards, Science of The Total Environment, Volume 651, Part 2, https://www.sciencedirect.com/science/article/pii/S0048969718338828

Hoover, A. (2022, June 10). These influencers live trash-free in a garbage world, Morning Brew, https://www.morningbrew.com/daily/stories/2022/06/10/influencers-live-trash-free-in-a-garbage-world

Kim, L. Incentives, Demographics, and Biases of Ethical Consumption: Observation of

Modern Ethical Consumers, University of California, https://www.econ.berkeley.edu/sites/default/files/Kim_Laura_F18%20Honors%20Thesis.pdf

Shen, M. et al. (2020, May 1). (Micro)plastic crisis: Un-ignorable contribution to global greenhouse gas emissions and climate change, Journal of Cleaner Production, 254, https://www.sciencedirect.com/science/article/abs/pii/S0959652620301852?casa_token=U8PV0S4NpoAAAAAA:7XiABOjdLWumEZeQDV6XHsiGVwlopPMLtaBUIrG-IUehwszg7wlX-Lm0VIcgrQ-4aBVxHwTHa4w

Sinai, M. (2017, June 27). How Many Times Can Recyclables Be Recycled?, Recycle Nation,https://recyclenation.com/2017/06/how-many-times-can-recyclables-be-recycled/

The Environmental Impact of Food Packaging. (2018, October 08). FoodPrint, https://foodprint.org/issues/the-environmental-impact-of-food-packaging/

VanRemoortel, A. (2018, May). Cultural Capital Among Zero Waste Consumers, Wheaton College, https://digitalrepository.wheatoncollege.edu/bitstream/handle/11040/24562/Anna_VanRemoortel_HonorsThesis.pdf?sequence=2&isAllowed=y

Zero Waste Packaging Market Size, Share, Report 2022-2030. Precedence Research, https://www.precedenceresearch.com/zero-waste-packaging-markethttps://www.precedenceresearch.com/zero-waste-packaging-market