Lab 1 – Product Description

Refill.Me - Team Iron

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1. Introduction

Most goods, food, drinks, and other goods today are stored in some type of packaging. Most of the packaging used for the products consumers buy is made up of either glass, plastic, paper, or aluminum (Carvalho, 2022). Some of these materials are recycled but a lot of them are not. Containers and packaging make up a very large portion of solid waste, container and packaging combined for added up to 82.2 million tons of waste generation in 2018 (Containers and packaging, 2022). The production and waste of this amount of materials is a major factor in global warming. This is because nonrenewable resources are used to make these materials. For example fossil fuels are used to make plastic and aluminum, and coal is still widely used at most factories. Some of the material used in most packaging, like plastic and glass, cannot be recycled back into the environment because they do not biodegrade. Materials like this are put back into the environment and pollute it.

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Figure 1

Recycling Rates in 2013
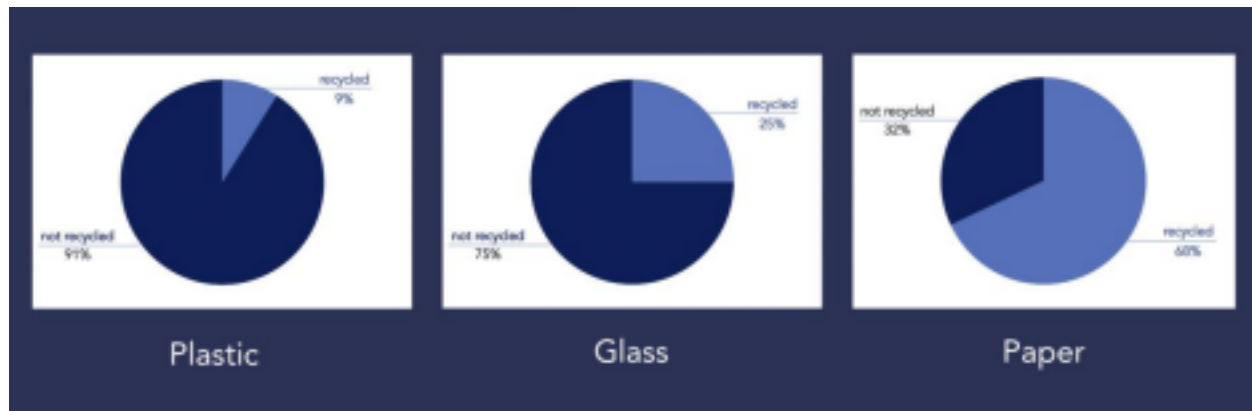
In the past we have looked at recycling as a widespread solution to packaging waste, however if we look at the percentages of this waste that is recycled, we can see this is not a solution to packaging waste. As shown in Figure 1, glass or paper is recycled. Packaging waste is a major problem that will have lasting effect on the environment if not addressed. Refill.Me is our solution to this problem to significantly reduce packaging waste by supporting package free shopping.

2.1. Key Product Features and Capabilities

Refill.ME is a mobile application made for shoppers who want to participate in package free shopping. The application will have a version that is optimized for shoppers as well as a version that is optimized for tablets for the store owners. The goal of Refill.ME is to connect package free shoppers with package free stores, and reduce packaging waste. This will help people who are interested in package free shopping but do not have information on which stores around them offer package free options as wells as what products the individual store offer package free. Refill.ME will help both novice package-free shoppers get into

package-free shopping, as well as help experienced package free soppers maintain their

shopping habits. This application will support local businesses by giving them a new way to

connect with their package free sopper base. Refill.ME will provide practical information

regarding package-free shopping. This application will also collect data to help store owners

optimize their offerings for package-free shoppers. The application will keep users engaged by

having a reward feature called Reward.Me that will enable shoppers to collect points for

package-free purchases and use these collected points to redeem certain benefits, which will

depend on the store.

2.2 Major Components (Hardware/Software)

The key features offered by the application to the customer will be a container guide,

container recommendation, shopping List and Reward.Me. It will give customers the ability to

search by icon, scan barcodes or enter the product name. The feature Refill.Me will offer store

owners include, product and price dashboard, reward point conversion, coupon dashboard, store

rating, store analytics, store search, and product search. The store owner will also have the option

to search by icon, scan barcodes or enter the product name.

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Figure 2

ReFill.Me Major Functional Component Diagram

Presentation Layer   **Application Layer**   **Data Layer**
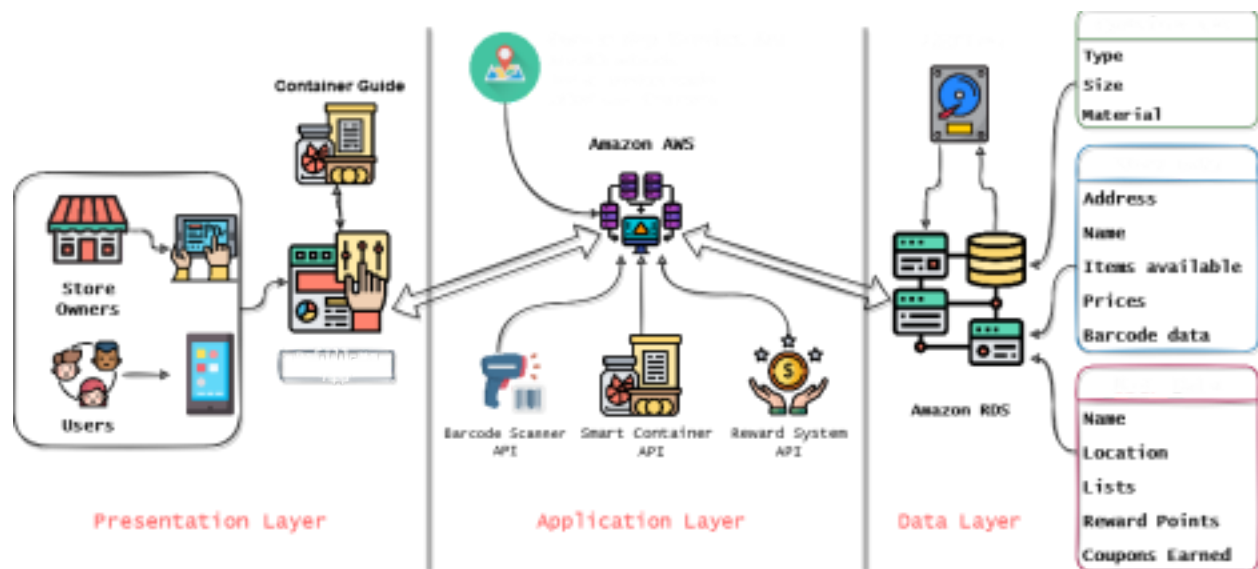
ReFill.ME will have a three-tier architecture as shown in Figure 2. Firstly, hardware which for shoppers will be mobile phones and for store owners a tablet. The application layer will have a web server, and we will integrate various API's which will link with the database. The data layer will have relational tabs for storing product, store and user information as well as relational tabs for data analytics.

3. Identification of Case Study

Refill.MEs' main customer base will be eco-conscious shoppers who would like to buy package free goods. These shoppers will range from Gen Z to baby boomers, who are highly educated and from diverse income levels. The customers will be from mostly from the east and west coast of the United States, where most package-free stores and shoppers are found. One of our target groups of users will be wealthy middle age parents that often shop a lot for their families, but would like to shop package free. The stores Refill.Me will target are supermarkets

with bulk sections, package-free stores and farmers markets. Shoppers will use Refill.Me to

search for product, store and container information. Shoppers will also use Refill.ME to create

shopping lists as well as collections as redeeming rewards from Reward.ME. Store owners will

use Refill.ME to display package free products and their prices to customers, increase their

digital presence and get the search information from customers in their area. In the future we

hope grocery shopping apps as well as trucks that sell package-free products on the go can use

Refill.ME.

## 4. Refill.ME Prototype Description

The Refill.ME prototype will show a proof of concept for our final product. The prototype will

be have the ability to provide all the functionality the real world product will provide. This

functionality includes the ability for shoppers to find package free stores or stores with package

free options near them, search for package free products and get container guide

recommendations. The prototype may not have some features of the real world product

available but it will have all functionality needed to show the proof of concept for Refill.ME.

4.1 Prototype Architecture (Hardware/Software)

The Prototype Architecture for Refill.ME will have a three-tier architecture as shown in

Figure 3. There will be a presentation layer, application layer and a data layer. The front end

presentation later will include the Refill.ME App that users and store owners will interact with as

well as the container guide included in the application.

Figure 3

ReFill.Me Prototype Major Functional Component Diagram
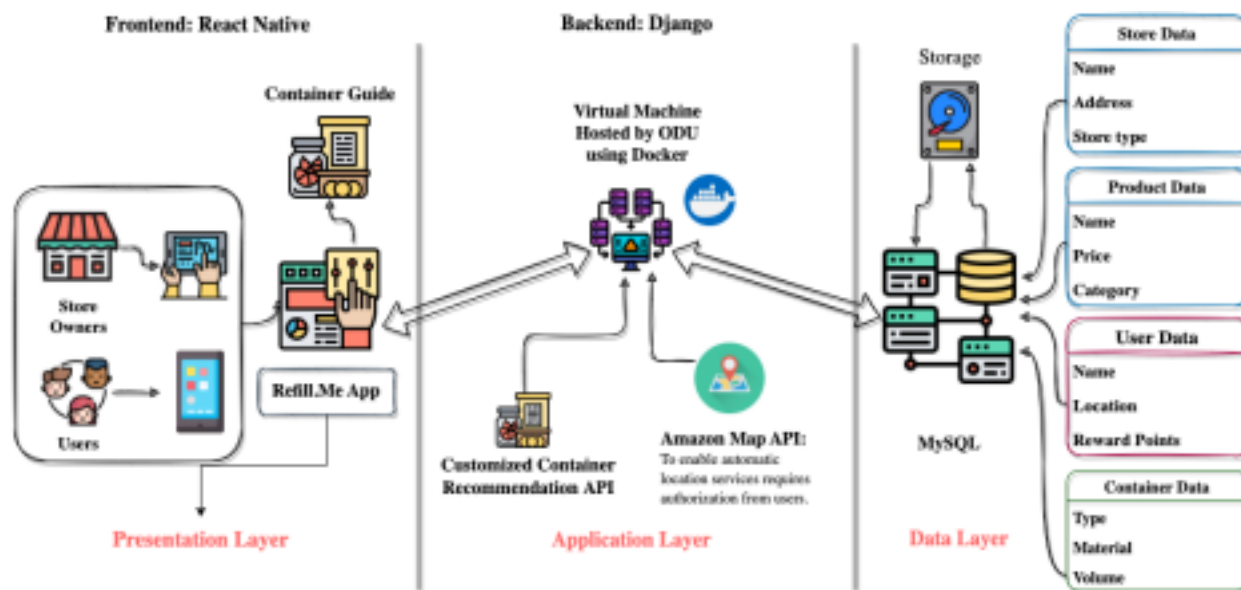
In the application layer we will be using a virtual machine hosted by ODU using Docker

containers, and the Django framework will be used for the application layer. This will let us

build a customized container recommendation API and an Amazon Map API to enable automatic

location services. Lastly we have a Data Layer that will be using the MySQL database. We will

keep store date, product data, user data and container data here.

4.2 Prototype Features and Capabilities

The prototype for ReFill.ME will include several features and capabilities that will let the user

do package free shopping. The application will let users search for information about containers,

and give them access to a container guide. Users will be able to search for package free products

by icon, or name. We will also implement a shopping list, reward points for users, suggested

edits for products, and the option to connect shoppers to advocacy and petition sites. We will not

be implementing coupons and search by barcode in the prototype. Search by icon, store rating,

and the search information dashboard will be partially implemented.

4.3 Prototype Development Challenges

There are some challenges when it comes to the prototype development of ReFill.ME. The first challenge it the prototype will be developed by a group, of 7 over a three month period of one semester. This will be a challenge when it comes to time, as it will be a short period of time that we have to develop the application. To mitigate this challenge we have chosen programming languages known by most if not all of the group.

The second challenge with the product development of ReFill.ME is having cohesion between each layer of the application. Different members of the group are dedicated to developing each layer and some members may not be as familiar with what is used in the development of other layers. We are mitigating this challenge by documenting learning and resources for everything used in the development process and making these resources available to all members.

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4. Glossary

Amazon Relational Database Services (Amazon RDS): a web service to set up, maintain, and scale a relational database in the cloud.

Android: an open-source mobile phone operating system used on mobile devices such as smartphones and tablets.

Application Programming Interface (API): a set of rules for two different programs to communicate with each other.

Amazon Web Services (AWS): a cloud computing platform.

Amazon Maps API: a programming interface that allows developers to add mapping capabilities like interactive maps and custom overlays to android applications.

Application Layer: a layer where an application can effectively communicate with other applications on different computer systems and networks.

Backend: a computer system or application that is not directly accessed by the users but rather responsible for storing and manipulating data.

Bauxite: a naturally occurring mineral.

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.

Bring Your Own Container (BYOC): an initiative to encourage shoppers to bring their own containers with them to the store in order to avoid creating packaging waste. **Cascading Style Sheets (CSS):** a stylesheet language used to create the design (fonts, colors, borders, etc.) of

webpages.

Compostable: breaking down into organic matter and not producing any harmful chemicals during that process.

Container: tote bag, produce bag, glass or plastic jar, glass or plastic box, glass or plastic bottle 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.

Continuous Integration and Delivery (CI/CD): a method for automatically merging contributions and deploying new stable software to a production environment. **Customized Container Recommendation Feature:** a feature of Refill.Me that suggests all needed containers for a particular shopping list based on the items added to the list by the shopper.

Crowdsourcing: a way to solicit user feedback using surveys (either paper based or online).

Database: an organized collection of structured information, typically stored electronically in a computer system.

Data Layer: a layer of the application/website which contains all of the data that is generated by users engaging with the application/website.

Django: a high-level Python web framework that enables rapid development of secure and maintainable websites.

Docker: a platform designed to help developers build, share, and run development processes. **EPA:** United States Environmental Protection Agency.

Experienced package-free shopper: a shopper who has knowledge of package-free shopping.

Expo: an open source framework for creating mobile apps.

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

Frontend: a computer system of the website/application which is exposed to users for direct interaction.

GitHub: a hosting service for version control and development of software. **GitHub Issues:** a GitHub repository feature that tracks issues, team-members' work, and development process of an application.

Google Maps: a web mapping platform and application that provides street maps, satellite imagery, and real-time traffic information.

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

Hyper Text Markup Language (HTML): a programming language used to create websites.

Integrated Development Environment (IDE): an advanced code editor with syntax highlighting, built-in debugger, and compiler.

iOS: a closed source mobile operating system used in iPhones and iPads from Apple Inc.

Javascript: a high-level client-side scripting language to implement functionality on websites.

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, and not considering environmental aspects.

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

MySQL: a relational database that uses SQL as its database language.

Node Package Manager (npm): a software-sharing repository for software and packages that are used for software development, especially software written in Javascript. **Novice package-free shopper:** a shopper who has no experience with, and thus, no knowledge of package-free shopping.

Optical Character Recognition (OCR): a software that recognizes and converts text from images to machine-readable format.

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

Package-free store (in the context of Refill.Me): a supermarket with a bulk section, a store exclusively selling loose products, and a vendor 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.

Package Manager: a set of software tools that automates the installation, updating, configuration, and deletion of programs in a systematic way.

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

Presentation Layer: a layer where functions like data conversion, data encryption and decryption as well as data translation take place.

Produce bag: a reusable bag, usually with a window and tare weight label, that is used for

buying fruits/vegetables.

Python: a high-level programming language that supports multiple programming paradigms, including structured, and functional programming.

React Native: a framework that allows for the building of native mobile apps using the programming language React.

Relational Database: a type of database that stores and provides access to data points that are related to one another.

Rest Framework(s): an application programming interface that conforms to the constraints of REST architecture.

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

Structured Query Language (SQL): a widely used database language used for inserting, querying, and retrieving data from relational databases.

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.

Virtual Machine (VM): a digital version of a physical computer.

Visual Studio Code (VS Code): a source-code editor that can be used with a variety of programming languages.

Webpack: a software tool that bundles Javascript files to be used in a web browser.

Web Server: computer software and hardware that stores content for a website such as images, videos, and other data, and it operates on HTTP and other protocols to deliver the files for a website to clients who request it.

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