



FoodiePal: Ingredient Manager & Recipe Generator Final Report

Submitted to
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SOEN357

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1. Abstract

Our project aims to solve the research question “How can an app help users minimize food waste?” by developing a mobile app with three core features, a shopping list, a recipe generator, and an expiry date tracker, designed to help individuals in managing their pantries efficiently while reducing food waste by tracking available ingredients at home to reduce the unnecessary purchase of ingredients and suggesting meal recipes that utilize them in a timely manner. The app development process involved the use of Figma and Canva for the UI/UX development, programming in Javascript and CSS leveraging the React Native framework for the front end technologies, as well as PocketBase, and the open source MealDB API (for meal recipes) for the back end. For the app’s evaluation, we surveyed 21 participants and 90% of them found the app to be visually appealing while 95% found the app easy to navigate. Overall, over 90% of the respondents believed the app would reduce their production of food waste. These strong statistics show a significant potential in meeting that goal.

2. Introduction

As mentioned previously, our research question is “How can an app help users minimize food waste?” and from our research, we derive from the article “Commentary: Why Do We Waste So Much Food? A Research Agenda” that the main reasons and causes of food waste are the consumers’ purchasing and disposal habits [1]. Therefore, we hypothesize that “Implementing a shopping list feature and meal recipe recommendations that consider available food at home and their expiry date help users minimize food waste by 15% after 3 months of app use”, which is our project goal that we think is reasonable and achievable. These two features discussed help manage and better food waste habits by reducing the unnecessary purchase of ingredients and instead using the available ingredients in a timely manner. As for the metrics given, we assume that food waste reduction by 15% can be reasonably achieved over the course of 3 months of app use. The motivation behind our project involves countering the global and personal effects of food waste. Minimizing food waste helps households reduce their finances by decreasing the need to purchase unnecessary ingredients which are already available at home. Moreover, minimizing food waste betters the environment by reducing greenhouse gas emissions that contribute to climate change. According to the paper “Reducing Food Waste for the Climate, Nature, and People”, wasted food is responsible for approximately 8 percent of global greenhouse gas emissions [2]. Therefore, food waste can pose a significant problem and solving it can be extremely beneficial to both individuals and the environment.

3. Related Works

We wanted to get more insight into our main problem, food waste. Our research was divided into three categories: Analyzing statistics to understand the problem's severity, studying literature to pinpoint causes and solutions and analyzing existing products for inspiration.

Almost half of Canadian food waste is produced at the household level at 47% with 63% being avoidable through shopping and food usage habits [3]. The average household in Canada produces 79 kilograms of food waste annually according to the UN Food Waste Index, contributing to 9.8 million tonnes of CO₂ [3]. Globally, 1.3 billion tonnes of edible food is wasted yearly with North America and Europe leading with 95 and 115 kilograms of waste compared to sub-Saharan Africa, and South Asia which only 6-11 kilograms per year . [3].

According to *Food Waste Management, Solving the Wicked Problem*, food waste in developed countries mainly occurs in food distributions and households, including more than 40% [4]. The total estimate of food losses and waste is about one-third of food produced per year [4]. In developing countries, waste mostly happens in the post-harvest and processing stages [4]. Therefore, food waste is a problem concerning developed countries, meaning that an app-solution is a good medium. Finally, the authors discuss three consumer types: economical, environmental and ethical consumers and what they are driven by [4]. Additionally, *Food Waste at Consumer Level, A Comprehensive Literature Review* divides waste into two categories: household waste and away-from-home waste [5]. Household waste exists because of lack of awareness, improper food storage, misinterpreting date labels and cooking or serving too much food [5]. These factors will be addressed in our app which will serve to reduce food waste like with the help of an expiry date tracker.

To wrap up background research, we can analyze existing apps: SuperCook – Recipe Generator. This app aims to reduce waste by generating recipes with what the user already has at home and keeping track of one's food inventory. However, there is no shopping list or expiry date tracker. Similarly myfridgefood.com provides recipes but requires manual inventory input and it also has a cluttered and outdated interface.

4. Methods

4.1 Features

Shopping List: A streamlined shopping assistant that lets users easily add items, organizes the list by category, and suggests replenishment based on inventory levels.

Recipe Generator/Recommender: Provides recipe suggestions based on available ingredients, making meal planning effortless and reducing food waste by utilizing items on hand.

Expiry Date Tracking: Tracks expiration dates for ingredients, sends timely reminders, and highlights soon-to-expire items to help users reduce food waste and keep ingredients fresh.

Smart Search Functionality: A feature that allows users to search for recipes or ingredients easily.

4.2 Data Collection

We used **Google Forms** which provides an easy way to distribute surveys and collect responses, which were exported to **MS Excel** for analysis by using features such as pivot tables, charts, and formulas which made it easy to identify trends and summarize data.

4.3 Project Management

Trello is a visual project management tool that organizes tasks into boards, lists, and cards. It allows teams to collaborate efficiently, keeping the project workflow structured.

GitHub is a version control platform that hosts code repositories, enabling teams to work on code collaboratively while maintaining code quality throughout the development process.

4.4 UI / UX Development

Figma and **Canva** were used to develop the UI/UX of an app efficiently. To understand our target audience and how they will interact with our app, the design process involved creating user personas, storyboards, user journeys, and a user flow diagram (see Appendices A - D). App interactions include adding or deleting ingredient items in the pantry and shopping list sections to allow inventory management, as well as browsing for meal recipes. Sketches, wireframes, and multiple iterations of the mockup design were created to visualize and enhance the app's design and functions (see Appendices E - G). The first iteration had a cluttered look that was remedied by the second iteration's smoother grey and white colors. The second iteration also ensured functional consistency by giving clickable areas/buttons an orange color as opposed to the surrounding grey/white, promoting learnability and usability. The third iteration further enhances the overall look by giving it a simpler and cleaner layout, giving a more modern feel.

4.5 Front-End Technologies

JavaScript: JavaScript was used to create engaging user interfaces with animations, form validations, and responsive interactions.

Cascading Style Sheets (CSS) is used to style the layout, colors, fonts, and overall look of an application.

React Native: allows developers to use a single codebase, leveraging React components to create highly performant and visually appealing mobile apps.

4.6 Back-End Technologies

PocketBase serves as a self-hosted real-time database with built-in authentication and file storage. It's useful for smaller applications, offering a user-friendly interface and RESTful APIs.

SQLite is a compact, self-contained relational database management system. Its serverless architecture eliminates the need for a separate database server, making it easy to deploy and maintain.

TheMealDB API [6] is a free and open-source API that provides a database of meal recipes, ingredients, and categories. It's an excellent resource for recipe recommendations and ingredient management.

4.7 Testing

The iOS Simulator, part of Xcode, allows developers to test iOS applications on virtual devices that mimic the behavior of Apple devices.

The Android Emulator, included in Android Studio, enables developers to test Android applications on a range of virtual devices.

4.8 Hardware

Smartphones with either **iOS** or **Android** operating systems are required. The app will be compatible with:

iOS Devices: iPhone models running iOS version 10 or higher to ensure optimal performance, compatibility with the react native, and security updates.

Android Devices: Android smartphones running OS version 5 or higher to ensure optimal performance, compatibility with the react native, and security updates.

5. Evaluation

Regarding our research question, “How can an app help users minimize food waste?”, we evaluate the effectiveness of our proposed solution, which is the implementation of a shopping list, pantry management with expiry dates, and meal recipe recommendations, by evaluating our app. The goal of the evaluation is to assess whether our users think that our app can help them reduce food waste by using these listed features. Our evaluation consisted of surveying 21 users of different targeted personas on the overall design and features of the app. After letting participants test out the app for themselves, surveys were created with Google Forms and distributed online. The responses were then collected through Google Forms which were represented in chart, table, or graph forms to enable data analysis. We surveyed our users on the app’s aesthetic and navigation, as well as the effectiveness of its core features.

Given the short timelapse of this project, it would have been impossible for us to carry out our initial evaluation method. However, in the future, we would like to assess whether implementing a shopping list and meal recommendation feature can help users reduce food waste by 15% after three months. We will conduct a mixed-method study involving self-reported data, app usage analytics, and user feedback. This study will focus on individuals, families, and households that actively use the app’s shopping list, recipe recommendations, and expiration tracking features—tools informed by consumer research to encourage sustainable food management behaviours. The primary measure of success will be a 15% reduction in food waste, evaluated through user self-reports and real-time food disposal logs within the app. Users will estimate their typical food disposal habits before using the app and then report periodically on changes in these behaviours throughout the study period. Users can also log disposed of items directly in the app to help us track disposal in real-time. A measurable reduction of 15% in either reported or logged disposal will indicate successful waste minimization.

6. Results

To address our research question, “*How can an app help users minimize food waste?*”, we developed an app centered around three core features designed to help society manage their pantries efficiently while reducing food waste. These features, Shopping List, Recipe Generator, and Expiry Date Tracker were crafted to promote sustainability and mindful consumption.

The *Shopping List* feature is designed cleanly and minimally to enhance usability. The layout is divided into two sections: Items to Buy and Purchased Items. Each item is displayed in the corresponding section along with its name, quantity and a trash can icon to easily remove it.

Various visual markers like crossed-out text and a checkmark within a red dot are used to distinguish purchased items. This intuitive layout ensures users can easily and efficiently manage their shopping lists, preventing overbuying and forgetting essential items. Additionally, this interactive feature encourages users to keep their lists organized and pursue mindful shopping habits. This simplistic colour palette and design enable users to solely focus on the task at hand, keeping distractions at a minimum.

The *Recipe Generator* prioritizes readability and accessibility, allowing users to find recipes based on ingredients they already have at home. Users can search by keywords, such as a specific item, and view a scrollable list of suggestions. Each recipe is accompanied by a thumbnail, its name, and a tag to identify its general category. Selecting a recipe opens up a detailed recipe screen with an image of the dish, the ingredients and a detailed set of instructions to prepare this meal. Moreover, recipes that interest users are easily findable with the help of the Favourite button via a heart icon. Users can easily find recipes with the help of the search bar, allowing them to utilize items they already possess, reducing waste. This search functionality reduces the need for users to browse the internet endlessly, empowering them to cook meals at home while trying out new recipes. Furthermore, the consistent aesthetic design guarantees information remains clear and uncluttered, even when presenting detailed recipe pages.

The *Expiry Date Tracker* is designed to help users stay on top of their perishable items. With a focus on readability, each item is displayed in a container along with its name, quantity and expiration date where a colour-coded system is used to highlight items that have a near-expiry date. Items can be added with the input field at the top of the screen. A calendar and trash can icon next to each item allows users to update the expiration date and delete the items that have been consumed or discarded. The simplistic layout and colour system helps users quickly scan their pantry and identify the items nearing expiration, allowing them to use up these items before they need to be discarded. It promotes meal planning around those items automatically reducing their waste production. Overall, this user-friendly input system and visual cues encourage users to actively manage their pantry and keep it up to date.

To evaluate the overall design and features of the app and to determine if the prototype aligns with the initial research question, we surveyed 21 participants. To begin with, the app's aesthetic is appreciated by users with over 90% rating it as very appealing. Similarly, 95% of participants found the app easy to navigate with features that were clearly labelled and easy to understand, as affirmed by over 90% of the participants. Users highlighted the Expiry Date Tracker as one of their favourite features, with 100% of participants believing that this feature would help reduce food waste. Similarly, the Shopping List feature was praised with over 85% of participants believing that it would make managing their food inventory easier. The recipe

generator is favoured by over 75% of the participants. Overall, over 90% of the respondents believed the app would reduce their production of food waste and affirmed that they would recommend it to others seeking to minimize food waste. These findings showcase the app's strong potential to meet its goal of promoting food sustainability while also highlighting areas that need some improvements (see Appendix H).

7. Discussion

After letting people from our target audience try out the app for themselves and fill out our survey, we can confirm that our product was a success and received overall positive feedback. Our main goal was to address the issue of food waste of the average household as it accounts for an important percentage of the global food waste. We were able to help users reduce food waste by integrating various effective features in our app including a recipe generator, a shopping list, an expiry date tracker and an overall pantry and fridge organiser. As showcased by our survey results, an overwhelming majority of the participants found the app intuitive and easy to use. Many believed that it would be useful and reduce their own personal food waste at home. In fact, over 90% of participants believe the app would reduce their food waste and help them develop sustainable consumption habits.

When comparing our app to ones already available on the market such as SuperCook, we can see that our app distinguishes itself by also including other essential features such as a shopping list and expiry date tracker which furthermore discourages food waste. These additions make our app an even more effective solution by addressing not only food waste at home but also conscious and informed grocery shopping. Our app's attention to HCI, UX and UI made it simple and easy for users to navigate which encourages users to use the app and engage with its features. The overall clean interface also received praise as visual appeal is also essential to bring in new users as well as keep a stable user base. In brief, the 90% of participants who found the app visually appealing and the 95% who found it easy to navigate are strong indicators that the app's design and functionality resonate well with users.

Of course, there were some limitations. Considering our time frame, we could only manage to get a sample size of 21 participants which means that our results might not fully represent a wider user base. Another problem with our app is the reliance on manual input, which can be a hassle for many and may not be fully inclusive for users with disabilities. Especially when users download the app for the first time as they would need to input their entire pantry and fridge content which could take hours to manually input. This also includes expiry dates as they would also need to be imputed at each purchase. Future iterations of the app could benefit from some

upgrades such as integrating a more automated feature such as barcode or grocery store receipt scanning.

8. Conclusion

In conclusion, when starting this project, we set out a clear and concise goal to create an app that would help households reduce overall food waste. We went through various steps to ensure our app would be successful. Creating this product took a long process of pitching the proposal, stating our problem, creating a hypothesis, doing lots of research, going through the crucial steps of UI and UX design with the help of personas, sketches, storyboards, surveys, etc., developing the app based on said design methods and finally evaluating the effectiveness of our app. However, all these steps were essential in creating a good mobile application.

Our app was proven to be useful as evaluated through a survey taken by 21 participants. Over 90% rated the app's aesthetic as appealing, and 95% found it easy to navigate with clear, understandable features. The Expiry Date Tracker was particularly favored, with 100% of participants believing it would help reduce food waste. The Shopping List feature was also well-received, with 85% of users finding it helpful for managing their food inventory. The Recipe Generator was liked by 75% of participants. Overall, over 90% of respondents believed the app would effectively reduce food waste and would recommend it to others. These results demonstrate the app's strong potential to promote food sustainability.

Food waste at the personal level is a problem that impacts the environment but also our finances. By building an app with features like a shopping list, a recipe suggestion based on food inventory at home and an expiry tracker, we make it easier for people to be mindful and reduce household food waste. Our initial hypothesis was that our app would reduce food waste by 15% over the course of three months, and after gathering feedback from some participants, we're happy to see the results are promising. If we were to continue developing the app, getting more participants and calculating more statistics, our hypothesis would be realistically feasible. In the course of this project, we were able to build a functioning app that looks appealing, is easy to navigate and that serves its purpose.

Our app demonstrates that technology can be used in our daily lives to encourage more sustainable and green habits. By taking the main issue of overbuying and letting food spoil without use, we were able to create a tool that effectively reduces food waste as confirmed by the feedback received. That said, there is definitely room for improvement and moving forward, we can improve the app and offer a valuable tool for our community. Features regarding making

it easier to input food or making the overall process faster with barcode or receipt scanners is the next step in development.

REFERENCES

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- [2] Collins, A. (March 18, 2024). *Reducing Food Waste for the Climate, Nature, and People*. NRDC. Reducing Food Waste for the Climate, Nature, and People (nrdc.org)
- [3] Blair, N. "Food waste in Canada statistics for 2022," Made in CA, Sep. 14, 2022. <https://madeinca.ca/food-waste-canada-statistics/>
- [4] E. Närvenen, N. Mesiranta, M. Mattila, and A. Heikkinen, Eds., *Food Waste Management: Solving the Wicked Problem*. Cham: Springer International Publishing, 2020. doi: 10.1007/978-3-030-20561-4.
- [5] L. Principato, Food Waste at Consumer Level. in *SpringerBriefs in Environmental Science*. Cham: Springer International Publishing, 2018. doi: 10.1007/978-3-319-78887-6
- [6] Free Meal API | TheMealDB.com. (n.d.). <https://www.themaldb.com/api.php>

APPENDIX A: USER PERSONAS

Layla Collins



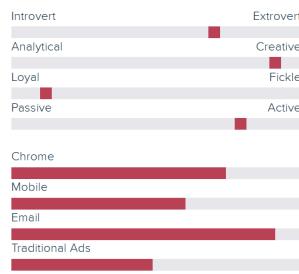
"I'm always giving my all, but it feels like there's never enough time for everything."

Age: 42
Work: Elementary School Teacher
Family: Married with 2 children
Location: Vancouver, BC
Character: The Overworked Mother

Organized Caring
Resourceful Hardworking

Bio

Layla is a middle-aged elementary school teacher living in Vancouver, with her husband and two children. Dedicated to her students and family, Layla's days are packed, leaving her constantly juggling work and household responsibilities. She values healthy eating for her family but struggles to find the time and energy to plan balanced meals or keep track of what groceries she already has at home. Layla often overbuys groceries because she forgets what's in her pantry, leading to wasted food and frustration. After long, exhausting days, she finds meal planning overwhelming. Yet, she dreams of a solution to simplify her grocery shopping, help her efficiently use what she has, and ensure her family always eats nutritious meals.



Goals

- Optimize time spent on grocery shopping and cooking meals
- Make sure her family eats healthy meals, especially her kids

Frustrations

- Overbuying food due to forgetting what's home
- Too busy and tired to plan healthy meal plans



Brands



Thomas Lee



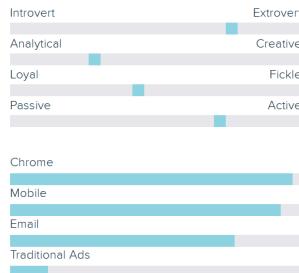
"I'm all about making the most of what I have, whether it's time, space, or money."

Age: 21
Work: Undergraduate Student
Family: Single
Location: Toronto, ON
Character: The Budget-Conscious Learner

Social Motivated
Tech-Savvy Open-minded

Bio

Thomas Lee is a college student navigating the challenges of living away from home for the first time. With a packed schedule of classes and part-time work, he often finds cooking to be a daunting task. Sharing a cramped dorm kitchen with roommates adds to the complexity, as pantry space is limited, and coordinating fridge storage can be chaotic. Thomas dreams of improving his cooking skills and building healthier habits by preparing home-cooked meals. While he's eager to save money, he often feels stuck, lacking the confidence to get started. Despite these challenges, Thomas is determined to turn his small kitchen into a space where he can experiment and grow.

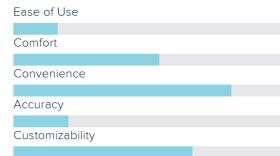


Goals

- Learn to cook with simple and easy recipes
- Save money by buying less takeout
- Be healthier by eating homecooked meals

Frustrations

- Has very limited cooking skills and knowledge
- Shares a dorm with roommates, therefore, has limited pantry space and cooking space



Brands



Sofia Ashton



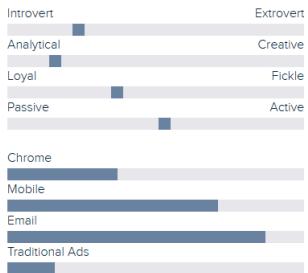
"Living sustainably isn't just a choice—it's my way of making a difference every day, no matter how small."

Age: 35
Work: Marketing Manager
Family: In a relationship
Location: Austin, TX
Character: The Eco-Minded Optimizer

Independent Flexible
Idealistic Innovative

Bio

Sofia, a marketing manager, is passionate about creating a lifestyle that aligns with her values of sustainability and health. Living in Austin, she balances her fast-paced career with a deep commitment to minimizing waste and making eco-friendly choices. Sofia enjoys experimenting with creative ways to repurpose leftovers. While she values technology, she dreams of a simplified approach to managing her kitchen, one that lets her focus more on living sustainably and less on navigating fragmented tools. Always curious, Sofia loves learning and adapting new habits that make her life and the planet better.

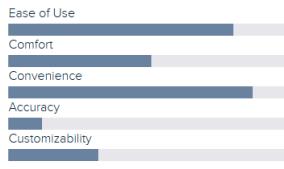


Goals

- Reduce the food waste produced from her house
- Make healthier and environmentally friendly choices
- Learn more recipes

Frustrations

- Struggles to keep track and manage perishable items
- Dislikes juggling multiple apps to achieve a healthy and eco-friendly lifestyle

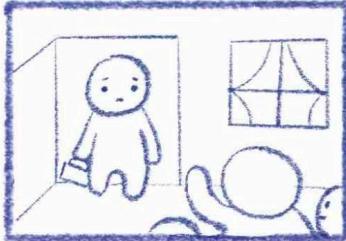


Brands

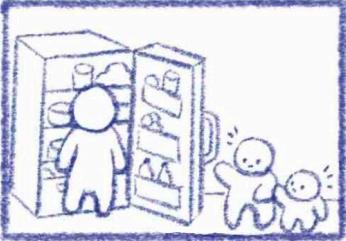


APPENDIX B: STORYBOARD

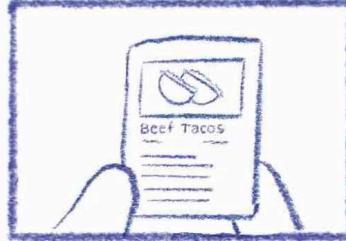
Persona : Layla Collins
User story: Recipe generator



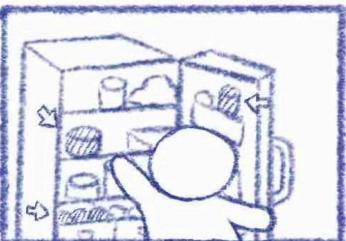
After a long day at work, Layla didn't have time to go grocery shopping as she was too tired.



Her kids are hungry and want to eat. Checking the fridge, she doesn't know if she can make anything as there isn't much.



She takes out her phone and uses FoodiePal, who has all her fridge and pantry items stored. Clicking "generate recipe", it suggests tacos as she has all the ingredients.



She finds and collects what she needs.

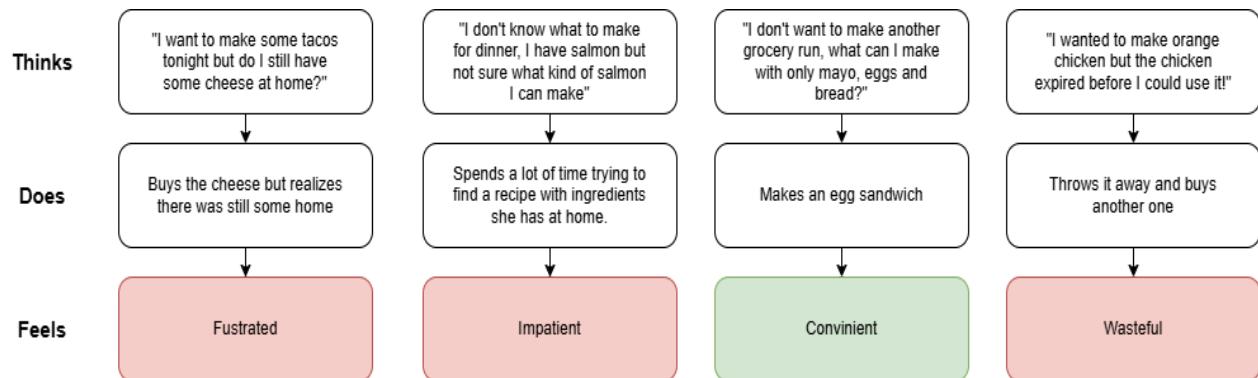


The tacos are made according to the recipe.

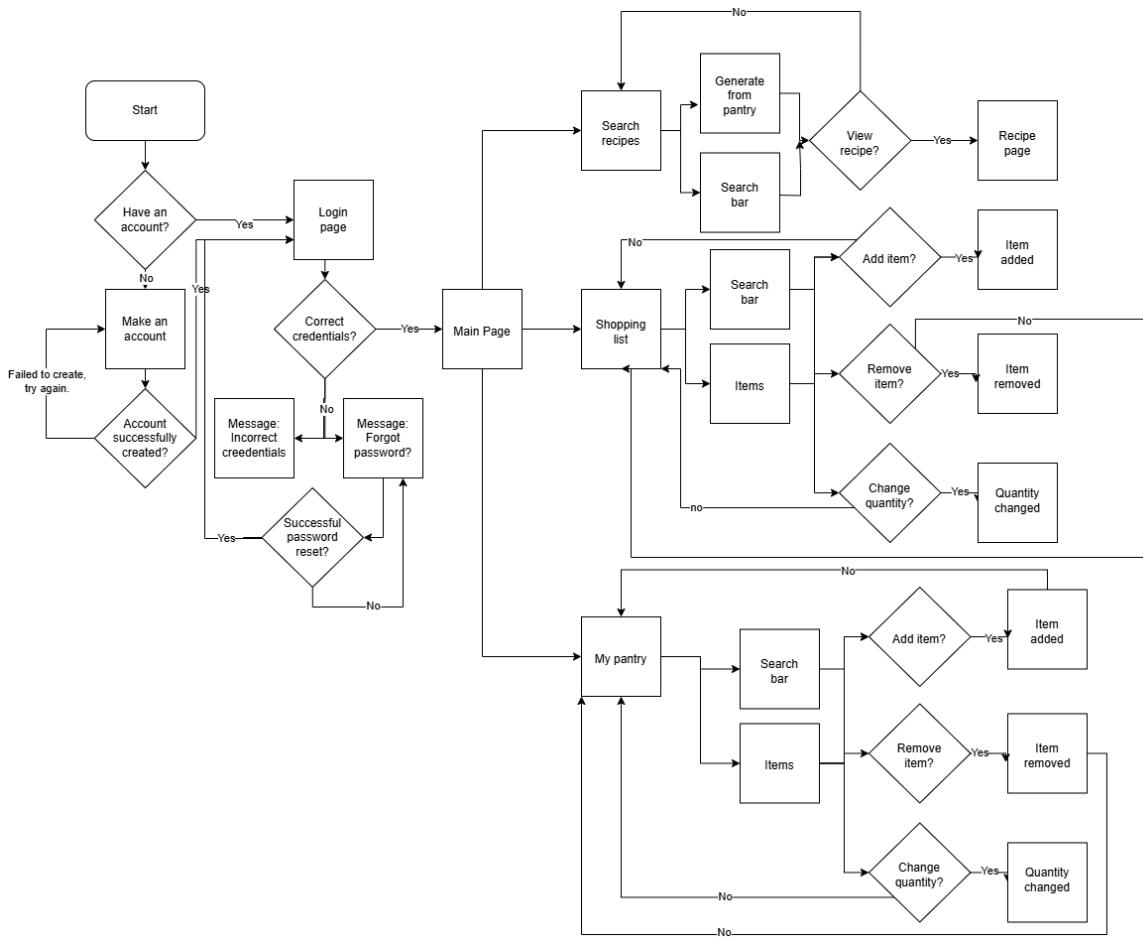


Everyone is happy! Not a dime was used and no food was wasted.

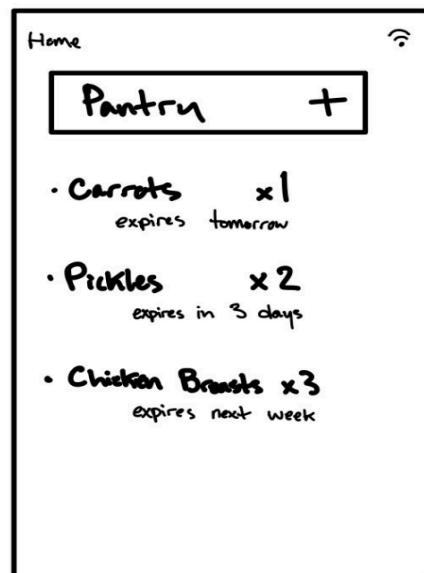
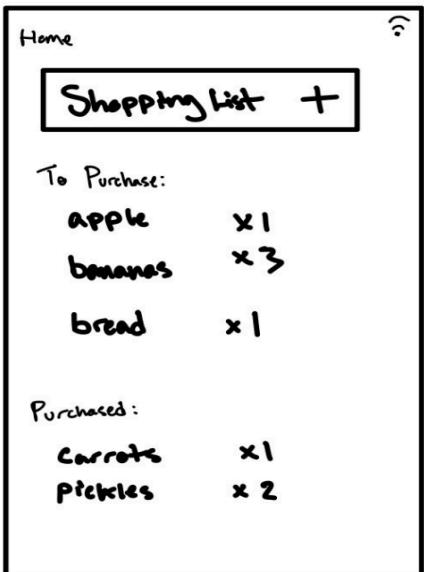
APPENDIX C: USER STORY



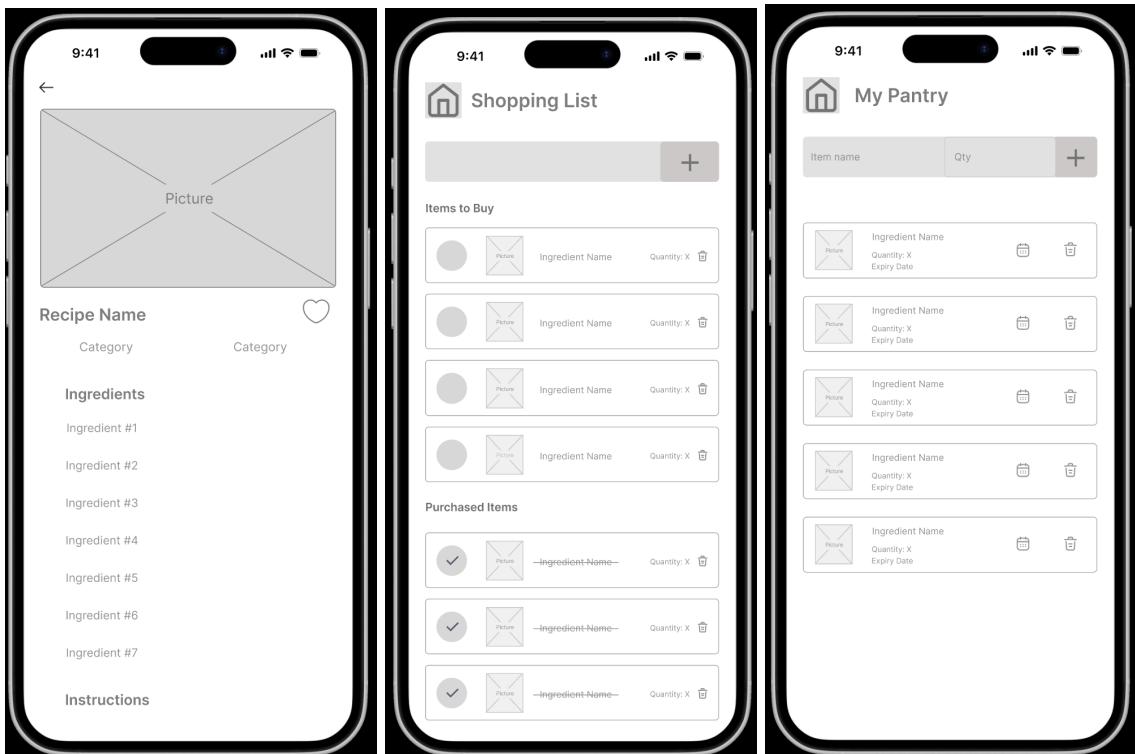
APPENDIX D: USER FLOW DIAGRAM



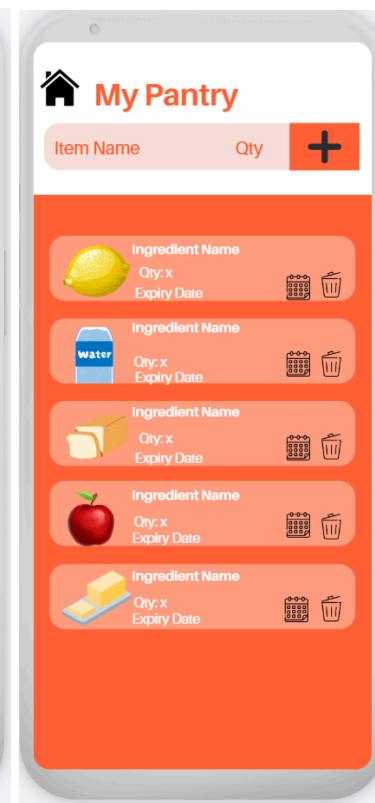
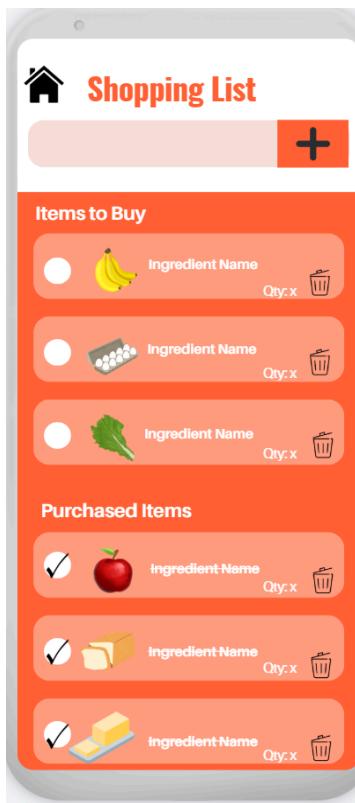
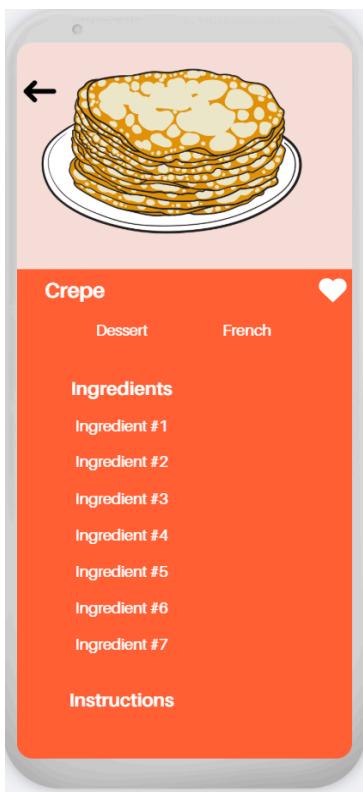
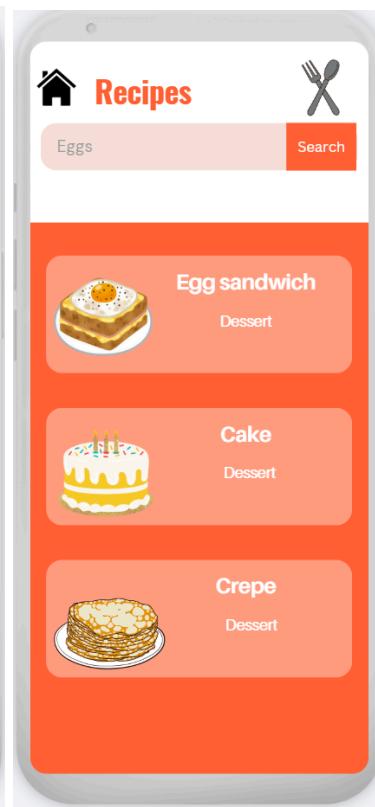
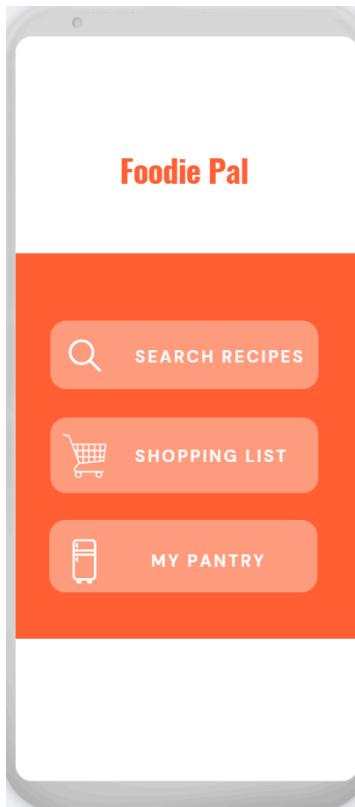
APPENDIX E: SKETCHES

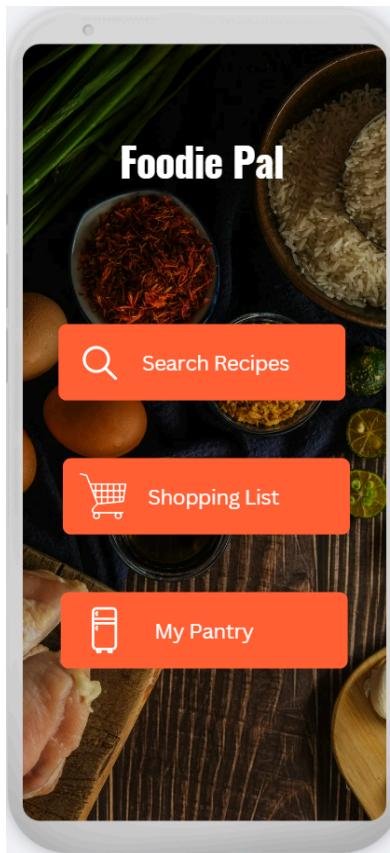


APPENDIX F: WIREFRAMES



APPENDIX G: FIGMA MOCKUPS (3 ITERATIONS)



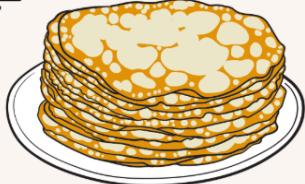


Recipes

Eggs Search

- Egg sandwich** Dessert
A small image of an egg sandwich.
- Cake** Dessert
A small image of a tiered cake.
- Crepe** Dessert
A small image of a stack of crepes.

Crepe

← 

French

Ingredients

- Ingredient #1
- Ingredient #2
- Ingredient #3
- Ingredient #4
- Ingredient #5
- Ingredient #6
- Ingredient #7

Instructions

Shopping List

Add new item +

Items to Buy

-  Ingredient Name
Qty: x Delete
-  Ingredient Name
Qty: x Delete
-  Ingredient Name
Qty: x Delete

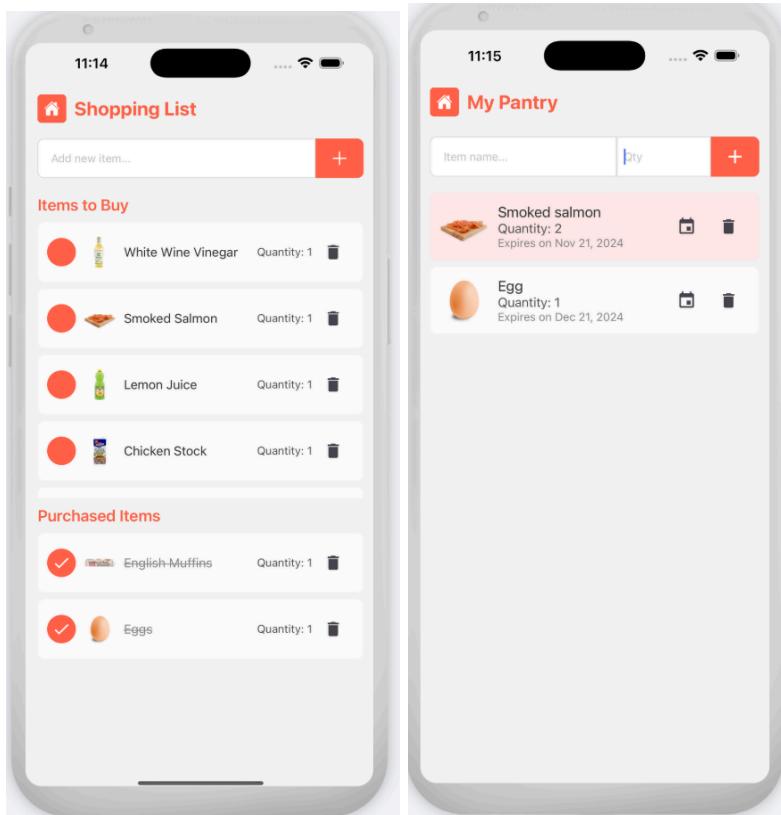
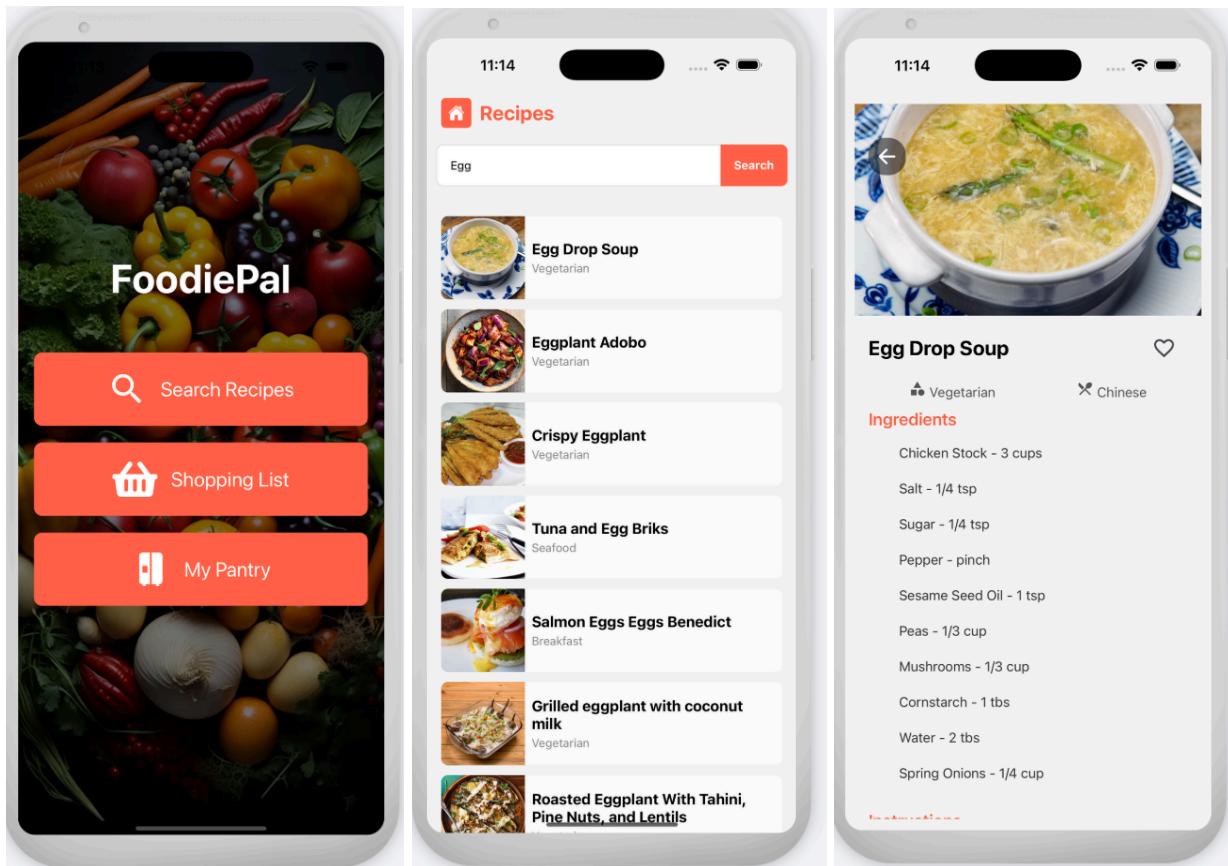
Purchased Items

-  Ingredient Name
Qty: x Delete
-  Ingredient Name
Qty: Delete
-  Ingredient Name
Qty: Delete

My Pantry

Item Name... +

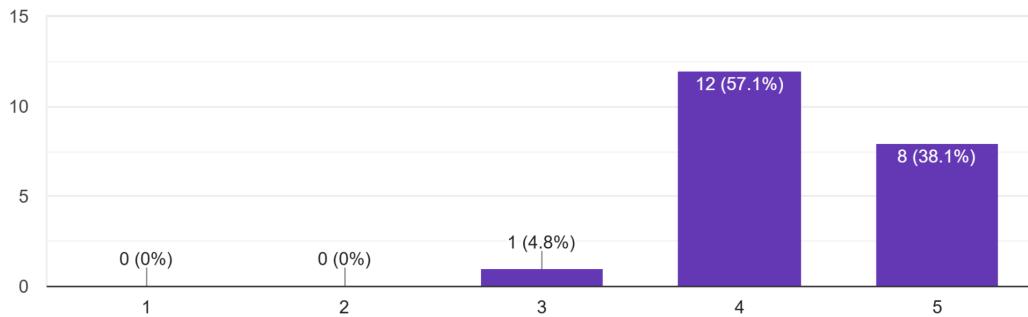
-  Ingredient Name
Qty: x Expiry Date Delete
-  Ingredient Name
Qty: x Expiry Date Delete
-  Ingredient Name
Qty: x Expiry Date Delete
-  Ingredient Name
Qty: x Expiry Date Delete
-  Ingredient Name
Qty: x Expiry Date Delete



APPENDIX H: PROTOTYPE EVALUATION SURVEY RESULTS

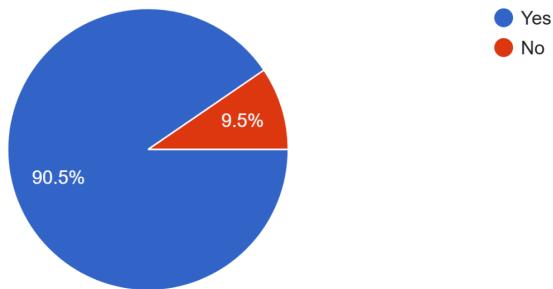
How easy was it to navigate the app?

21 responses



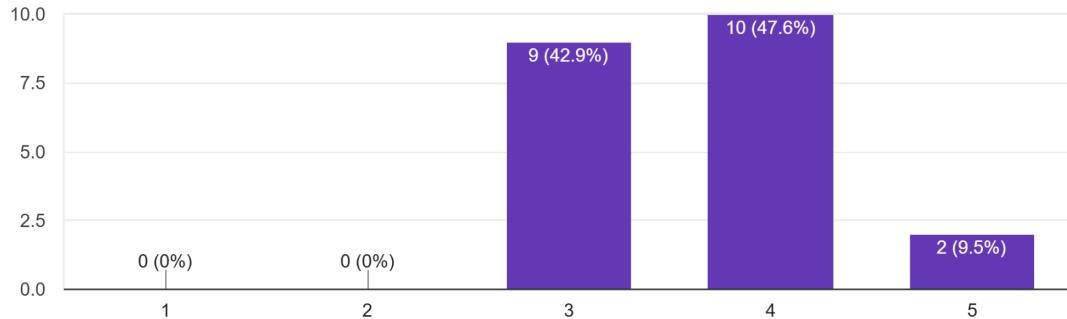
Were the features clearly labeled and easy to understand?

21 responses



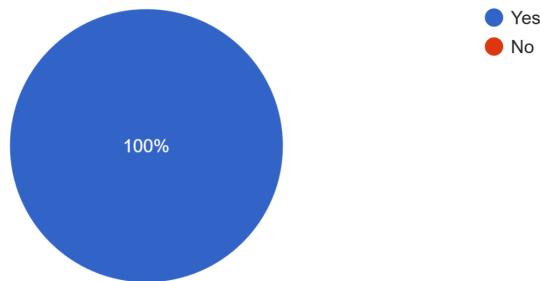
How visually appealing did you find the app?

21 responses



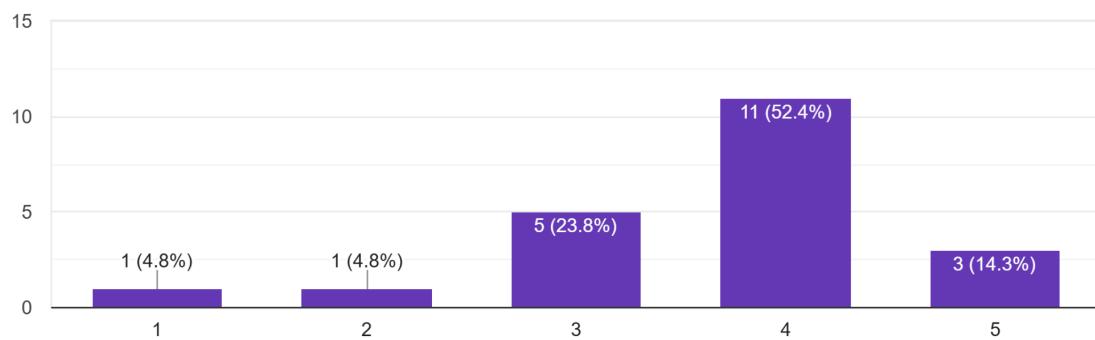
Do you think the Expiry Date Tracker is useful for reducing food waste?

21 responses



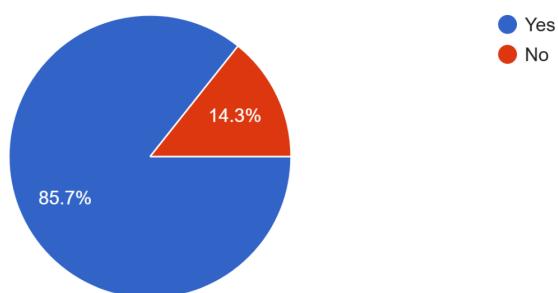
How helpful is the Recipe Suggestion feature?

21 responses



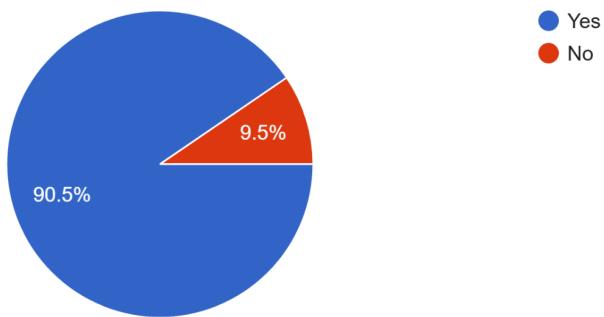
Do you feel that the Shopping List feature makes managing food inventory easier?

21 responses



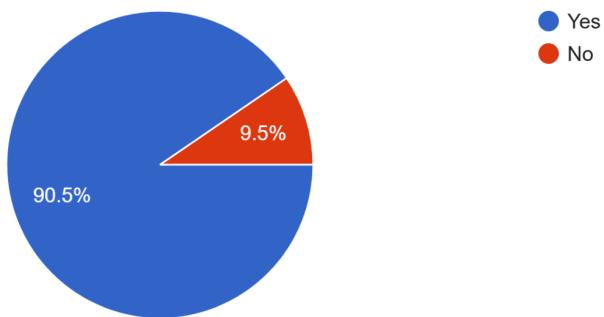
Would you recommend this app to someone trying to minimize food waste?

21 responses



Overall, do you think this app would help you reduce your household's food waste?

21 responses



APPENDIX I: GITHUB REPOSITORY LINK

<https://github.com/jacobsch/Soen357-Final-Project>

APPENDIX J: VIDEO DEMO LINK

<https://drive.google.com/file/d/17YCj19MiFs2AGEsUMvTe7gWI3KUOPTL2/view?usp=sharing>