Reverse Recipe

Evaluation

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ABSTRACT

Reverse Recipe attempts to empower users to be able to shop, cook, and organize the kitchen in a revolutionary way. Our interface design concept evaluations of heuristic and empirical analysis are reported in this paper. These insights will help us to optimize our project and deliver a high-quality application.

KEYWORDS

Heuristic analytical evaluation, Empirical evaluation, UI, Usability, User-friendly, Discoverability

I. Introduction

Both heuristic and empirical evaluations are critical to how we proceed to the next step of our app development. Heuristic evaluation helps us identify the problems with the user interface tasks that users have to overcome to be able to use the app at its current state. The heuristic evaluation was carried out by two of our team members who are familiar with the app and its workflow. The empirical user test focuses on just one of the app features to get an actual user's perspective and assess whether UI is easy and learnable or users experience difficulties when interacting with the app. The empirical evaluation was conducted by two actual users. The outcome of these evaluations will be incorporated into our update for the app's workflow and transition to high-fidelity prototyping stage.

II. Analytical Evaluation

A. Goals

The purpose of our analytical evaluation is to gain insight into the application's quality of usability in various contexts encountered by users, and to use our findings to identify usability problems and make improvements wherever possible. Accordingly, we have chosen to use Nielson's heuristics as our evaluation criteria, with two of our team members as test users who can walk through the tasks involved in the app's core functionalities to examine their conformance to the heuristics, focusing on those which are most relevant in the context of our application's use.

B. Method

Some of the key tasks and method we used in this evaluation included:

1. App Initialization:
    a. Sign up as a new user for the first time

    b. Log in to an existing account and find data saved to your account.
2. Inventory Control:
    a. Use the scan function to add add several items to your ingredients inventory
3. Recipe Discovery:
    a. Find recipes based on matching ingredients in your inventory
    b. Access instructions for selected recipe(s)

The reasoning behind using the heuristic evaluation process is to understand the different criteria through the lens of our target users: home kitchen users. We have explicitly tried to identify issues that may arise at different severity levels for users based on factors like age, attention, and general technology familiarity - allowing us to optimize usability and discoverability for as wide a user base as possible.

C. Materials

Using Nielsen's 10 Heuristics[1] as a reference point, we adapted the following questions to examine in detail while walking through the tasks listed above, and other smaller tasks that may arise. Some may not apply as strictly to some tasks, and some are less concerned with any particular task as they are with the app's experience as a whole, but all are relevant from an analytical standpoint to gain insight to our app's user experience.

1. Ease of Use (Recognition rather than recall)
    a. Are you unable to navigate to the page you want or don't know what is going on?
    b. Can you go forward and backward easily and quickly get back to the homepage?
    c. Is it easy to delete something that you don't want after scanning it in to your recipes' item list?
2. Usefulness (Match between system and the real world)
    a. Do you feel disconnected to the world when using the app?
    b. Are you annoyed or easily frustrated when using the app?
3. High-level view (Visibility of system status)
    a. Is inventory clear and easy to understand?
    b. Is the result of scanning (success/failure) easy to understand?
    c. Is the match between inventory and recipes presented clearly?
4. Consistency (Consistency and standards)
    a. Do identical or similar buttons on different pages do the same thing?
    b. Is the arrangement similar between pages?
    c. Are there buttons that contradict expectations established by other buttons?
5. Feedback (Error prevention)
    a. If a user has an error during log in, does the app let you know specifically why?
    b. When unable to identify scanned items, does the app adapt to the error level by either suggesting possible items or indicating ways to improve a scan?
6. Graceful Recovery (Help users recognize, diagnose and recover from errors)
    a. Are error messages understandable and descriptive? Do they make follow-up actions clear?
7. Timeliness (Flexibility and efficiency of use)
    a. How long do users take to get from the home screen to an item page in a task?
    b. Does the app give ways to quickly revisit frequently used pages? Are there any shortcuts that directly navigate there??
    c. When scanning items, is it takes a long time to figure out what the item is.
8. Clean Presentation (Aesthetic and minimalist design)
    a. Does the app contain too many controls or options on a specific page?
    b. Do item pages & recipe pages have information that is readily useful to users?
    c. Is every function of each page clearly defined and free from distraction?
9. Usage Flow (User control and freedom)
    a. Is it easy to connect use of related tasks together? (e.g.: going from scanning a few items to finding relevant recipes)
    b. Are tasks connected in logical ways at various junctures in their process? (e.g.: can you go from the homepage to searching for a recipe to seeing what ingredients you have scanned or need to purchase)
10. Help (Help and documentation)
    a. Do labels and instructions presented in-line adequately answer user questions, without needing a dedicated help section?

In each task, we identified the heuristic criteria that were most relevant or raised explicit issues in their completion, and also included an overview evaluation based on our

findings throughout the task-completion process.

D. Analysis

See appendices A - D for the individual heuristic analysis.

E. Result and Insights

For the visibility of the system in regards to the selected tasks, the system is presented nicely. It is easy to navigate and learnable. Changes that could be made in this field for the selected tasks include: Adding indicators to a given filter category to help clarify the number of ingredients within that category. Adding an indicator in setting for what account is currently logged in. These additions will help clarify certain elements of the app and reduce confusion.

The app contains various buttons and symbols that are similar to those of a real world system however it also contains discrepancies. Such discrepancies and their fixes include: using the word ‘match’ instead of search. Even though the work ‘match’ clear indicates its function, it is not as widely used as ‘search’ in the real world. Switching the wording may help with the learnability of the app.

For user freedom, the major limiting factor of the app is the ability to skip certain features or navigating through the app. The app forces users to login before being able to use the app. This greatly limits users who are browsing or checking out the app for the first time without commiting. A solution to this would be to implement usage of the app as a guest and the addition of a login to enable certain features of the app (like favoriting or sharing to social media).

For consistency, the app re-uses similar icons to perform the same functions. (A heart to favorite, back arrows, and ‘X’ buttons to close things). The usage of “G”, “F”, and “T” are not clearly identifiable as 3rd party platforms and should use official platform icons to represent those platforms instead.

For error prevention, the app includes some hints as to what the user should input but is rather lacking as a whole. Users are not informed of the amount of additional ingredients they need to add until searching for recipes in addition to unclear password requirements and no recipe spell-checks. These issues can be easily fixed through

For recognition over recall, the app does not use recognizable social icons nor does it some of the symbols indicate that the should be clicked. To address this issue, the app should include actual icons from the social platforms instead of makeshift ones.

For flexibility and efficiency of use, the app provides a lot of customizability but is not completely without flaw. To expand on the already flexible program, users should be allowed a custom way to filter inventory and add specifications like quantity. In addition, users should be allowed to store their details on their device instead of limited to an online account option.

For aesthetic and minimalist design, the general layout and design of the app is clean and uncluttered however it does have a few things that could be improved on. Social media buttons could be moved onto the login page to allow users to login with different platforms as most modern apps allow this. Images should also be collapsable when scrolling so that the screen is not cluttered. Lastly, the ability to filter items should be placed within an “Advanced Search” tab, or something similar, as having filters present with every search can be frustrating and/or unnecessary.

In terms of error recovery, the prototype provides very little. It does not possess a mechanism to deal with account creation problems, recipe spell-check errors, or search error resolutions. To address these issues, the app should include detailed error messages on the login screen for issues related to the account, an automatic spell checker or smart-fill option to assist in searching for recipes, and offer additional resolutions for errors that may occur.

Lastly, for help and documentation, there are no help options readily available on any screen. To address this issue, the app should include help selectors in the corner of the screens. Alternatively, users could be given a tutorial if it is their first time using the app.

Changes to Analytical Evaluation

- To make analysis more efficient, the tasks to be analyzed were condensed to more specific, concrete tasks and given more detail, so as to be able to question process more directly.

- While we initially wanted to focus only on a few adaptations, we edited and adapted our questions to match the original order of Nielsen's 10, for familiarity and consistency. The individual questions formed the focus areas for the walkthrough findings.

III. Empirical Evaluation

A. Goals

An empirical evaluation made through a user test will aim to provide researchers with insight on whether or not our designed user interface for scanning ingredients and creating a meal using them is easy to learn and navigate. This objective was determined based on one of the primary focuses of the application: to optimize/streamline an everyday process to potentially contribute to quality of life improvement for occupied individuals. To that end, it is important that design elements not only be intuitive, but also straightforward, in order to create an efficient user experience.

B. Method

The task was designed with our goal in mind. In order to understand how current prototype aligns with that goal, data on user ability to navigate the app and use a core feature was necessary. If the empirical evaluations are able to provide data on comfort, accessibility, and ease of operation, the team will be better equipped to deliver a product with design decisions that enable user success with the application. To that end, users with no previous knowledge of the app were selected for the task in order to observe the user-friendliness and difficulty curve of the interface.

The reasoning behind empirical evaluation is to mimic users' real world actions while using the app prototype in an attempt to generate user feedback and thoughts on the design. Data collected helped inferences be made regarding both the efficiency and effectiveness of the UI, and bring attention to potential design flaws that hinder the user's ability to either use, or learn how to use, the application and its core features.

The concept and pre-conditions of the app are explained to the users. User was then explained their task: to scan their ingredients into the application, and find a recipe to make using their available ingredients. Users had the option of selecting meals they would like to try, and have the ability to mark both their selected meals and/ or ingredients as their "favorites". Although the context may differ, users whom are experienced with technology should be familiar with this task of creating plans, and marking objects as their favorite. This provided insight on how a user may interact with the system to perform a given objective. The task tested the user's ability to learn and navigate the app. It also tested the application's ability to perform its intended role while providing a comfortable, effective user experience.

A low-fidelity prototype design was selected for use in the evaluation. In doing so, design flaws that are discovered can be easily documented, reviewed, and resolved in a future iteration of the prototype. With limited research and information on usage of the application in these early stages of development, it is more effective to use low-fidelity prototypes for bulk collection of data and flaws to determine changes before committing to a high-fidelity prototype.

The user details for empirical evaluation can be found in appendices F and G.

C. Materials

This empirical test involved a physical copy of a low-fidelity prototype provided to the users for this task. The test allowed the researchers to observe the users' experience in navigating the app's interfaces, and provide insight on potential problems with the design. Users received no prior training or information outside of the pre-conditions and task description to reduce potential biases when using the prototype to accomplish their task.

Once the task description were given to the user, they were given the prototype to begin. The user had the opportunity to ask questions before being given the prototype if clarification of the task is needed; they were not allowed to ask questions during the task and operated on their own. This restriction helped create an experience similar to a real-life situation where the user was navigating the app in an ordinary, everyday setting. All user questions were documented alongside the post-interaction interview questions.

Observational notes were taken as the user works through the application to complete their task. The researcher attempted to document any of the initial comments, impressions, and reactions of the user, as well as when and where the user faced difficulties. Users were told that they can verbalize their thought processes; their body language and actions were also observed and recorded. In addition, documentation included whether or not the user was able to complete the given task.

Task Description:

The Reverse Recipe application is a software tool to keep track of ingredients available in your refrigerator and pantry to create meal plans and/or a shopping list. The prototype for the app can be utilized to perform the task described above. The assumption is that you already have an account created, and you have previously entered your login information using the application on your personal phone. Furthermore, you have given permission for the app to access the camera on your device. You are welcome to simulate usage of the app, such as by pressing, clicking,

and swiping as if this was an interactive prototype. The number on the paper prototype will guide you to access the appropriate screen according to your interaction with each screen. This order and sequence of tasks was selected to simulate a real progression of expected app usage.

NEW TASK DESCRIPTION

1) Locate and navigate to the scanning feature.
2) Add an item to your inventory using the scanning feature by lining up the barcode or item with the camera.
3) Review the item's information that appears after scanning, making any changes if necessary. Save the item.
4) Scan more ingredients as necessary using steps 2 and 3.
5) Review your inventory and search for a list of recipes that can be made using your available ingredients.
6) Select a recipe you would like to learn more about.
7) View ingredients and instructions of the selected recipe.

ORIGINAL/ALTERED TASK DESCRIPTION

1) From "Home Page", select the scan button to proceed to the "Scan" screen.
2) Align the scan area with the barcode on your item or just take a picture for our AI recognition software to register ingredients that you are scanning.
3) Update the information regarding the entered ingredient by utilizing the "Edit" button or save the entry by utilizing "Save" button on the same screen.
4) Press the back button on the top left side of the screen to scan more ingredients.
5) Press the "Match Recipe" button to be presented with populated recipes on the "Recipe" screen based on ingredients available in your inventory.
6) Select any recipe that you would like to be navigated to its details.
7) View ingredients and instructions of the selected recipe.

Interview & User Interaction:

The guideline for the follow-up questions asked users about their experience navigating the app, as well as details and thoughts regarding their interaction with it.

1) How did you feel about navigating through the app to perform the task?
2) How difficult was it to find the scanning function? Did you find the process of scanning or manually adding items confusing at all?
3) Can you think of any changes that might improve the feature?
4) How difficult was it to access the ingredient inventory page?
5) How difficult was it to search for a recipe?
6) Did the recipe page present all the information you would want? Was it presented in a way that was easy to read or find what you wanted?
7) What changes would you make to the recipe page?
8) How difficult was it to figure out how to add a recipe to your favorites?
9) Do you have any overall impressions of the app you would like to share, based on what you experienced while performing the task?
10) Do you feel that the app/task was easy to understand, or would you have preferred to be given an in-app tutorial before beginning?
11) Did you feel like you were lost at any point while navigating the interface?
12) What did you like and/or dislike regarding this experience?
13) Any other thoughts, questions, or comments?

The prototype used for this evaluation is attached at the end of this document. Each screen will be enlarged and printed on separate sheets of paper for the user to work with during the task. This allows the evaluators to present users with different screens as they interact with and navigate through the design.

The following describes the navigation flow of the prototype, based on screens available in the current iteration. The page numbers are assigned such that the page number corresponds with the screen number in attached prototype.

- Screen #1 goes to Screen #4 if users are logged in
- Screen #1 goes to Screen #2 if users are new to the app or logged out
- Screen #2 goes to Screen #3
- Screen #3 goes to Screen #4
    - Several icons on Screen #3 are used with linked social media accounts, not currently represented in this prototype.
        - "G" ICON: Login using linked Google account.

        - “F” ICON: Login using linked Facebook account.
        - “T” ICON: Login using linked Twitter account.
- There are several buttons on Screen #4:
    - “Scan” button goes to Screen #5
    - “Inventory” button goes to Screen #8
    - “Recipe Book” button goes to Screen #10
    - “Menu” button goes to Screen #14
    - “Settings” button goes to Screen #16 (where user can logout)
- There are several buttons on Screen #5:
    - “Scan” button scans the object or barcode centered within the camera frame and opens the modal on Screen #6
    - “Manual Entry” button opens the modal on Screen # 6 for manual entry
    - “Inventory” button goes to Screen # 7
- Screen #6 displays the scanned/manually entered ingredients
    - “Edit” button allows user to edit item info on Screen #6
    - “Save” button adds the item to Screen #7, but does not change screens
    - “Add” button allows user to add an item manually without leaving Screen #6
    - “Heart” button adds the item to “Favorites” on Screen #15, but does not change screens
    - “Back” button goes to Screen #5 for more scanning
- Screen #8 top banner buttons filters the current view
- “Ingredient” buttons on Screen #7 opens modal on Screen #6
- “Match Recipe” buttons on Screen #8 goes to Screen #10 if sufficient ingredients are entered
- “Match Recipe” buttons on Screen #8 goes to Screen #9 if sufficient ingredients are not entered
- “Shopping List” buttons on Screen #8 and 9 goes to Screen #15
- “Search For Recipes” button on Screen #10 goes to Screen #11
- “Match Recipe” button on Screen #11 goes to Screen #12
- “Recipe Title/Image” buttons on Screen #12 goes to Screen #13
- “Heart” button on Screen #13 adds recipe to “Favorites” on Screen #15, but does not change screens
- “Logout” button on Screen #16 goes to Screen #2
- All arrow buttons in the top-left, where present, return to the most recent, previous screen

D. Empirical Data

See appendices F - G for the collected empirical data.

E. Result and Insights

Appendix F:

The user interviewed in Appendix F did not have any navigational difficulties. He found the app simple, innovative and user-friendly. The user emphasized that with minor changes, he will most likely incorporate the usage of this app in his daily life. Thus, these findings highlighted that we are on the right track in meeting our goals for this project.

Some changes suggested by the user pertained to Screen #6: “Object Modal”, where the user suggested a color change of the borders of entry boxes on that page while editing or saving entries for improved visibility and user-friendliness. In addition, he brought to our attention the need for shortcut buttons on the bottom side of screens for frequently visited pages, such as Screen #8: “Inventory”. This would improve the user flow of the application for users while also eliminating unnecessary backtracking. The user also noted that although he appreciates the simplicity and organization of the paper prototype, he recommends some cosmetic improvements such as addition of pictures, videos and interactive animation for final product.

The result of this interview and the user’s insights calls for more improvements in the revised version of the app. It is important to realize that this evaluation was conducted only on a section of the app with a specific task in mind. The outcome can be used to not only enhance the tested section of the app, but can also be applied to other screens throughout the app to keep a consistent flow.

Overall, the user interviewed in Appendix F was very excited to use the scan feature of the app. He expressed his interest in the scan feature not only in terms of ease of use and eliminating the need for manual entry, but also the

flexibility this feature of the app provides by suggesting recipes based on inventory contents and populating a shopping list for missing ingredients. This unique capability of the app in combination with bringing together the inventory of all ingredients available in both the refrigerator and pantry could impact meal planning in a positive and meaningful way.

Appendix G:

The user in Appendix G found that the screens pertaining to the given task were simple to navigate, and did not report any struggles accessing the inventory and recipe features. It was noted that the scanning feature was particularly easy to find, since it was in the middle of the main screen. These observations suggest that our design aligns with our goals to focus on fast access to the app's primary features. She observed that she would be inclined to consistently use a tool like ReverseRecipe if it was always quick to use, but would likely use it less or not at all if it felt tedious.

With that in mind, it may be beneficial to consider quality of life features, such as adding quick-access to other functions on screens where logical. For example, the user praised the ability to reach their inventory from the scanning screen. While one can also easily reach the Inventory screen by backtracking to the main screen, small, time-saving additions like this could improve a user's overall experience.

The user in Appendix G noted a few aspects of the design that could be improved. For example, she stated that while she understood the intent of "Match Recipe", she felt the button descriptor could be "worded better". Moving forward, it will be important to consider the labels and wording used in the UI; while this user was not confused by it, that may not be the perspective of others. In addition, she mentioned a brief moment of confusion when trying to edit information of a scanned item. She expected to be given a different screen for editing, and was not immediately able to understand that our intent was for the user to be able to edit information within the same modal instead.

These comments make it evident that future iterations of the prototype should be adjusted and reviewed with an emphasis on clarity. In reference to the second example, while the finished product would make it clear how editing appears, prototypes used in testing will need to distinguish subtle changes like this in the UI.

The user offered a suggestion for improving the scanning feature, as she felt that taking a picture of an item may be unreliable at times because of variations in the lightning or color of the objects, based on her experiences with other mobile applications with similar functions. Apple iPhones use a Face ID feature, where users must capture their face from multiple angles so that the camera can recognize their face to unlock the phone. Including a similar "full-scan" requirement may improve scanning accuracy and can be represented by a screen with a prompt. However, potential drawbacks can include an increased time required to use a key feature, thus it will need to be carefully considered with our goals in mind.

Changes to Empirical Evaluation

The general task description was adjusted to include a less specific set of instructions, rather than the information describing to users what specific buttons to press during the evaluation. For example, the original instruction, *"Press the "Match Recipe" button to be presented with populated recipes on the "Recipe" screen based on ingredients available in your inventory"*, was adjusted in the new description to: *"Review your inventory and search for a list of recipes that can be made using your available ingredients"*.

These changes were made due to concerns that the original description might influence biased task outcomes and data. The objective of the evaluation was to determine how user-friendly and navigable the prototype was in its current state. Thus, the description needed to provide user subjects with enough information to understand the context of the task without providing any part of the solution.

The changes were made to allow for a more realistic and natural situation where users would have to figure out how to complete the task on their own instead essentially following explicit instructions. This helps ensure that the data collected for use in the evaluation analysis is unbiased. The empirical evaluations provided in Appendices F - G were made based on these changes.

ACKNOWLEDGMENTS

Shannon Farazi, Carter Fritsch, Dylan Kieu, Yu Chuan Tey, and Michael Ton, "Project 7", pp 1-23, unpublished.

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Appendix A
Heuristic Evaluation Walkthrough #1

User: Carter Fritsch **Task: App Initialization**

Heuristic	Findings: Positive/Conformance (+) & Negative/Nonconformance (-)	Potential Fixes (Δ) & Other Insights (!)
#1: Visibility of system status	+ First App Screen clearly establishes if user is logged in or not - Main screen gives no indication of what account is being used	**Δ** Add indicator in settings for what account is logged in.
#2: Matching Real World & System	**N/A**	**N/A**
#3: User Freedom	- Login is unskippable	**Δ** consider a smaller, less prominent button to continue as guest usage / limited-feature usage.
#4: Consistency	+ Starting with login is a standard experience for users - "G", "F", & "T" not clearly identifiable as 3rd Party account platforms	**Δ** Use official social platform icons to indicate
#5: Error Prevention	- Password requirements not clear	**Δ** Give hint text for password requirements **Δ** If possible, autofill with previously-used account on device
#6: Recognition over recall	- Social icons do not make their purpose clear, user would need to remember previous usage in this or other apps	**Δ** Add clarifying text, like "Or, log in with…"
#7: Flexibility and Efficiency of Use	+ Allowing user to log in with existing apps instead of requiring new credentials	**Δ** Give option for local user / on-device data storage, instead of requiring online account creation.
#8: Aesthetic and minimalist design	+ Clean Interface - Generally Uncluttered & Straightforward Initialization process.	**!** social media login options could move to the first login page, since they can be made to work for first-time or returning users.
#9: Error Recovery	- No mechanism for indicating errors with account creation or problems with	**Δ** Provide detailed error messages on login screen for problems found with login info
#10: Help and documentation	+ First App Screen clearly establishes if user is logged in or not - Main screen gives no indication of what account is being used	**Δ** Add indicator in settings or homescreen for showing what account is logged in.

Appendix B
Heuristic Evaluation Walkthrough #2

User: Carter Fritsch **Task: Inventory Management**

Heuristic	Findings: Positive/Conformance (+) & Negative/Nonconformance (-)	Potential Fixes(Δ) & Other Insights (!)
#1: Visibility of system status	+ Highlighted filter quickly communicates what category of ingredients are shown	**Δ** Add number indicators to show number of ingredients in a given filter category
#2: Matching Real World & System	+ Placement of "Inventory" Button on Scan screen recalls the "Gallery" access button on many Camera UIs, connecting a familiar concept	**Δ** Move 'shopping list' to top right (where it is found in most shopping related apps)
#3: User Control & Freedom	+ Inventory filtering allows finding specific kinds of ingredients. - Inventory only links back to main screen	**Δ** Give options for scanning and adding manually on the inventory page **Δ** Allow custom ingredient filters
#4: Consistency	+ Heart Symbol in inventory corner reflects favorited status, same symbol as in individual item screen.	
#5: Error Prevention	- User cannot know they need to add more ingredients or not until searching for a recipe.	**Δ** Add indicator on or near recipe match button showing number of currently-matched recipes.
#6: Recognition over recall	+ Heart symbol intuitively marks an item as favorite - Heart does not make clear that it should be 'clicked'	**Δ** Give the 'favorite' heart a full enclosing button, caption, or other indicator of 'toggling' purpose
#7: Flexibility and Efficiency of Use	+ Edit item allows customization for semantic interests of users	**Δ** Allow custom ways to filter inventory ! Add field for populating item quantity / source / expiration / price
#8: Aesthetic and minimalist design	+ Scan tool is uncomplicated and uncluttered - Object image takes up larger portion of item screen than needed	**Δ** Let image can be minimized / collapsed on scroll
#9: Error Recovery	+ Insufficient ingredient search points to - Same search only gives one option for resolution	**Δ** Offer additional resolutions for error resolution
#10: Help and documentation	- Help options not readily available on any screen	**Δ** Add help selectors to corner of pages / give a 'Manual' option in the menu.

Appendix C
Heuristic Evaluation Walkthrough #3

User: Dylan Kieu **Task: Recipe Discovery**

Heuristic	Findings: Positive/Conformance (+) & Negative/Nonconformance (-)	Potential Fixes(Δ) & Other Insights (!)
#1: Visibility of system status	+ recipe search function is straightforward as the button clearly indicates what it does (match recipe) +Search bar prompts user to enter name/title	
#2: Matching Real World & System	+Placement of the match button allows user to make the connection of the button's function -"match" is not universally used as opposed to "search"	Δ Change "match" to "search"
#3: User Freedom	-Users are forced to go through the recipe book to search for specific recipes. -Filters are only set for recipes users look up and not when they want to match it with a recipe from inventory.	Δ Allow users to specify filters when they match recipe from their ingredients
#4: Consistency	+Back arrows are consistent. Search button colors/button style is consistent with previous search buttons.	
#5: Error Prevention	+tells users what to enter in search box -No quick link or auto fill	Δ Maybe do not specify starting filters, have it under an advance tab that would allow users who want to filter things out to do so. Also the placement is after the search so users may press search before looking at filters. Δ Could provide users with an autofill option that may prevent spelling errors
#6: Recognition over recall	+back button and the search bar are universally used.	
#7: Flexibility and Efficiency of Use	+allows user to enter custom names and filters.	
#8: Aesthetic and minimalist design	+not cluttered, presented neatly for users -filters is preset and after the search function	ΔCould hide filters under a "advance" tab or something similar
#9: Error Recovery	-No error messages for spelling errors or that there are no recipes under certain filters	ΔInclude an auto spell-check when users type. Prompt users telling them that no recipe was found by that name.
#10: Help and documentation	-Help is not readily available incase user gets lost	Δ Implement a help icon to possible provide tips and tell users what to do. Could possibly include a beginners guide to the app.

Appendix D

User: Yu Chuan Tey **Project 7 - Analytical Evaluation**

1. **Ease of Use (Recognition rather than recall)**
    a. Will you be lost or unable to navigate to the page you want or don't know what is going on?

        No, is really easy to navigate to the page that users want and also will not know what is going on.

    b. Can you go forward and backward easily and quickly get back to the homepage?

        Going forward and backward is easy, because there is an arrow on the top left to to backward. Going back to the homepage take longer time due to there is no home button.

    c. Is it easy to delete something that you don't want after scanning it in to your recipes' item list?

        Yes, there is a “x” button at the top left of each ingredient in the inventory. This will be a lot easier to remove the ingredient that you don't want.

2. **Usefulness (Match between system and the real world)**
    a. Will you feel disconnected to the world when using the app?

        No, the app is friendly and easy to use. Most of the things look clean and easy to navigate.

    b. Are you annoyed or easily frustrated when using the app?

        No, the app is so easy to use and things are useful and working.

3. **High-level view (Visibility of system status)**
    a. Is inventory clear and easy to understand?

        The inventory have different category(ie. all, meat, other), which means that user can find an ingredient they want easily. There is also a “match recipes” button and “shopping list” button. Therefore the inventory is really clear and easy to understand how to use.

    b. Is the result of scanning (success/failure) easy to understand?

        The result of scanning should be easy to understand and less failure.

    c. Is the match between inventory and recipes presented clearly?

        The match between inventory and recipes are present clearly.

4. **Consistency (Consistency and standards)**
    a. Do identical or similar buttons on different pages do the same thing?

        The similar buttons on different pages do the same thing, for example the top left arrow always go back to a page.

    b. Is the arrangement similar between pages?

        The arrangement are similar between page, some pages have the same outline, such as 2 column for the buttons.

    c. Are there buttons that contradict expectations established by other buttons?

        No, buttons that did not contradict expectations by other buttons.

5. **Feedback (Error prevention)**
    a. If a user has an error during log in, does the app let you know specifically why?

        When user has an error during log in, the app should let the user know the password or Id is incorrect.

b. When unable to identify scanned items, does the app adapt to the error level by either suggesting possible items or indicating ways to improve a scan?

The app did not have any suggestions or show any error when unable identify scanning items.

6. Graceful Recovery (Help users recognize, diagnose and recover from errors)

a. Are error messages understandable and descriptive? Do they make follow-up actions clear?

There is an alert message when clicking match recipes in the inventory page, when inventory's ingredient does not match any recipes, then it will show error.

7. Timeliness (Flexibility and efficiency of use)

a. How long do users take to get from the home screen to an item page in a task?

users have to log in to their account, then they can choose to go inventory, recipe book, menu, setting, and scan. When user choose to go inventory, then user is in the item page. Therefore does not take lots of time.

b. Does the app give ways to quickly revisit frequently used pages? Are there any shortcuts that directly navigate there??

The app didn't have a ways to quickly revisit frequently used page. There is also no shortcuts.

c. When scanning items, is it takes a long time to figure out what the item is.

Usually it doesn't take long time to figure out what the item is.

8. Clean Presentation (Aesthetic and minimalist design)

a. Does the app contain too many controls or options on a specific page?

The app does not contain too many controls or options on a specific page. All the control or options are useful and will not feel extra

b. Do item pages & recipe pages have information that is readily useful to users?

All the pages have their own information that is readily useful to user.

c. Is every function of each page clearly defined and free from distraction?

Every function of each page clearly defined and free from distraction. Every button has their own purpose and which means that they are free from distractions.

9. Usage Flow (User control and freedom)

a. Is it easy to connect use of related tasks together? (e.g.: going from scanning a few items to finding relevant recipes)

Yes, it is easy to connect all related tasks together. For example, when users scan an item. Then the item will save into inventory page. In the inventory page, user could open recipe page or shopping list page.

b. Are tasks connected in logical ways at various junctures in their process? (e.g.: can you go from the homepage to searching for a recipe to seeing what ingredients you have scanned or need to purchase)

The tasks are connected in a logical way and are connected all the tasks together.

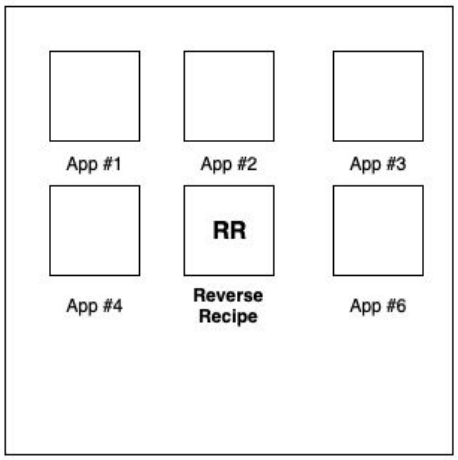
10. Help (Help and documentation)

a. Do labels and instructions presented in-line adequately answer user questions, without needing a dedicated help section?

The instructions for the error message answer user questions. For example, the allert page, it clearly show that "your inventory items are not match to a recipe". User will know clearly what is going on and also there is a suggestion to how to solve the problem.

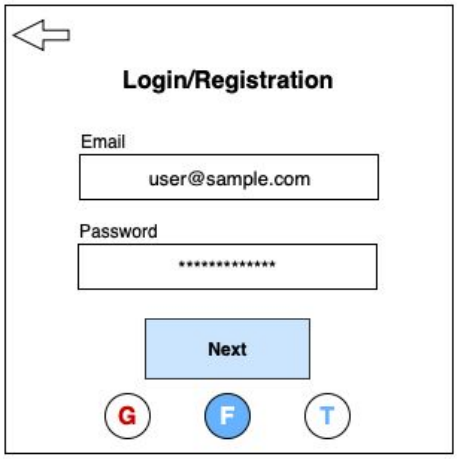
Appendix E
Prototype Screens

#1 App Icon

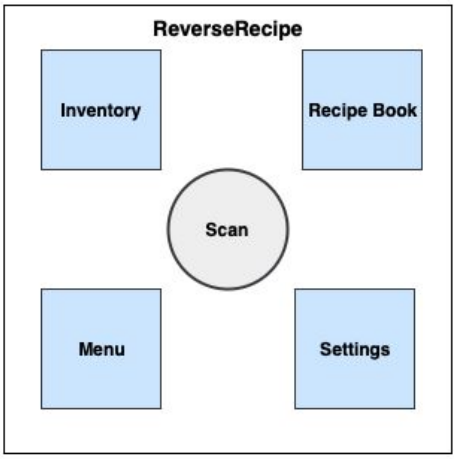


#2 Start

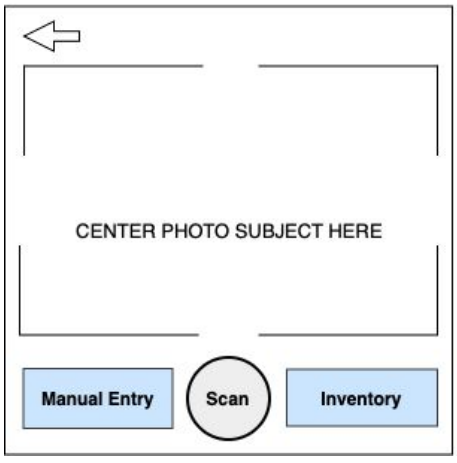
#3 Login/Registration



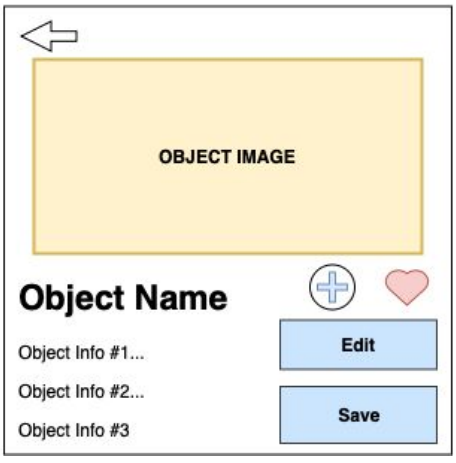
#4 Homepage



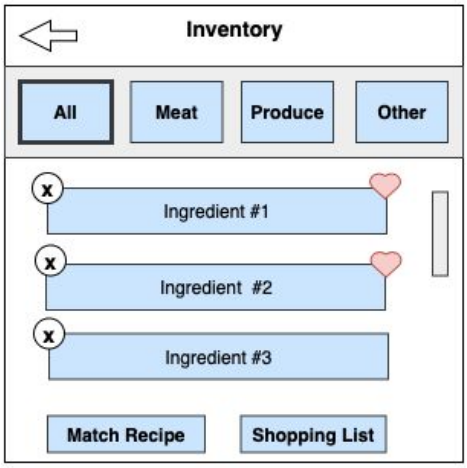
#5 Item Scanning



#6 Object Modal

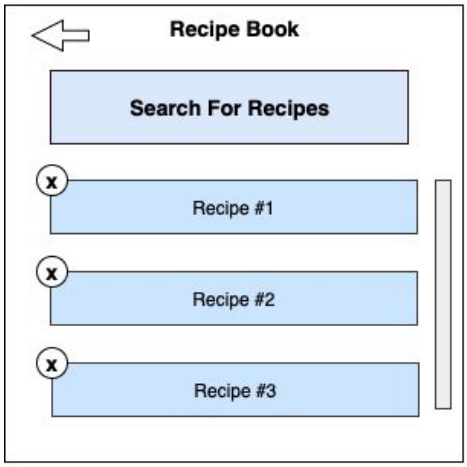


#8 User Inventory

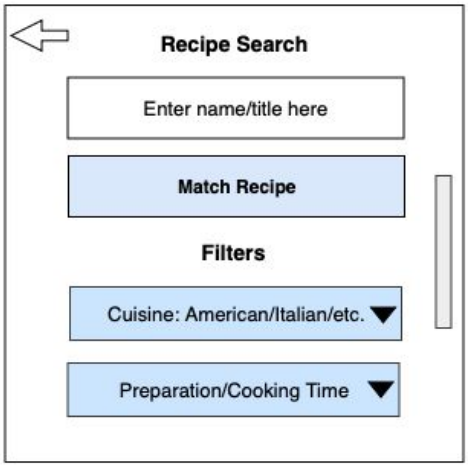


#9 Alert

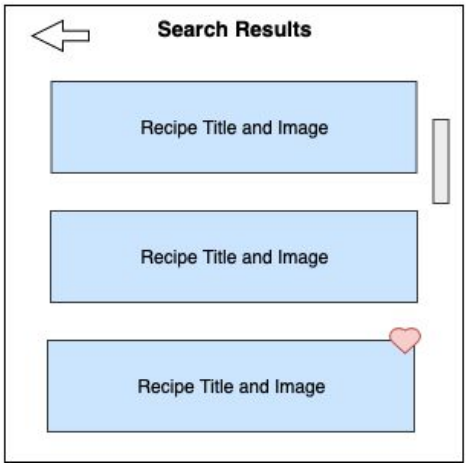
#10 Recipe Book



#11 Recipe Search

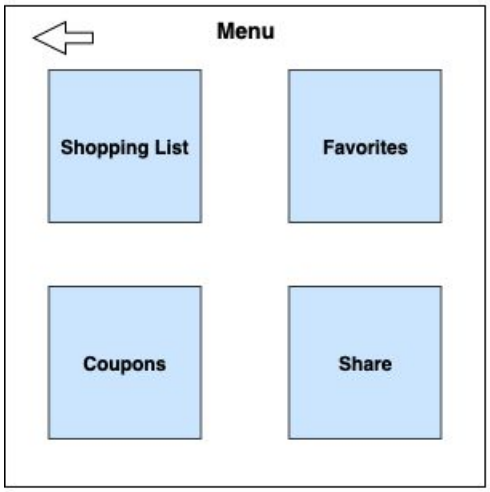


#12 Search Results

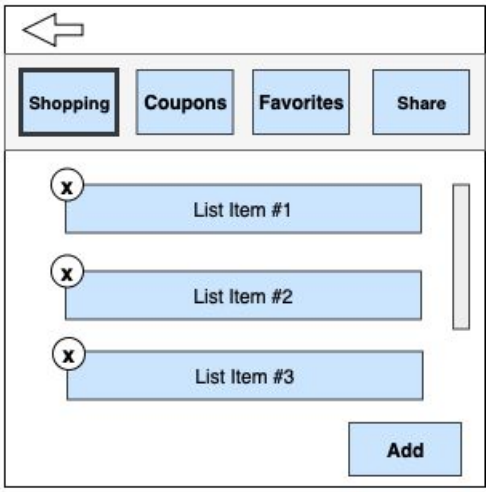


#13 Recipe Information

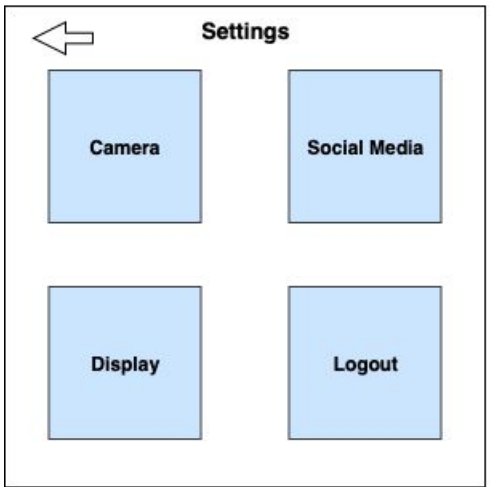
#14 Menu



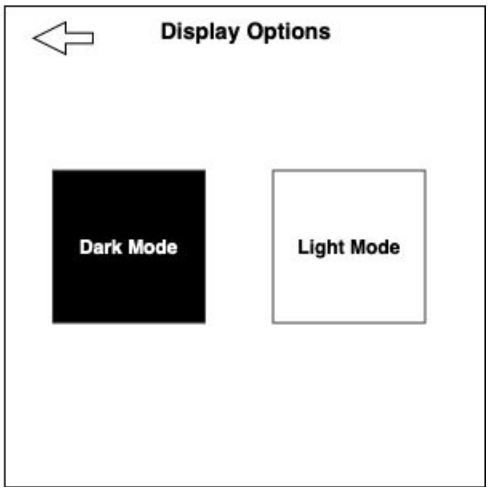
#15 List View



#16 Settings



#17 Display



Appendix F

Empirical Observation

Researcher: Shannon Farazi

User: Married male in his early 40's that is an expert in using technology and web services applications. He currently manages his own construction company where he collaborates with others in building high rises in major cities. He is an ideal candidate as he fits the demographic of the target audience, has a busy life, and does not have previous exposure to our application design.

Observations

The research was conducted in the user's office at his workplace with minimal, but not distracted background noise. User was calm and ready to examine the prototype. User was provided with basic information regarding the purpose of our project and what is the goal of this interview. The revised task description was provided to the user. User read and understood what he needs to do. He expressed that he was familiar with similar apps like this one and got excited about being a part of the development of Reverse Recipe app.

The user's utilization of the app was documented as he navigated from screen to screen of the provided paper prototype. The documentation is as follows:

Screen #1:
User expressed that he would first press the "Reverse recipe" button to access the app as he placed his finger on RR logo.

Screen #4:
User was happy that the app remembered him and granted him access without going through the login entry again. He liked the Homepage display and noted that it is simple enough for anyone to be able to easily access the scan button. He pressed the "Scan" button.

Screen #5:
User praised the simplicity of the scan page and expressed that he is presented with enough information through the screen design of "Manual Entry", "Inventory", "Scanning", and "Back" buttons. He pretended that he scanned a can of chilli beans by pressing the "Scan" button.

Screen #6:
User imagined that he sees the image of the can of chilli beans on the top. He liked adding and favoring the chilli beans. He pretended to press both. He noted that by pressing edit, he can make changes on the same page like changing the name to "Hot Chilli Beans". He also mentioned it would have been more helpful if entry box borders change color as a result of pressing the "Edit" and "Save" buttons. Then, he pressed the "Back" button to go to the previous screen. He mentioned it would be nice to have some shortcut buttons on the bottom of the page so that users can go to "Inventory" faster.

Screen #5:
User hesitated to press the "Manual Entry" button and expressed that he figured he could manually enter information when he was on previous page. He noted that he would not want to do that because scanning is faster. He pressed the "Inventory" button.

Screen #8:
User noticed the top banner and mentioned how nice it is to be able to filter the inventory. He liked that his favorites were depicted clearly, but he expressed he would like to swipe the entries to delete them rather than has his big finger on the “X” buttons. Then, he continued by pressing the “Match Recipe”.

Screen #9:
User was in favor of the “Alert” message and expressed that he did not expect to give him the”Shopping List” button. He thought that was clever and new. Then, he wanted to press the “Shopping List” button, but pressed the”Back” button since he realized the “Shopping List” button is not functional yet (AKA Screen #10 is about Recipes).

Screen #8:
User pressed the “Match Recipe” button and pretended that he has enough inventory.

Screen #12:
User mentioned that he liked seeing that his favorites show up automatically similar to previous screens. He then pressed the first button..

Screen #13:
User excitingly said, “oh, so here I can favor them.” He then pretended that he can scroll down and see all the info on this page. User was informed that he has completed the task.

Overall the user did not have any problems completing the task successfully. He expressed his likes and dislikes freely. He also suggested that the presence of shortcut buttons for some of prevalent screens is needed in his opinion. However, he was satisfied with the app’s progress so far and mentioned that he thinks it is innovative and provides users with never tried before options.

Questionnaire

1. **How did you feel about navigating through the app to perform the task?**

   I felt it was easy enough for anybody to do it. I had no problems and went through it fast and was able to successfully complete the task while enjoying it.

2. **How difficult was it to find the scanning function? Did you find the process of scanning or manually adding items confusing at all?**

   It was very easy to find the scanning function. Nothing about the app confused me and I had no problem scan or add items. I personally love the scanning part, but some people might want to manually enter items.

3. **Can you think of any changes that might improve the feature?**

   Yes, I mentioned it before too that if the border of entry boxes change color to indicate they are saved or being changed, it would be nice and more user friendly. In addition, the shortcut buttons at the bottom of the page would be nice for fast access to some main pages rather than utilizing the back buttons all the time.

4. **How difficult was it to access the ingredient inventory page?**

   Nothing was difficult to access on the app. I didn’t have any problem accessing the ingredient inventory page. I believe there were more than one way to get there, but I would add a third shortcut if possible. I think the inventory page is one of the most visited pages of this app.

5. **How difficult was it to search for a recipe?**

   I think it was easy as it has a dedicated button, “Match Recipe”. I saw a “Recipe Book” button on the home page. If it allows me to search for some good recipes that way too, it would be nice. You know like multiple ways to do a search.

6. **Did the recipe page present all the information you would want? Was it presented in a way that was easy to read or find what you wanted?**

   II think it was simple enough since I had no problem with it in its basic form. I’m sure it would be even more hyped up later on with pictures, videos and such.

7. **What changes would you make to the recipe page?**

   Since this is the beginning of development for this app and I was presented with a paper prototype, I didn’t expect hyped up presentation and interactive animations. I would expect it in the final product though.

8. **How difficult was it to figure out how to add a recipe to your favorites?**

   It was easy for me. The heart symbol is pretty universal sign for favorites.

9. **Do you have any overall impressions of the app you would like to share, based on what you experienced while performing the task?**

   No, I was happy with what I saw. It was very simple, discoverable, user friendly and innovative. I can’t wait to see the final product.

10. **Do you feel that the app/task was easy to understand, or would you have preferred to be given an in-app tutorial before beginning?**

    No, it was easy and straightforward enough to not need tutorial. I think the app requires someone who is willing to explore and do lots of clicking, taking pics and such. If someone needs a tutorial then they would not be long term users of the app.

11. **Did you feel like you were lost at any point while navigating the interface?**

    No, I didn’t. I was always eager to click and see more.

12. **What did you like and/or dislike regarding this experience?**

    I like it since nowadays basically piece of technology requires you to go through a similar thing in one way or another.

13. **Any other thoughts, questions, or comments?**

    No, I think I have said enough.

Appendix G

Empirical Observation

Researcher: Michael Ton

Subject Married female, approximately in her mid-30's. Works full-time in healthcare. Husband works full-time, and they also have a four-year old son. She describes herself as "a busy mother and wife" and reports that her skill with technology is "good". No prior experience or knowledge of the ReverseRecipe app.

Observational Notes

User test took place in the subject's home, with no other individuals in the house at the time. No background noise occurring. Prior to being given task, subject appears calm, to be in an "average"/"ordinary" mood. Subject has noted that she is interested in what she'll see. Subject does not seem confused and expresses that she understands the task after receiving the task description and pre-conditions, which appears to fit her reported familiarity and/or adeptness in handling technology. Subject asked one question before the task, asking if she had to actually go grab items to scan or if she could pretend. She was informed that she can pretend to scan any number of objects she wanted.

The following list shows the user's progression through screens during the task and observations of the subject. The numbers denote the current screen number of the user as they perform the task.

#4: User selects "Scan" button, laughing a little bit while noting that it was easier to find than she thought.

#5: User holds up paper, as if it were a camera, then sets it back down and presses the "Scan" button.

#6: User tries the "Edit" button, but is not given a new screen. She looks at researcher for a moment, as if a bit confused, and hits the "Favorite" button and then the "Save" button after a couple seconds.

#5: User pauses for a moment before selecting "Scan" again.

#6: User hits the "Save" button. User does not seem confused this time.

#5: User hovers over the "Inventory" button for a second and clicks it.

#8: User tries selecting "Meat" and "Produce", then comments "Oh, it probably looks the same" upon realizing she will not be given a different screen for clicking them. After looking at the screen for a few seconds, user selects "Match Recipe" while commenting: "I'm guessing this is it".

#12: User mentions the hearts, telling herself "That must mean it's a favorite" and noting that she saw it earlier for the item additions. User selects the second recipe on the list.

#13: User observes the information screen, and jokes that "maybe I should have picked a different one since this one is only four stars" (in reference to the UI showing 4 out of 5 stars for the current prototype screen). Researcher confirms that the task is now complete.

The subject was able to complete the given task in a quick manner, and did not seem to struggle at any given point. There seemed to be some confusion with the “Edit” function in screen #6, but she seemed to understand that it may function differently than she expected, which is discussed in the questionnaire.

Questionnaire

1. **How did you feel about navigating through the app to perform the task?**

At first it was kind of weird, just because it was all done through paper. It was interesting to experience **laughs**. Other than that, I think it felt really easy. I didn’t have to do any guessing or anything like that to find out where to go.

Did having to use the papers to do this make the task feel difficult or uncomfortable?

No, it was just weird. Having the papers handed to me when I “clicked” a button was just funny, but I could see how everything worked and it makes sense.

2. **How difficult was it to find the scanning function? Did you find the process of scanning or manually adding items confusing at all?**

Very easy. The scan button was right there in the middle of the paper when you open the app. Adding ingredients in wasn’t hard either, seemed like a typical “take a photo” thing, like it reminds me of how my Bank of America **(BoA)** app lets me scan in checks to deposit it that way.

So did using a scanning feature before make this easy for you? Or maybe a better question is, was the scanning feature in the BoA app hard to use at first?

It wasn’t hard so I don’t think it would be hard here if it were my first time using that kind of feature. I know in the BoA app, it can be finicky with lighting and stuff. Oh, and I was also thinking about when scanning, if you only need to take one picture or just scan from one angle? It might be useful to have make people scan from multiple angles to make sure it identifies the right thing if there’s no barcode.

So similar to how Face ID on iPhones have you move your head to get all angles from the front?

Yeah, like that. That might be far ahead of what you guys are trying to do, but when I hit scan I was sort of expecting to have to do that and differentiate between a barcode and an actual object, like an option.

3. **Can you think of any changes that might improve the feature?**

Besides the scanning thing I just talked about, I was a little confused about the editing button. When I tried clicking it I wasn’t given a screen, so I guessed it would just be done on the same window but it wasn’t clear. So maybe use another screen for that or make it more clear how that’s done?

4. **How difficult was it to access the ingredient inventory page?**

Not difficult since I could go there using the button after adding stuff in. I think that was useful instead of having to go back to, I think it was the first screen of the app that had another Inventory button.

5. **How difficult was it to search for a recipe?**

It wasn't difficult, but the words "match recipe" on the button I clicked made me kind of double-take before I clicked it. It makes sense, but I don't know... I think it could be worded better?

Any suggestions that would make it better?

Something like "Find a Recipe Using Your Ingredients"? That's a little long though, so I'm not sure. To clarify, since I knew what the task was, I could guess or figure it out easily, but the wording just seems weird. That's just my opinion on it.

6. **Did the recipe page present all the information you would want? Was it presented in a way that was easy to read or find what you wanted?**

It was all good I think. It was clear what it's supposed to look like and seemed simple.

7. **What changes would you make to the recipe page?**

There was one thing that was odd. I remember on the page to add ingredients, there was a heart and then a save button, which made sense to me because I figured the heart would mark something as favorite, and the save button would like, add it to your current stock. But the recipe page only had a heart? I know task was just to see the recipe info, but it felt like that page was missing the save button because it seems like there's a difference between saved and favorited things.

8. **How difficult was it to figure out how to add a recipe to your favorites?**

Easy, the heart makes it obvious what it's for. **laughs**

9. **Do you have any overall impressions of the app you would like to share, based on what you experienced while performing the task?**

Yeah I mean, it would be a pretty straightforward and easy to use app. Things are clear, you know, nothing is too cluttered I think. It would look good on a phone screen. I don't think I have any problems with it. I'm curious to see what the final product would look like.

10. **Do you feel that the app/task was easy to understand, or would you have preferred to be given an in-app tutorial before beginning?**

Easy, although I'm sure it might not be easy for others. Like my parents might need a guide for the app when they first use it.

11. **Did you feel like you were lost at any point while navigating the interface?**

No, I don't think so. The task was straightforward and it seemed like the app was streamlined. An example is being able to go straight to inventory after scanning things. That makes it easier instead of having to go backwards and go somewhere else in the app to get there.

12. **What did you like and/or dislike regarding this experience?**

In terms of the "testing" experience? It was different, it felt like a test that I did well on so that felt good... **laughs**. I don't think there was any issue with anything. The app seems like a nifty idea.

**Would something like this be helpful to you?*

Yeah I think it could. If it ends up as quick to use as it seems to be, then I could see myself using it. If it feels tedious, or like too much effort for what it does I guess? Then I might use it less after a while.

13. **Any other thoughts, questions, or comments?**

I know this is still very much in-progress, so it might not necessarily look like this in the end, but I like the simple aesthetic of this early version, and I hope that kind of somehow stays in the end.

Peer-Evaluation of Team Members:

Table 1: Group members, Assigned Tasks, and Task Completeness Grade

Group Member name	Role	Responsibilities and Assigned tasks	Tasks Completeness Grade* 0-5
Shannon Farazi	Leader	● Managing the meetings ● Empirical Evaluation ● Helping on writing the document	5
Carter Fritsch	Collaborator	● Analytical Evaluation ● Helping on writing the document	5
Dylan Kieu	Collaborator	● Analytical Evaluation ● Helping on writing the document	5
Yu Chuan Tey	Collaborator	● Analytical Evaluation ● Helping on writing the document	5
Michael Ton	Collaborator	● Empirical Evaluation ● Helping on writing the document	5