

Project Milestone 5: Final Prototype and Process Book

Process Book

This is our team's process book documenting all the design processes for the final prototype. This will cover all the details including whom we designed for, the reason why we targeted them, how we developed insights, how we made design decisions, and how we arrived at our final design.

Motivation

Our primary target audience is college students who are willing to cook healthily with limited experience. As college students, we've heard too often that students have a hard time planning and preparing their meals and we understand how difficult it is especially under time and money constraints. Our team's ultimate goal is to help college students reduce time spent on planning meals and cooking while saving some money.

Most college students are situated in densely populated areas – usually urban areas. While students in urban areas may benefit from convenient access to grocery stores, other students in less densely populated areas – such as college towns – have a very limited chance of visiting them. Another common aspect of the group is that they want to spend less time preparing meals as their lives are too busy. Students primarily rely on the internet to look for recipes. However, their lack of experience makes it challenging to make great use of them. Therefore, our team anticipated that many of the stakeholders would be interested in making the best use of the ingredients in their hands – while achieving maximum efficiency of their time and money.

Empathize

To gain a better understanding of how college students prepare meals and eat, our team conducted two different methods – survey and interviews. Through the survey, our team was able to gather large data that helped us analyze how students' dietary habits differ from one another and their preferences. Our team sent out an online survey to reach as many participants as possible. In addition, the anonymous nature of the survey encouraged the responders to be more reliable in their responses.

Below is the initial survey. Questions were intended to ask about their dietary habits, cooking skills, etc. – in order to understand what potential problems our target group is facing.

Survey

1. Age (select one)
 1. 15-20
 2. 21-25
 3. 26-30
 4. 30+
2. Gender (select one)
 1. Male
 2. Female
 3. Other
3. Major (short response)
4. What is your definition of being healthy? (long response)
5. How many meals do you eat per day? (numeric short response)
6. Do you think you currently have healthy eating habits? (yes/no)
7. Do you meal prep? (yes/no)
 1. (If no to the previous question) What is the reason why you do not meal prep? (short response)
8. How do you learn about recipes? (short response)
9. Can you please tell us why you are satisfied/dissatisfied with your current learning method? (long response)
10. How much do you spend on food on a monthly basis? (numeric short response)
11. Did you learn some cooking from home before coming to college? (yes/no)

12. Do you cook? (yes/no)
13. What are the reasons why you cook/don't cook? (long response)
14. Are you satisfied with your current lifestyle related to eating (how to learn, meal prep, etc.)?
15. (If no to the previous question) What do you want to change or learn more about?

Though our initial intent of the survey was to attain a mass amount of data, there were several limitations; 1) several questions failed to elicit answers directly related to our research goals; 2) some questions should have been designed to make participants answer with more details.

Reflecting on the survey questions, our team realized questions 7, 8, and 9 were the most successful in eliciting insightful answers while questions 4, 6, and 10 failed.

3 Good Questions:

Q7 – Not only our team estimated that around 60% of college students prepare meals, but we identified that some of them think of cooking as a hassle. As a result, our team focused more on ideas that may make preparing meals less burdening.

Q8 – Our team learned that the majority of the potential users rely on Youtube videos to look for food recipes – indicating that college students have some interest in food recipes even if they find cooking time-consuming.

Q9 – This question revealed that college students who picked YouTube showed huge satisfaction with it, mentioning how easy it is to follow the step-by-step instructions. At the same time, several students pointed out the difficulty of choosing between the videos as there were too many. Some students also mentioned that they had to rewind videos to look for details while cooking or adjust the amounts of ingredients by themselves – which is somewhat of a hassle. This question brought us to come up with the idea that “recipe recommendation” can reduce the stress coming from meal planning.

3 Bad Questions:

Q4 – This question failed to gain relevant answers to our research goal. Asking about the personal definition of “being healthy” was too subjective; answers varied a lot and many of them were irrelevant to diet.

Q6 – Although this question revealed that around 40% of the students don’t think they cook healthy meals, our team could not gain any more insights. We should have added follow-up questions regarding the reason why they think in that way.

Q10 – Our team found that college students spend about \$5~8 per meal through this question. However, the average amount was not useful information regarding our team’s research goals. Instead, we should have asked if they were satisfied with their grocery expenditure or their personal priorities.

Our team changed the 3 bad questions to below before conducting interviews.

Q4 – What is your definition of a healthy diet?

Q6 – Do you think you currently have healthy eating habits? (yes/no) What is the reason? Do you want to improve it?

Q10 – Rank the items in the order you think is important in your dietary life.

<Nutritional balance, time spent on preparing meals, money spent on groceries, etc.>

Thanks to the feedback, our team managed to make adjustments before executing the interviews. With the higher-quality answers, our team was able to dive deep into potential users’ needs and to better understand their individual motivations and challenges in their dietary lives.

Interview Protocol (Group 2)

Interview No: _____

Date: _____

Thank you for your participation today. My name is _____ and I am a graduate student at the Georgia Institute of Technology. This interview will take about 30 minutes and include several questions regarding your dietary life. I would like your permission to record this interview for accurate documentation. If, at any time during the interview, you want to reorder or exclude something from the record, please feel free to let me know. All your responses are confidential.

The purpose of this interview is to investigate the barriers and factors to providing healthy and balanced meal options for college students with limited cooking experience and budget.

Your participation in this interview is completely voluntary. Do you have any questions before we begin? Then with your permission, we will begin the interview.

1. (Demographics) Age, Gender, Major?
2. What is your definition of a healthy diet?
3. Do you think you currently have healthy eating habits? What is the reason? Do you want to improve it?
4. How many meals do you normally have in a day? Do you eat at regular hours?
5. How many times do you usually eat out in a week?
6. Do you cook? What is the reason?
7. Do you meal-prep (cooking a large portion of food in advance)? What is the reason?
8. How do you learn about recipes? Are you satisfied with the current method of learning? Were there any difficulties with it?
9. Did you learn cooking from home before college?
10. How much do you spend on food monthly? How much on prepping a meal on average?
11. How much money do you spend on ordering a meal on average?

12. Rank the items in the order you think is important in your dietary life. <Nutritional balance, time spent on preparing meals, money spent on groceries, etc.>

13. What is the maximum time/budget you're willing to spend when preparing a meal?

*** If the participant wishes to discontinue, ask if they would be willing to share why:

Thank the participant for his/her participation.

According to the results of the survey and interviews, most participants wanted their meals prepared in around 30 minutes. An interviewee said, "Working on schoolwork and other work is more important to me than putting an unnecessary amount of effort into making food." Another said, "While I find cooking interesting, I don't have anything in my kitchen, so I gotta work with what I have." Our team began thinking of potential prototypes based on these findings.

Define the Problem

As we conducted our user research, we discovered a few pain points that college students and new graduates face when trying to learn how to cook healthy meals. Here are the pain points we found:

Limited Time: Many college students have busy schedules with classes, homework, and part-time jobs. They often don't have much time to devote to cooking, which can make it challenging to prepare healthy meals regularly.

Evidence: Our interviews showed that users struggle to find time for cooking and often resort to fast food or frozen meals. In our task analysis, we observed that users frequently searched for quick and easy recipes that didn't require too much time. For instance, we spoke with our persona, Shreya, who is a busy college student with a restricted diet. She shared her struggle to find new recipes that suit

her dietary restrictions that require less effort to prepare. Shreya also mentioned her limited cooking skills, which make it challenging to cook healthy meals.

Lack of Knowledge: Another pain point is a lack of knowledge about cooking skills. Some users may not know how to cook making it difficult to create healthy meals.

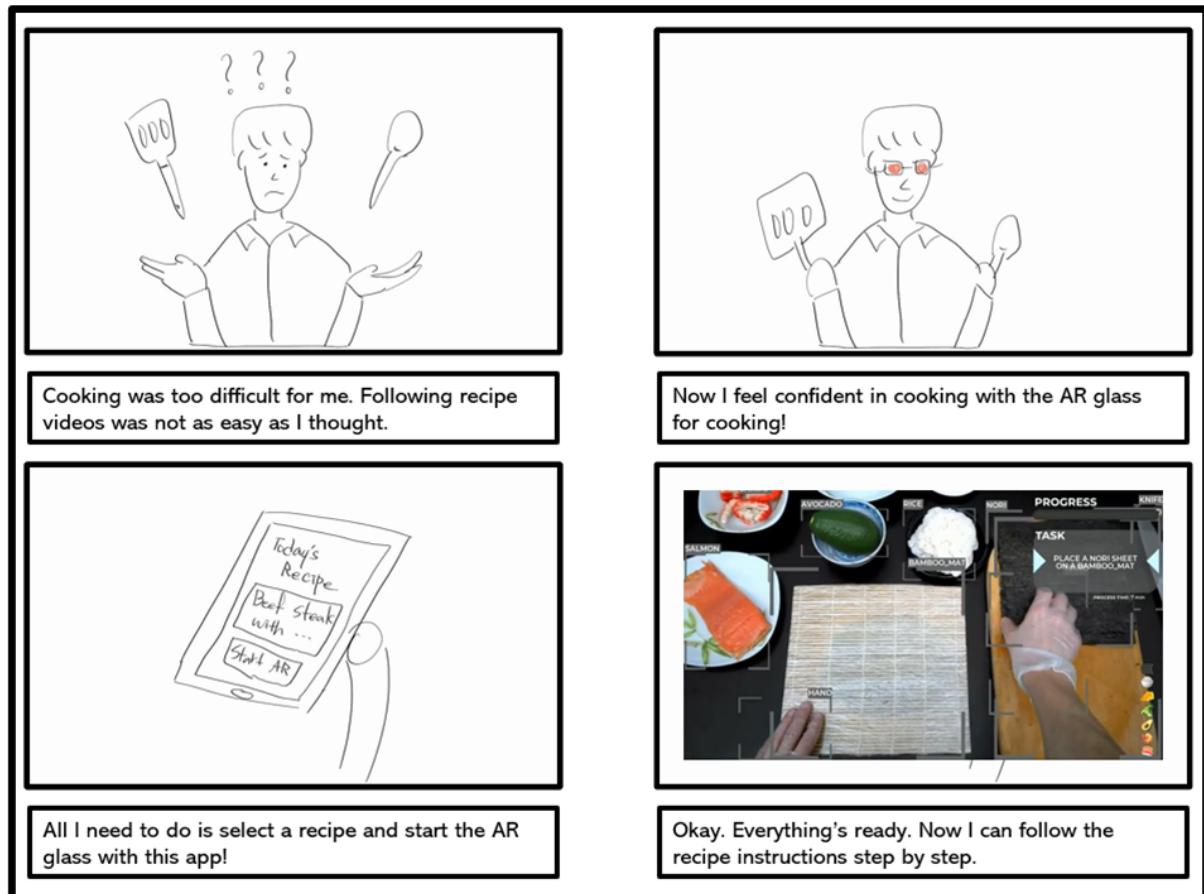
Evidence: In our interviews, we found that some users were unsure of what ingredients they had in their fridges or how to use them to make a meal. Our personas also showed that many users didn't have much experience with cooking and relied on basic recipes or pre-packaged meals.

Dietary Restrictions: Many college students and new graduates have specific dietary restrictions, such as allergies or intolerances, that make it challenging to find recipes that fit their needs.

Evidence: Our interviews/ surveys showed that users often struggled to find recipes that met their dietary preferences. In our task analysis, we saw that users frequently filtered search results by dietary requirements. In our user research, we came across Justin, a college student who is allergic to gluten. Justin shared his frustration with finding gluten-free recipes that suit his taste buds and are easy to prepare. He also mentioned his struggle to identify gluten-free ingredients and the time-consuming process of finding suitable substitutes.

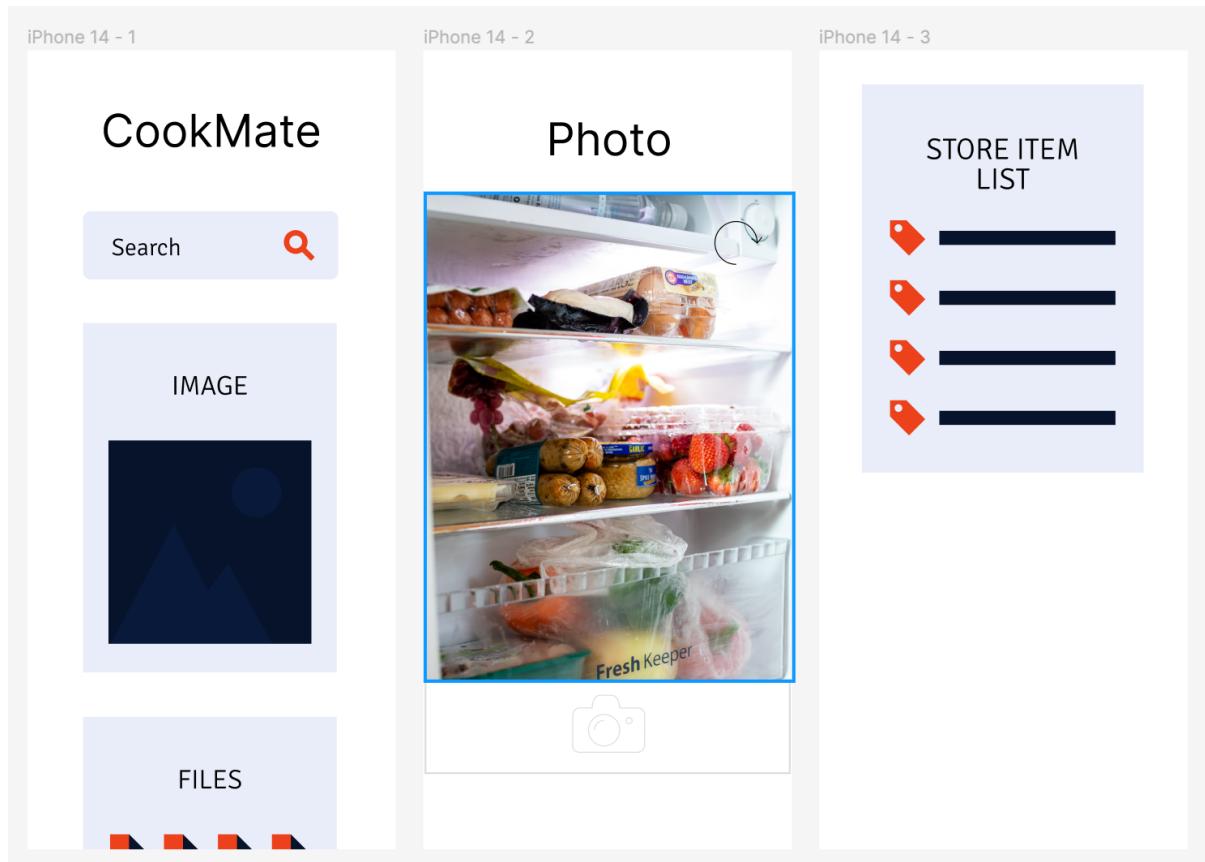
Prototype - 1st Iteration Process

Prototype 1: AR Glass for Cooking & Recipe



The first prototype is an AR glass for cooking & recipes. Users can choose the recipes they want and start the AR feature through a mobile application. AR glass then helps the user cook by giving detailed instructions on the recipe. Prototype 2 is designed to address the following scenario. In this scenario, a typical graduate student wants to start cooking by himself in order to have healthier meals. He, however, does not have prior experience in cooking and of course, does not know about any recipes. Fortunately, he finds out that there are tons of useful recipe videos on Youtube. They are actually very helpful in learning new recipes. But he feels it's a hassle to rewind the videos to look for details while cooking at the same time. Plus, he has to watch the recipe videos again and again whenever he cooks as he cannot remember the exact process. But now, thanks to the AR glass for cooking (Prototype 1), it's so much easier to follow the exact instructions step-by-step without a need to memorize anything.

Prototype 2: Recipe and food image Uploader (CookMate)



In this prototype, users would upload an image and a generative AI would attempt to generate a recipe for the dish it thinks is in the image. Alternatively, a recipe could be uploaded, and generative AI could attempt to generate images of what the recipe has. The prototype would be something similar to the image-to-recipe algorithm, which would take an image as an input and generate a recipe based on the ingredients and dish it detects.

Prototype 3: Self-Assembly Application



The self-assembly app is designed to assist college students in preparing budget-friendly meals independently. Each package will feature unique codes, such as A21, that identify the required ingredients. Users can either scan the code or enter the product ID displayed on the box. The app will provide video instructions and/or a step-by-step recipe to follow along with. Additionally, the app will display nutritional information, including calorie count, protein, fat, and carbohydrate content. Users will also receive information about any necessary preparations they need to make in order to prepare the dish.

Chosen low-fidelity prototype: **Prototype 2 (CookMate)**

The reason for choosing Prototype 2 over the rest are:

Firstly, CookMate offers a unique and engaging user experience that is not commonly found in other food-related apps. The app allows users to upload an image and use generative AI to generate a recipe for the dish. This approach is creative, interactive and provides users with an opportunity to explore and experiment with their culinary skills.

Secondly, from our research, we have discovered that a significant number of users have encountered difficulty in determining what meal to prepare. Although users found it convenient to follow existing recipes, the process of creating a recipe based on available ingredients was deemed to be a challenging task. This implies that users require assistance in the ideation and creation of recipes, especially when limited by the ingredients at their disposal.

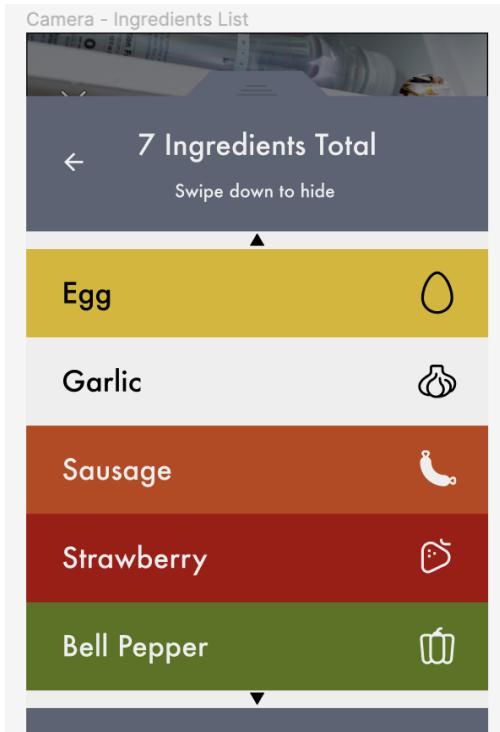
Thirdly, CookMate has a high potential for scalability. The app can be expanded to include more features such as personalized recipe recommendations based on user preferences, cooking tips and tricks, and community forums for sharing recipe ideas and techniques. This potential for scalability can help CookMate evolve into a comprehensive platform for food enthusiasts, chefs, and aspiring cooks.

Additionally, CookMate offers a unique solution for non-targeted users who want to explore their culinary skills and experiment with new dishes. The app offers a creative approach that is likely to attract the non-targetted audience as well.

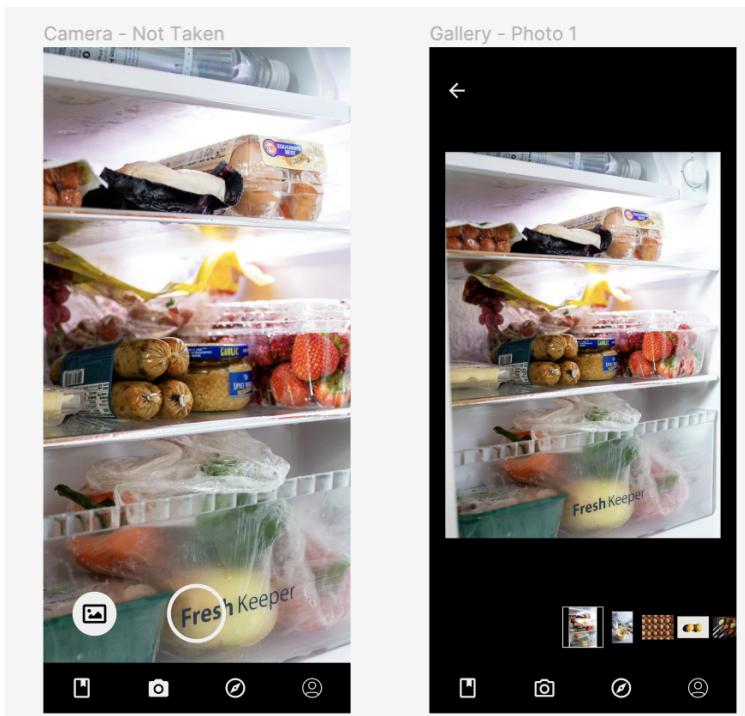
Lastly, while the other prototypes may have unique features, CookMate offers a unique selling proposition that differentiates it from the competition. The app uses generative AI to generate recipes based on images or vice versa, which is a unique and innovative feature that can attract users looking for something new and creative.

Improvements:

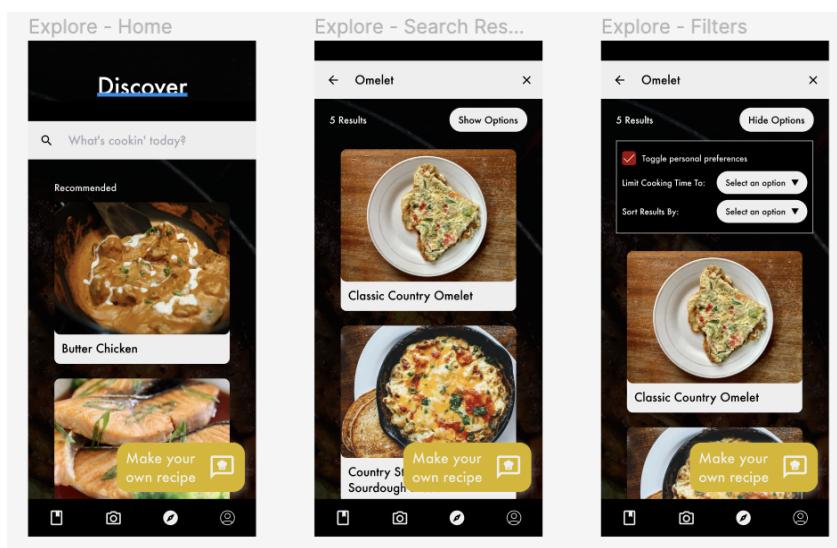
We have updated the features of CookMate based on user feedback to better address the needs of college students who want to cook healthier meals on a budget.



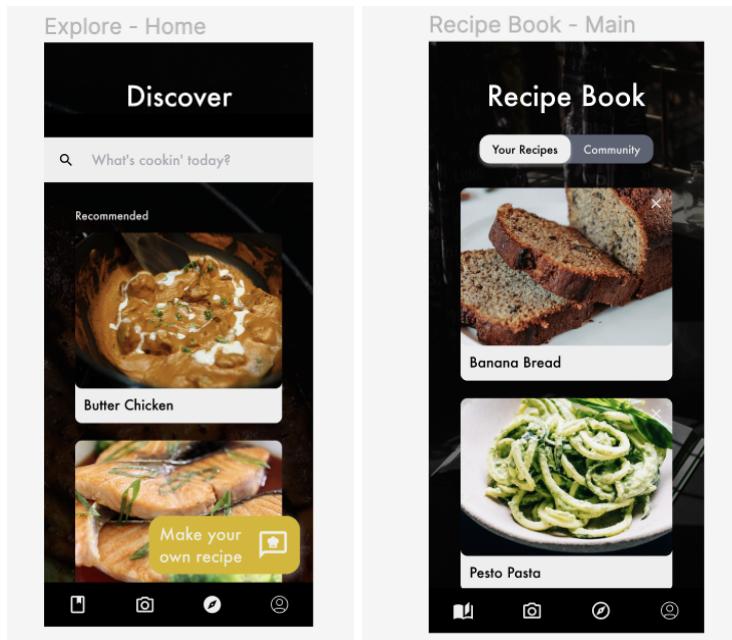
Set dietary restrictions: We have added a profile feature where users can set their dietary restrictions, such as dairy, gluten, or nut allergies. This feature addresses the pain point of users who want to find appropriate recipes based on their dietary needs. By setting their dietary restrictions, CookMate can generate recipes that are safe and suitable for them. By saving the restrictions, they don't have to input it every time, resulting in saving time.



Take multiple photos to scan all the ingredients: We have improved the app's ability to scan ingredients by allowing users to take multiple photos of their pantry or fridge to capture all the ingredients even if they are hidden behind something. Users can also edit/ add ingredients to their list because they may use communal fridges or pantries where some ingredients are not theirs. This feature addresses the pain point of users who want to keep track of their inventory and ensure they have all the ingredients needed for a recipe.



Discover recipes that take less than 30 minutes to cook: We have added a feature to filter recipes based on the time it takes to cook. Users can discover recipes that take less than 30 minutes to cook, addressing the pain point of college students who want to spend less time cooking and more time studying.



Save new recipes in your recipe cookbook: We have added a feature that allows users to save new recipes they discover in their recipe cookbook. This feature addresses the pain point of users who want to keep track of their favorite recipes and access them easily.

Evaluation - 2nd Iteration Process

Usability Evaluation

The heuristic evaluation carried out by the experts has offered crucial insights into our fridge-scanning app prototype, CookMate. In this section, we address selected key insights from our heuristic evaluation, such that the issues are ranked based on their severity. Below is a detailed overview of some of the main issues, their severity, how these could keep users from achieving the objective that we identified in the beginning, and recommendations to address each concern. We also list design guidelines/solutions to address the pain points and why these are good solutions to address the pain points. Note that not all Nielson Normans' 10 design heuristics are present because we only list the key insights:

1. Match System & World (*Severity: 4*)

It was not clear how to view multiple pictures on one screen, in a compact gallery view. For example, if the users take multiple pictures, they can see all their lists of pictures by swiping left and right, but some addressed concerns that they want to see all the pictures on one screen. They said this is so that if they don't remember which fridge/pantry section they took pictures of, they can recall quickly by looking at the compact view of all the pictures, instead of swiping 5+ images. This could keep the users from quickly accessing recipe suggestions and also make them frustrated because they can't move on to the next phase of recipe suggestions right away. The recommendation to address the concern is to make a compact gallery view as the users suggested right before the pictures analysis phase, such that they can see all their pictures on one screen for the last time. It might also be a great feature to allow removing some pictures before the final analysis in that user flow, just in case the users want to exclude some pictures before final picture submissions for the analysis. These features will help the users generate ingredients from correct pictures more quickly.

2. Help and Documentation (*Severity: 4*)

The app lacks help and documentation. This could keep users from quickly accessing the recipes, which is one of the main purposes of the application. Thus, in order to assist first-time users, an interactive tutorial should be added for effective app usage. The tutorial will especially be about setting dietary restrictions, how to add custom recipes, and how to use the discover / recipe-book section, because while the user flow for taking pictures for the recipe recommendation is easy enough, the users might not even be aware of other features such as setting the dietary restriction feature. This guideline/solution is a good solution to address the pain point because, after the tutorial, which should be no more than a few minutes, the user can know the entire flow of the application and can use the application effectively.

3. Help Recognize, Diagnose, and Recover from Errors & Error Prevention (Severity: 4)

The users mentioned we should be able to edit the quantities of ingredients and also have features to add/remove ingredients in our user flow. This part is both a usability and utility issue. First, it is a usability issue because it is technically possible to keep taking pictures until the quantities are correct and the correct ingredients are analyzed.

Also, it was not clear to users that the delete option was available until we pointed it out. Thus, it is possible, but not easy/obvious to recognize the feature and pleasant to use, making it a usability issue. Second, it is a utility issue because these features are something that the users need in the first place, because the computer vision algorithm may generate incorrect analysis forever until a manual editor is present.

These pain points can be addressed by adding a more visible/apparent feature to allow quantity editor and ingredients add/remove the feature, which will allow the users to quickly point out wrong analysis before the computer vision algorithm analysis phase and move on to the recipe generation phase. We talk more in-depth about the utility side of this feature in the Utility Evaluation Section.

4. Visibility of System Status (*Severity:* 2)

The app could explore alternative ways of indicating system status besides the loading circle for scanning the fridge. Right now, the users don't know how long the ingredients analysis could take, which may frustrate the users because one of the primary goals of the users is to generate quick and easy recipes quickly. In order to mitigate the users' pain points, there could be a progress bar or a more interactive scanning animation to provide better visual feedback. To address the users' pain points, there could be system status indicators that have been enhanced with alternative methods, such as progress bars and interactive scanning animations, for better user feedback.

5. Consistency & Standards (*Severity:* 2)

The design in certain user flows was not consistent in that in order to add custom recipes, the user would have to go to the 'Discover' section of the app. However, adding new recipes was impossible in the 'Recipe Book' section, which felt counter-intuitive for some users. This could prevent the users from quickly getting used to the app and make them feel that the app is not consistent in its design. In order to address the issue, we should add the 'Make your own recipe' button in the 'Recipe Book' section of the app as well. This will address the users' pain points of not having features available in the app that they expect and thus could improve the user experience.

6. Flexibility & Efficiency of Use (*Severity:* 2)

The users mentioned that in the ‘Discover’ section, they could only adjust options such as adjusting cooking time limits, sorting the results, and enabling/disabling dietary restrictions, only after having searched the recipes through the search bar. This is not a flexible and efficient use of the app because allowing the options to be enabled before the search is better for decreased search time of recipes. Thus, in order to address this pain point, the solution would be to allow ‘set options’ to be available before the users search for the recipes, thus allowing for efficiency of use.

Utility Evaluation

Our prototype was able to successfully support the users to achieve the goals we identified in the beginning because, through our app, users were now able to successfully make quick and easy food from the comfort of their homes with ingredients from their refrigerators/pantries / etc. We allowed the users to make recipes that catered to their needs through dietary restrictions, ingredients quantities editor, limited cooking time adjuster, etc. Not only that, we were able to provide a variety of new recipes through the ‘discover’ and ‘recipe book’ sections of the app. With this, we were able to confirm that we could support users in achieving the goals that we identified in the beginning, providing quick and easy recipes with limited time from already-bought ingredients to college students.

Also, the utility evaluation has offered crucial insights into our fridge-scanning app prototype, CookMate. Below, we address those pain points and possible solutions to address the pain points:

1. Quantities Editor

Users need the ability to fix errors/inaccuracies that the computer vision algorithm makes when scanning items in pictures. The most notable inaccuracy the app can make is the ingredients’ quantities. For example, when pictures are taken, while the computer vision algorithm may recognize that eggs are present by recognizing egg cartons, it will be impossible to know how many there actually are inside. This could keep the users from achieving the research goals because producing incorrect recipes from the ingredients prevents generating recipes from already-bought ingredients

because they are incorrect. Depending on the number of said ingredients, some recipes may or may not become available. Not only that, even if there are plenty of ingredients for specific recipes, the user may want to save some ingredients for later and thus adjust the quantities. In other words, it is imperative that users be able to manually fix/adjust the number of ingredients there are after the algorithm has finished analyzing the pictures. This new feature of being able to manually fix/adjust the number of ingredients is a good solution to the user's pain point because now the user can generate correct recipes for the quantities of the ingredients which will help users recover from errors and improve the overall experience.

2. Ingredients Inclusion / Exclusion

Similar to the above, the computer vision algorithm might not always be accurate. Users should have the option to prompt further requests to change the quantities of the inputted items. While we do have this feature already, it is hard for users to know that the feature is possible before being told. Not only that, The users mentioned that the lack of features allowing the addition/removal of ingredients might induce errors in the application. This is problematic because there may be ingredients that are incorrectly added by the computer vision algorithm's mistake or users may want to add ingredients that were not recognized by the algorithm. This can interfere with the research goals because generating recipes from incorrect ingredients means the ingredients are not already-present, which was one of our primary assumptions. Thus, users should be able to know right away that the feature to manually add/remove more recipes is present because the computer vision algorithm may not have been able to recognize some from the pictures, or may have incorrectly added some things that are not actually there. This can be done through a more explicit tutorial, or bouncing state as Sidra mentioned in order to let the users know that we can delete the ingredients. This can be a great solution to address the pain points they mentioned because it would lead to more accurate ingredient lists that will be used for the recipes generation algorithm in the next steps.

Studio Session Feedback

The first feedback was if the app allows quantity recognizer from the computer vision analysis right away. We explained that it was not entirely possible with the current technology so we offer a manual quantity editor.

The second feedback was if we could generate recipes that we are missing only a few ingredients. We explained that we can sort the recipes by relevancy or how much of the ingredients overlap, such that we can still search for recipes that we may not have the entire ingredients of.

The third feedback was we should have a better user interface on our ingredients lists section. We should fill the majority of the screen with the ingredients, and have the ‘add’ and ‘view’ buttons to be smaller in order to allow users to see ingredients better. Not only that, our two buttons ‘add’ and ‘view’ need not be so big.

Our final feedback was a usability issue. The information button that provides more information about the ingredients is not really visible, so the suggestion was to have a hovering feature to make it more obvious that it is clickable. Also, deleting the ingredients from our ingredients list was not something obvious until pointed out. It was suggested that we should maybe have a bouncing state when we first go to the screen, so that the users may know that deleting ingredients is an available option. It is even possible to have deleting ingredients feature available in the tutorial section.

Final Prototype

The feedback from the final presentation can be summarized in several points:

- Ingredient scan-to-recipe:
 - For ingredients, give the option to add quantities and add missed ingredients
 - Scroll bar for the ingredients instead of the up/down arrows
 - Keep the tags for the food pictures...
 - Adding from barcode
- For the preferences:
 - Select/deselect preferences when choosing a recipe???
 - Adding preferences not clear
- Other suggestions:
 - What about a notification system?
 - Taking notes on recipes

The changes made based on these suggestions were:

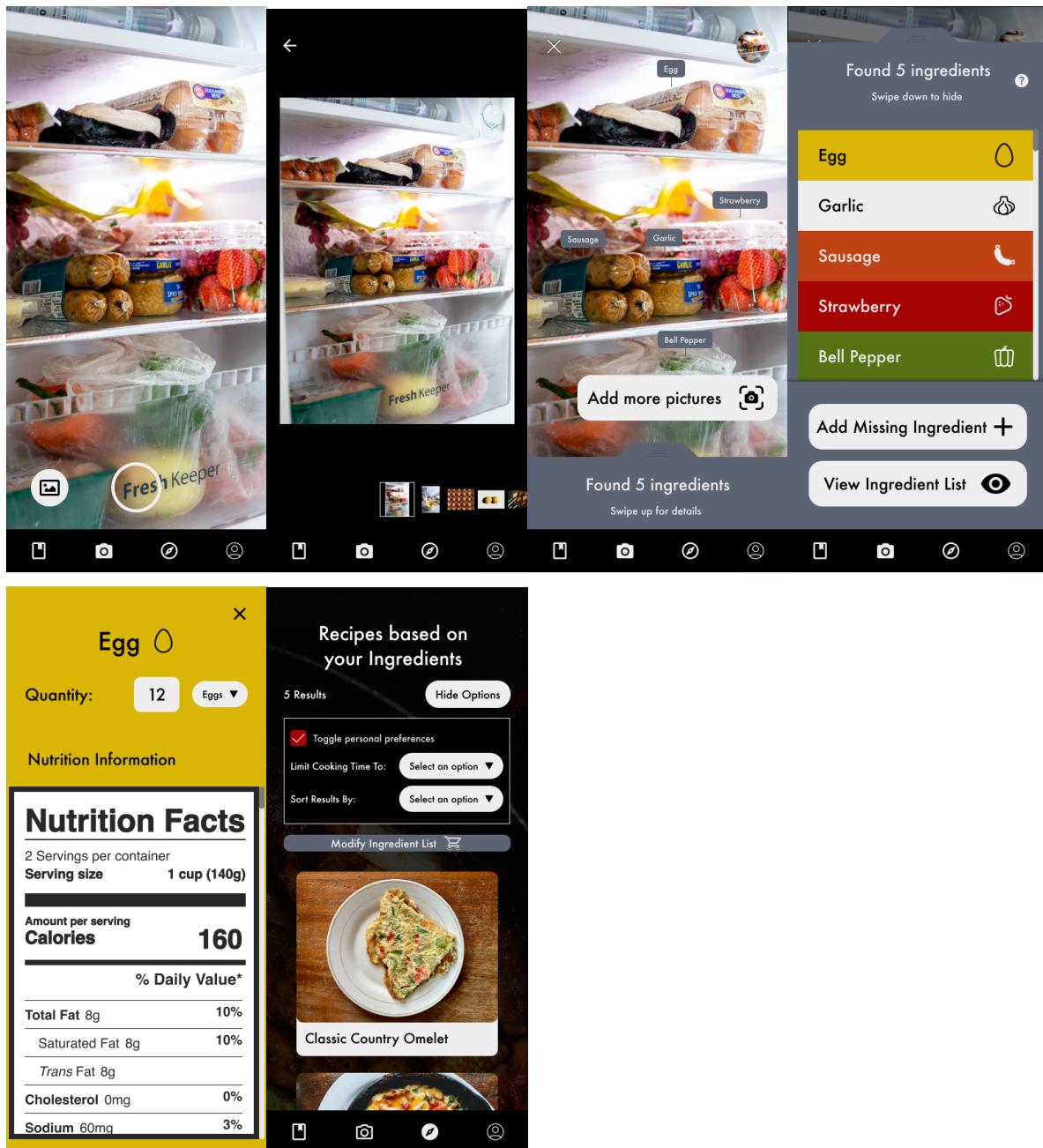
- Up/down arrows changed to a scroll bar
- Added swipe to delete items function
- For ingredients, added the ability to add quantities and add missed ingredients

In addition, feedback from the think aloud studies that were incorporated were as follows:

- Adding quantities for each ingredients
- Deleting items is not very intuitive, maybe add a swipe-to-delete ingredients?
- Have a compacted gallery view for all ingredients
- Maybe taking out the pictures for the instructions in the recipes?

Some of these points were already incorporated from the studio session, and while the other points have not been fully acknowledged, they provide valuable insights to our prototype that we plan to include in a potential future iteration.

Flow 1: Camera - take pictures of ingredients and search for recipes



Flow 2: Explore and Create Recipes

The image displays two screenshots of a mobile application interface, likely a food delivery or recipe app.

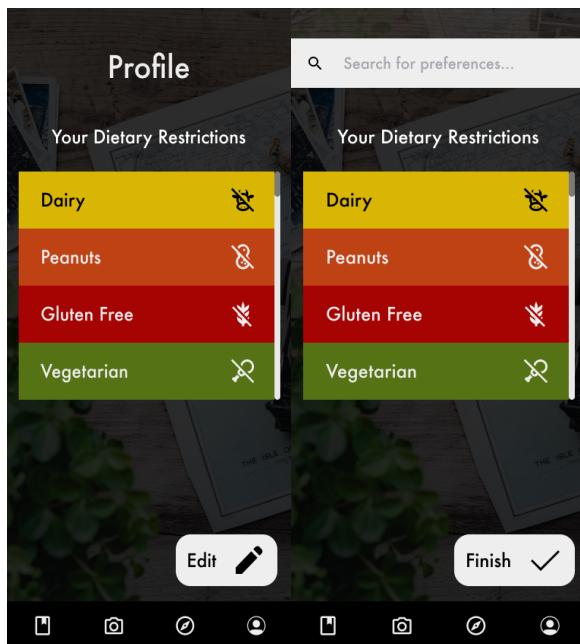
Top Screenshot (Discover Screen):

- Header:** "Discover" and search bar "What's cookin' today?"
- Left Column (Recommended):** Butter Chicken (image).
- Middle Column (Search Results):**
 - 5 Results: "Classic Country Omelet" (image).
 - 5 Results: "Country Sourdough" (image).
- Right Column (Detailed Recipe View):**
 - Title:** "Classic Country Omelet"
 - Description:** "This omelet is the absolute best omelet you've ever tasted in your entire fricking life. Like bruh you're missing out if you've never had a country style omelet. Check it out man."
 - Cooking Time:** Active Cooking Time: 30 minutes Total Cooking Time: 30 minutes
 - Ingredients:**
 - 3 eggs
 - 2 cloves of garlic
 - 1/2 cup sausage
 - 1/2 bell pepper
 - Salt, to taste
 - Black pepper
 - Cooking oil

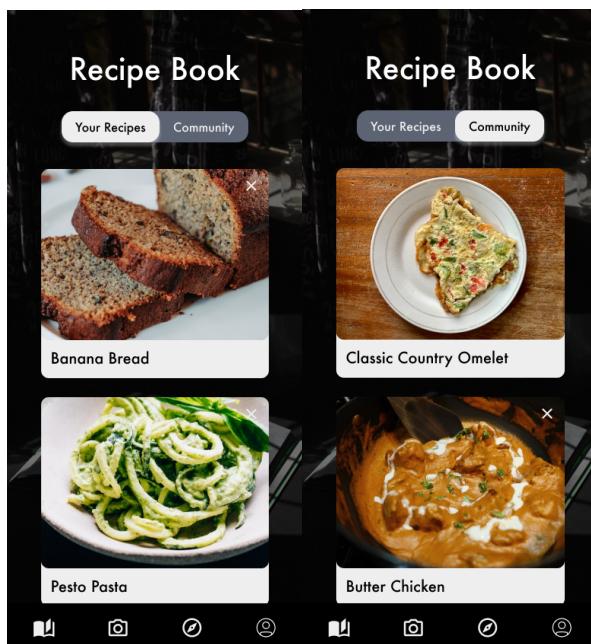
Bottom Screenshot (Create Your Own Recipe Screen):

- Header:** "Create Your Own Recipe" and search bar "What's cookin' today, boss?"
- Text Input:** "Give me your best recipe for a country omelet!"
- Response (Red Box):**
 - Text:** "Sure! Here's the recipe for a country omelet"
 - Ingredients:**
 - 3 eggs
 - 2 cloves of garlic
 - 1/2 cup sausage
 - 1/2 bell pepper
 - Salt, black pepper to taste
 - Instructions:**
 - Prep work: dice your sausage and bell peppers into 1/4 inch pieces. Mince garlic. Crack the 3 eggs into a bowl, and whisk until yolks and whites are fully combined.
 - Add 1/2 tbsp oil to a non-stick pan.
- Text Input:** "Write your message here" with a send button.
- Text Input:** "3. Add your minced garlic to"

Flow 3: Set Preferences



Flow 4: Save favorite recipes



View the final prototype screens here:

<https://www.figma.com/file/uaeHcixdy5vbQOJ9BBF3bt/Main-Prototypes?node-id=0%3A1&t=xqBEU7mPvx5VZIiF-1>

View the interactive version of the prototype here:

<https://www.figma.com/proto/uaeHcixdy5vbQOJ9BBF3bt/Main-Prototypes?page-id=0%3A1&node-id=3-8&viewport=135%2C202%2C0.11&scaling=scale-down&starting-point-node-id=1%3A4&showproto-sidebar=1>