

Design Project: KitchenPal
HF 770 - Team 6
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Bentley University

Design Summary

Introduction to the Problem

Our product, KitchenPal, is a home food inventory management system and recipe application. We created this product to solve some of the issues associated with home cooking. The major issue we seek to solve is food waste. According to the National Resources Defense Council, the average American wastes about 25 percent of food purchased. For a family of four, this comes out to be about \$1,365 to \$2,275 per year. Food is also the third-largest expense in an American household.¹ One of the reasons that food goes to waste is because people simply forget what they have stocked in their fridge and pantry. Another reason is that they sometimes don't know what to do with the remainder of some ingredients that were previously purchased for a specific recipe. This reason is also related to another issue associated with home cooking: lack of inspiration. People often feel discouraged when confronted with the task of cooking because they feel that they lack enough skill or creativity to come up with interesting and enjoyable meals.² In addition, people are becoming much more health conscious and trends such as meal-prepping are growing in popularity.

Given all these factors, we saw a real need for a product that could help people by reminding them of when products will expire and by providing inspiration on how to use these soon-to-expire products. There are currently some food pantry management apps out there that will alert you when food is about to expire or that will find recipes for you based on current ingredients. Some also include shopping list features. However, they do not incorporate real-time food consumption data. What differentiates our product from the rest is that it will allow users to track how much food they have left in their inventory and will therefore be able to alert users if a particular item is about to run out. It will also be able to recommend recipes based on the actual amount of different ingredients in our kitchen. Because it will prevent food waste, we believe our product could save users hundreds of dollars.

¹<http://money.usnews.com/money/blogs/my-money/2013/04/02/how-much-food-does-the-average-american-waste>

² Smith, L. P., Ng, S. W., & Popkin, B. M. (2013). Trends in US home food preparation and consumption: analysis of national nutrition surveys and time use studies from 1965–1966 to 2007–2008. *Nutrition Journal*, 12(1), 1.

Persona Development

To further understand who our primary persona would be for our product, we conducted a literature review and user interviews. In our literature review we learned that different age groups approach food planning differently. Baby boomers tend to plan ahead for their week and like to keep their pantries stocked. Millennials, on the other hand, are more spontaneous and plan backwards, choosing to buy ingredients based on what they plan to make. 25 percent of the meals consumed by 20-somethings include items purchased the same day. There is also a major focus on health and wellness, and 43 percent of consumers view their grocery store as an ally in this pursuit.³ It seems that both baby boomers and millennials would benefit from a product that would allow them to keep track of food inventory and provide inspiration for new recipes. We interviewed both millennials and baby boomers and it seemed that millennials would be the most comfortable using this piece of technology due to their exposure with other apps and technology currently on the market. Due to young age, millennials are also considered novices in the art of cooking so having an aid to help them use their resources efficiently would benefit them the most. Therefore, we constructed our primary persona to be the following:

Laura Chen



Personal Narrative

Laura Chen is a data analyst in Boston, MA. When she is not working or traveling, she can be found at home researching new recipes to try. She's always looking to try new things whether she's eating out or experimenting with a new recipe at home. She plans out a couple meals a week and then improvises new dishes based on leftover ingredients. She keeps a list of ingredients on her phone whenever she goes shopping. Occasionally she buys ingredients for a specific new recipe, uses them only once, and then doesn't know what to do with the rest of it, so she ends up throwing it away. She feels badly about wasting food and would like to find a way to manage her resources better.

Age: 29	Goals	Pain Points
Occupation: Data Analyst	<ul style="list-style-type: none">• Eat interesting food at home• Minimize food waste• Save money• Improve food shopping experience through the use of shopping lists	<ul style="list-style-type: none">• Doesn't like wasting food• Doesn't know how to use certain ingredients that she's bought and doesn't want to waste them
Marital Status: Single		
Location: Boston, MA		

³ Food Marketing Institute. (2014). US Grocery Shopping Trends 2014 Overview. Fmi.org

Design Process

In order to solve the issues outlined above, we brainstormed on what would be the best way to track a home food inventory. We initially considered an in-store scanning device that would allow customers to scan specific items that they were interested in using but didn't know how to incorporate into a dish. This device would've been similar in form to the current price check scanners found in stores today. To populate a customer's food inventory, the grocery store would gather the purchasing information collected at checkout and would then send it to an app used by the customer. Due to the uncertainty of working with national food retailers, we decided to think of a way to bring this process into the user's home. In thinking about which designs to consider we came up with some requirements for our product:

At-home device

- Large touchscreen that responds to wet and sticky fingers
- Scale to weigh food
- Text to speech ability
- Natural language voice user interface
- Wifi enabled
- Scanner (for receipts)
- Optical Character Recognition (OCR)
- Removable tray for easy clean-up

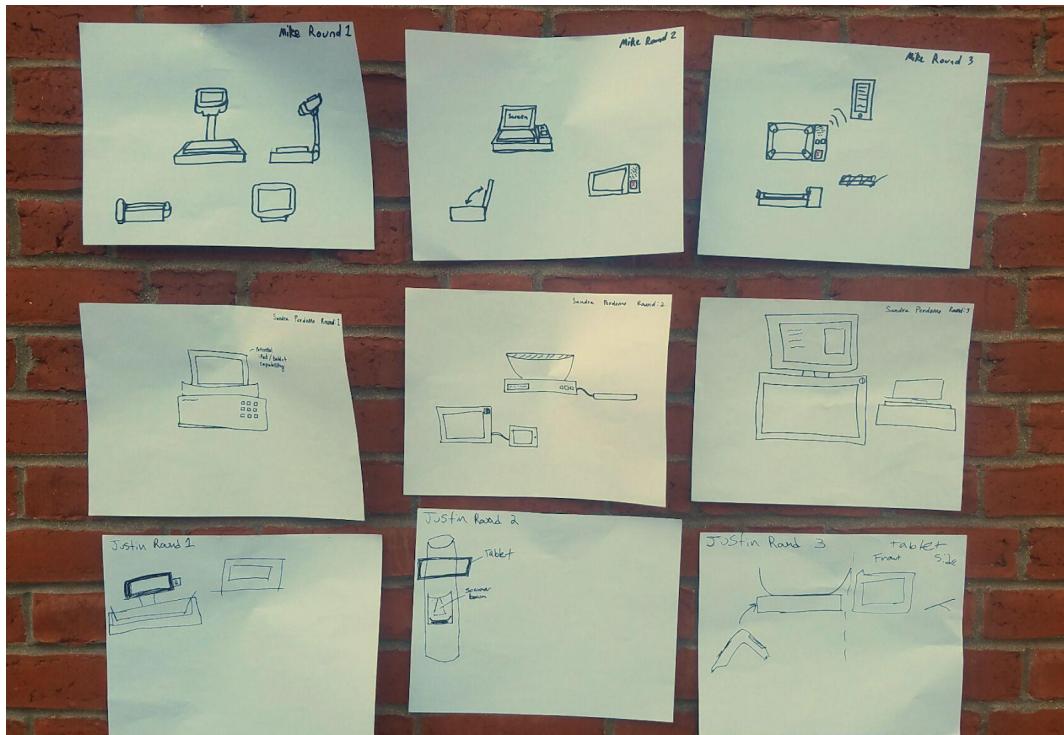
Shared with app

- Recipe database
- Food inventory database
- Shopping list
- Add recipe ingredients missing from inventory to shopping list
- Food expiration reminders

App

- Mobile shopping list that can be used to keep track of items that have been picked up
- Mobile recipe finder

After considering our requirements, we decided to conduct a braindrawing session to come up with ideas for our industrial design framework.



This exercise was helpful because it helped us visualize what we wanted our product to look like. We decided that our product would consist of a scale to weigh items and an interactive screen that would serve as an inventory management system. The scale will sit atop of a user's kitchen counter just like any other frequently used appliance. Accompanying this device is a tablet component that would offer recipes, step-by-step cooking instructions, and shopping list management. This tablet is attachable to the scale device for storage purposes.

After considering the complexity required to incorporate computer vision into our product, we decided to have an Optical Character Recognition system, and a voice recognition

system for more plausible management. With this in mind, we created a low-fidelity industrial design prototype and then a final prototype with more visual fidelity:



In it you will find the scale device with a touch screen and a tablet that is docked to the back of the scale. The scale component of the device will be used primarily for inputting items

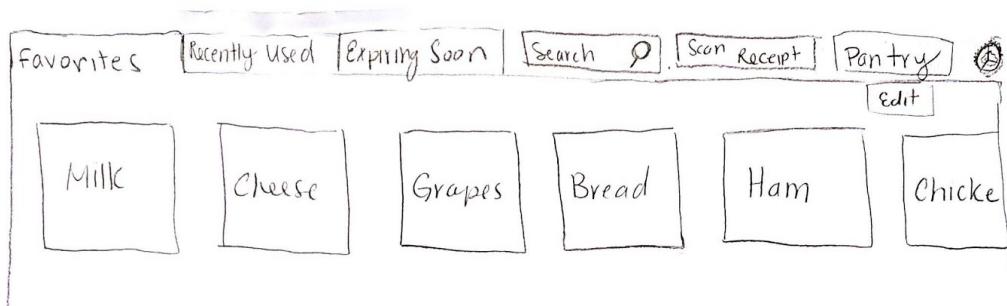
into the system after purchase and keeping track of inventory by weighing food as it is used. Items that have been purchased can be entered in the system via a receipt scanner or manual input.

The tablet will be primarily used for searching for recipes, creating shopping lists, and viewing inventory. It can also be removed from the dock and carried around the kitchen as desired. An example of this would be when it is being used to follow a recipe while cooking. Both these pieces of hardware will employ the use of bluetooth connectivity to communicate with each other. They will use wifi to connect to databases on servers that store information about food shelf-life, storage methods, shopping lists, and recipes. There are some features that the user may find easier to work with on the tablet, such as inventory management, due to its larger screen size. An example of this would be if a user wants to browse their inventory and make adjustments to it. There will also be a mobile app that will incorporate the recipe and shopping list component and is intended for use in stores while shopping for food.

The system will alert the user when they are reaching a low level on previously designated items that they wish to always keep in stock. Items such as eggs, milk, and bread are staples in the American diet and are frequently replenished. The system would know what is considered as a low amount by taking the user's previous consumption habits and calculating an average serving size for this particular item. For example, if a user usually eats 2 eggs per day, it will notify the user once there are only 2 eggs left in the carton.

User Feedback and Design Considerations

Our initial design for the home page of the scale was the following:



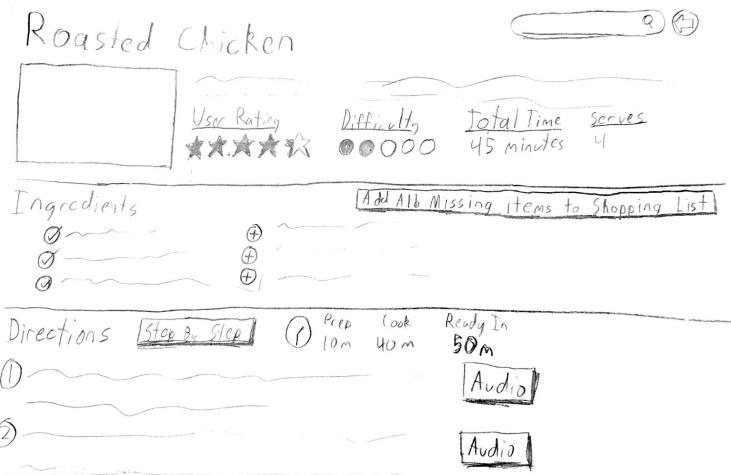
We thought it would be helpful to provide the user with many functions on the home screen to save them time and effort. Through our user interviews, however, we learned that this

screen was too busy and disorienting. One user in particular was unsure as to what tapping the “Milk” button would do for example. We therefore decided to simplify this home screen and it became:

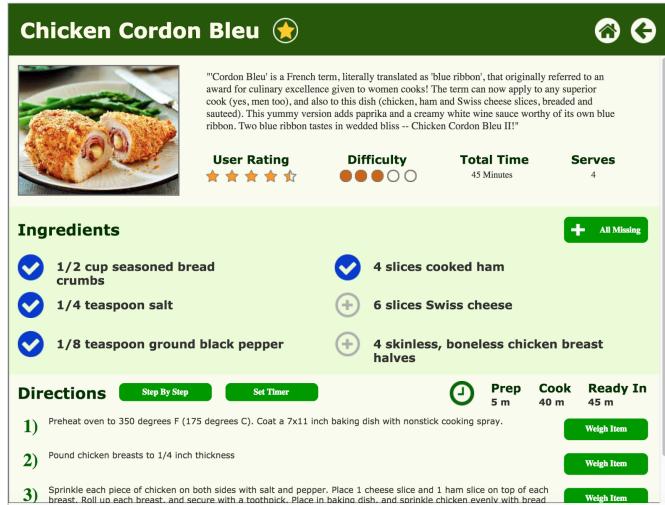
Inventory			
Add Items	Filter	Search	Settings
Item	Amount	Expiration	Added
Chicken Breast	2 lbs	2 days	Yesterday
Raspberries	3 lbs	3 days	Today
Fresh Spinach	5 oz	4 days	3 days ago
Tomatoes	8 oz	5 days	1 week ago

It should be noted that the “pantry” button was removed and all information regarding pantry is shown upon arrival to the home screen. The word pantry was also confusing as it denotes the concept of dry goods to some users. Therefore, the word “inventory” will be used instead of “pantry”.

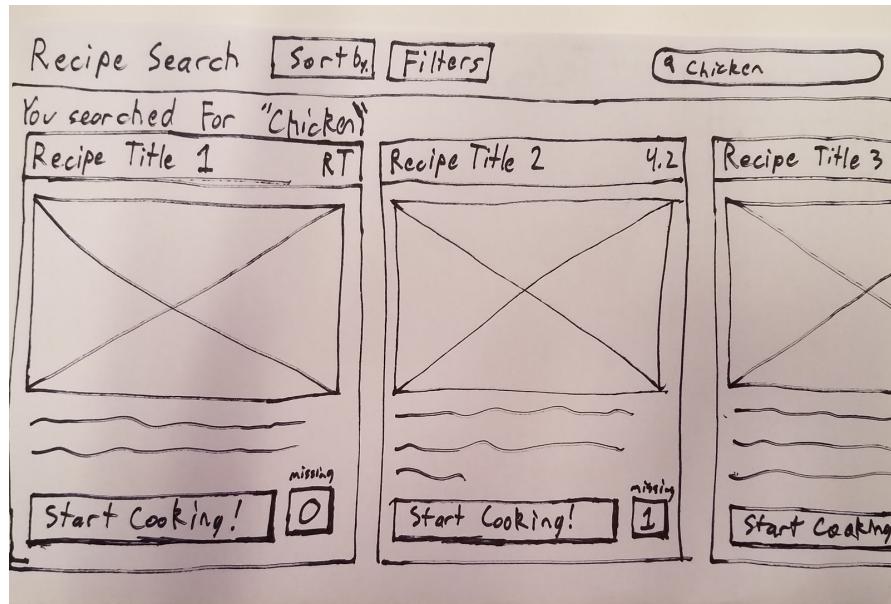
Another of our users showed confusion when faced with the following design for the recipe view:



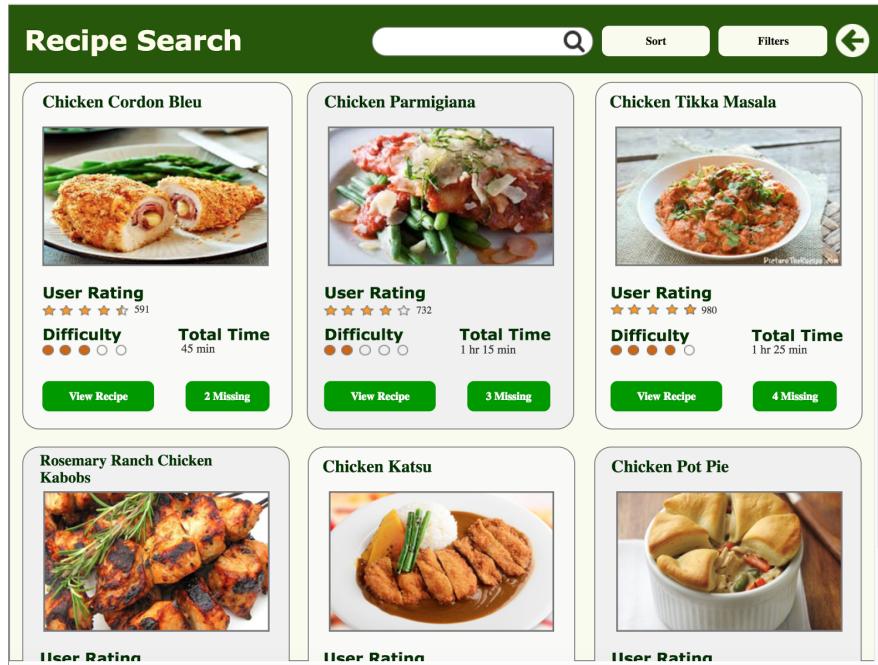
What was confusing to this user in particular was the use of checks and plus signs. They weren't sure what these symbols meant. This became clear to the user through the use of color to denote items in stock and items missing from stock.



Lastly, our users had trouble with the following on the recipe search screen: the horizontal scrolling and clicking on an actual recipe to view the recipe details. One user tried clicking on the image of the recipe to view the details instead of the “start cooking!” button.



To fix this, we implemented a vertical scrolling feature and will allow the user to click anywhere on the recipe box (minus the missing ingredients button) to open the recipe details.



Throughout our entire design process we were constantly referencing back to some of the principles of good interaction design. For example, we tried to take a user's mental model for recipe searches into consideration. Given the prevalence of recipe apps and websites currently on the market, we knew that straying too far from the typical layout of these products would be confusing to our users. We also tried to use icons that were highly recognizable such as a left-pointing arrow to represent "back" and a "home" icon to represent home. We knew that keeping these icons consistent in our product would reduce the cognitive load of our users since they wouldn't have to spend much effort learning new icons.

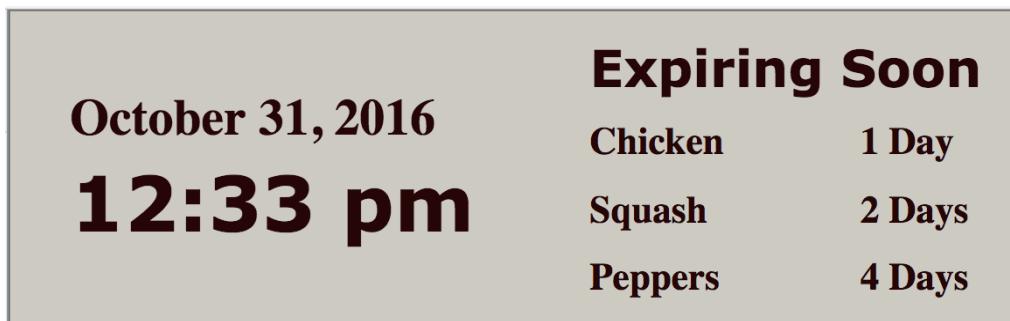
As a whole, our product aims to solve the problem of food waste by reducing the cognitive load associated with grocery shopping and cooking. It does this by presenting the user with useful information when it counts most. For example, one of the main features of KitchenPal is the inventory list found on the home screen. On this home screen, the user will be able to see which products are close to their expiration. Essentially, our product takes a task that people usually have to perform in their heads and does it for them.

Key Paths

Key Path 1: Using food that's about to expire

Laura has purchased chicken last week, but she didn't get a chance to use up all the chicken that she bought. KitchenPal shows her that the chicken she bought will be expiring soon. Because Laura doesn't want any food to go to waste, she starts to look for recipes that incorporate chicken.

- 1) Laura sees the chicken is expiring soon on the idle screen, so she wants to look at her current supply. She taps the idle screen of the Scale to view her inventory list.



- 2) The inventory list is automatically sorted by the expiration date, showing the chicken breast is expiring soon. She taps the chicken breast entry to see her current supply.

Inventory			
Item	Amount	Expiration	Added
Chicken Breast	2 lbs	2 days	Yesterday
Raspberries	3 lbs	3 days	Today
Fresh Spinach	5 oz	4 days	3 days ago

- 3) Seeing the amount of chicken about to go bad, Laura taps the Find Recipes Icon to start looking for ingredients that use chicken breasts. A notification appears on the scale explaining that the tablet has found recipes that uses chicken breasts.



- 4) On the tablet, recipes that uses chicken breasts are displayed. Seeing that she has all the ingredients for Chicken Cordon Bleu, Laura taps the dish to view the recipe.

- 5) Laura reviews the recipe ratings, ingredients, and cooking process on the recipe view screen. Interested in making this dish, she gathers the ingredients and taps the “Step by Step” button to start up the cooking wizard.

Chicken Cordon Bleu

"Cordon Bleu" is a French term, literally translated as 'blue ribbon', that originally referred to an award for culinary excellence given to women cooks! The term can now apply to any superior cook (yes, men too), and also to this dish (chicken, ham and Swiss cheese slices, breaded and sautéed). This yummy version adds paprika and a creamy white wine sauce worthy of its own blue ribbon. Two blue ribbon tastes in wedded bliss -- Chicken Cordon Bleu II!"

User Rating ★★★★☆ **Difficulty** ★★★☆☆ **Total Time** 45 Minutes **Serves** 4

Ingredients

✓ 1/2 cup seasoned bread crumbs	✓ 4 slices cooked ham
✓ 1/4 teaspoon salt	⊕ 6 slices Swiss cheese
✓ 1/8 teaspoon ground black pepper	⊕ 4 skinless, boneless chicken breast halves

Directions

- 1) Preheat oven to 350 degrees F (175 degrees C). Coat a 7x11 inch baking dish with nonstick cooking spray.
- 2) Pound chicken breasts to 1/4 inch thickness
- 3) Sprinkle each piece of chicken on both sides with salt and pepper. Place 1 cheese slice and 1 ham slice on top of each breast. Roll up each breast and secure with a toothpick. Place in baking dish and sprinkle chicken evenly with bread

Prep 5 m **Cook** 40 m **Ready In** 45 m

Weigh Item **Weigh Item** **Weigh Item**

- 6) By using the cooking wizard, Laura can follow along as the tablet explains the necessary steps for preparing the meal. As a step is completed, Laura can either tell the tablet to go to the next step with a verbal command, or tap the "Next Step" button on the screen.

Chicken Cordon Bleu

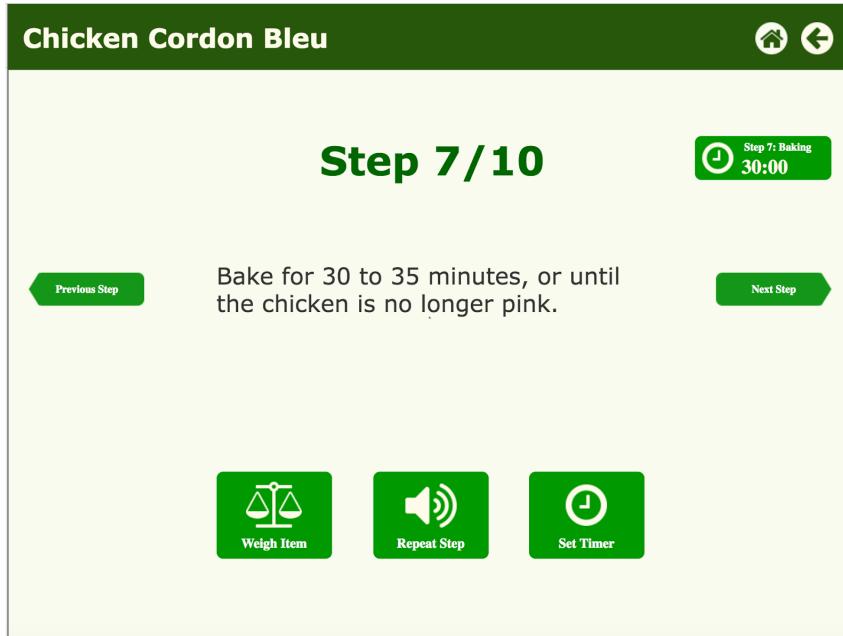
Step 1/10

Preheat oven to 350 degrees F (175 degrees C).

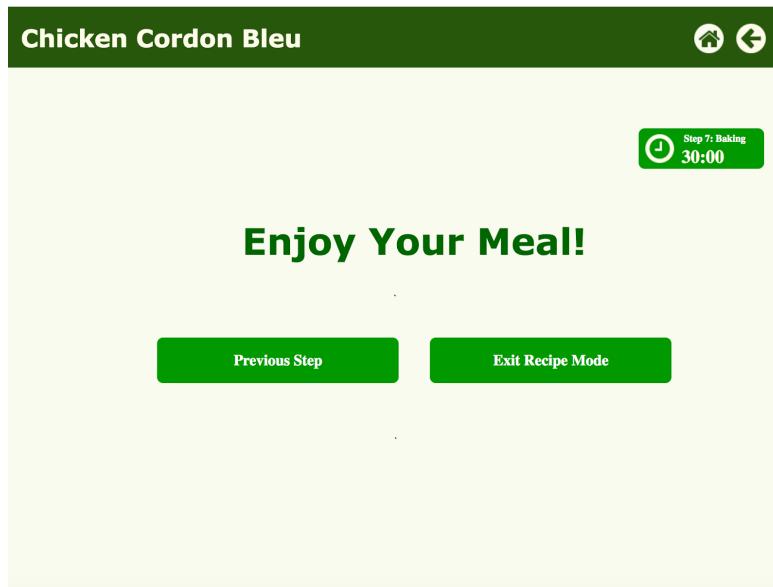
Previous Step **Next Step**

Weigh Item **Repeat Step** **Set Timer**

- 7) After a few steps of preparation, Laura needs to place the dish in the oven for at least 30 minutes. She instructs KitchenPal to start a timer by verbal command or by tapping the “Start Timer” button, which goes off when the step is completed.



- 8) She finishes the Chicken Cordon Bleu a few minutes after the alarm goes off, and the KitchenPal tells her to enjoy her meal before she eats dinner.



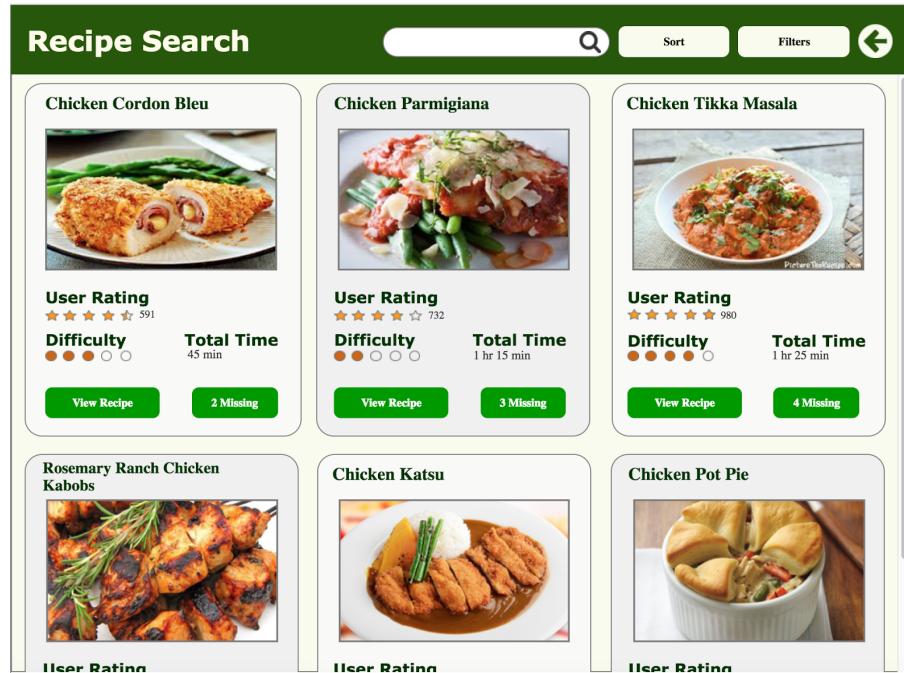
Key Path 2: Making a Shopping List

Laura wants to make the Chicken Cordon Bleu again from earlier in the week, but she doesn't have all the ingredients with her. She's running out of food anyways, so she wishes to make a shopping list based off of dishes she wants to make for the upcoming week

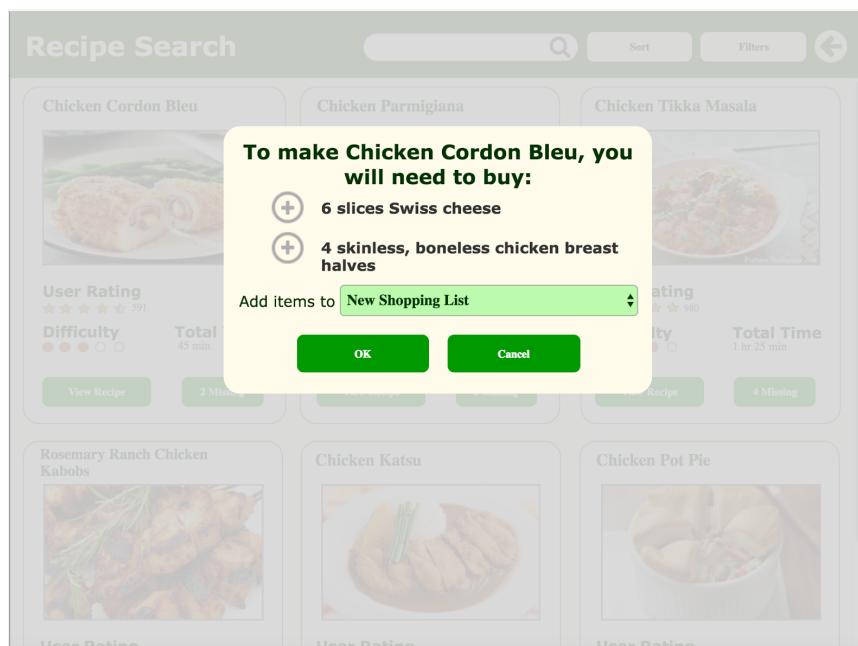
- 1) Laura grabs KitchenPal tablet and starts to look at recipes by tapping the "Recipes" button.



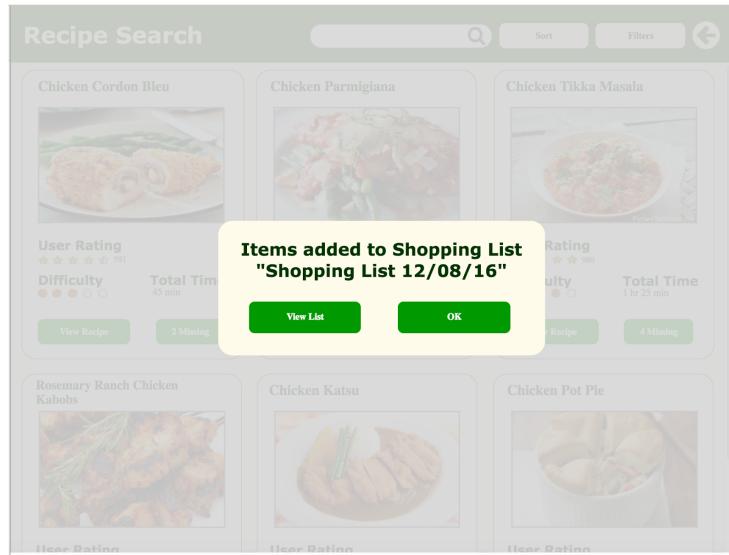
- 2) A list of recipes start to compile ordered by the amount of items Laura is missing to create the dish. She sees that the Chicken Cordon Bleu is missing two items now, so she wants to see what items are missing. To do so, she taps the "2 Missing" button that now appears below Chicken Cordon Bleu.



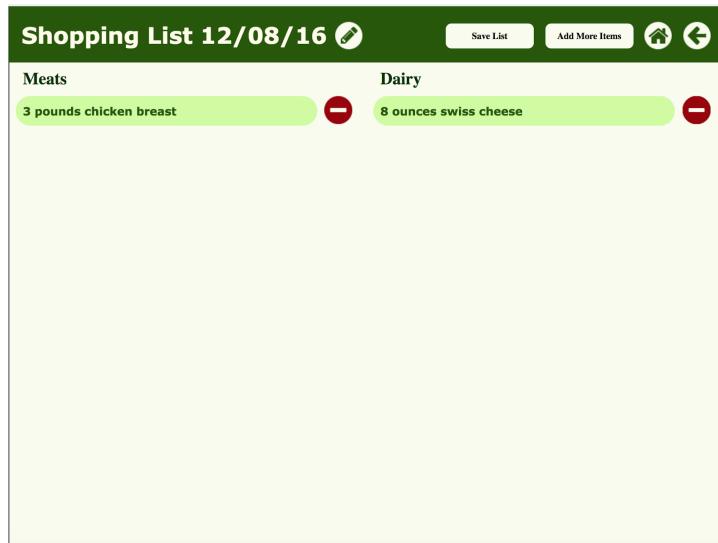
- 3) Laura sees that she is missing both chicken breasts and swiss cheese. However, she can create a new shopping list using these ingredients for her upcoming trip. She taps the “Add to List” button to add these items to a new shopping list.



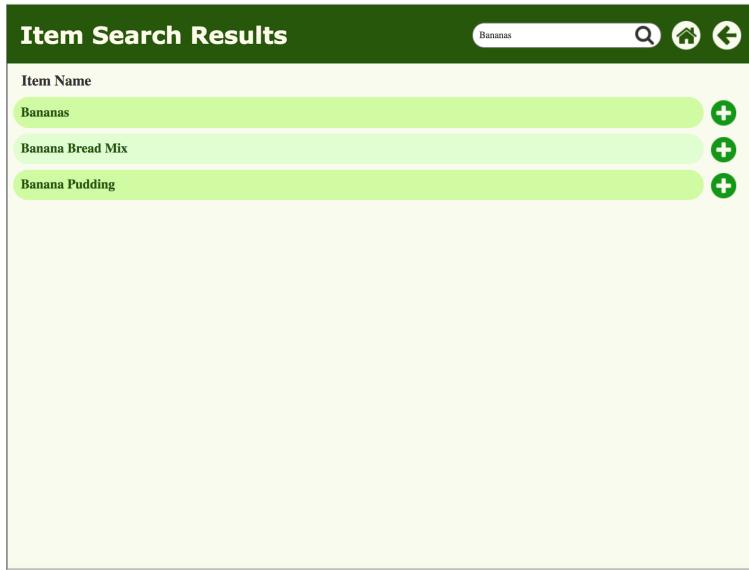
- 4) The missing item is added to Laura's new shopping list. She wants to see the contents of this list thus far, so she taps the "View List" button to access the new list.



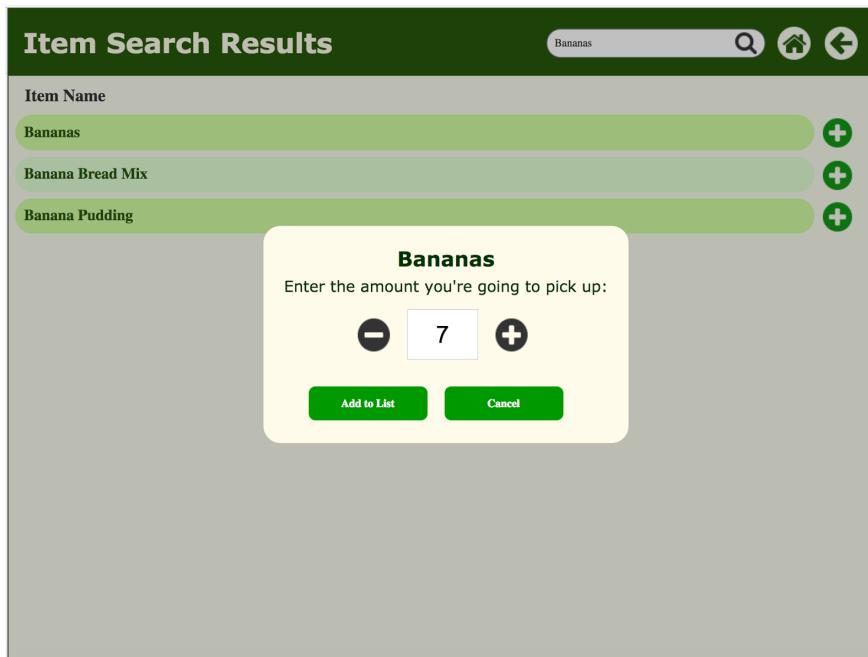
- 5) The new shopping list has items missing from the Chicken Cordon Bleu added on the list. Laura, realizing that she wants to grab some bananas for the morning, wants to specifically add that item. She taps the "Add More Items" button and searches for "Bananas" in the item database.



- 6) Several entries for Banana appear, but Laura only wants actual bananas. She taps the Bananas entry in the list to tell the KitchenPal her interest in the item.



- 7) The KitchenPal asks her how many bananas Laura wants to purchase on her next shopping trip. Laura adjusts the number of bananas she wants to buy using the plus and minus buttons or by directly editing the value in the text box. She then taps “Add to List” to add the Bananas to the shopping list.



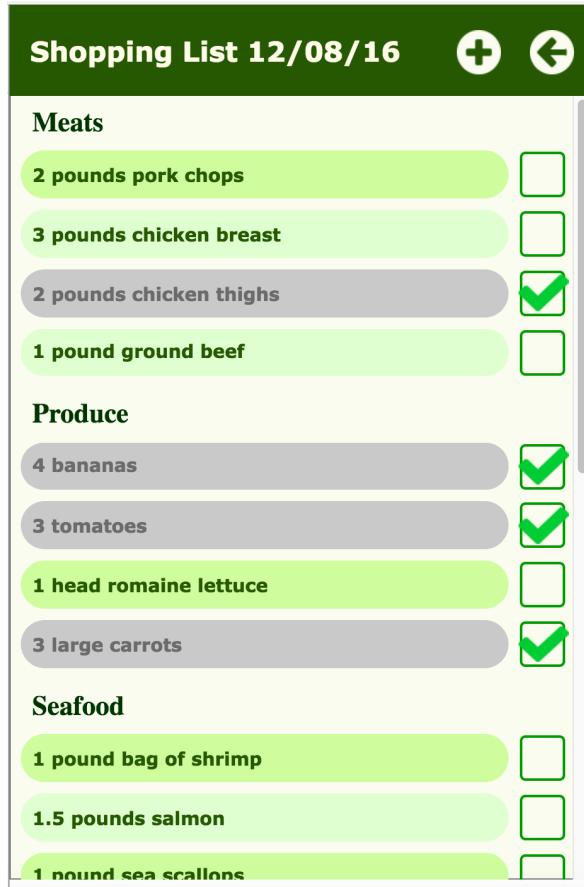
- 8) Laura looks at several recipes and has compiled quite a list of ingredients to pick up. Satisfied with the amount of items on the list, she saves the list by hitting the “Save List” button.

Shopping List 12/08/16		Save List	Add More Items		
Meats		Dry Goods			
2 pounds pork chops		16 ounces of rice			
3 pounds chicken breast		16 ounces of canned black beans			
2 pounds chicken thighs		8 ounces of garbanzo beans			
1 pound ground beef		6 ounces of spaghetti			
Produce		Dairy			
4 bananas		1 dozen eggs			
3 tomatoes		8 ounces swiss cheese			
1 head romaine lettuce		1 gallon milk			
3 large carrots		6 ounces parmesean cheese			
Seafood		Frozen			
1 pound bag of shrimp		1 bag perogies			
1.5 pounds salmon		1 bag peas			
1 pound sea scallops		1 pizza			

- 9) The shopping list Laura created is saved onto the KitchenPal database.

Shopping List 12/08/16		Save List	Add More Items		
Meats		Dry Goods			
2 pounds pork chops		16 ounces of rice			
3 pounds chicken breast		16 ounces of canned black beans			
2 pounds chicken thighs		8 ounces of garbanzo beans			
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Seafood		Frozen			
1 pound bag of shrimp		1 bag perogies			
1.5 pounds salmon		1 bag peas			
1 pound sea scallops		1 pizza			
"Shopping List 12/08/16" has been saved!					

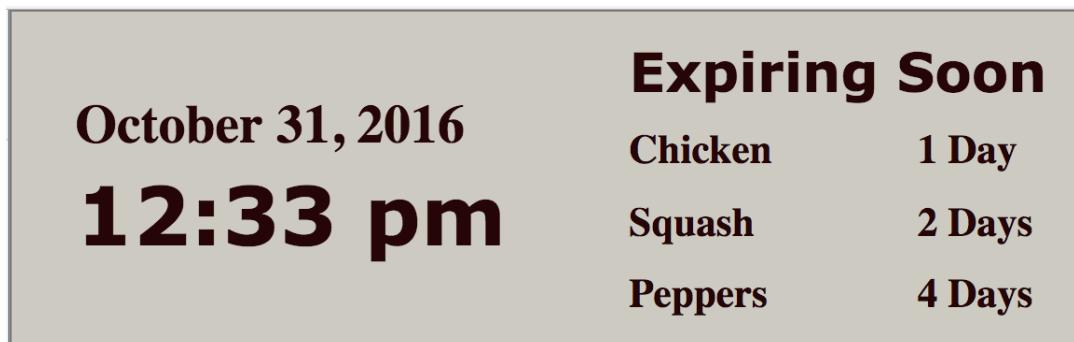
- 10) At the store, Laura can access the shopping list and start tracking the food she's buying.



Key Path 3: Adding several items to the inventory

Laura has come back from her shopping trip with lots of groceries in tow. Rather than manually inputting individual items in the inventory, the KitchenPal allows her to input multiple items at the same time if she brought her receipt home from the store.

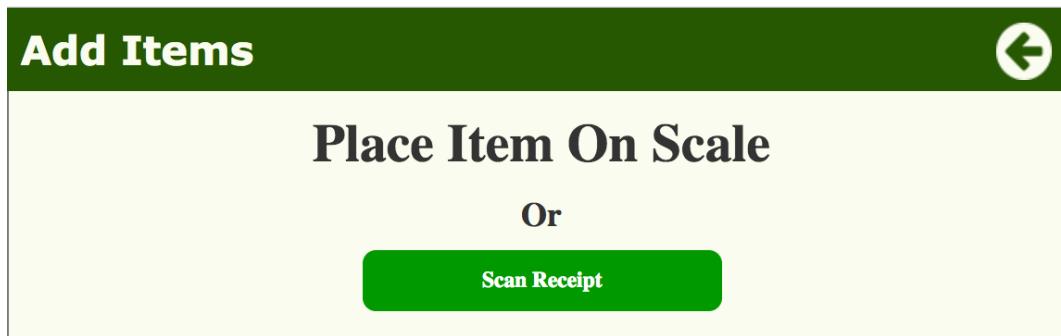
- 1) Laura taps on the KitchenPal's scale screen to wake up the device.



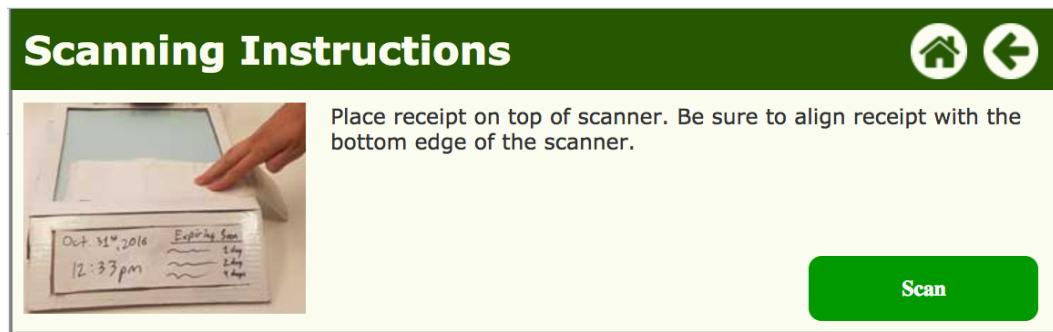
- 2) At the inventory screen, Laura taps the “Add Items” button to begin updating her inventory with the items she just bought.

Inventory		Add Items	Filter	Settings
Item	Amount	Expiration	Added	
Chicken Breast	2 lbs	2 days	Yesterday	
Raspberries	3 lbs	3 days	Today	
Fresh Spinach	5 oz	4 days	3 days ago	

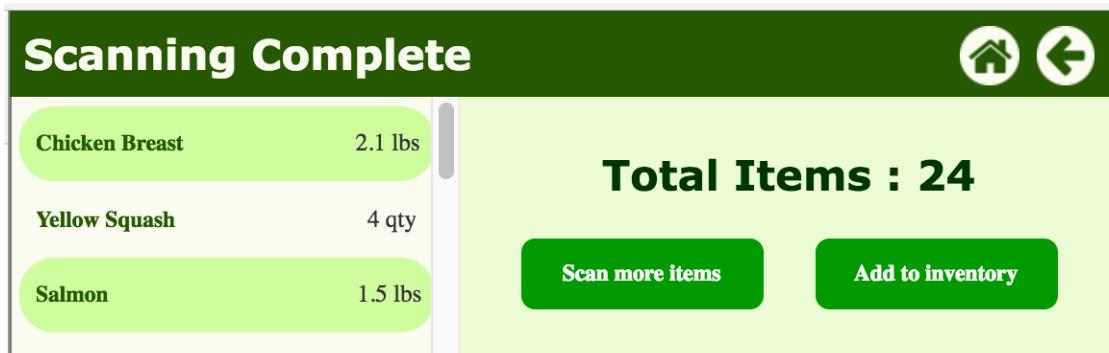
- 3) At the Add Items menu, Laura can choose to use the scale to weigh a single item at a time, or to scan a receipt she picked up at the store. With her receipt in hand, she taps the “Scan Receipt” button.



- 4) The KitchenPal instructs Laura on how to use the scanner to read the receipt. When Laura is ready to scan the receipt, she taps the “Scan” button.



- 5) Using ORC technology in the device, the KitchenPal reads the receipt and displays what it believes to be the contents of the receipt. After reviewing the list the KitchenPal compiled, Laura presses the “Add to Inventory” button to add these items to her inventory.



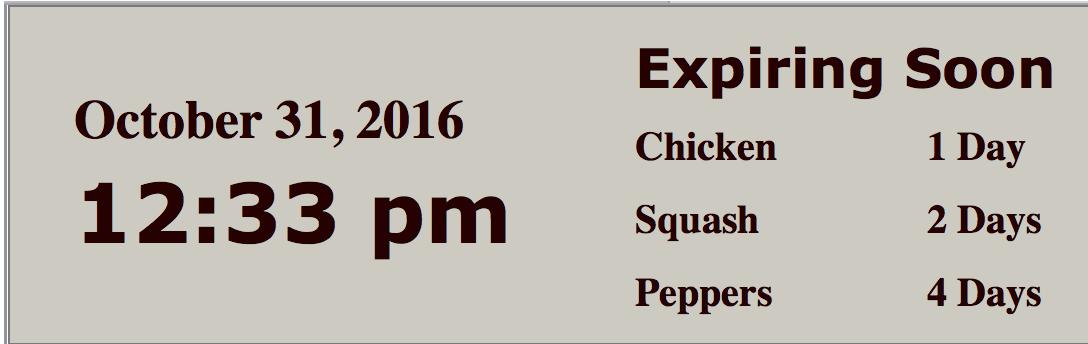
- 6) With her inventory updated, KitchenPal shows Laura the home screen with the new items added to her inventory.

Inventory		Add Items	<input type="text"/>	Filter	
Item	Amount	Expiration	Added		
Chicken Breast	2 lbs	2 days	Yesterday		
Raspberries	3 lbs	3 days	Today		
Fresh Spinach	5 oz	4 days	3 days ago		
Tomatoes	0 oz	5 days	1 week ago		

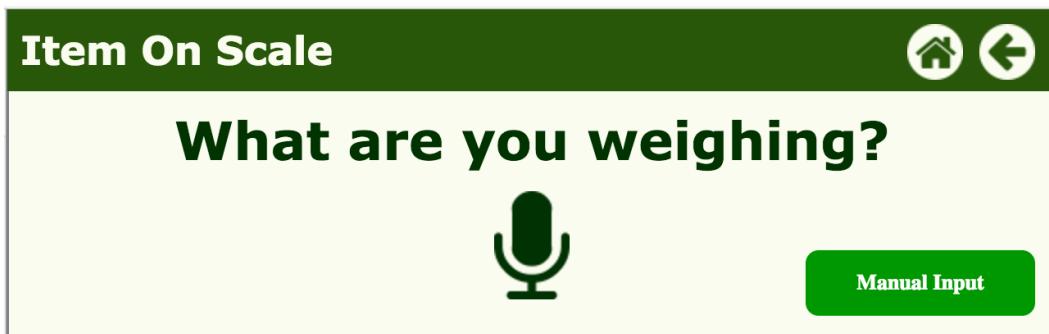
Key Path 4: Updating inventory using the scale

Not wanting to repeat the close call with the Chicken Cordon Bleu, Laura wants to extend the longevity of her chicken supply. Using the KitchenPal, she updates her inventory to reflect the amount of chicken that she has in her inventory.

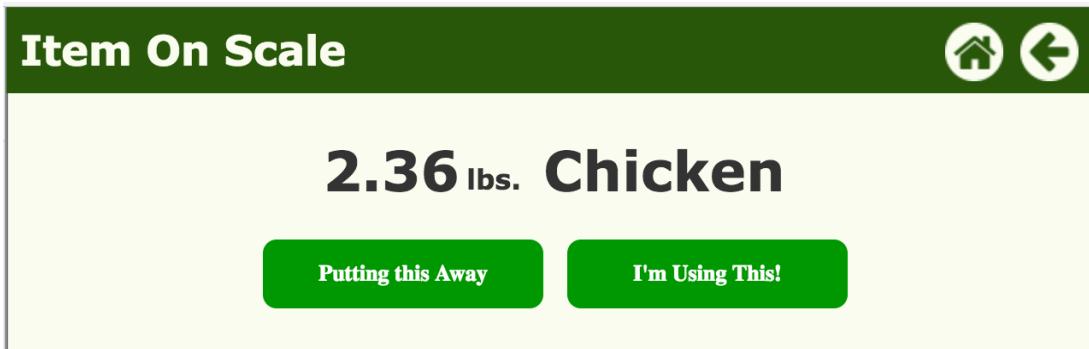
- 1) Laura places the chicken she plans to store onto the device.



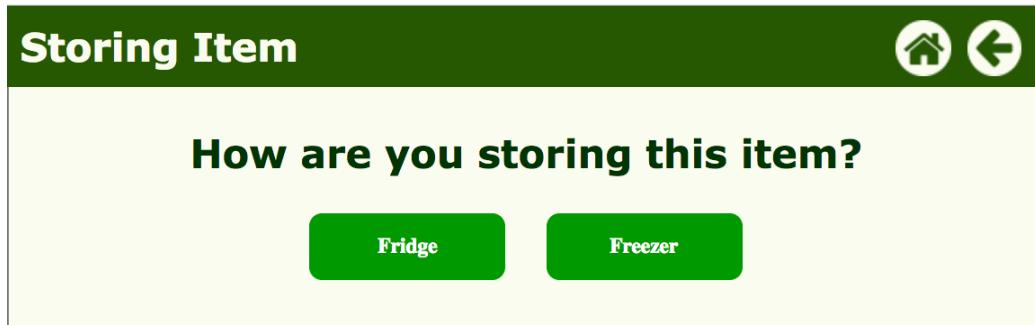
- 2) Detecting weight on the scale, KitchenPal asks Laura what item she's weighing. Laura tells KitchenPal verbally that she is currently weighing chicken breasts.



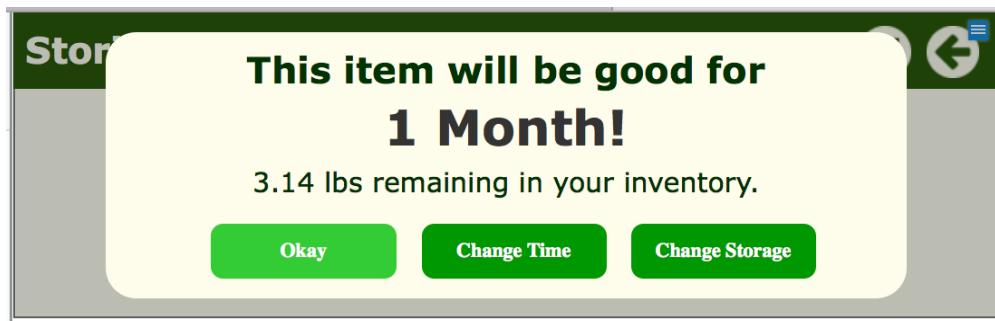
- 3) KitchenPal hears Laura say "Chicken Breasts", and reveals the weight and the name of the item on the scale. It asks if she's going to use the chicken for a recipe or storing the amount for later. Laura tells KitchenPal that she's putting the chicken away.



- 4) Knowing that chicken can be stored in multiple manners, KitchenPal asks the method Laura wants to use to store the chicken. Wanting to extend the longevity, she tells KitchenPal that she's freezing it.



- 5) KitchenPal informs Laura that the chicken that will be placed in the freezer will be good for one month. Once this has been established, Laura hits "Okay" to exit out of the Weigh Item Menus.



- 6) Laura now sees the Inventory Menu on the scale screen with the updated values for item expiration dates.

Inventory			
Add Items	Filter	Search icon	Gear icon
Item	Amount	Expiration	Added
Chicken Breast	2 lbs	2 days	Yesterday
Raspberries	3 lbs	3 days	Today
Fresh Spinach	5 oz	4 days	3 days ago
Tomatoes	8 oz	5 days	1 week ago

Appendix-User Feedback

Tosa Two Heart User Interview

Age: 24

Occupation: Grad Student

- Doesnt See Pantry at home (try shelf
on hand or storage)
- Want Click on button to see recipe detail
= scroll difficult
- click on pic to get to recipe
- Recipe detail
- Line how easy to read
- Though first thing could be Review
- Ingredients didnt realize missing
Step by Step guide
- Speaker moves through page
- Step 2 weigh item moved
- Try make rec
would rather have all steps displayed on screen so don't have to touch
- Don't understand Scale home
weigh Item
= Dumps
- Chicken
recipe detail
- Hard to see what is there vs what is missing
- try green ✓ red ✗ add button

Jade Nguyen User Interview

Age: 30

Occupation: Grad Student

User: Jade Nguyen

Age: 30

Occupation: Grad Student

User Feedback

- Show scan right after first scan...
- What will happen when you click on favorite?
 - Home screen confusing
 - rethink favorite / ~~favorite~~ organization
- Rethink "Add to shopping List" button
- Add one item to list on "Scale Item Detail" screen
- Tablet Favorites not clear
- View Recipe instead of "start cooking" on recipe search

↑ take your
Scan your
receipt...
for example
Milk