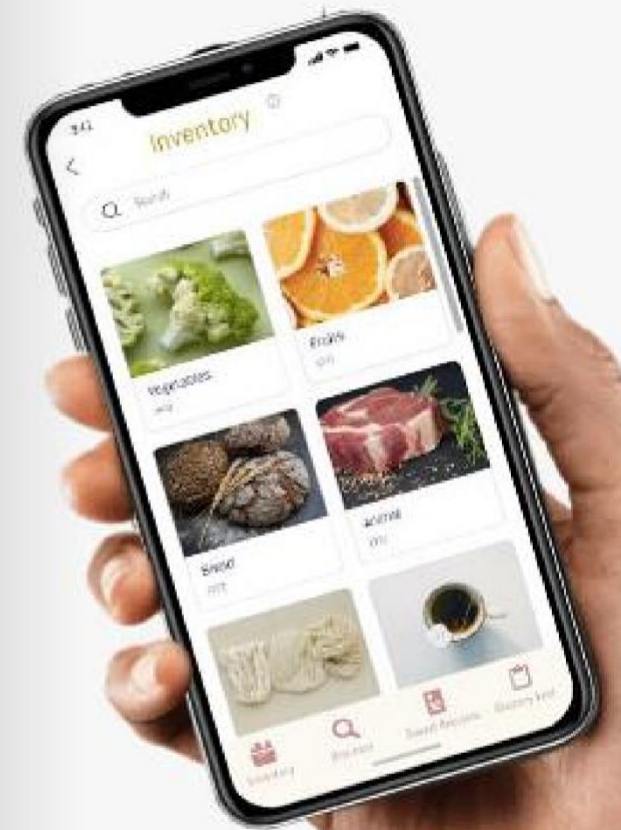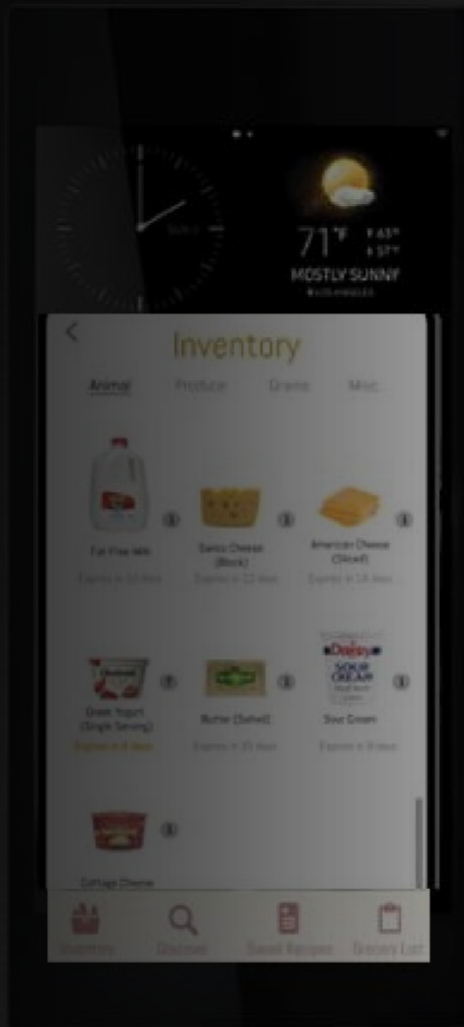# Smart Pantry

Kevin Merle, Ryan Koch, Tom Ribeiro

The Problem

Personae

1. *Tara is at the grocery store. She looked up a great chicken Milanese recipe at work but does not know if she has lemons or parsley at the house. She tries to call someone at the house, but no answer. She buys them anyways but returns home to find lemons and parsley in the fridge.*

2. *Mike is a foodie. He cooks for his family of five, but his kids always accuse him of making the same recipes over and over. He wishes he were more creative in the kitchen, but has a hard time utilizing items in his pantry to create new dishes.*

3. *Kristen is a busy mom. She is on the run driving the kids to practice, doing their laundry, cleaning the dishes, and making meals. She has a lot on her plate and has formed a habit of wasting food. She has a hard time prioritizing food management amidst her other motherly tasks.*
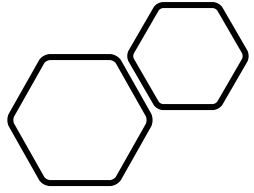
Design Process

User Research → **Wireframe** → **Mockups** → **Prototype** → **Usability testing**

Top User Concerns

1. **What's in my fridge at home?**
   Provide users more situation pantry awareness

2. **What's about to go bad?**

   Remind users when food is going or about to go bad

3. **Accidentally doubling up while grocery shopping.**

   Help users quick review stock and easily add what's missing.
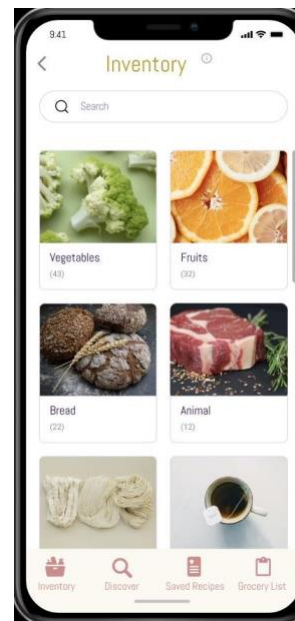
Top User Concerns

4. **Coming up with new recipes.**
   Provide users relevant recipe suggestions

5. **Planning with budgeting in mind.**

   Incorporate local market prices for recipes and grocery list items.
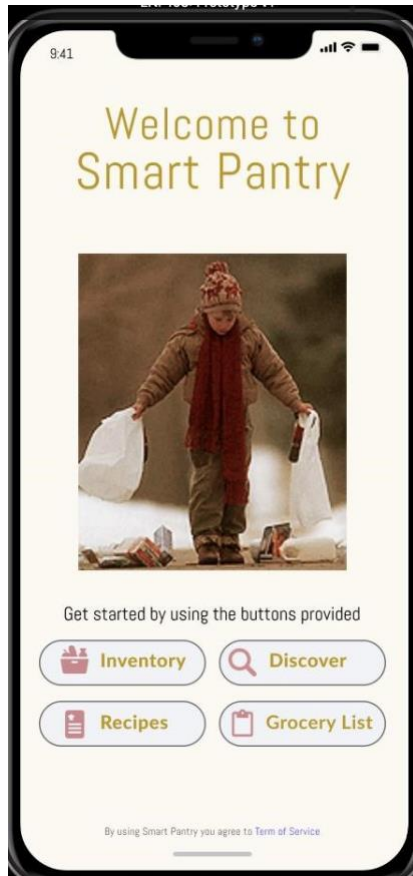
CONCEPT:

What if you could keep an inventory of all the groceries in your house…I.e., how much flour you have, how many gallons of milk, etc.

Low stock reminders

~~Customized recipe suggestions~~

Expiration date tracking

Sale alerts on frequent purchas

items

Digital inventory list with voice

activation

How does it work?

Sensors in Pantry & Fridge

App

Or

Voice

Story

Mike goes grocery shopping. After Mike has paid for his groceries, his grocery list is then sent digitally from the grocery store to his smart pantry system! The system then knows what Mike is bringing home. Once Mike arrives home, he puts his groceries away just like he normally would and the multiple sensors throughout the fridge and pantry work together to figure out where each item is "living". The system then actively monitors food consumption. For example, if Mike eats a can of soup, the system knows to automatically update the digital inventory.
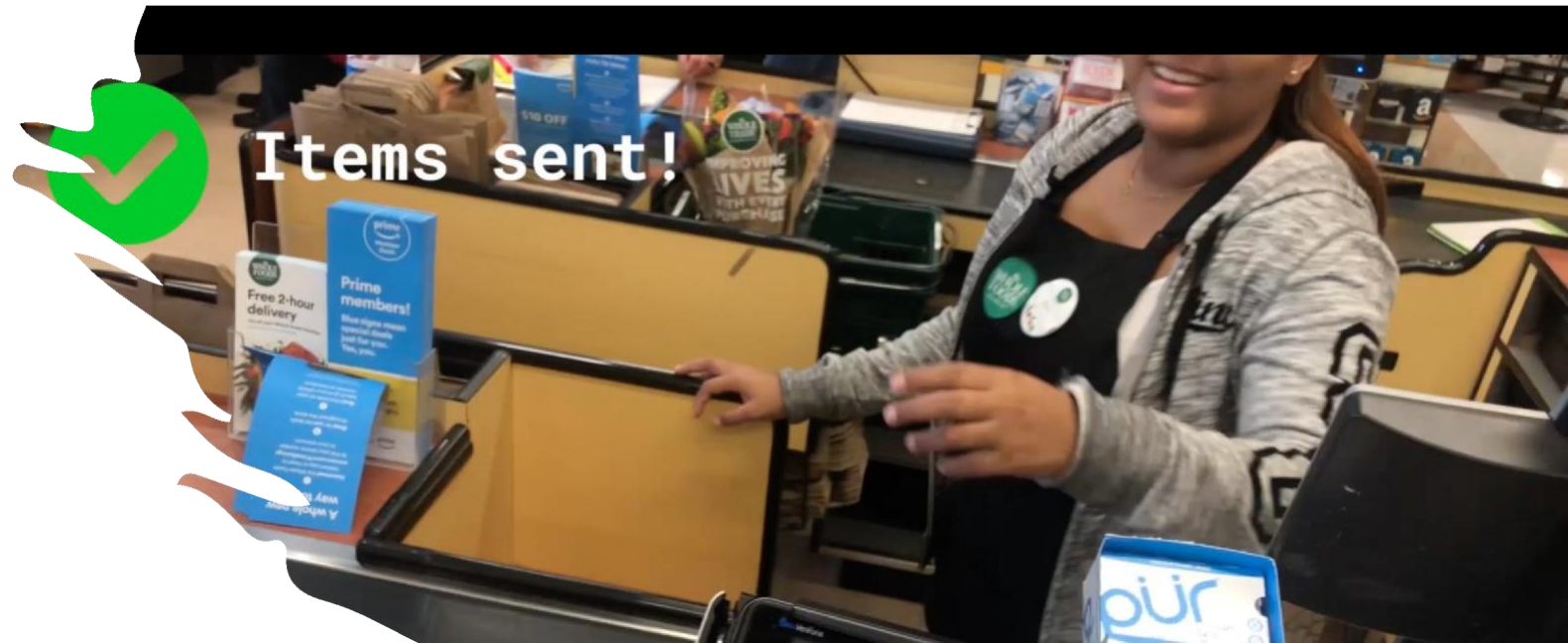
Sensor Technology

- The system would be based on computer vision, deep learning algorithms, and weight sensors all working together to create a truly smart pantry.

- Being human factors students (not mechanical engineers), the focus of this project is less on the technical aspects of the system and more about understanding the user's needs, designing appropriate workflows, and ultimately producing a prototype of the app that is testable.
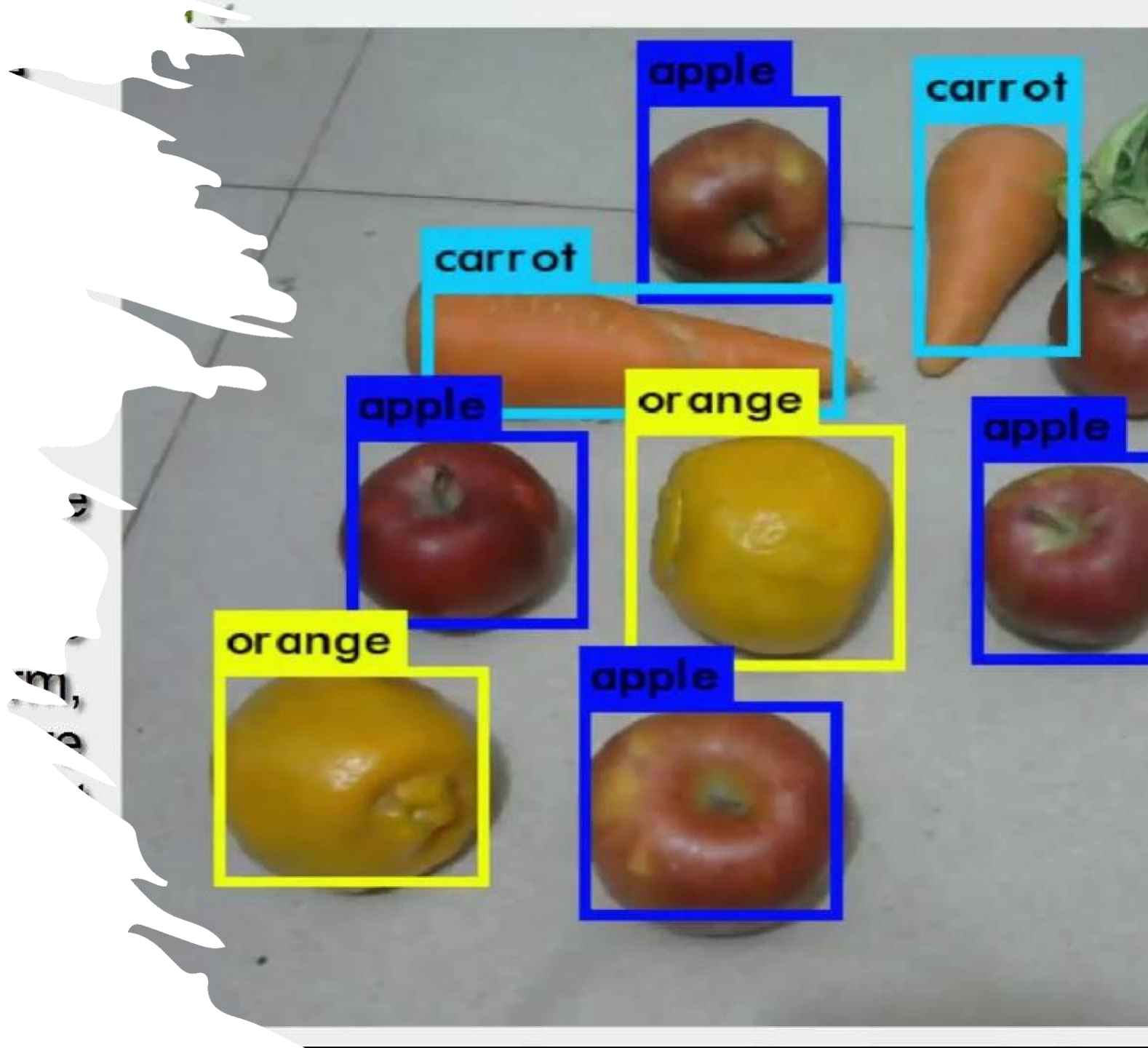
Workflow

- Choose a recipe based on suggestions
- Grocery shop for missing items
- These items get "sent" to your home based on your grocery receipt
- Once you arrive home, your smart pantry is now updated with the new grocery items

Workflow

While at work, you are wondering if you have ingredients to make pizza

You open the pantry app and verify what you have and how much of each ingredient
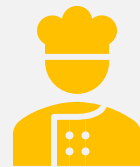
You then can choose recipes based on your current inventory or based on the idea that you will pick up new ingredients at the store

Workflow

Your smart pantry says "Kevin, your chicken is nearing expiration, would you like me to recommend recipes for you tonight?

You say yes or no

If yes, you can browse the recipes on your phone in the pantry app

Once you choose one, your pantry app will then prime the smart kitchen (if you have smart kitchen) for that recipe. E.g. preheat oven to 400 or be ready to dispense 5 cups of water.

Cook your meal by following the voice activated instructions - it's that easy

App Design

Design Process

User Research

Wireframe

Mockups

Prototype

Usability testing

Prototype

User Research to Wireframes

- Leveraged user research to brainstorm solutions

- Sketched solutions (IA, user flows and processes, features, user scenarios)

- Data led to the following features
  - Inventory
  - Discovery
  - Saved Recipes
  - Grocery List

Inventory

Welcome to
Smart Pantry

Get started by using the buttons provided

Inventory   Discover

Recipes   Grocery List

By using Smart Pantry you agree to Term of Service
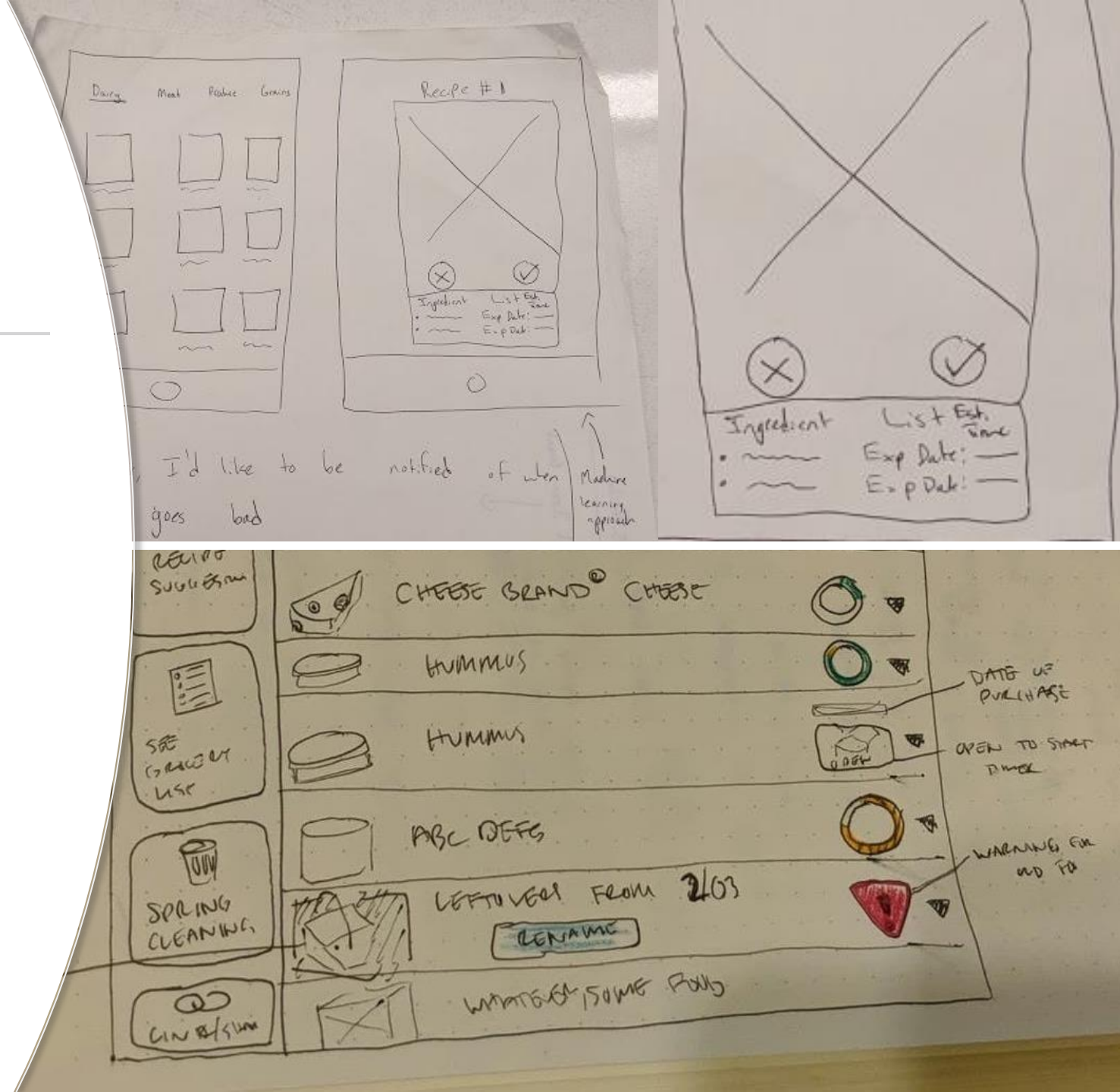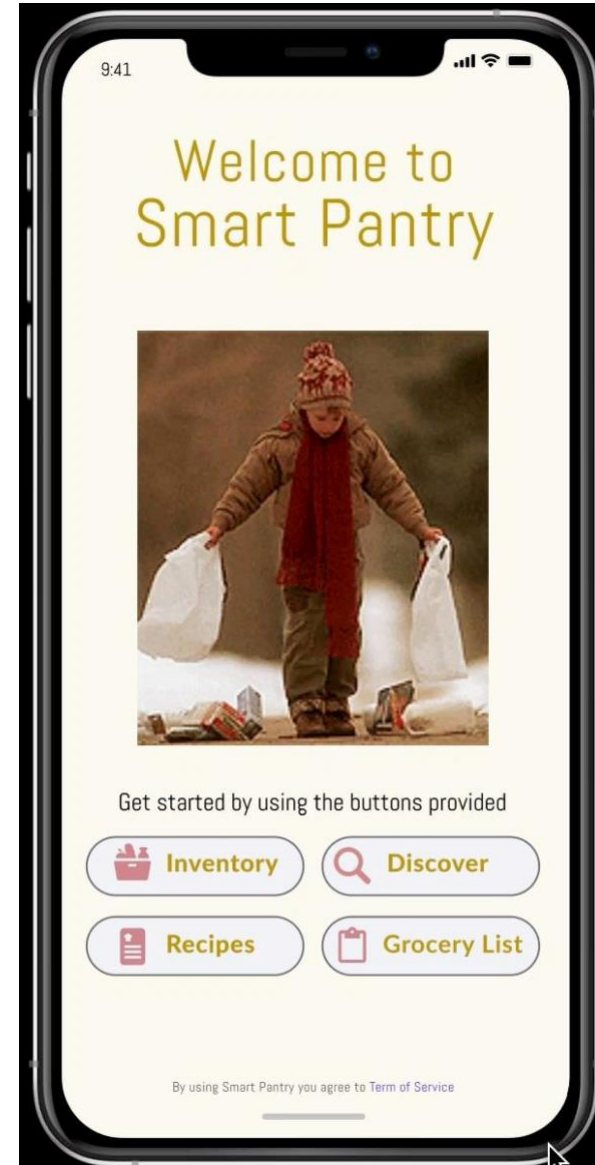
Discover
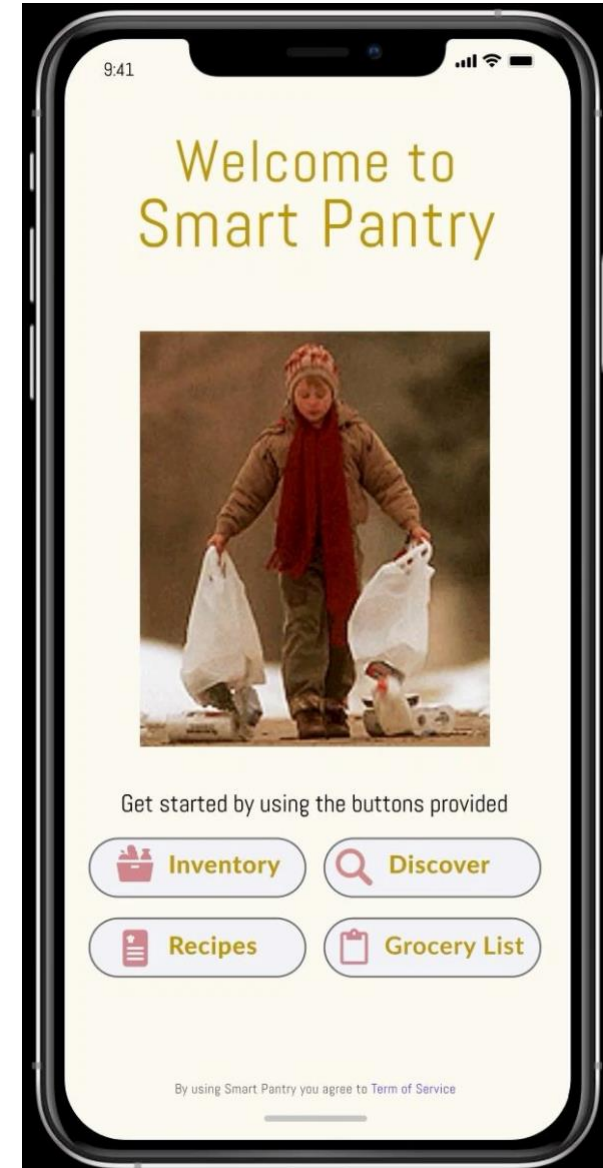
Saved Recipes

Grocery List

Risk Analysis

- Nine primary tasks identified

- Fourteen Hazards

- Five Hazard groupings
  - Sickness
  - Security
  - Trust in System
  - Time Wasted
  - Food Waste

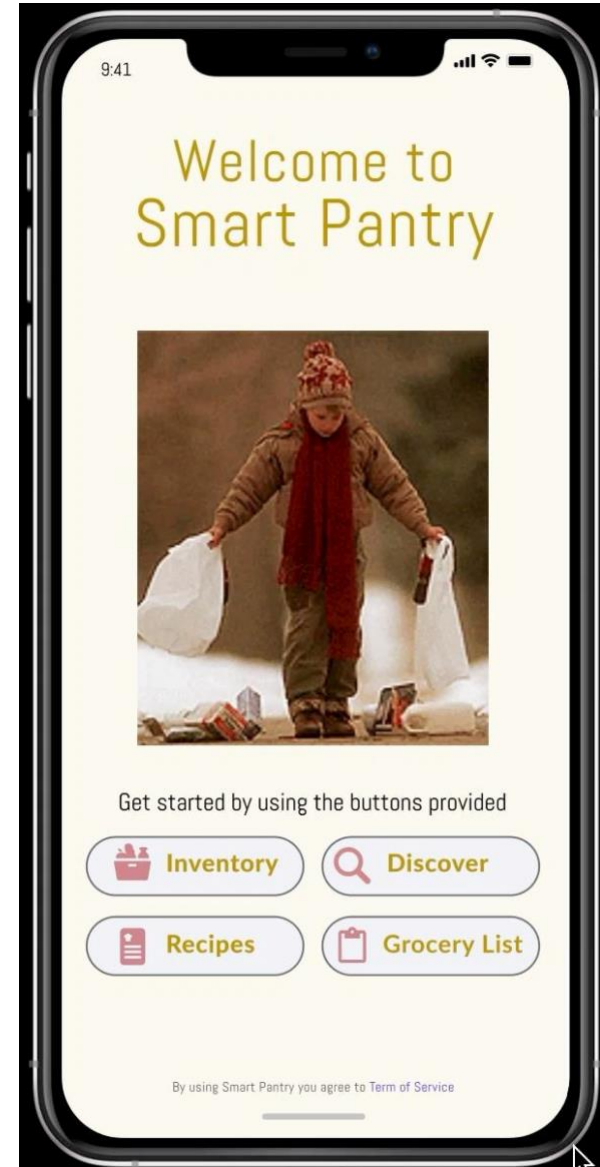| Risk Management Worksheet						
Product: Home Pantry App	Date Prepared: 21 April 2020		Date Modified: 21 April 2020		Prepared by: Group4	
Task:	Hazards	Hazard Type	Risk Level:	Controls		Residual Risk:
View items in inventory	Data Privacy	Security	IIIA Medium	No personally identifiable data will be stored on our servers. Transmitted data will only contain grocery items (no CC).		IA Low
	Inventory inaccuracies requiring manual adjustments	Time	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IA Low
	Inventory inaccuracies resulting in missing ingredients	Trust	IIIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IA Low
	Inventory inaccuracies resulting in excess food	Waste	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IA Low
	Misidentification of food in home pantry	Waste, Trust	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IIA Low
Identify food nearing expiration	Inaccurate expiration date resulting in food waste	Waste	IIIC Medium	Food expiration algorithms will prioritize safety over waste. A reminder to user will be generated when food is nearing expiration to check food for freshness.		IIC Medium
	inaccruate expiration date resulting in spoiled food and sickness	Waste, Sickness	IVC High	Food expiration algorithms will prioritize safety over waste. A reminder to user will be generated when food is nearing expiration to check food for freshness.		IIIB Medium
Reminder to user that parishable items are expiring/ have expired	Reminder not viewed resulting in spoiled food and possible sickness	Waste, Sickness	IVC High	Reminders will need to be acknowledged before they will be removed from display		IIIB Medium
Recommend recipes	Excessive recipe recommendations overloading user	Time	IC Low	Algorithms will recommend tailored recipes. Users can set the number of recommended recipes		IB Low
	Misidentification of food in home pantry	Time, Trust	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
Identify missing food items in recipes	Misidentification of missing food items	Time, Trust	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
Reminder to user that grocery items are running low	Reminder not viewed resulting in running out of food	Time, Trust	IIC Medium	Reminders will need to be acknowledged before they will be removed from display		IB Low
Notification to user identifying foods that are on sale	Inaccurate sale notifications	Trust	ID Low	Use national databases to update notifications. Local chains may not be represented.		ID Low
Purchased grocery items saved to inventory	No internet/ cell service	Time, Trust	IID Medium	App will sync when it returns to cell phone range/ wifi signal		ID Low
	Login/ syncing issues	Time, Trust	ID Low	App will sync when it is restarted. Database will exist on servers remotely to prevent corruption of data and allow cross platform use.		ID Low
	Inventory inaccuracies requiring manual adjustments	Time, Trust	IIC Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
	Misidentification of food in home pantry	Trust, Waste	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
Determine location for all food in home pantry	Inventory inaccuracies requiring manual adjustments	Time, Trust	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
	Misidentification of food in home pantry	Trust, Waste	IIB Medium	Inventory system will be thoroughly tested prior to use. Inventory system will be easily adjusted using voice commands		IB Low
	Login/ syncing issues	Time, Trust	ID Low	App will sync when it is restarted. Database will exist on servers remotely to prevent corruption of data and allow cross platform use.		ID Low

Likelihood		
Rating	Likelihood	Criteria
A	Remote	<1% probability of occurance. Redundancy is built into the process to prevent this occurance
B	Unlikely	5% probabilty of occurance. Redundancy is built into the process to prevent this occurance, however, potential exists for occurance under certain circumstances that have not been fully defined
C	Average	10% probability of occurance. Controls are in place, however, user error may result in occurances.
D	Likely	20% probability of occurance. Minimal controls defined, user error and network error may result in occurances.
E	Extremely Likely	>20% probability of occurance. No defined controls, user testing resulted in common occurance

Severity		
Rating	Severity	Criteria
I	Negligable	Minor inconvenience. Trust in the app remains intact
II	Moderate	Time and Waste may see a short spike as user learns the app. User continues to use the app, trust remains intact
III	Critical	User experiences more Time and Waste using the app than when not using the app. Trust in the app is lost.
IV	Catastrophic	User experiences health concerns (sickness and/or death). Trust in the app is negative. Legal actions may result.

		Likelihood				
		Remote	Unlikely	Average	Likely	Extremely Likely
		A	B	C	D	E
Severity	Negligable I	L	L	L	L	L
	Moderate II	L	M	M	M	M
	Critical III	M	M	M	H	H
	Catastrophic IV	H	H	H	H	H

Usability Testing

Participants

- Four Participants
  - Each session lasted ~20 minutes

	P1	P2	P3	P4
Scheduled session	4/26/20	4/26/20	4/26/20	4/26/20
Gender	Female	Female	Male	Female
Age range	50's	20's	20's	25
Persona (grocery shopper, family shopper, frugal shopper, etc.)	Mother, family shopper, online shopper	College student	Uninterested in cooking, vegan	vegan/vegetarian; wants to reduce trips to store and save money, graduate student

Tested Use Cases

1. "You just discovered this app. You're away from home and want to know what you have in your kitchen, pantry, etc..."

2. "You're tired of cooking the same old thing for dinner. How might you use the app to mix things up…"

3. "You're thinking about cooking a meal, you remember you recently saved a recipe, what do you do now?"

4. "You're at the grocery store, how do you know what you want to buy?"

Results
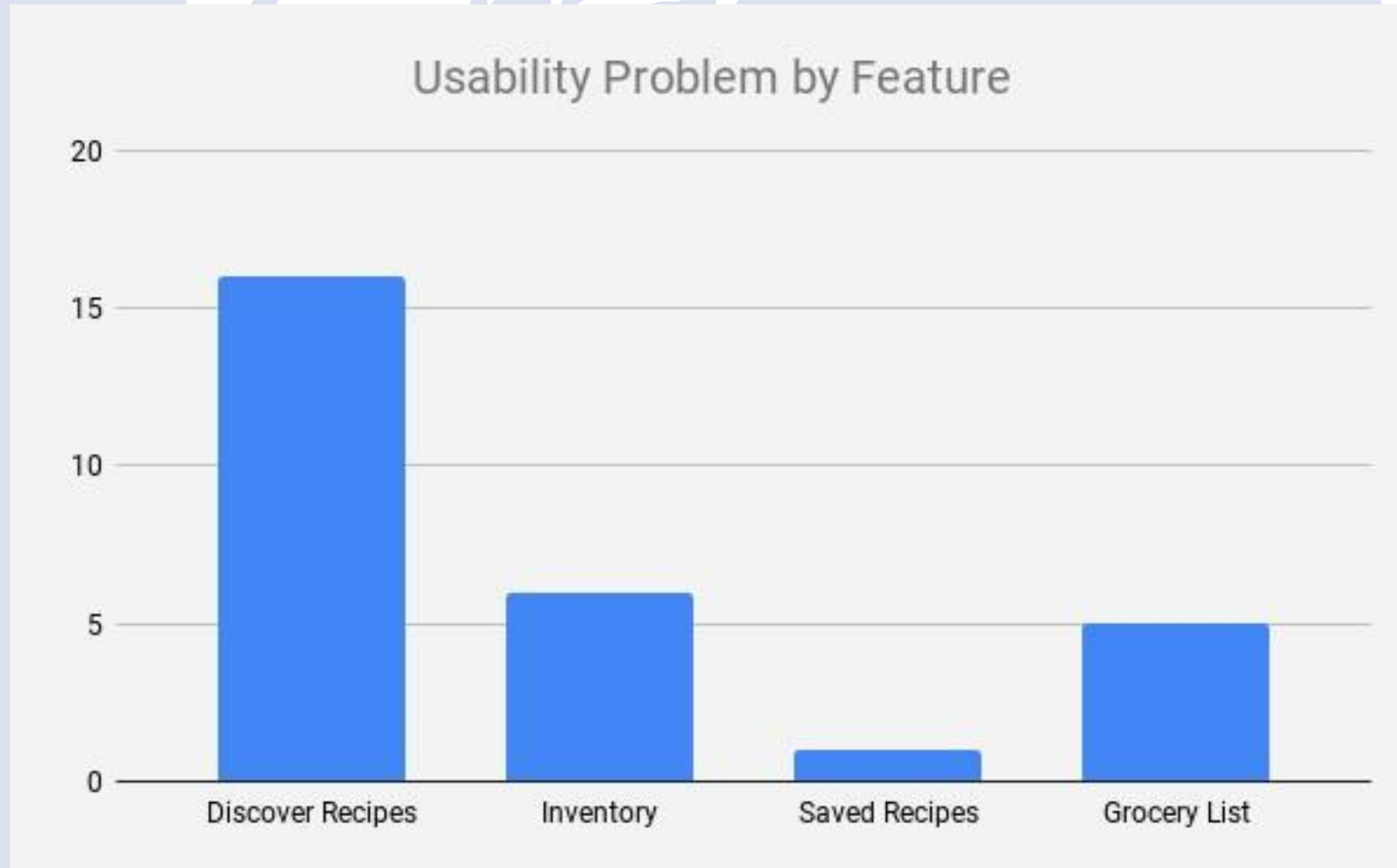
Usability Problem by Feature

Feature	Count
Discover Recipes	16
Inventory	6
Saved Recipes	1
Grocery List	5

Usability Results

Discover Recipe

"Confusion around like button… does this place the recipe in my saved recipe tab? Is the X more important than the heart?"

Inventory

"The tense is confusing… it should be "Your Ingredients", "Your *Ingredients* Needed", "Your *Grocery List*"

Grocery List

"Linking to the *grocery list*, how do I add items to my grocery list...what is the workflow? Do I add them from the *Saved Recipes* page? Is it one click?"

Root Cause Analysis

What is a Root Cause Analysis?

Root Cause Analysis Insights

Discover Recipe

"confusion around like button… does this place the recipe in my saved recipe tab? Is the X more important than the heart? Root Cause: Button Design (4)

Inventory

"The tense is *confusing… it should be "Your Ingredients", "Your Ingredients Needed", "Your Grocery List"*

Root Cause: Nomenclature (Information Architecture)

Grocery List

"linking to the grocery list - how do I add items to my grocery list...what is the workflow? Do I add them from saved recipes page? one click?"

Root Cause: Automation of Task (2)

Observation   Feature   Root Cause   Design Recommendations

Observation						Feature	Root Cause	Design Recommendations
confusion around like button - does this place the recipe in my saved recipe tab? & (the X is more predominant than heart so I'm more inclined to the "X" "it's darker than the heart")	1	1	1	1	4	Discover Recipes	Design of buttons (i.e., "Like (X)" and "Heart") was a cause of confusion. Root cause was determined as design of buttons UI component of "Discover Recipes" tab	Change opacity of X and Heart on Discover Recipe screen to be equal so not to bias the user towards one or the other
notes number displayed next to each category of food in inventory	0	1	1	1	3	Inventory		No change, this was easily identified and understood by users
linking to the grocery list - how do i add items to my grocery list…what is the workflow? Do I add them from saved recipes page? one click?	0	1	1	1	3	Grocery List	Automation of Task	Add cues, toast messages, in-app messaging to help users understand very easily how to add items from discover or saved recipes to grocery list
1. users went to recipes tab when trying to discover recipes to make…maybe change title to saved recipes 2. Ownership - name of title - "My grocery shopping list" it needs to be more personalized	1	1	0	1	3	Discover Recipes	Name of Button	change "recipes" button title to "Saved Recipes"
users wanted the option to search for recipes based soley on ingredients in their pantry - no grocery shopping	1	1	1	1	4	Discover Recipes	Misunderstanding of feature	…in discovery make it clear if certain recipes are "ready to make now" recipes
confusion around no waste score…what is it? (+ 90% No Waste Score - went to click (i) information icon)	1	1	1	1	4	Discover Recipes	What is no waste score	Should this be highlighted on the start page (just a quick blurb)?
consider adding a "add to grocery list" icon on the recipe itself or an "add all" (feature request) 2. change title of categories tense for Ingredients Needed … participant hits "view recipe from saved recipe", :ingredients have" and "ingredients needed" participant mentions tense (keep tense consistent) .. it (i.e., should be "Your Ingredients", "Your Ingredients Needed", "Your Grocery List", etc). Nomenclature issue / IA issue	1	1	1	1		Ingredients Needed	A recipe is only discoverable if your pantry has atleast 1-2 core ingredients	A recipe is only discoverable if your pantry has atleast 1-2 core ingredient -- Solution: backend logic - create a rule to display "discover" recipes (discoverable) you must have atleast 1-2 recipes in your Inventory to display a "discoverable" recipe. Additionally, nomenclature should be changed(i.e., should be "Your Ingredients", "Your Ingredients Needed", "Your Grocery List", etc)
1. I dont need to know which ingredients below to which recipe in the grocery list view 2. Ingredients needed - " I wouldn't say Ingredients you Need" not all recipes NEED certain ingredients.. they're more like recommendations, you can substitute things and customize recipes or supplement things if you're missing or have preferences for different cheeses"	1	1	1	0	3	Grocery List	Feature	Feature request: ability to substitute ingredients
I dont want to search in the grocery list view - i.e. the search bar	1	1	1	0	3	Grocery List	Search bar feature	Remove search bar

Design Recommendations

Thanks for Listening!