

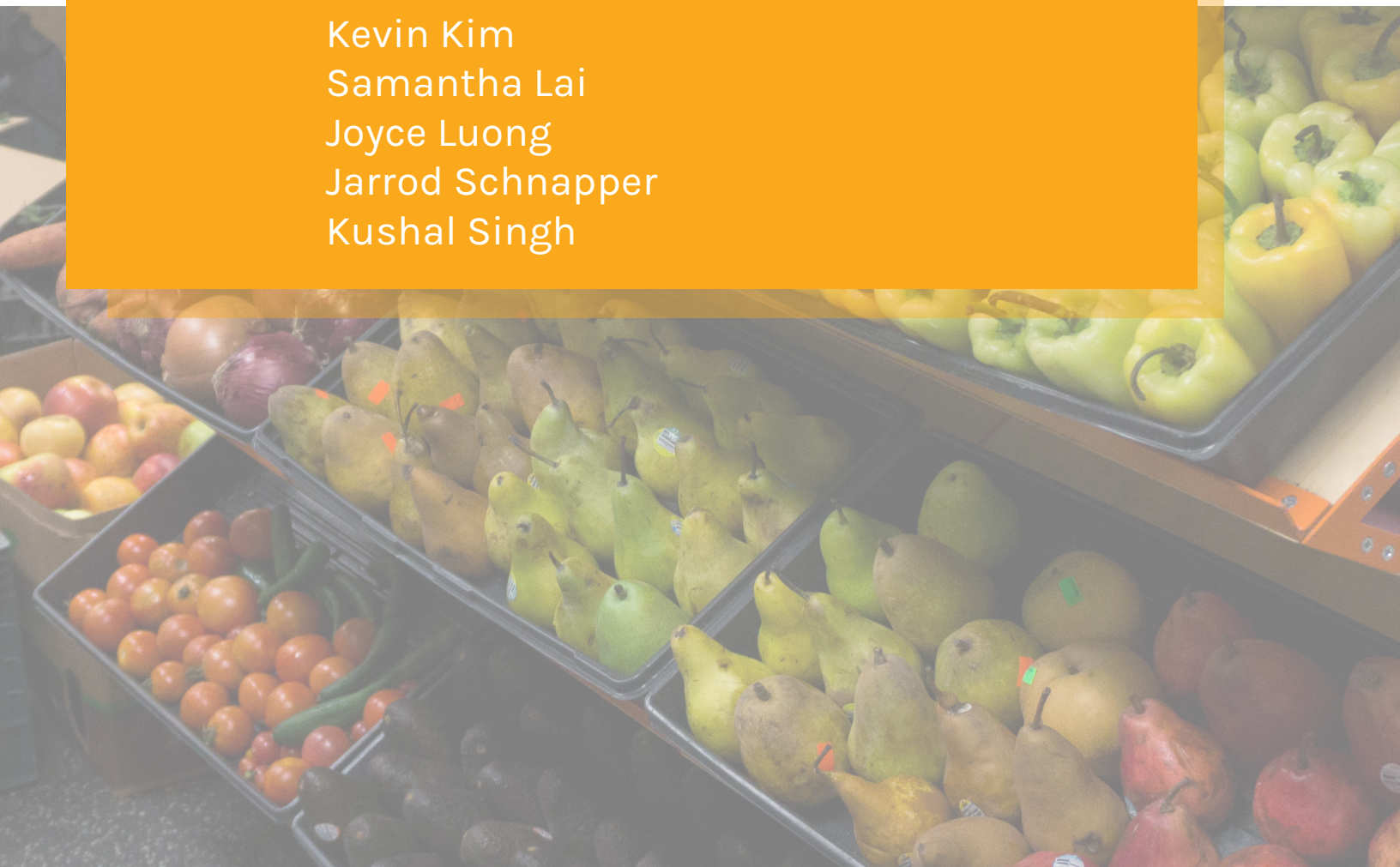


UC Berkeley

Food Pantry App

CS160 | Fall 2018 | Team 17

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Overview

Our project is a **two-sided system** that **increases and improves communication** between the UC Berkeley Food Pantry (UCBFP) and its users.

The **mobile app** provides a live inventory to keep users updated on pantry stock levels, a food recovery feature that allows users to notify the pantry of food recovery opportunities, and a feedback form to help the pantry improve their services.

The **web application** serves as the pantry's inventory system while receiving food recovery opportunities and feedback from mobile users.

We hope that this app will decrease food waste and spread awareness of the pantry, permanently changing campus culture to address food insecurity.

Brainstorm Process

We started by listing out every app idea we could think of on the theme of Access + Ability, compiling a list of 50 ideas that were mostly geared towards users with physical or learning disabilities.

One idea stood out after multiple rounds of paring down our list:

An app for finding social programs and resources for physically disabled and economically disadvantaged people.

Our proposed app would leverage a user's current location (via latitude and longitude information through Google Geocoding APIs) to suggest welfare programs in a user's community. This idea sounded promising because we would be able to increase access to resources for anyone in need and the app could be scaled to a local, state, or even national level.

Realizing that this would require an understanding of all welfare programs in existence, we tried to make our project more feasible by first narrowing the focus to areas surrounding UC Berkeley, then only to programs addressing food insecurity.

However, we found that we had again taken on too much, because we would have to round up a plethora of programs and applications with different interfaces operating independently of each other. Not only was it unrealistic to implement every program available, but it didn't do these programs justice to try and consolidate them all into one app that reduced them all to a watered-down description.

After repeatedly running into implementation barriers, we looked to our community for something we could potentially achieve in a semester. We zeroed in on creating an application to help an organization that works to relieve food insecurity on our own campus:

The UC Berkeley Food Pantry



Intermediate and Final Design Sketches

We knew that we needed some separation in our product between pantry users and pantry volunteers. However, these separate parts needed to collaborate to implement the functionalities we wanted to offer, approaching the tasks from different angles.

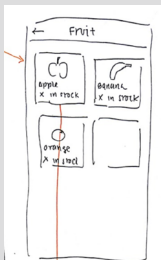
One of the first solutions we entertained was a single mobile app with a login screen so that a user's login information would specify their pantry user/volunteer status. We rejected this solution because it violated pantry user anonymity by requiring users to create accounts.

Next, we considered asking the app user whether they were pantry users or volunteers, with no logins. This was problematic because it allowed anyone to access the administrative functions of the pantry facing app and involved an unnecessary action on every launch.

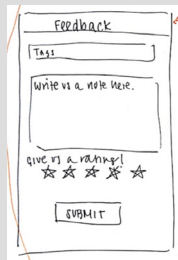
We repeatedly found that for the volunteer app, there was too much information to display. Realizing that we were forcing a mobile solution upon pantry volunteers rather than responding to their needs appropriately, we split our system into a mobile app for pantry users and a web application for pantry workers.

Intermediate Paper Prototype

Deciding on the web + mobile solution allowed us to start iterating on the design of our pantry user-facing mobile app. Here is our first paper iteration of the mobile app.



Live Inventory
Items in the fruit category as cards



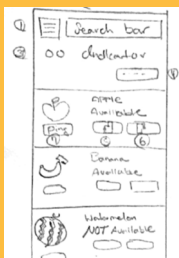
Feedback Form
We started with a star rating system and a text field for comments.



Food Recovery
This includes options to choose a location or send the phone's current location.

Final Paper Prototype

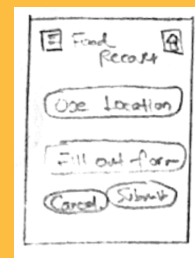
In these sketches, we had not yet done any user testing, but we refined the display to fit what we predicted our user needs to be. Here are some key changes we made from the last iteration.



Live Inventory
We changed the way we presented the information on the search screen, which freed up space.



Feedback Form
The functionality didn't change in this iteration.



Food Recovery
The functionality didn't change in this iteration.

Scenarios

Our app aims to serve three main groups: pantry users, pantry volunteers, and members of the community. Here are examples of how the app might be used.

Pantry User

Between classes, he wants to grab a snack but doesn't want to walk all the way to the basement of MLK only to find that the pantry has just run out of apples. Using the app, he first checks that the pantry is open, then makes sure that apples are in stock. He is alarmed that the number in stock is decrementing (someone is currently at the pantry checking out), but sees there are 20 apples in stock and is reassured that there will still be apples when he gets to the pantry. When he arrives, he picks up two apples and heads to checkout.

Samantha is a food pantry volunteer. A large shipment of produce has just come in and she is in charge of restocking items. She opens the web application on her laptop and uses a barcode scanner to load each produce item individually and input the new stock count. Once she is finished, she sees that Kevin has come into the pantry and is ready to check out with two apples. She navigates to the checkout screen on the web app and uses the scanner to scan the apples' barcodes. The newly decremented stock count is visible in the mobile app immediately.

Samantha routinely checks the feedback tab, making a mental note to read and share the feedback with the other volunteers at their next meeting. Upon opening the Food Recovery tab, she sees a new notification from Joyce that there is pizza to pick up on campus. Another volunteer in the pantry is available to take over the check-out desk, so Samantha texts Joyce to confirm that she is available to pick up Joyce's donation.

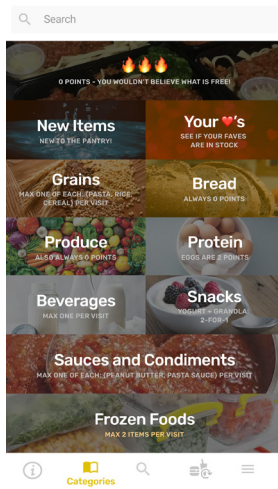
Pantry Volunteer

Community Member

Kevin is a food insecure Cal student. Between classes, he wants to grab a snack but doesn't want to walk all the way to the basement of MLK only to find that the pantry has just run out of apples. Using the app, he first checks that the pantry is open, then makes sure that apples are in stock. He is alarmed that the number in stock is decrementing (someone is currently at the pantry checking out), but sees there are 20 apples in stock and is reassured that there will still be apples when he gets to the pantry. When he arrives, he picks up two apples and heads to checkout.

Figma Wireframes

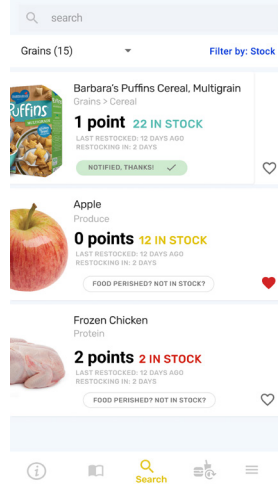
Iteration One



Categories

Tapping on a category shows the food items within. The fire emoji category represents prepared food that was recently donated, and needs to go quickly.

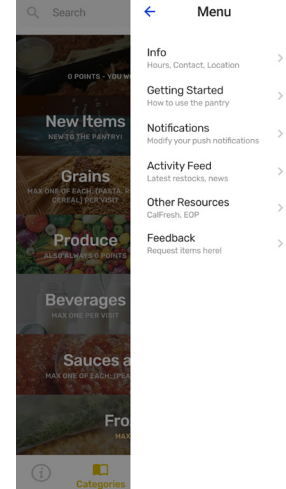
Iteration Two



Inventory

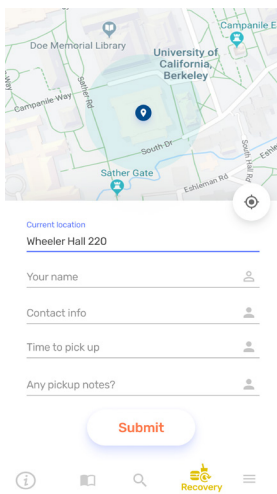
The inventory displays items with their category, points, stock count, restock indicators, and a favorite button. It includes a button to notify volunteers if an item is perished or not in stock.

Key Changes



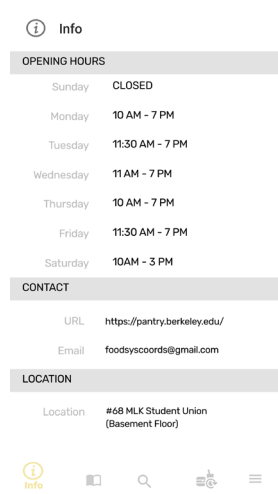
Menu

The menu allows users to find info, control notifications, view events that are happening, access information about other resources, and submit feedback to the pantry.



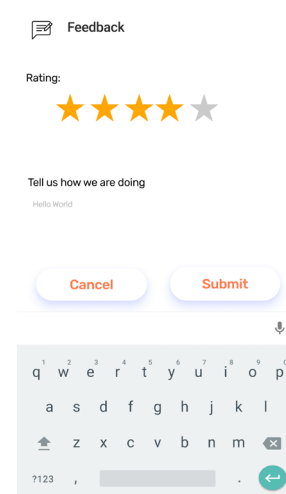
Food Recovery

A short form lets users notify the pantry if there is food available for redistribution.



Info

Displays pantry info.



Feedback

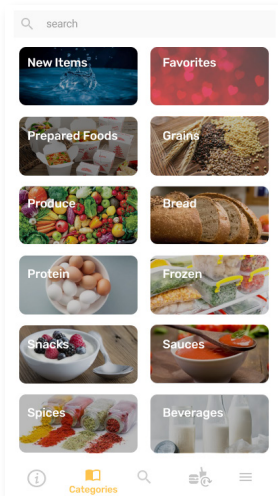
Provides avenue for feedback.

Figma Wireframes

Iteration One

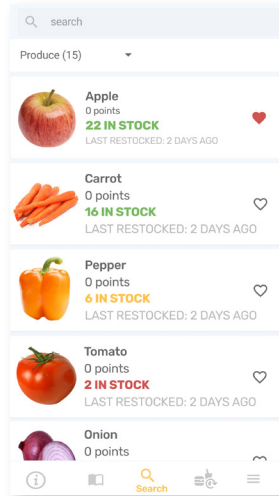
Iteration Two

Key Changes



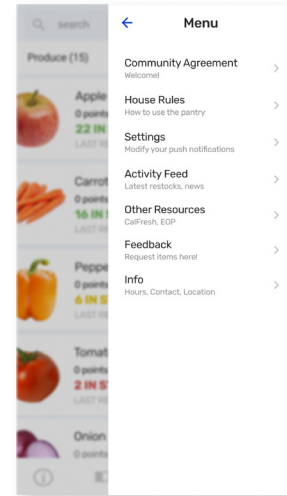
Categories

We updated the fire emoji to be "Prepared Foods" and decided to use smaller cards as we got feedback that the previous iteration was too dark.



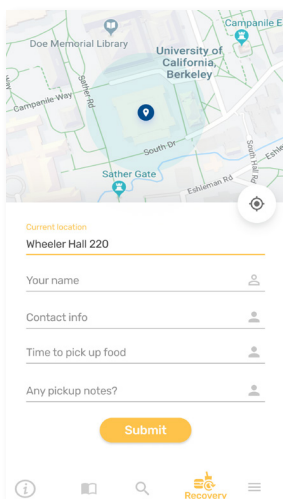
Inventory

The inventory (reachable via search or categories) displays items with their pictures, points cost, left in stock, a favorite button, and a last restock indicator.



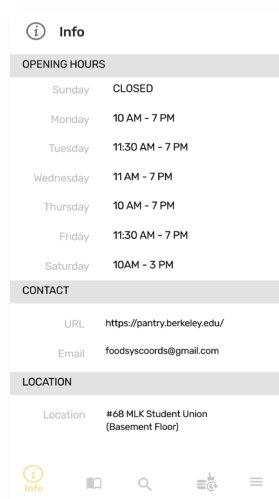
Menu

We updated the menu to move the community agreement and house rules to the top (as they are important).



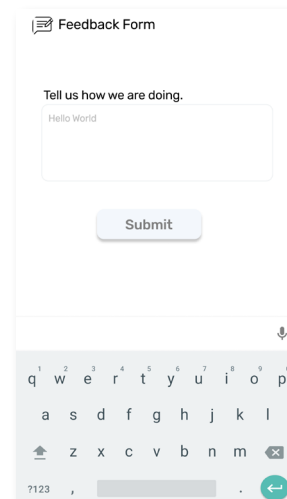
Food Recovery

We changed some of the UI



Info

We did not change this



Feedback

We removed the star rating for the feedback form.

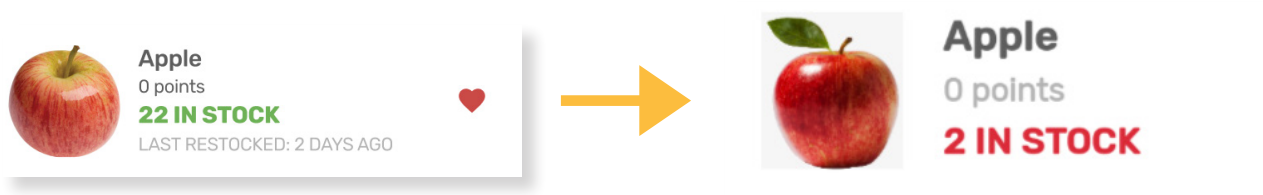
Figma Wireframes

Iteration One

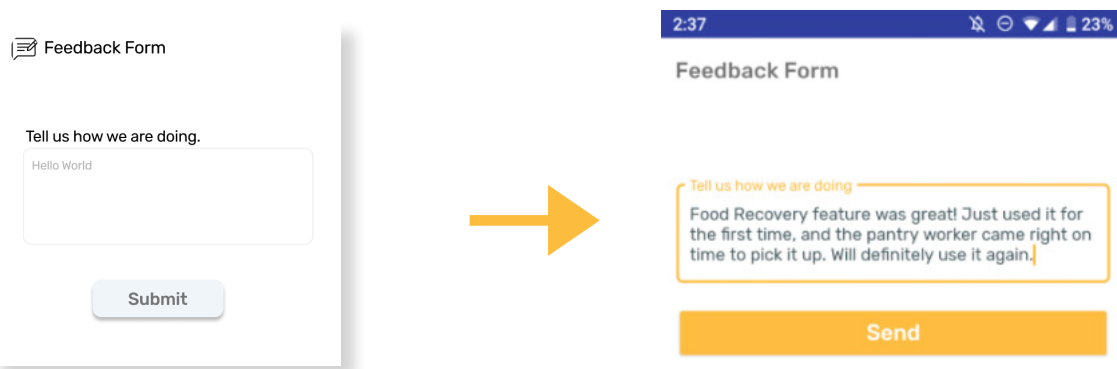
Iteration Two

Key Changes

From iteration 1 to iteration 2, many of the changes we made were motivated by our user research. We removed the "Last Restocked indicator" because the pantry generally restocks items on the same day each week, so, this information wasn't providing student users with valuable information. It also made the Card View (i.e. the UI field) more minimalist and aesthetic, providing the information that pantry users cared about—item count and item cost.



Furthermore, we removed the 5-star rating feature, since pantry users said that many ratings reflected areas that were outside their control, such as food branding and quality of food. Additionally, the numerical rating did not give volunteers suggestions for improvement. In contrast, the text box that remained would provide the pantry workers with specific user feedback.



User Studies

By conducting user studies at every stage of our app development, we made sure that we were creating a product that was specific in addressing their pain points and that the pantry coordinators stayed up-to-date on the evolution of our app. Below are key insights from each of these interviews.

UCBFP Coordinators

Gender | 1 Female, 1 Male
Age Group | 20's
Location | Food Pantry

These interviewees are UC Berkeley students who serve as the coordinators of the pantry. They are knowledgeable about how the pantry is run and have plenty of ideas about how they'd like to see the pantry improve. In our early planning stages, they introduced us to the idea of a food recovery feature and were very excited about our feedback feature. In later parts of the project, we consulted them frequently at every stage of prototyping. The coordinators also helped us understand the benefits and drawbacks of their current checkout system. They were concerned about its inefficiency and thus discouraged adding a significant amount of time to each transaction when designing the checkout procedure. However, understanding that more specific data on pantry use would be useful for restocking accurately and supplying figures in grant proposals, they conceded that small losses of efficiency were not as important as insights that they could potentially gain.

UCBFP Data Analytics Lead

Gender | Male
Age Group | 20's
Location | Food Pantry

One of this interviewee's main insights was that he was concerned about the level of extra training that would be required of them to operate the pantry. We took this as motivation to make the web application intuitive and straightforward to make the organization and resulting data worth the extra book-keeping. He was skeptical of their ability to provide exact stock counts, which we addressed by allowing the pantry volunteers to update the stock manually at any time to keep the numbers accurate. A last important insight was that he believed a star system wasn't appropriate for the type of service they were offering, citing that it was nonspecific and didn't give them any way to try and improve.

UCBFP Volunteer

Gender | Male
Age Group | 20's
Location | Food Pantry

This interviewee told us about the pantry from a user's perspective. Due to the honor system by which the pantry operates, he explained, the pantry does not turn people away who have exceeded their 'allotted' visits. A important detail is that they don't even keep track of how many times people have been there, in the spirit of the pantry being an emergency resource. We plan to reflect this in our app by intentionally not implementing any indicators of visit frequency and making sure that we exude a welcoming attitude in the language of the app.

User Studies

UCB Food Pantry User 1

Gender | Male
Age Group | 20's
Location | Food Pantry

This pantry user, along with almost all of our other interviewees, supported the live inventory feature. They commented on how it could show the coordinators relative item popularity and allow them to keep the pantry in stock more effectively. They suggested displaying the house rules so that users could be reminded of how points could be spent. Their interactions showed us what was intuitive about our design.

UCB Food Pantry User 2

Gender | Female
Age Group | 20's
Location | Food Pantry

The frequent pantry user tested our high fidelity prototype on an android device. They mentioned that they love the pantry as a resource and found interface easy to use as well as very inviting. A key finding from this interaction was that the user constantly went from the category to inventory screen and didn't seem to express any desire to click the other activities. They mentioned that the inventory was extremely relevant to their pantry usage, but that the exact stock count wasn't necessary. They would be fine just knowing if an item was low or out of stock. This is something we may consider for future iterations.

UCB Food Pantry User 3

Gender | Male
Age Group | 20's
Location | Food Pantry

A key insight from this user was that they were concerned about how the food recovery would keep the pantry and the user donating food in contact after the form was sent. To address this, we plan on implementing an in-app chat system in the future. In the meantime, we hope that sharing contact information between the two parties will be sufficient. They liked the layout of the recovery screen, but thought it could benefit from an in-chat function to communicate with the pantry worker who is coming to recover the food. Lastly, they wanted some more info from the info interface, like when certain items get restocked in general so they can plan accordingly.

Competitive Analysis

Plentiful

Plentiful is an application for food pantries that tracks clients, manages visits, and provides data analytics to understand the pantry usage.

Clients can use the app to find and reserve food at pantries nearby. Plentiful isn't specific to any single pantry and is meant to assist a variety of pantries. This app struggles with scaling and providing specificity to all the pantries it covers.

UCBFPA

Our application will avoid these issues by developing to fit the needs of the UCB Food Pantry.

Got Food?

This application aims to help food insecure people connect with others in their neighborhoods to find accessible food pantries and soup kitchens nearby. Unfortunately, it does not appear to be functional. Regardless of your location, the application only outputs kitchens or pantries in Illinois.

UCBFPA

We created a working system that looks to the community as a valuable avenue for relieving food insecurity.

University Lunch Box

This application helps students take advantage of events with free food available. It allows students to filter by types of events they are interested in, such as tech events. However, the application is nonfunctional and users cannot proceed after the home screen.

UCBFPA

We believe that the concept of taking advantage of food on campus is very powerful, so we incorporated the ability to recover food from events on campus into our app.

Competitive Analysis

Our competitive analysis was helpful in providing big picture ideas to keep us on track to creating a useful product, but none of the ‘competing’ apps had goals or target users that sufficiently lined up with ours. In order to show exactly what points we wanted to address and thus provide a meaningful measure of our success, we compare our system to the current functionality of the UC Berkeley Food Pantry.

Pantry

App

Inventory

The Food Pantry currently does not have any inventory system in place. The pantry coordinators are skilled at eyeballing the stock and knowing when to order items, but they lack quantitative measures that can be used for grant proposals and usage analysis.

Our inventory system not only gives them a simple way to input new shipments and collect data on the popularity of items during checkout, it also gives them full administrative power to edit stock counts and keep the inventory as accurate as possible. This improves the experiences of both the pantry volunteers and the pantry users.

User Purchase Info

The pantry’s primitive checkout protocol currently is unable to record information about what items are taken at each transaction beyond the broad categories of produce vs. shelf item vs. bread.

The ability to track the specific items purchased by users will help the pantry collect more accurate data on their services and allow them to better communicate to their umbrella organization about their impact.

Food Recovery

When we first spoke to the coordinators of the food pantry, they explained that they were planning to put a system for food recovery in place but had not yet implemented any system at all.

Our application offers an end-to-end implementation of this program for them, helping them take a huge step towards cutting down on easily preventable food waste.

Technical Challenges

01

Android App

A major technical challenges we faced during implementing our application stemmed from learning Android Studio. Since we were unfamiliar with the environment at first, much of the time implementing features was used in researching what was possible and how to execute them in Android Studio specifically. However, once we were able to find good solutions to fit our application and functionalities, the implementation process was mostly straightforward..

Another technical challenge we faced was passing information between different activities within our mobile app. We required the database information in multiple activities, but encountered issues with passing HashMaps between activities to keep the app updating in real time. Our solution was to pull the appropriate data from our database every time we accessed an activity. However, this introduced another challenge: because we pull the data upon start of all the activities, our app has a slight loading time before it can present the data. In order to solve this challenge, we will have to implement a way to save certain data in external storage to reduce loading time.

One last notable challenge was that we observed slightly variant behavior across different Android devices. Running the application on a Pixel 3 device worked as intended, but on a Nexus 5 device, the app behaved slightly differently. It was still functional, but it showed us that we needed to test on multiple devices to ensure our app's functionality.

02

Web App

Given that we were experienced with the particular web stack (vanilla HTML/CSS/Javascript) and the extensive amount of tutorials and help available online, we did not find many technical challenges that got in the way of implementation. However, the large scale of the project made it hard to implement every single feature that we wanted to offer and we had to prioritize some features over the others. Originally, we wanted to provide the real time inventory view within the web app in addition to the mobile app. We also wanted to use the web app to give food pantry workers a lot more power over updating the app.

Technical Challenges

03

Database

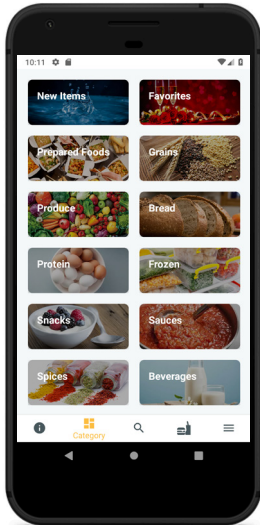
The biggest challenge with Google's Firebase database was getting it configured to our application. In order to hook a specific Firebase database onto a mobile app, there is a lengthy setup process involved that includes adding a several permissions to the Android Manifest file as well as the build.gradle files and app.gradle files in Android Studio. However, once this setup process was complete, it became fairly intuitive and straightforward to use.

04

Integration and Running on a Mobile Device

Due to our application being a two-sided app connected by a database, debugging posed a unique challenge. All the parts of our application were interdependent on each other, so debugging required more than just manipulating the Android code. In order to overcome this challenge, we had to be more communicative and be more solid on our architecture of our system. However, this actually turned out to be beneficial to our development process, since we could debug certain parts from either the Android or the Web side, allowing us to be more flexible and optimize the code for the resources of the system.

Final Design

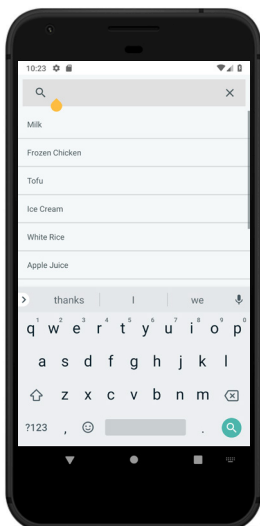
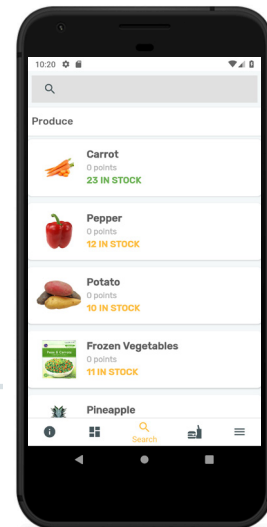


Categories

The categories function as tags for items offered at the pantry. Each button leads to inventory screens that list all the items in the category.

Live Inventory

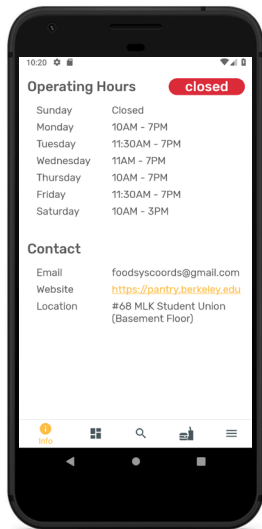
Each card in the live inventory displays item name, picture, cost in points, and stock count. Stock count updates in real time when the web app changes the database during restocking or checkout.



Search

Users can item by name rather than having to scroll through all items in a category.

Final Design

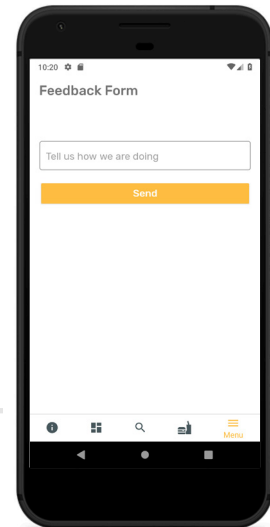


Information

This screen displays live updating location, hours and contact info. Pantry can edit their information through the web application.

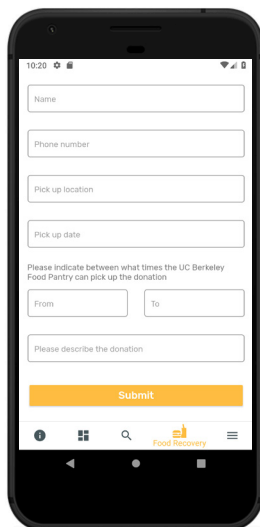
Feedback Form

Mobile users submit a feedback form that is pushed and stored in the database. The pantry receives the feedback immediately through the web app.



Food Recovery

This feature allows users to submit a form and specify information about the donation. Once the form is submitted, the pantry will receive the information immediately through the web app.



Final Design

Updating Inventory

Pantry volunteers can add new items and load existing items to update the stock counts.

The screenshot displays the UC Berkeley Food Pantry app interface on a laptop screen. The app has a dark blue header with the title 'UC Berkeley Food Pantry' and navigation links for 'INVENTORY', 'CHECKOUT', 'FOOD RECOVERY', and a user profile 'JOYCE LUONG'. The main content area is divided into two columns: 'Add Item' and 'Load Item'.

Add Item Form:

- Item Name: Brown Rice
- Barcode: brownrice
- Cost in points: 1
- Quantity: 33
- Category selection (checkboxes):
 - Prepared Foods
 - Bread
 - Snacks
 - Beverages
 - ☒ Grains
 - Protein
 - Sauces
 - Produce
 - Frozen
 - Spices
- Image upload field with a file icon and the text 'brownrice.jpg'.
- A yellow 'SUBMIT' button.

Load Item Form:

- Barcode: brownrice
- A yellow 'SUBMIT' button.

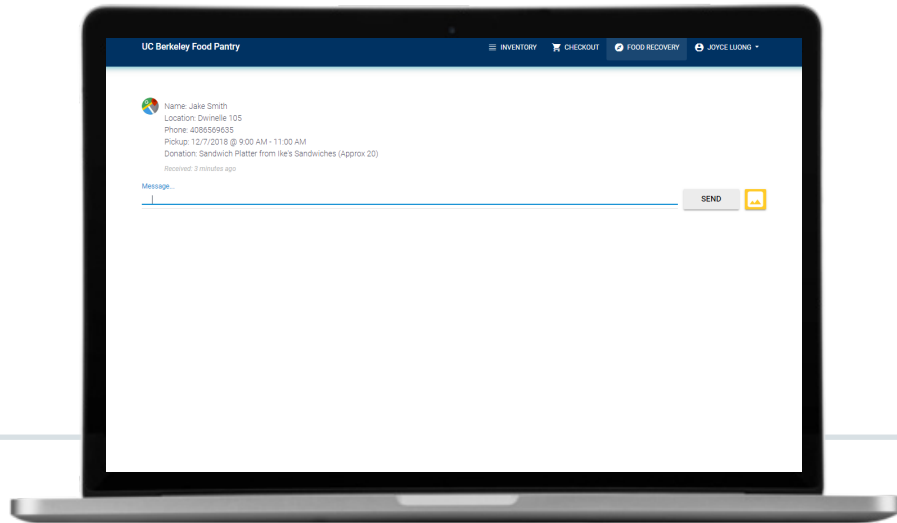
Edit Item Form:

- Item Name: Brown Rice
- Barcode: brownrice
- Cost in points: 1
- Quantity: 33
- Category selection (checkboxes):
 - Prepared Foods
 - Bread
 - Snacks
 - Beverages
 - ☒ Grains
 - Protein
 - Sauces
 - Produce
 - Frozen
 - Spices

Final Design

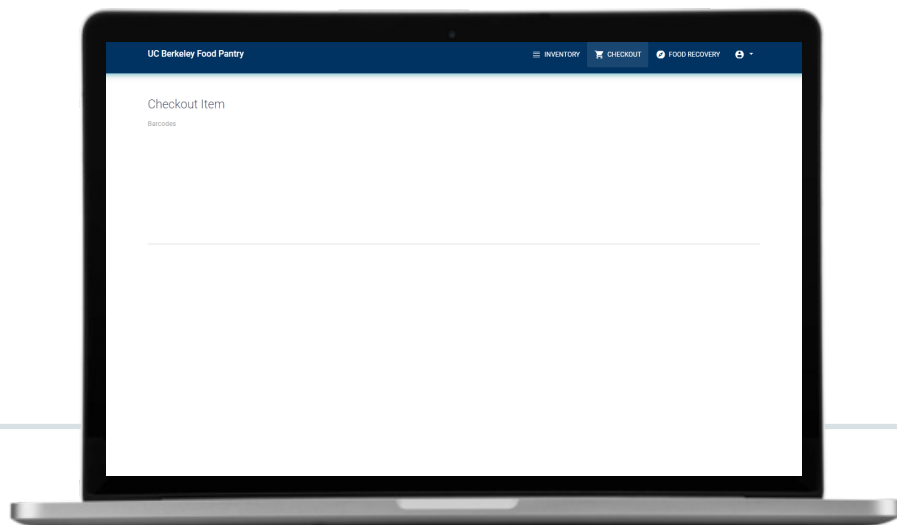
Food Recovery

Pantry volunteers receive notifications from mobile users of food available for pick up and redistribution.



Checking Out

The barcode scanning system allows pantry volunteers to efficiently update the inventory during checkout, keeping all users up to date on exact stock counts.



Summary and Future Directions

At the start of this project, we agreed that we wanted to create something meaningful for our community. We were drawn to ideas that helped users take steps to find resources to help themselves and others. This led us to something simple and powerful--making the UC Berkeley Food Pantry more accessible and connecting it to the community it serves.

Our target users fall into three main groups: people who use the pantry as a resource, people who work at the pantry, and everyone else--people in the community who all have the potential to help the pantry's cause, whether they are aware of it or not.

Many people fall into more than one of these groups. Pantry users want to supplement their diets with nutritious food and take advantage of all available resources without wasting their time. Pantry volunteers work to create the best pantry experience possible for users and need a streamlined system that allows them to work efficiently. The community as a whole supports the pantry's cause, but lacks an easy avenue for contributing. Our application addresses the concerns and pain points of all three groups.

We've developed an end-to-end system to boost pantry accessibility and equip pantry volunteers with tools to better serve their users.

To cater to the different needs of our user groups, we've split our app into a mobile side for pantry users and a web application for pantry volunteers. Throughout the design development process, we constantly sought feedback from our target users to iterate on the design, gather new ideas, and make sure it was evolving toward what we envisioned together.

We've improved on what the pantry currently offers to its users, but we've also introduced brand new ways for them to save time and provide more. Our live inventory connects pantry users to the pantry by using the web application to keep mobile users updated in real time about what's in stock. Meanwhile, it keeps the pantry organized in a quantitative way that it couldn't have been without an inventory system. The food recovery function leverages input from the community and connects the campus directly to pantry workers who make immediate use of extra food. Integrating this procedure into campus event protocol is more than just cutting down on food waste and implementing a project that the pantry has been planning to put in place. It means normalizing the conversation about basic needs and making awareness of food insecurity part of campus culture.

We're proud to be wrapping up this class, and we're also excited to keep moving forward with this project and put it in place for the UC Berkeley community to use.

Links

Github

<https://github.com/cs160-berkeley/finalproject-fa18-group17-fa18>

Firebase

<https://console.firebase.google.com/u/1/project/testcalnourish/overview?pli=1>

Web App

<https://testcalnourish.firebaseio.com>

Figma

<https://www.figma.com/file/RudML2gAUDVNKMhfVyKeMuAY/CAL-NOURISH?node-id=210%3A1745>

Video

<https://www.youtube.com/watch?v=Jspyi6kGSFI&feature=youtu.be>
W