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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Date: June 9, 2022

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Donation Pick-up and Tracking App for Colombian Food Bank

BE ACCEPTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREES OF

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Donation Pick-up and Tracking App for Colombian Food Bank

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Donation Pick-up and Tracking App for Colombian Food Bank

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ABSTRACT

Banco de Alimentos Cali is responsible for picking up food donations from local businesses, organizing by perishable dates, and distributing them to the communities in need. When donations are picked up from the donor, the bank is responsible for sending their donors a certificate with the donation's information, including the dollar equivalent of their donation. This certificate is sent out only if the donor requests it for tax deduction purposes. While this plan may seem simple in theory, the food bank often struggles to get the necessary information from their drivers in regards to the donation, which ultimately delays the delivery process of the receipt and certification for the businesses tax exempts.

Through our partnership with the Frugal Innovation Hub at Santa Clara University, we were given the opportunity to design a better solution for the food bank's recurring issue. Our application will require the drivers to input necessary data into a form with required fields to ensure all necessary information is stored for the financial group to develop the certification at a much faster and reliable rate. Additionally, the application will allow the warehouse manager to assign new donations to drivers all through their mobile device, rather than manually checking an excel spreadsheet and writing scheduled pick ups on paper. The main goal for this application was to automate and simplify the donation process while preventing information lost.

ACKNOWLEDGEMENTS

We want to thank Allan Baez Morales, the Frugal Innovation Hub, and our advisor Professor Angela Musurlian for giving us the opportunity to work on this project. We are grateful for your guidance and support in planning and developing this application. We wish the best for this project and we couldn’t have done this without your support.

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Chapter 1

Introduction

1.1 Background

Cali is Colombia's third largest city and is home to over two million residents that have also taken a huge hit by the ongoing Coronavirus pandemic. More than 60% of the population live off less than $165 a month. For the past two decades, Cali has been above the national unemployment rate which means that the majority of its citizens struggle to put food on the table. Who are Banco de Alimentos Cali (BDA) and what do they do? BDA is a private social organization that was created 22 years ago, that works to provide food and nutrition security to the poor population of the city and the surrounding municipalities, providing access to a basic basket with products collected, recovered and used in order to benefit social organizations that will then distribute those baskets to the needed population. So far they have helped around 272 social organizations, have fed 69,500 people, collected 4,450,000 tons, and served almost 100,000,000 plates.

1.2 Problem

The current problem with Banco de Alimentos Cali is that their process of collecting donations often misses important information regarding each donation. In turn, the food bank cannot honor their two week turnaround time for certification delivery. The main reason for this is that the entire process is very reliant on spreadsheets and verbal communication. There is no definitive way to handle these issues and lacks structure in how these donations are being handled. Once one part of the process is delayed, it becomes a bottleneck and it slows down the entire workflow.

1.3 Proposed Solution

The Banco de Alimentos Cali allowed us to design and eventually develop a web/mobile application that will allow their drivers to collect all essential data before even arriving at the warehouse. Because all the data will be collected via a form in the application, this will eliminate the risk of mishandling information as the driver continues their donation pickup route. We will achieve this by making the form have required fields that will not allow the driver to submit the form without all the information. This will allow the financial team at the food bank to access each driver's data to create the certification needed for the donors to successfully file their tax exemptions.

Additionally, the application will also route the drivers through the most efficient route as they enter more stops. This will allow the drivers to be a lot more time efficient with their daily routes. This intended solution will also take a lot of unnecessary stress and responsibility which will allow the Banco de Alimentos Cali to ensure total satisfaction for their partner donors and their communities.

Chapter 2

Requirements

2.1 Functional

2.1.1 Critical

- The application will allow administrators and warehouse workers to do the following:
    - Assign donations to drivers
    - View donations in progress
    - Input additional donation details, such as final weight
    - Record completed donations
    - Create/remove users
- The application will allow drivers to do the following:
    - View a map of donations to pick up
    - Generate an optimal route to pick up donations
    - Input any additional information for each donation, such as signatures and pictures of receipts

2.1.2 Recommended

- The application will allow administrators to make changes to donation information when the donor-inputted information is inaccurate

2.2 Nonfunctional

- Application must be user friendly
- Donation and donor data must be securely stored
- The application should have a usable, pleasant interface for all user types

2.3 Design Constraints

- The application must be a mobile application that works on both iOS and Android
- The application must be in Spanish
- Our application must be lightweight in order to accommodate the amount of data accessible to the truck drivers.

Chapter 3

Use Cases

The main use case for this application is to ensure drivers input essential information needed for the food bank to provide their donors with receipts and certifications for their tax purposes.

The drivers will be prompted to log in to the application to ensure that each of their entries has a stamp with their names to allow their managers to see who's responsible for what entries. If the account is not already existing, the application will prompt them to register. Once logged in, the application will have a navigation bar with two main sections: Assigned Donations, and settings. Within the assigned donation, the driver will be able to click on a donation. Within each donation, the driver has the ability to click on "Route" which will give them the most optimal driving route based on where they are. Within the same view, the driver has to take a picture of the donation information, e.g. receipts, and will also be able to request a signature from the donor. When a receipt is missing, the driver must select "Could not get receipt" and a text box will appear. Using this text box, the driver must specify the reason for not getting the receipt which will ensure all data is collected whether a receipt is present or not.

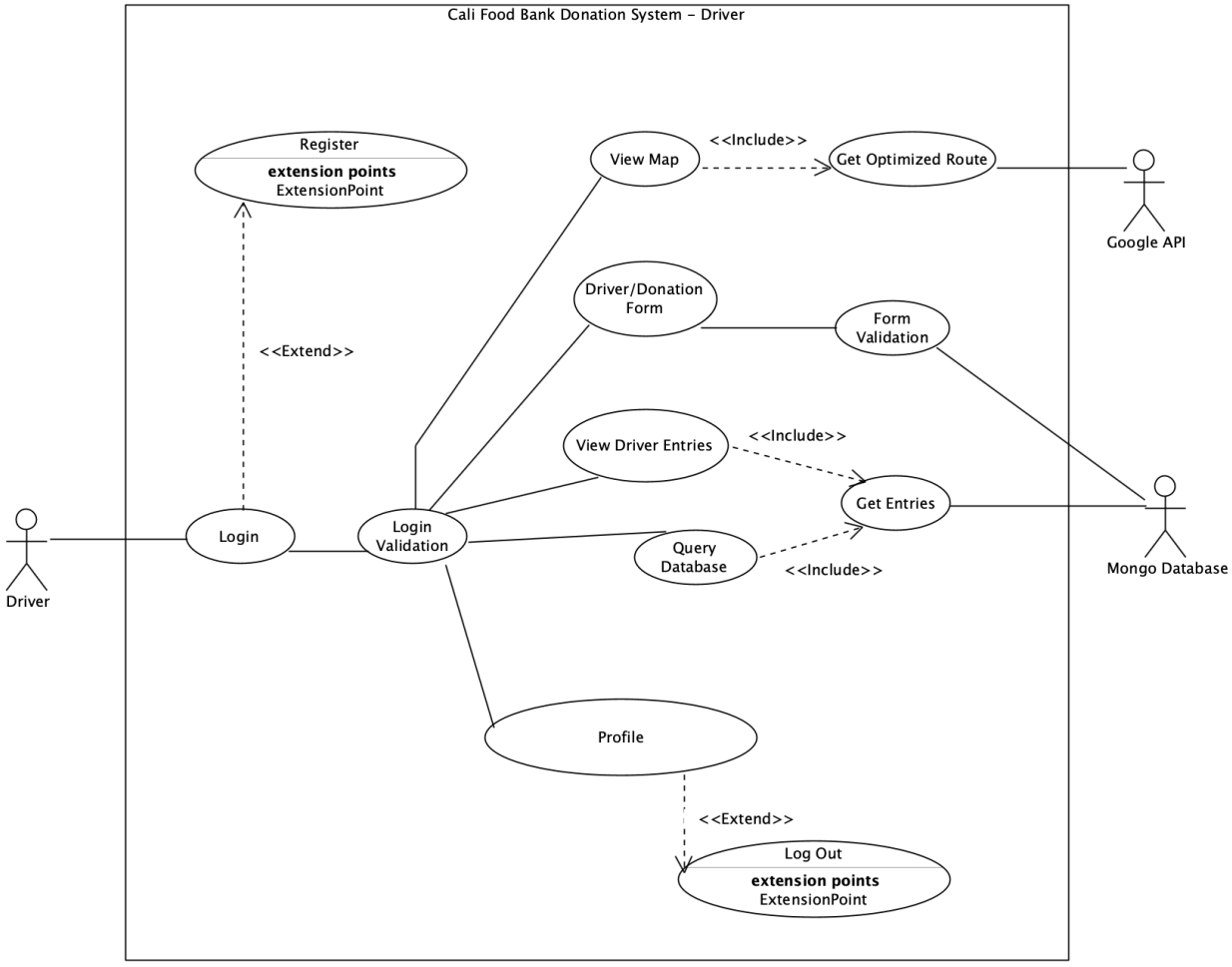

Figure 3.1: Driver Use Case Diagram

The admin is also prompted to log in with universal credentials. Once logged in, the administrator is able to view all the driver entries divided by week, as well as the ability to query through the database to find specific entries. When the driver submits an entry, that entry appears in the pending section for the admin to approve.

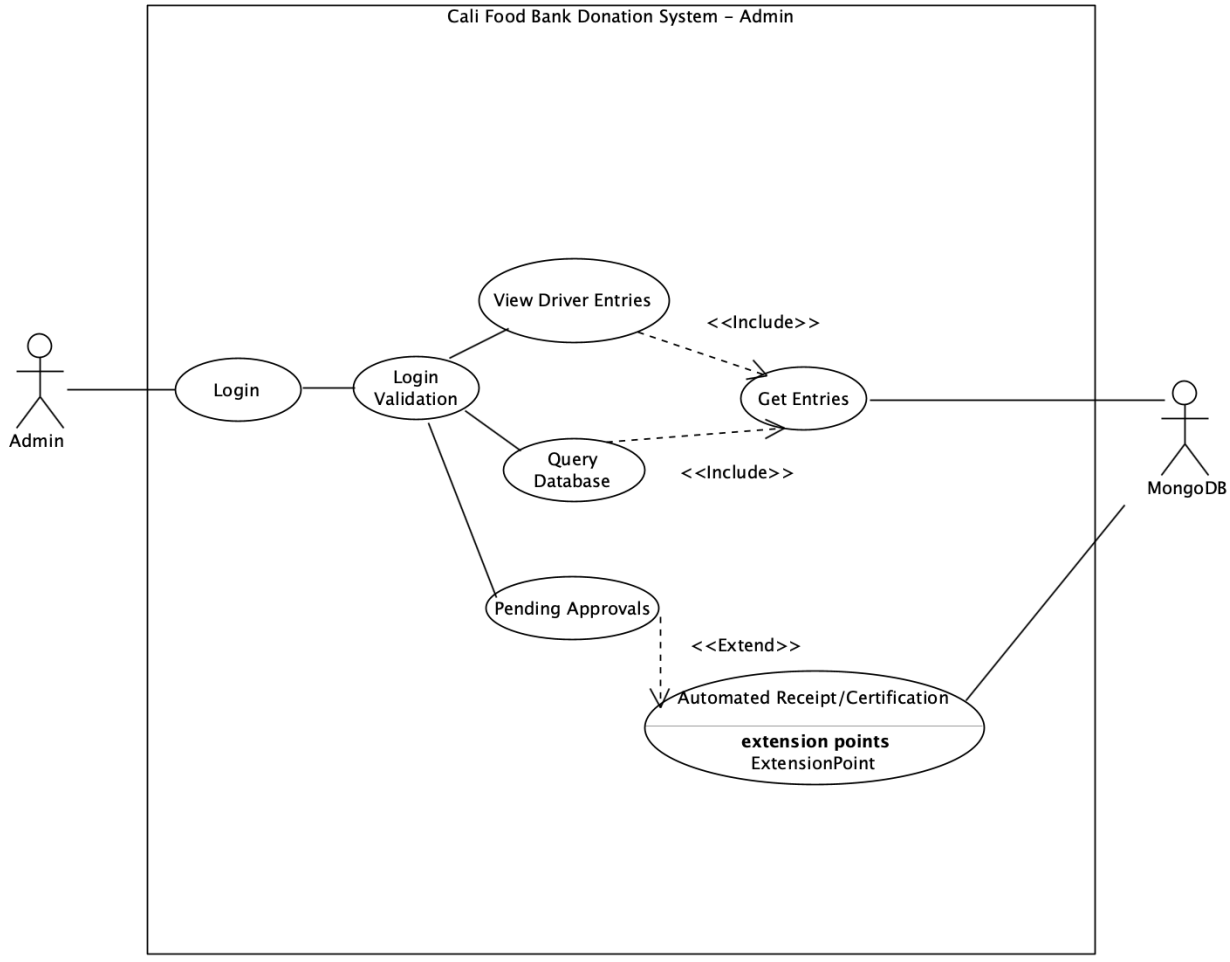

Figure 3.2: Admin Use Case Diagram

Chapter 4

Activity Diagram

Figure 4.1 shows the model of the activity diagram for drivers. They will be prompted to log into the application. Then the driver will be able to view all the donations assigned to them in one page. When the driver clicks on a donation, it will allow them to use their preferred map application and route them based on where they are. When they're inside the donation assigned to them, they input all the required information and that donation is then sent to the database. They will also be able to change their own information, such as passwords, in the setting section.

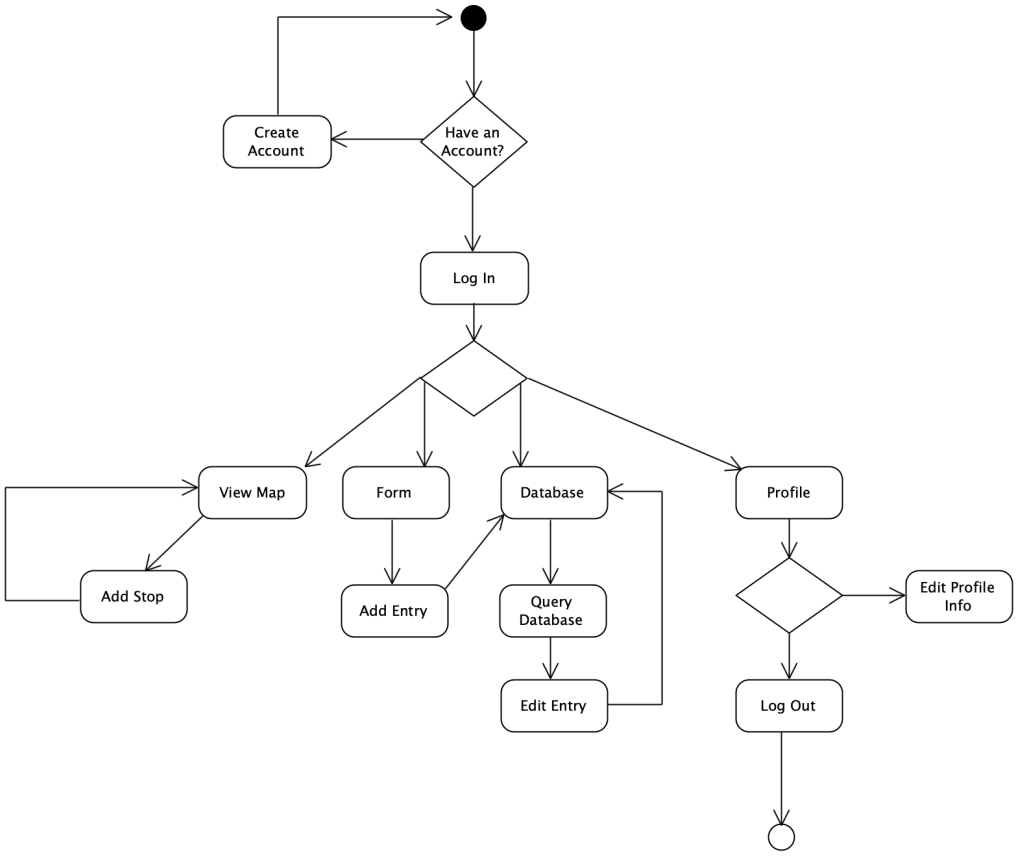

Figure 4.1: Driver Activity Diagram

Figure 4.2 shows the model of the activity diagram for administrators.

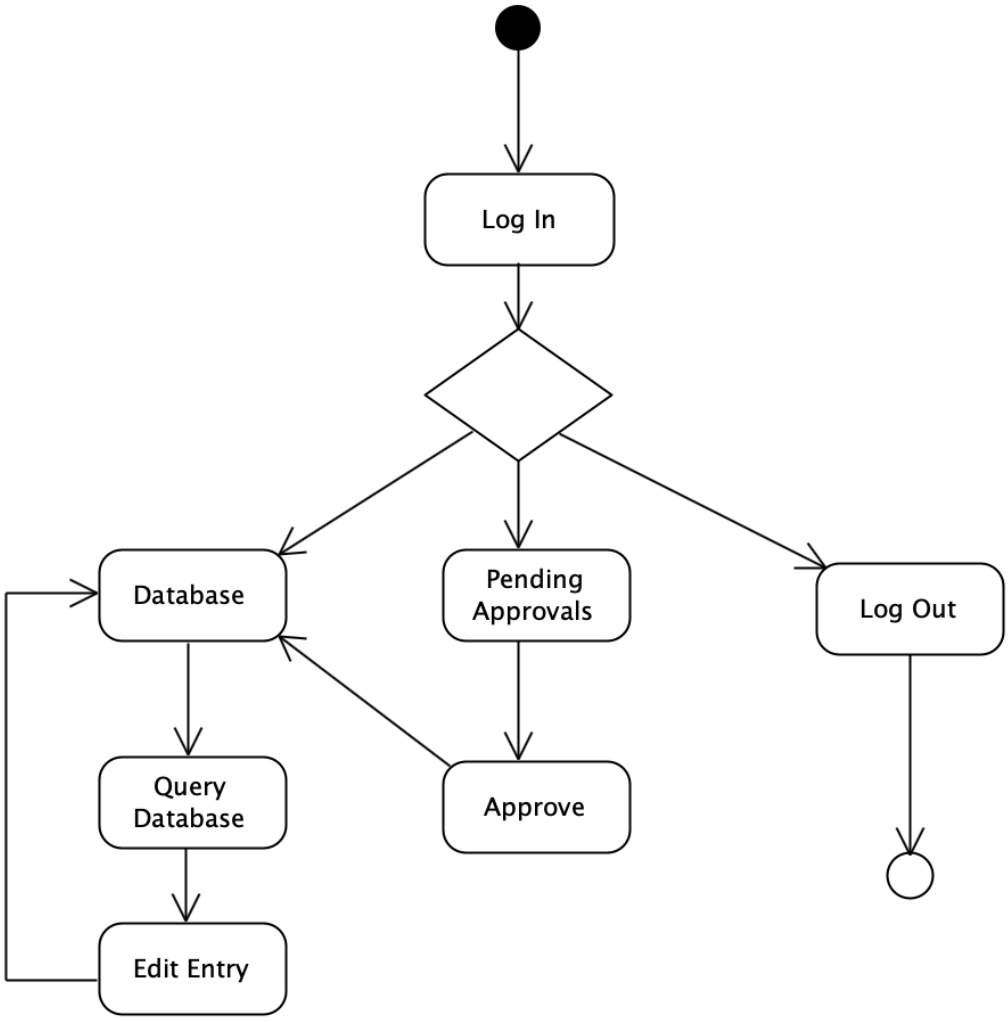

Figure 4.2: Admin Activity Diagram

Figure 4.3 shows the entire donation process that the food bank must go through every time there's a new donation. There are 3 food bank employees involved. The contact manager is the one that is in direct contact with the donors whenever they have questions or concerns. The manager gives the truck drivers the donor information such as address, phone number, and general donation information. Truck drivers proceed to pick up donations and deliver them to the warehouse manager where they process the donations and sort them. The last step is the finalized donationation information which is sent to the finance employees for certificate generation.

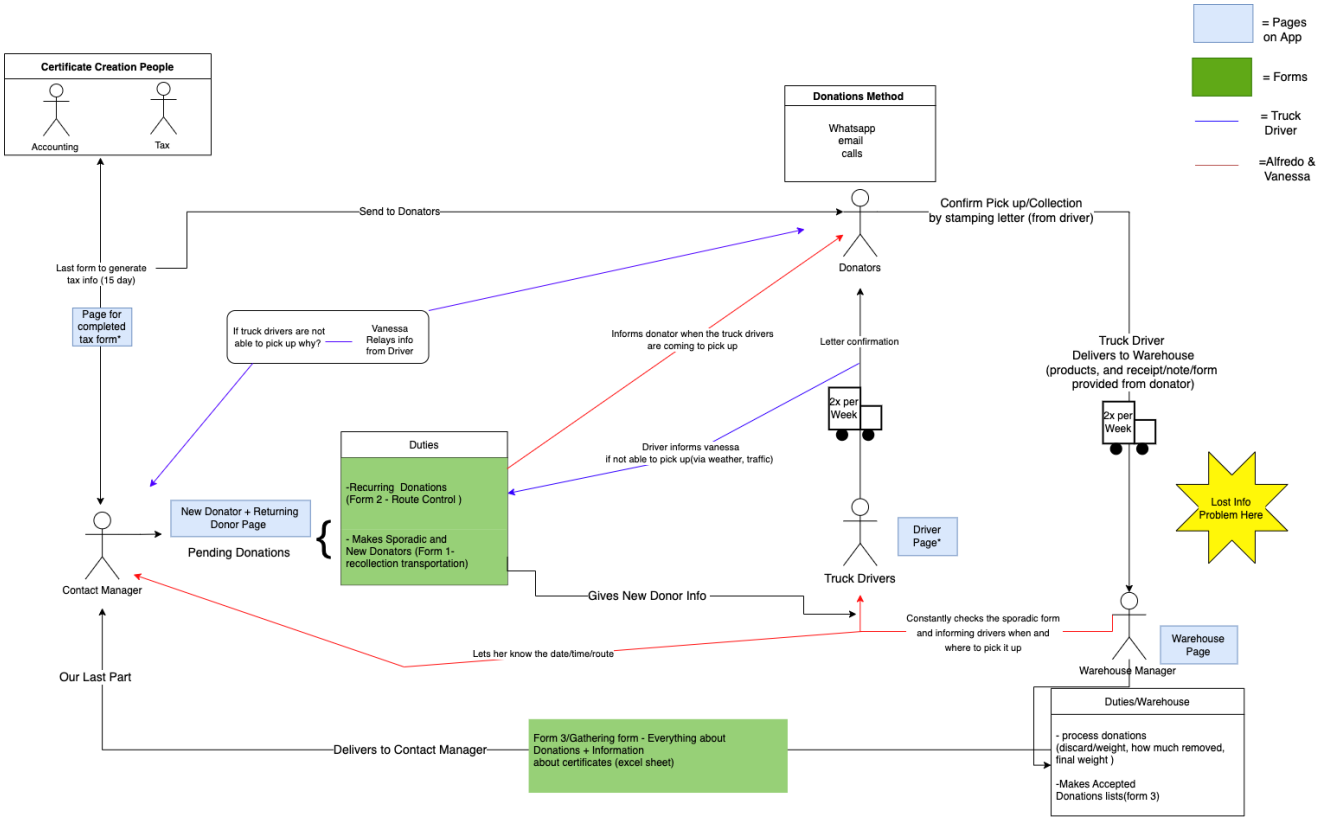

Figure 4.3: Entire BDA Cali Donation Process Diagram

Chapter 5

Conceptual Model

5.1 Proposed Solution

Our rough draft of our conceptualized model:

The first figure is Figure 5.1 which is the login screen. The UI that we drew up included a login page where admin can log into their accounts. There is also an option to create an account if needed.

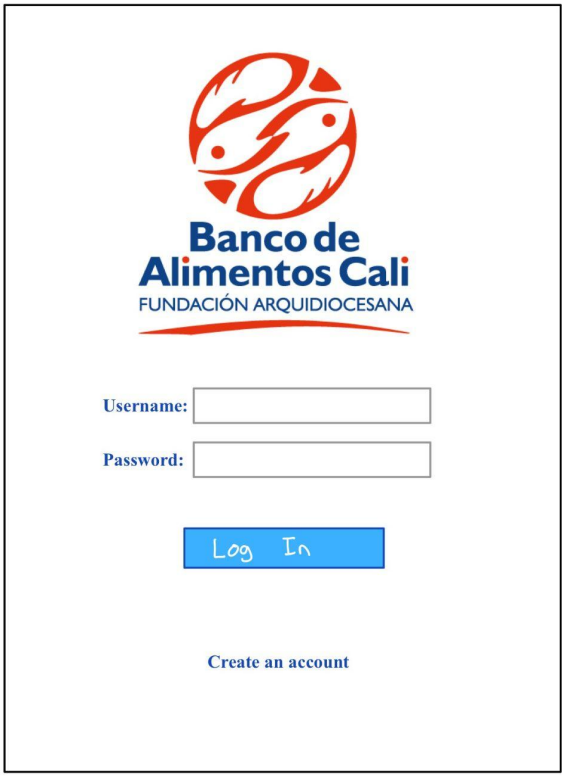

Figure 5.1: User Login

Next is Figure 5.2 which depicts the main functionality of the application. Recording and storing donor information and their donation information into our database so that we can access and manipulate this data later on. In the donor page we see some required information needed indicated by the red star. Next is where the donation information is listed. The date and time should be pre-populated at the time of when the driver has picked up the donation. Next is the type of donation whether it is food, money, or non food items. The comment section is for describing exactly what the item was or how much money they were donating. For handling there are two things, one for perishability(for foods and shelf life) and one for tax exemption.

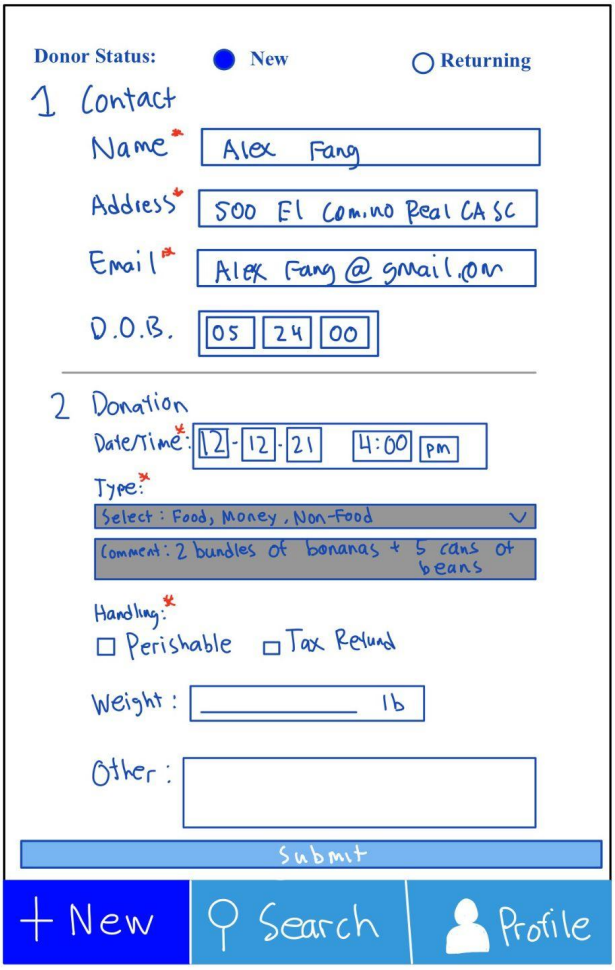

Figure 5.2: New Donation

The next figure is Figure 5.3 which is for returning donors. As you can see there is a unique id that needs to be inputted so that information stored in the database can pre populate the **1 Contact** part of the form. The rest is the same as the previous figure.

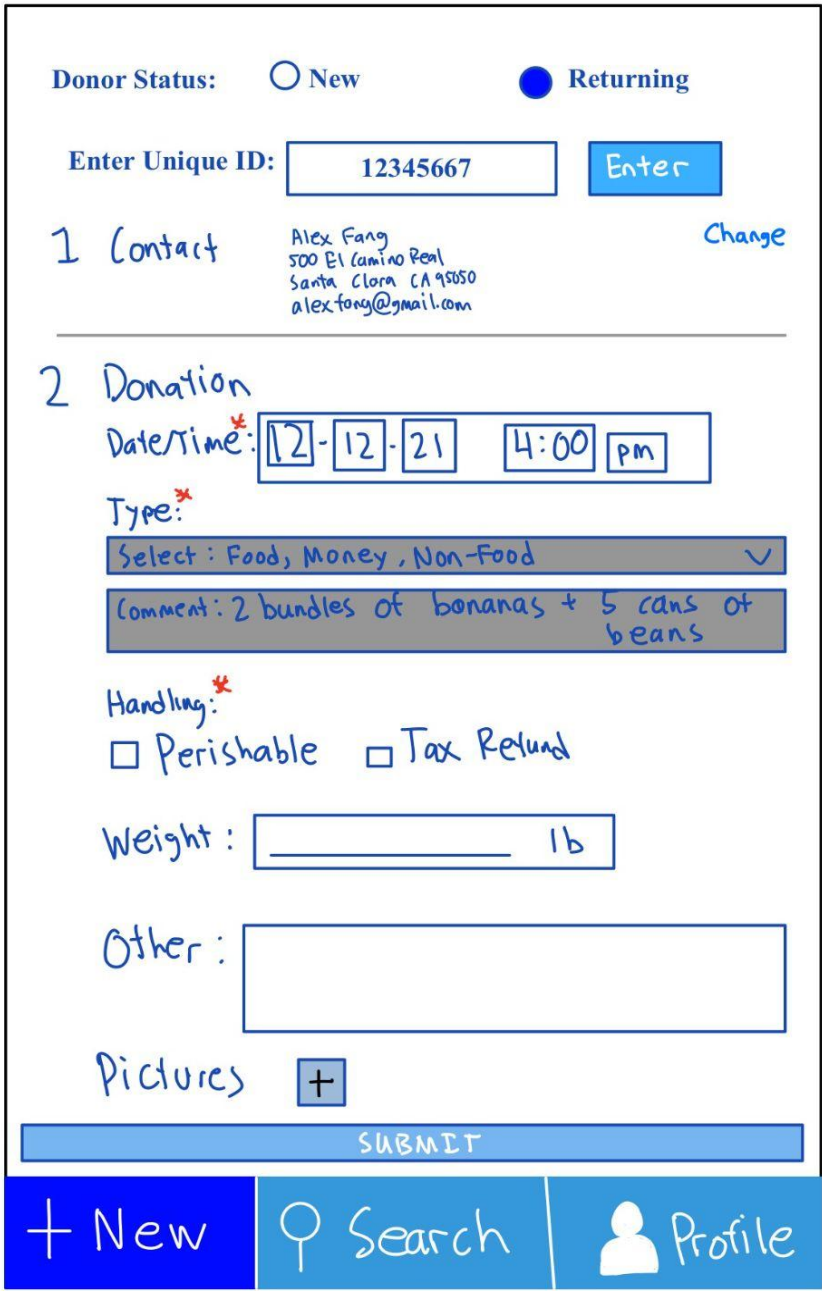

Figure 5.3: Returning Donor

Figure 5.4 is the search function where admin can search for specific donations by filtering through the user ID. Other filter options could be available such as date, type of donation, etc. For money donations we see a progress checker for when the tax exemptions are due. Green indicates the tax exemption was already completed whereas red means the tax exemption has not been started yet. Orange indicates it is currently being processed by the accounting department.

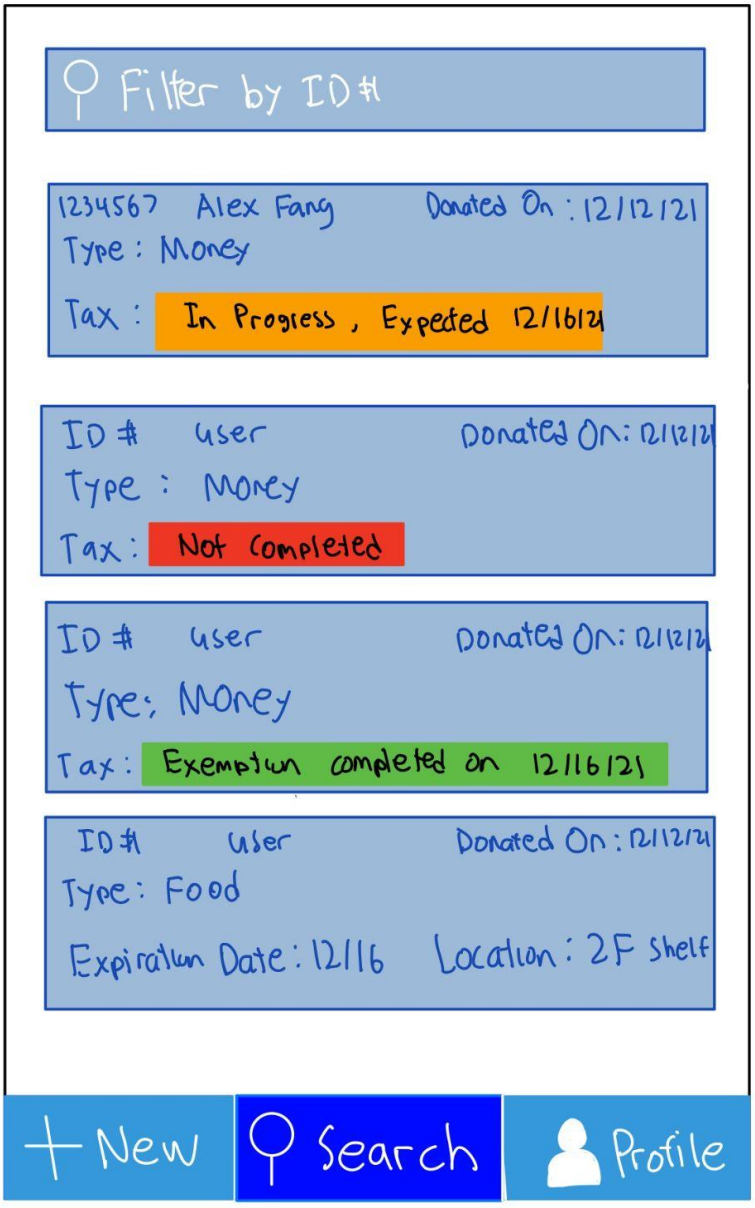

Figure 5.4: Search Feature

Chapter 6

Technologies Used

6.1 User Interface

Our application's user interface for mobile devices was developed with React Native. React Native is widely used in the industry and has a large community of developers. This is advantageous because there's a significant amount of resources available online, and all questions we asked the community were answered promptly. Another advantage to React Native is that both iOS and Android versions of the application can be developed simultaneously, therefore saving the team a lot of time. Additionally, we also integrated Google Forms and Google Spreadsheets to keep track of data. The form will be used to add new donations into the system and it will display any submitted form on the application as a new donation. Once on the application, the administrators/warehouse workers will proceed to go through the entire app's functionality and once a donation is completed, the donation will then be sent to a Google Spreadsheet where the finance workers can view all donation information and create certificates in a timely manner.

6.2 Database

A database of donors and donations was needed to carry out the functions of our application. Our database contains drivers' and admins' login information. For this, we used Google's Firebase Realtime Database. Because of its simplicity, intuitive set up process, and lack of need for server infrastructure, Firebase was the best database to use for our application. Additionally, Firebase applications remain responsive even when offline, making it useful for situations in Cali when drivers may lose reception in some parts of their route.

Chapter 7

Architectural Diagram

7.1 Proposed Architecture

Our application is meant to simplify the entire process of generating donation certificates. This means our architecture must be as simple as possible as well as our user interface. Below is a diagram that describes the interactions within our application.

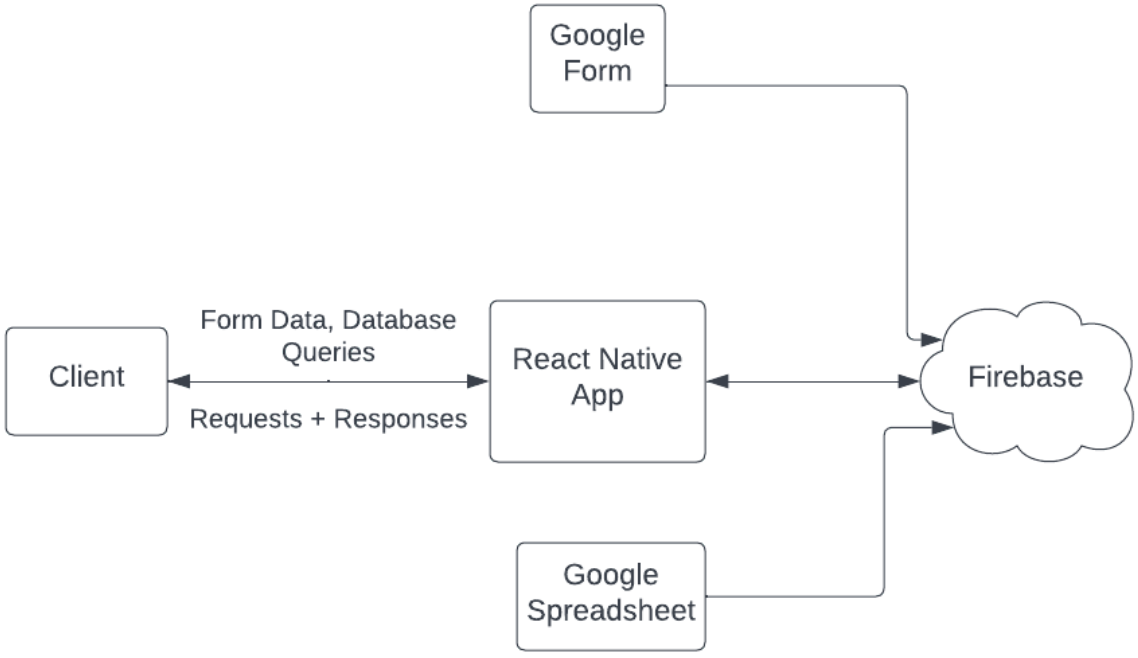

Figure 7.1 Application Architecture

Chapter 8

Design Rationale

In this chapter, we showcase our actual application interface. As a group, we made substantial changes from our originally mock up designs. We created a beautiful looking user interface by incorporating the food bank's colors. Additionally, we added rounded corners whenever it was appropriate to do so, such as for buttons and data inputs. Doing this created a modern and exquisite feel to the application.

8.1 User Interface

Login screen:

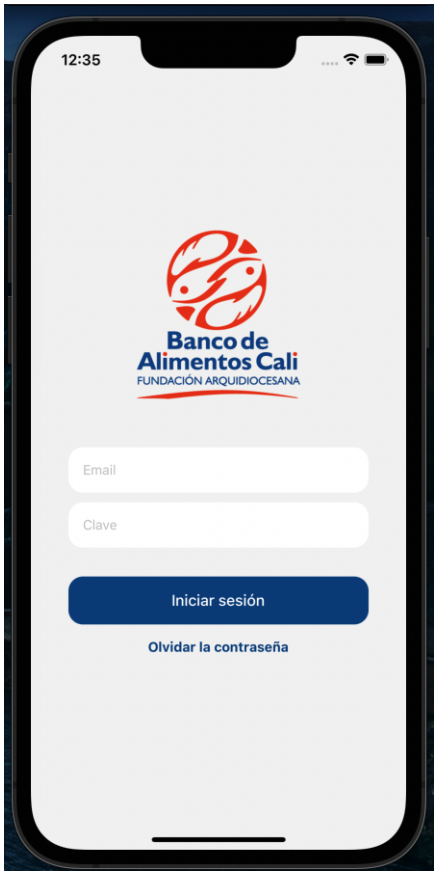

Figure 8.1: Final Login Screen

Pending Donations:

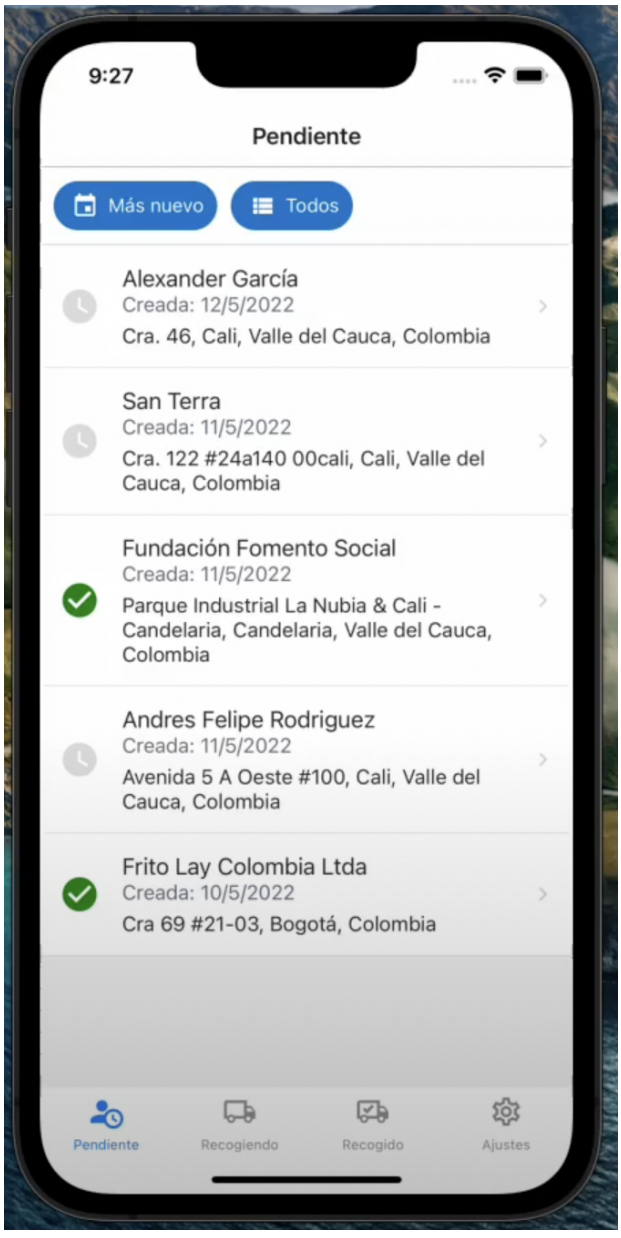

Figure 8.2: Final Pending Donations

Donator Information:

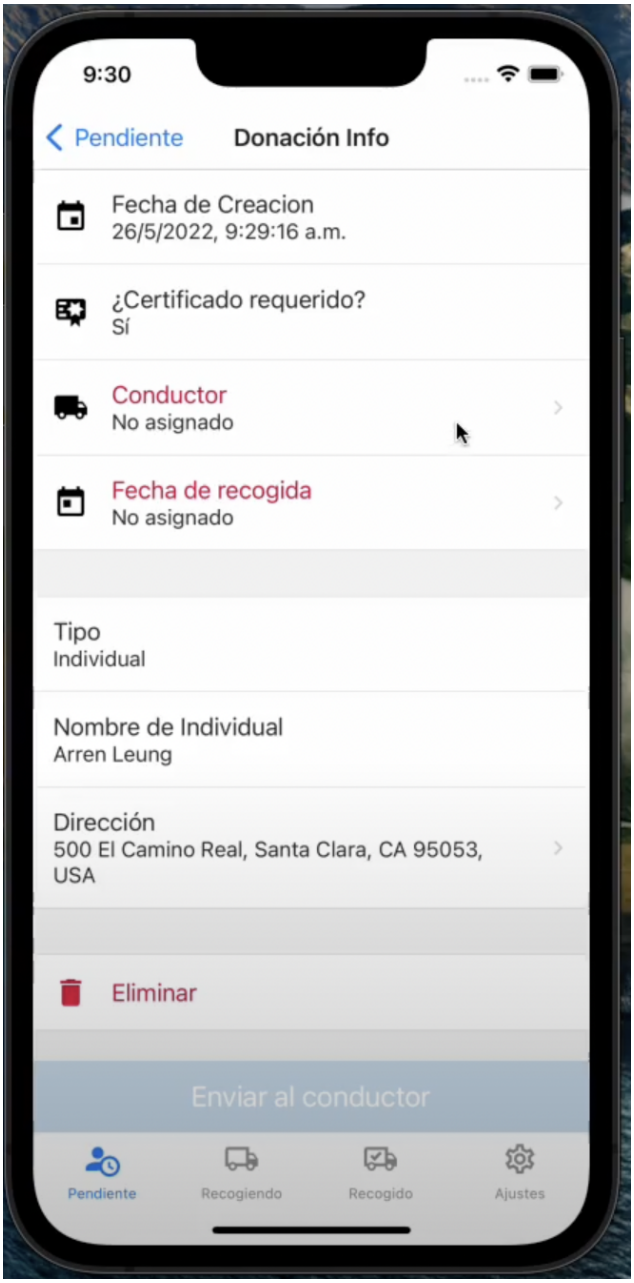

Figure 8.3: Final Donator Information

Driver Management:

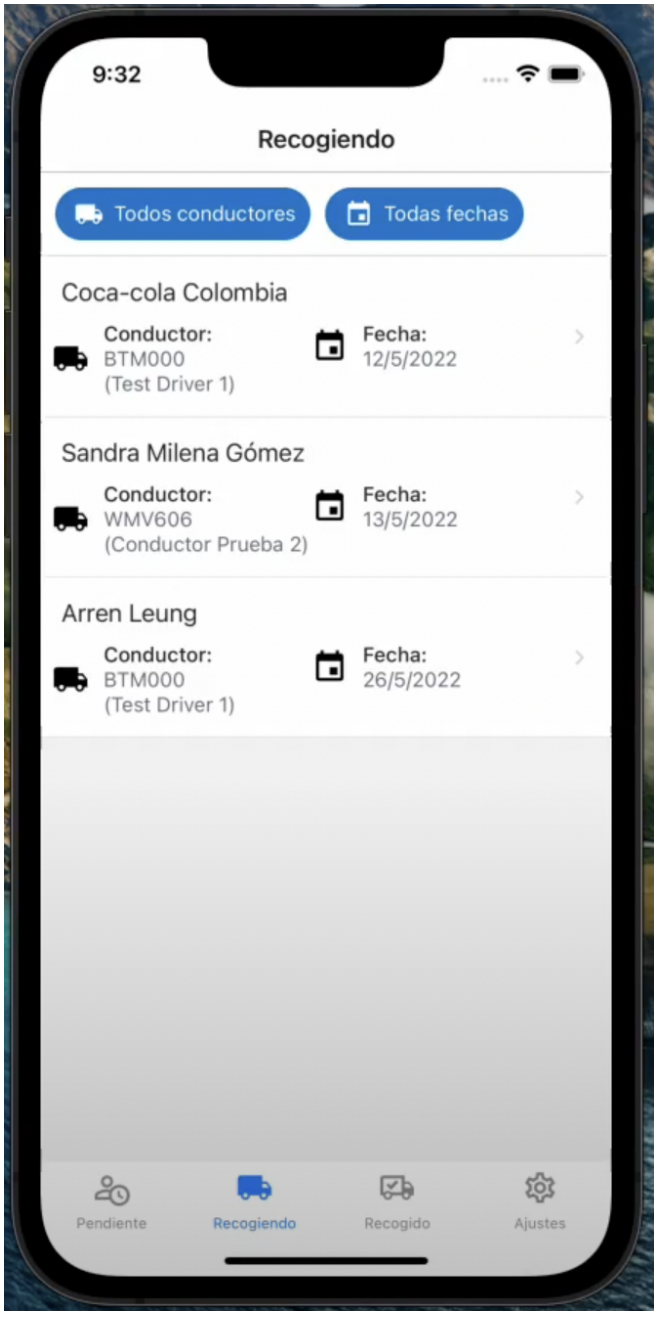

Figure 8.4: Driver Management

Driver Pickup Management:

Figure 8.5: Final Driver Pickup Management

Chapter 9

Test Plan

9.1 Interface Testing

We intended to conduct user interface testing by having multiple people provide feedback throughout the development process. The main purpose behind this testing phase was to ensure a simple interface for inexperienced technology users to be able to move around the application with ease. Since our main users for the application are the drivers, we made sure to demo our functioning prototype as soon as possible to ensure all provided feedback was implemented before the deadline. Like mentioned, this application was created to be extremely user friendly in case the Banco de Alimentos Cali hires new drivers. This allows them to pick up right where the previous driver left off.

9.2 Alpha/Beta Testing

Similarly to the interface testing phase, we made sure to have a semi-functional application early on in order to receive feedback on all components and use cases for the application. This allowed our group to have enough time to make necessary changes desired by the food bank employees. Additionally, we allowed the financial team, specifically Vanessa, our point of contact, to give her input since she is the one that will be in charge of utilizing our database design to deliver receipts and donation information to her finance team for them to create the certificate. We made sure all potential users of the application were satisfied with a working product.

Chapter 10

Development Timeline

10.1 Year-Long Timeline

September

- Met together as a group and got introduced to the project idea
- Learned about necessary qualifications and components
- Declare programming language and necessary libraries
- Outlined outcomes of the project

October

- Met with the Frugal Hub and learned about what this is about
- Develop diagrams and design prototypes
- Estimate cost analysis of project and submit funding proposal to school for engineering

November

- Finalize state diagrams
- Meet with direct contact at Cali Food Bank and interviewed her together
- Brainstormed questions to be answered

December

- Finalize Design Report First Draft
- Develop wireframes/prototype of conceptualize project
- Distribute workload among team members

January

- Present proposed app structure to client
- Develop initial application
- Start to work on presentation

February

- Feedback from client
- Work on iteration/prototype #2

March

- Finalize Application
- Visit Cali-Colombia to test usability case

April

- Finalize Application
- Establish post project necessities and how to keep application running

May

- Senior Design Conference 2022
- Post Conference Report

June

- Finalize Final Report

10.2 Risk Analysis

In this section, we introduce our risk analysis table. Our original main concern was user privacy. Our solution implementation consisted of using Google's Firebase. This ensures that all the data passing through the application is secured. The second biggest issue we were worried about was managing queries and bugs. As we've known when developing software, bugs are something we cannot avoid. This is why we tried to keep our code as clean as possible with comments and making sure we worked in a timely manner to debug whatever problems came up. The final risk was time. Our client, the food bank, had a difficult time getting across their needs for such an application. This is why as a group, we decided to meet regularly with each other to discuss any potential updates or changes made by the food bank. Ensuring that we delivered a functioning application was the main goal, so as a group, we tried to deliver a solution for their problem.

Risk	Consequences	Probability	Severity	Impact	Mitigation
User Data Privacy	Leak of personal information such as banking credentials	0.2	10	2.0	Ensure framework we are using is reliable and supported
Manage querying database / Bugs	Application doesn't store donations correctly	0.6	9	5.4	Comment code and work together as a team
Time	Application is not completed on time	0.3	6	1.8	Distribute responsibilities and weekly checkups

Chapter 11

Ethical Concerns

11.1 The ethics required in our project

While working on this project, as a group, we had to consider a few things when it came to ethics. First and foremost, we had to ensure we were professional with our partners, clients and with each other. This is why we made sure at least one Spanish speaker was present when meeting with our clients from Colombia. While we lacked in some areas, such as replying to emails promptly, we still managed to keep ourselves accountable and meet necessary school deadlines and group deadlines. Even though our project was software based, it was still important for us to provide some form of deliverable with our advisor to ensure we have a functioning application by the end of the school year.

11.2 Implication of application

Originally, our group had a few ethical implications. Throughout the entirety of the project, our client had a difficult time getting across what they wanted and expected from our application. Based on their description of their current process, we believed that we had to keep each donor's NIT, also known as their tax number, safe within our database. We later realized that it'd be easier for each donor to input this information while also having the warehouse workers verify this information with their already existing database. Similarly, our application will only be used within the bank's employees so we didn't have to make sure passwords were hashed and secured compared to a public application. One last ethical issue we encountered was the fact that our application runs on Wi-Fi/Data. We had to keep in mind that our application was made for people in Colombia, a country where cellular data is less accessible compared to the U.S. This is why our group made sure that there was at least a Wi-Fi connection within their facilities and warehouses.

Chapter 12

Conclusion

12.1 Summary

Our application was designed for the workers of BDA Cali food bank working to feed the community in Colombia. The project features both driver and administrative capabilities to either manage donations and assign real time drivers. Users are able to edit pending donations and assign them to specific drivers on specific dates and time. Once queued into the database, drivers are then able to complete these donation pickups entering specific information about the donation that was previously lost prior to the development of this application. Once pickup is completed and verified the transition to the warehouse is now more seamless and smooth making the entire process more efficient and majority of the issues being solved.

Our team faced a variety of challenges and obstacles throughout the course of the project. One of the largest obstacles we faced was that there was a lack of ability to fully test and perform the application due to travel restrictions to Colombia. This year, the Colombian presidential election is taking place and that makes traveling there too unsafe for us.

Debugging was another big issue that we had to overcome. Many of us were unfamiliar with the programming language and how to operate using a database. There were several instances where small bits of code were not working, small issues such as cosmetic and formatting were annoyances. To resolve this we utilized online videos and online forums to help solve some issues as well class notes from previous classes.

12.2 Lessons Learned

We learned many valuable lessons throughout this project. One of the most important lessons was learning how crucial communication is. Our project would not have been possible if we had not met with our client weekly. The client provided us with feedback throughout the development process which was necessary to ensure delivery of a product that will fulfill their needs. Another reason meeting with our client regularly was necessary is because their needs changed over time. As we developed their application they came up with other ideas of what they needed which helped us adapt our project as the feedback came in. We learned communication between team members is very crucial too. We learned how to keep a consistent development pace in order to meet our deadlines.

12.3 Next Steps

Our next steps for this project is to deploy the application to the IOS and Android app stores. We need to create accounts for our two administrators and from there they can create the driver accounts. From here, the Frugal Innovation Hub can change the app based on feedback from its users. The app is ready to be used.

Donation -Pick-up-and-Tracking-App-for-Colombian-Food-Bank-Publication

Final Audit Report 2022-06-10

Created:	2022-06-10
By:	Darcy Yaley (dyaley@scu.edu)
Status:	Signed
Transaction ID:	CBJCHBCAABAAS18ZJwOI5MyVRJKDSgpjlN_iiW71eSUI

"Donation -Pick-up-and-Tracking-App-for-Colombian-Food-Bank-Publication" History

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