



Requirements Specification

Inclusive Solutions

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Accepted as baseline requirements for the project:

For the Client:

For the team:

Table of Contents

Introduction - 3

Problem Statement - 4

Solution Vision - 5

Project Requirements - 6

Functional Requirements - 6

Performance Requirements - 10

Environmental Requirements - 11

Potential Risks - 14

Project Plan - 16

Conclusion - 17

Introduction

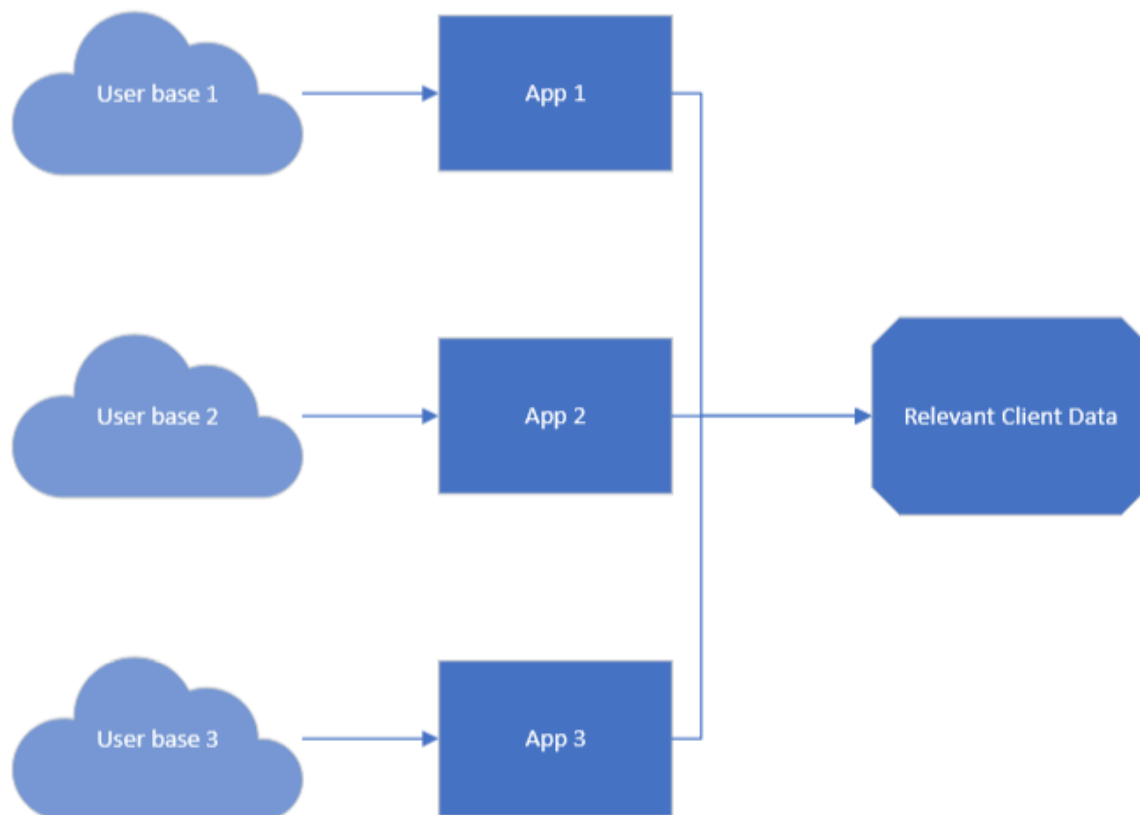
Living in a world that is unable to accommodate everyone's needs is difficult, especially when considering basic public services. Some require wheelchair accessibility, others need baby changing stations, and every person hopes for safety in their daily environments. Each of these requests are well-grounded. Our project strives to mitigate the feeling of being unaccommodated by allowing individuals to share and receive information about any local business's ability to meet their specific needs. A secured mobile platform that collects this information would assist businesses in learning to recognize and address accessibility-related issues. There is a significant need to spread awareness in this way; even in the age of information, existing technologies and applications have failed to do so. Ongoing prototypes have given us valuable insight into what exactly is required of such a project. This allows us to explore the key challenges involved in developing these platforms, addressing underlying issues more carefully and extensively.

This project extends under the crowd-sourcing mobile application industry, where the most prominent entity is Yelp. This application serves to provide quality ratings on any business based on the information gathered from other customers. According to their Wikipedia page, Yelp is a billion dollar company with over 142 million unique visitors every month. If there is that much demand for quality assurance of businesses, the assurance of basic critical needs could benefit just as many people.

In order to make this project possible, Inclusive Solutions is working with Welcomed Here, founded by Susan Purrington. Welcomed Here strives to provide demographic information regarding acceptance, accessibility, and safety about local businesses to the public. Because this organization is non-profit and fairly new, it has no established funding scheme as of yet. They are currently using a *business to business consultation*, meaning they hire informants to conduct assessments of certain businesses. With this information they are able to provide an inclusion roadmap and connect to further resources in the community. The end goal of Welcomed Here is to elevate the reputation of businesses that provide accessibility for all individuals.

Problem Statement

Currently, our client and her prospective audience must rely on existing external products to obtain crowdsourced information pertaining to facility accessibility. This includes services like Yelp, the Green Book Project, or the Inclusive Recreation Resource Center.



The issue with this is that none of these sources contain all of the information our client would like. For instance, Yelp has good general data, but little data specifically catering to specific minority groups. Furthermore, obtaining useful data pertaining to our client's objectives requires conglomerating and filtering data from these sources, which requires a significant amount of work and analysis. To be specific:

- Lack of centralized data.
- Complex, unintuitive interfaces.
- Need for specific categorization of reviews.
- Need for accessible, easy to use features and implementation.

Solution Vision

In order to solve our client's issue, we will build our own Android application specifically designed to service our client's intended audience. Our solution will include specific desired features from similar applications. We will also construct our interfaces with accessibility and inclusivity in mind. Our application will provide both our client and our client's audience with a centralized source for inclusivity related criteria for facilities and public locations.

To be specific, our application will provide the following features:

- The ability to look up facilities about a specific location or the user's current location.
- The ability to report whether said facilities provide accommodation based upon our specific and exhaustive list of criteria.
- The ability for each user to specify criteria for themselves and have these preferences saved to their individual account.

We decided upon developing our own solution over the existing alternatives as this will allow us to develop our own interfaces and categorizations. We will be able to implement specific UI features that follow inclusive design choices. Our solution will have the added benefit of providing a centralized source of this information, solving the problem of needing to consult multiple sources for relevant information.

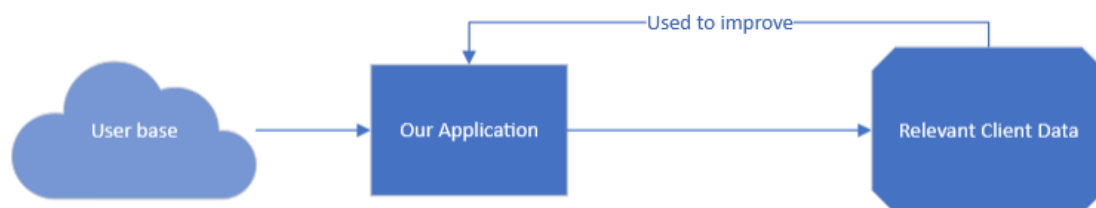


Fig. 1 This diagram illustrates how feedback from users is used to feed the client's need for data on whether a place is accessible and welcoming to everyone, which the client can then analyze and use to further improve the app, in addition to her own goals.

Project Requirements

1. A secure system to store each user's preferences, facility reviews, and other preferences.
2. A system for users of various backgrounds to contribute specific information matching various criteria for inclusivity.
3. A system for users to view information about facilities local to any location.

Functional Requirements

High-level Functions

1. **Users must be able to create a profile with the following components:**
 - a. First and last name
 - b. Verified email
 - c. Phone number
 - d. Password
2. **Users must be able to customize their profile according to their identity and ability. They have the ability to checkmark multiple options, and are not required to select any at all. The following intersections must be available for users to select:**
 - a. Ethnicity: AAPI, African, African-American, Afro-Latino Afro-Latina, Afro-latinx, Asian, Asian-American, Biracial, Black, Black-American, Hispanic, Caucasian, Indigenous, Interracial, Latina, Latino, Latinx, Native, Native-American, SWANA, [custom]
 - b. Religious Identity: Muslim, Jewish, Christian, Hindi, Buddhist, Atheist, [custom]
 - c. Age: [custom]
 - d. Gender: Woman, man, trans woman, trans man, non-binary, gender-fluid, gender-nonconforming, intersex, multi-gender, [custom]
 - e. LGBTQ: gay, lesbian, bisexual, pansexual, gender-queer, trans, femme, transgender, transfemme, transmasculine, [custom]
 - f. Disability:

- i. Mobility/physical: Upper limb(s) disability, lower limb(s) disability, wheelchair-user, manual dexterity, acquired brain injury (ABI), traumatic brain injury (TBI), asthmatic, diabetic, cancer, seizure disorder, arthritis, [custom]
 - ii. Vision: blind, moderate visual impairment, severe visual impairment, color blind, [custom]
 - iii. Hearing: deaf, mild hearing impairment, moderate hearing impairment, severe hearing impairment, [custom]
 - iv. Cognitive, developmental: dyslexic, ADHD, autistic, alzheimer's, dementia, bipolar, [custom]
- 3. The system must create a customized reporting system based on the needs that the user selected, and allow them to rate a location on each one.**
- 4. Users must be able to review locations based off the following criteria:**
 - a. Physical Accessibility: Easy grade ramp, front entry, easy pull handles, automatic doors, accessible parking, lower counters, elevators, stairs with railings, stairs with edge markings, single door entrance, vestibule entrance, wide pathways, plenty of seating, wheelchair rentals, scooter rentals, crutches/walker rentals
 - b. Sensory: Dim lights, no flashing light, no music, classical music, sensory space, offers sensory toys, headphone loan, good acoustics
 - c. Communication: Alternative devices, amplification, closed captioning, headphones, braille, visual aids, app available, website is accessible, clear information on website, clear directional signs
 - i) Interpreters available: American Sign Language, Spanish, Chinese (Mandarin, Cantonese), Korean, Vietnamese, Tagalog, Arabic, French, Native languages
 - d. Parking: Paved, wide spaces, van accessible, many spaces available, ramp near spaces, parent parking – young children, expectant parking, veteran parking, well-lit

- e. Symbols: LGBTQ+ rainbow, no confederate flag, no swastika, no hate symbols, closed captioning, accessibility icon
 - f. Bathrooms: Clean sanitary doors, open out doors, open in wide stalls, single handlebar, double handlebar, push plate handle, pull handle lever, handle foot handle, family friendly restroom, gender-neutral restroom, in-install changing stations, out-of-stall changing stations, companion restroom, touch-free soap dispenser, touch-free water faucet, touch-free towel dispenser, touch-free hand dryer, nursing station, step stools
 - g. Dietary: Gluten-free, halal, keto, kosher, pescatarian, vegan, vegetarian, dairy-free
 - h. Safety: Well-lit, strong cell service, blue lights, security on-site, camera surveillance
 - i. Business Ownership: Black-owned, Indigenous-owned, Latine-owned, Asian-owned, women-owned, disability-owned, veteran-owned, LGBTQ+-owned
 - j. Financial: Free, low-cost, sliding scale, donation
 - k. Extras: Friendly staff, knowledgeable staff, aides available, easy to locate, easy access to/from major roads, pet-friendly stroller-parking, feedback option, step stools
5. **Users should be able to view locations based upon criteria from their profiles as well as:**
- a. Location: A radius about their current location OR some entered location.
 - b. Distance: The specified radius distance about a location.

Low-level Functions

1. **System must allow users to log into their profile by entering the following information:**
 - a. Email or phone number
 - b. Password
2. **Users must be able to report concerns:**

- a. Types: Discrimination, legal, ADA, other [custom]
 - b. Contact User: Yes, no
 - c. Must display disclaimer: "The information provided is welcomed. will be used to contact the business prior to contacting the federal government. Statements are kept confidential."
- 3. System must allow users to verify their accounts using phone number or email**
 - 4. System must send confirmation email to user when creating profile**
 - a. If the user did not receive an email to verify their account, they must be presented with the option to send another email with the confirmed address or phone number
 - 5. The server must store a list of Google Maps IDs for places we have data on, the category of business: (restaurant, grocery, other shopping, fast food, bakery, Government, salon/barber, etc.), and the average review of each place in each criterion in a table in the database**
 - 6. The server must create and access a table for each place, where each row has a user, date, the specified criteria scores, open text for details, a tag flagging it as a reported concern, and an optional link to the S3 storage for images or videos.**
 - 7. The server must mediate between the client and the raw database, sending the user the requested info, and updating the averages when a user sends review data for a place.**
 - a. When requesting data, the client should send a list of nearby places found in Google Maps, and the server should respond with the review data of any places found in the database
 - b. If the table for a place exists, the review will be added to the table and the average will be updated in the averages table. If it doesn't exist yet, then it will put the review in the average, create the table for the place, and then add the review into the newly created table for the place.

- c. If a reported concern is tagged in a review, the review is formatted into an email and sent to an email address set up by Welcomed Here for receiving the concerns, and will be categorized by ADA, Discrimination, or Other.
 - d. If a review for that place already exists from the user, the server should then update that row with the new review data in the columns where there are values.
- 8. The client app would ideally be able to store reviews that didn't get an upload confirmation from the server within a certain amount of time for later upload when the internet connection becomes available**
- 9. When the user selects filters in the app, we need to apply them in the server level rather than in the user application, to minimize the amount of requests the client app will have to make to outside APIs**
- 10. Certain users should be able to be granted a higher level of access to interact with the system as moderators as well as as a normal user.**
- a. A moderator user should be able to remove a review if the user is found to have falsified ratings or to have harassed other users through their ratings
 - b. A moderator should be able to delete a business or hide it from search results in the event a large amount of fraudulent reviews are found for a location or if the location has closed or never existed.
 - c. A moderator should be able to change a user's profile picture or to remove a picture from the review if the user's picture may present a risk to the client.

Performance Requirements

- 1. Must only send paid Google Maps API calls when needed to minimize client budget**
- a. Should first just request IDs of nearby places, check for a match, then increase the radius by a mile if no places were found, up to 25 miles.

- b. Once a sufficient number of places are found, we will then fetch more data and sort them in a list by the user's selected criteria, with a calculated "aggregate welcomingness" score.
- 2. Must be responsive enough for someone with unmedicated ADHD to not lose focus while waiting for results to load on a 4G network.**
 - a. Ideally, the interface should respond within 2 seconds of interaction, and should send the review upload process into the background.
- 3. A user must be able to fluidly navigate the app with a controller and with a keyboard/mouse hooked into a phone, as these are the behind-the-scenes implementation of common modes used for providing accessibility in computing for those with motion issues that make a touchscreen hard to use.**
- 4. A user with vision or color vision issues must be able to navigate the app with a screen reader and must be able to reasonably navigate the app without elements that depend solely on color.**
- 5. A user with dyslexia shouldn't be tripped up by the fonts used; the sponsor has provided us with a font to use for the app that accomplishes this.**

Environmental Requirements

- 1. Use of Dyslexie font in the app for all text, this should make it easier to achieve Performance requirement 5 for all text.**
- 2. Use of either United Nations Blue (5B92E5) with white text or E5AE5B as accent color with black text**
- 3. Must follow the layout specification given in Welcomed.app overview.6.pdf document sent by our capstone sponsor**
 - a. Homepage: The client has requested a single-column layout in the homepage:
 - i. The word "welcomed." at the top-center of the screen.
 - ii. In the center of the screen, our client wants us to add 3 buttons. The first should say "Will you be welcomed?" and should take you to the Find A Location page. The second will say "Were you welcomed?" and should take you to the "Leave a Review" page after going through a pop-up pane that asks if they want to sign in,

or if they want their review to be anonymous. The third button in that cluster should say “Report a concern” and take the user to the “Report a concern” page.

- iii. In the lower 2/3rds of the screen, she wants us to have two buttons with the word “or” between them. The first of these would be a “Create Profile” button, which would go to the first “Create Profile” page. The second of these buttons would be a “Sign-in” button, which would take the user to the sign-in page.
- b. Find a Location:
- i. The client has requested a top navigation bar with the word “welcomed.” on the left side of the bar, that leads back to the homepage when clicked, and the user’s profile picture on the right, which leads to the profile page.
 - ii. In the main portion of the screen, centered, she wants the phrase “Will you be welcomed?” at the top of the main portion of the page. Below this, she wants a location search text box and a filter button. This filter button will lead to a filter selection page based on the criteria listed above.
 - iii. Below the search and filter buttons, we will put a map centered around the current location, which will move to the location selected in the search, if any location meeting the filter criteria is found, with a pin that can be clicked to display a popup window with that location’s information and reviews
 - iv. At the bottom center of the screen, she wants the “welcomed.” logo to link to the homepage.
- c. Review a Location page
- i. The client has requested the same navigation bar at the top of the Find a Location page also appear on this page in the same position.
 - ii. In the center of the screen, the client wants a “Check-In” button that will open a google maps view to find places around the user from Google Maps and let the user select one to review. We should also include a search box like in the Find a Location page just in case the user isn’t in the area.
 - iii. After that, a review interface should appear with a 0-5 star rating UI for each of the user’s keywords (unless the user isn’t signed in), an overall rating interface, a comment box for text, a photo/video

- upload button that opens the image/video selection UI provided by the OS, and a button linking to the Report a Concern page.
- iv. We should put a “Post” button at the bottom of the page that posts the review to the right, and the “welcomed.” logo in the bottom center.
- d. Report a Concern page
- i. Once again, the navbar should appear at the top of the screen as previously described.
 - ii. In the center, there will be a set of checkboxes, with the question “What type of concern?” above them. There will be 2 boxes, one labeled “ADA or Discrimination” and one labeled “Other”.
 - iii. Below that set of checkboxes would be a pair of radio buttons labeled “May we contact you?” with a “yes” and “no” option.
 - iv. In the center of the bottom third of the screen, there will be a button to submit this report. After pressing that button, a dialog box will pop up with the client’s disclaimer statement: “Disclaimer statement: The information provided to Welcomed. will be used to contact the business prior to contacting the federal government. Statements are kept confidential.”
 - 1. The user must select “I accept” to submit the concern report, or they can select “cancel” and be taken back to the homepage.
 - v. At the bottom-center of the screen, the logo should appear as a link that can take the user to the homepage.
- e. Create a Profile page
- i. At the top of the screen, in the center, there should be the word “welcomed.” that links to the homepage when tapped or otherwise interacted with.
 - ii. Below that, there will be a multi-page design in the center.
 - 1. In the first page, there should be text boxes for the user’s name, email, and phone number, along with 2 text boxes to enter and confirm a user’s password, along with a check box to make anonymous reviews the default.
 - 2. On the next subpage in this frame, we will ask the user (with a form or tags) for demographic info like age, gender, race, ethnicity, sexual orientation, and disability
 - 3. Following that page, we will take the user to a hub page to select which of the criteria in Functional Requirement 4 are

important for them, organized into small pages with check boxes for the criteria (including “other” with a text box) for each category specified.

4. After that, we will take the user to a page asking for permissions to access location and photos on the device
 5. Finally, the user will be taken to a page where they can either upload a profile picture or use a premade icon
- iii. At the bottom of the frame, centered, the client wants us to add the logo and have it also link to the homepage.

Potential Risks

First, to assess potential risks with our system we must fully understand the probabilities commonly associated with crowd-sourced reviews:

1. **There is not enough data being shared.** Platforms that rely on user-generated content will likely encounter the issue of limited data available during start-up. This often discourages users from participating; they feel that they have no incentive to contribute, as they may perceive the application to be overlooked or lost. This risk can be mitigated by incentivizing user reviews with rewards or reasoning.
2. **Poison Data.** Individuals may submit false reports in order to disrepute a business or entity. This results in the manipulation of a wider audience, causing chaotic data or deliberation structures to be skewed, rendering the crowd-sourcing process ineffective. A way to mitigate this is to allow user reports, liking and disliking of reviews and consideration of an accounts reliability or user score with reviews.
3. **Participation inequalities.** Given that the application is based in frameworks calculated by the intersectionality of each user, the overrepresentation of limited demographics do not align with the requirements of this project. However, this remains a high risk for any crowd-sourced platform. To mitigate this risk, as a stretch goal, the app can devalue repeated reviews of similar demographics to avoid overrepresentation.
4. **Inaccurate calculations.** Unreliable ratings, whether from poison data or faulty software, may have an effect on businesses. At worst-case, these entities may be confronted with reputational and financial loss. To mitigate this risk, we can

filter out older reviews to maintain a stream of as up to date information as possible.

- 5. Competitor products.** Existing services, such as The Green Book Project, Yelp, and the Inclusive Recreation Resource Center may update their structure to better target issues relating to accessibility in the same way we are. Due to higher prevalence or longer establishment of these companies, our application may be overlooked. To mitigate this, we find a way to make our app different and stand out from the competitor applications, both through marketing and quality of delivery.
- 6. Security breaches.** With any networked system, there is always a risk that a user's authentication token or login credentials could be compromised, allowing a nefarious actor to step in and steal user data or tamper with our existing data. Newer applications are often more vulnerable to being targeted by attackers. While Androids provide device-level encryption, they still rely on developers to implement security features while designing applications [1]. We need to prepare for potential attack vectors in our system at the authentication provider, server code, and database levels. The components associated with this risk are as follows:
 - a. Sensitive information disclosure: Through reverse engineering, attackers may be able to access hard-coded information such as login credentials, keys, and access tokens. A common approach to preventing this is code obfuscation. This may mean encryption, replacing class/variable names with meaningless names, adding useless code, or stripping out metadata.
 - b. Insecure data storage: Privacy violations are a risk of failing to encrypt sensitive data, caching data not intended for long-term storage, and ultimately not implementing safe practices meant for a specific platform.
 - c. Insufficient transport-layer protection: In the case that certificate validation errors are ignored after a failure, data can be revealed. This can also take place when reverting to plain-text communication.
 - d. Weak server-side controls: Failing to do patches, security configurations, and disabling necessary services may jeopardize data confidentiality.
 - e. Side-channel leakage: Many features of the device's OS are flawed programmatically and should be disabled. Failure to do so may result in

the leakage of the user's data, often in global OS logs, web caches, and temp directories.

Risk	Severity (1-5)
Insufficient data	1
Poison data	3
Participation inequality	2
Inaccurate calculations	3
Competitor products	2
Security breaches	5

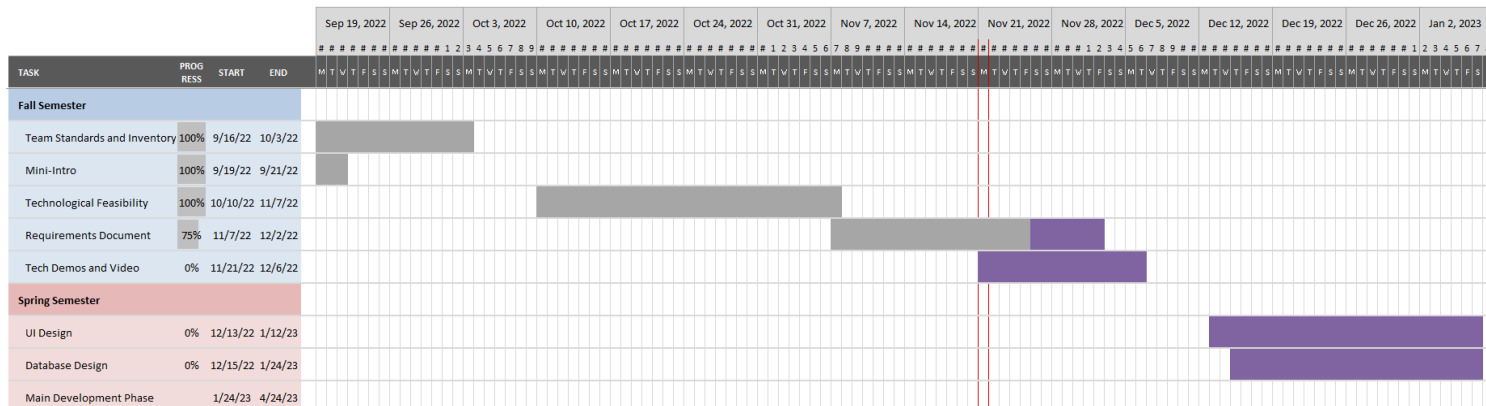
Project Plan

We should have our more technical implementation details written up in the CS486 assignment ironed out by the end of the design review in week 5 of next semester. At that point, we will be able to begin implementing the design and writing the code for the modules.

The UI design process will begin during the winter break to have us ahead of schedule. Any required research and preparation can also be done during this time. Any changes needed to be made to the UI layout will begin as soon as the semester starts. Our databases will be set up quickly after.

By the start of spring break, we should have mostly finished the writing of the code and should be ready to test it in the cases where it will actually be used, rather than just in discrete module demos.

By May, we should be able to iron out the remaining issues and have a final product that we feel comfortable sending to our sponsor.



Conclusion

Millions of Americans live with some disability that limits how they can interact with the world. Millions more are marginalized by their race, religion, sexual orientation, and gender, and fear harassment or harm from others when they go to a business. This makes it difficult for them to travel or try new places, because they don't know if they'll be able to feel safe there. Our client also wants to receive the data on these types of issues to take to businesses, allowing them to address it and make the world more accessible and welcoming for all.

Unfortunately, there isn't really anywhere that these people can go in order to find a detailed rating system for all of these potential issues that can mean the difference between a pleasant or miserable experience. The best they can do is to either take recommendations from friends or family or to just hope for the best. There are several services each attempting to solve part of the puzzle, but they all are missing different degrees of data. To solve this lack of useful information, our client has asked us to make an app to crowdsource the gathering of this information.

In this document, we explored the requirements that such an app would need to meet, such as the type of information that would be sent to and from the client, server, and outside APIs. We also described several qualitative requirements and the general UI layout given by the sponsor at the beginning of the project.

Overall, we seem to have enough laid out already to understand how we are going to proceed in the development process. Now that we have this listing of overall requirements, we can confidently say that we are getting to the point where we will have a fully functional system at the end of the Spring 2023 semester.

References

- [1] *Addressing security and privacy risks in Mobile applications*. IEEE Xplore. (n.d.). Retrieved November 20, 2022, from <https://ieeexplore.ieee.org/abstract/document/6243128>