

Florida International University
Knight Foundation School of Computing and Information Sciences

Software Engineering Focus

Final Deliverable

Project Title:
NuMom (Keeping Mothers and Infants Healthy)

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Abstract

This document presents the information necessary to gain a good understanding of the current state of NuMom (Keeping Moms and Infants Healthy) after the Summer 2023 Capstone II development cycle. NuMom is an application for both Android and iOS devices made with the intent to provide free and easy access to prenatal and postnatal learning resources to low-income, minority mothers, who have been found to regularly have reduced access when compared to other populations. Besides providing features such as location searching and document/immunization/appointment recording, the resources provided by this app include but are not limited to: growth milestones, feeding, safe sex practices, STDs, applying to help programs, etc.. The application is fully translated between English, Spanish, and Haitian Creole to ensure larger populations can access support systems for mothers and children alike. Throughout this semester, the development team of four people has put a focus on upgrading the application from Expo version 45 to 48. This means while various smaller features were implemented, a good amount of development time was spent on resolving both major and minor bugs.

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INTRODUCTION

Current System

The current system consists of a mobile app with support for both Android and iOS devices. Users can sign up for an account within the app to gain access to a variety of useful features. This includes the ability to search for clinics and shelters, learn about feminine sexual and reproductive health, and use tabs to keep track of important vaccination records, documents, and appointments. The application's target audience is new mothers from low-income minority households and/or single mothers.

Purpose of New System

The primary objective, as this semester was only 5 development sprints, was to focus mainly on bug/issue fixing-testing-finding rather than adding new functionality. The idea was to keep the app very stable on its current state so that further modifications can be made by the next Capstone students working on this project. A major part of the focus was on making the app more Android-friendly, as NuMom it performed better on iPhone devices.

USER STORIES

The following section provides the detailed user stories that were implemented in this iteration of the NuMoms project. These user stories served as the basis for the implementation of the project's features. This section also shows the user stories that are to be considered for future development.

Implemented User Stories

USER STORY ID	BELONGS TO	DESCRIPTION	ASSIGNEE
#01	Developers	Review Pull Requests for each Sprint	All members
#02	Developers	Post a new issue to GitHub	All members
#03	Developers	Task #1: Welcome Spring 2023!	All members
#625	Developers	Task #2: Password Strength Checker	All members
#642	Developers	Feeding page spacing in foods to avoid and important notes	Diego
#636	Developers	Not allow future dates in date of birth questionnaire	Joseph
#637	Developers	Move continue button up on all steps of sign up	David
#635	Developers	Added contrast to text boxes	Roni
#632	Developers	Fixed problem validating in app.json	Avraham
#647	Developers	Homepage no longer shows map on login	Joseph
#646	Developers	Fixed user being logged out when going back (Android)	David
#641	Developers	Making all text in WICScreen.jsx be included on the translation file	Diego
#652	Developers	White background not filling the whole screen on large-screen devices	Avraham
#649	Developers	App crashing when clicking settings	Roni

#653	Developers	Upgrade to Expo 49	Joseph and Diego
#662	Developers	Added deletion functionality to documents page	Joseph
#665	Developers	Document upload functionality	Joseph
#666	Developers	Updated ht_HT.json to not have English text	Diego
#648	Developers	Fixed dropdown not functional on Feeding page on Android devices	David
#654	Developers	Fixed map's pins when not giving access to location	Roni

Pending User Stories

USER STORY ID	DESCRIPTION
#406	Add a way to Rename/Delete Uploaded Documents
#638	Validate Sign-Up name to at least 3 chars and maximum of 50.
#651	Add visual elements to home page
#664	Add animations during screen transitions.
#667	Missing to add translations in English, Spanish, and Creole for MedicaidScreen.jsx
#668	Document refresh when uploading new document.
#611	Get rid of unused imports in files

PROJECT PLAN

This section describes the planning that went into the realization of this project. This project incorporated the agile development techniques and as such required the sprints to be planned. These sprint plannings are detailed in the section. This section also describes the components, both software and hardware, chosen for this project.

Hardware and Software Resources

The following is a list of all hardware and software resources that were used in this project:

iOS Device	Android Device	Software
iPhone 13 Pro	Google Pixel 6	Visual Studio Code
iPhone 11	Samsung Z Flip 2	Github.com
iPhone 11 Pro Max	Samsung Galaxy S21 Ultra	Github Desktop
		Firebase

Sprints Plan

The product owner chose the following user stories to be done during **all sprints**. They are ordered based on their priority.

- Work on a chosen open issue created last sprint.
- Create a new pull request (PR) for an issue you have been assigned to.
- Give reviews on 2 student's issues.
- Create a brand new issue (no new features).

Sprint 1

Team did not meet with the product owner/or mentor until the final days of the sprint, however the team read the documentation from the previous semester. No development was made during this sprint.

Sprint 2

User Story 1 - Welcome Spring 2023!

Install expo, run the app, and make the first pull request on the repo to make sure everyone can access the app.

User Story 2 - Password Strength Checker

After the meeting, Capstone 2 students should do this as an introductory task in the app.

User Story 3 - Post a new Issue to the Github

Test the app and post a new issue on Github.

Sprint 3

User Story 1: Work on issue #600 Date of birth restriction.

User Story 2: Work on issue #607, fixing the letter spacing in the feeding page.

User Story 3: #633: Add contrast to default text in textboxes.

User Story 4: #637 Move continue button up on all steps of sign-up.

User Story 5: Fix Problem validating fields in app.json.

Sprint 4

User Story 1: Work on issue #643, display map after clicking on facilities.

User Story 2: Work on issue #641, translating WIC page.

User Story 3: #610: Stop the user from being logged out when they press the previous page button.

User Story 4: White background not filling the whole screen on large-screen devices.

User Story 5: App crashing when clicking settings.

Sprint 5

User Story 1: Work on issue #653, upgrade expo to version 49

User Story 2: Work on issue #644, translating some text in several pages.

User Story 3: #648: Make the feeding page work on Android devices.

User Story 4: Fix the map when location services are not granted to the app by the user.

User Story 5: On a tablet phone the white background doesn't fill the screen.

SYSTEM DESIGN

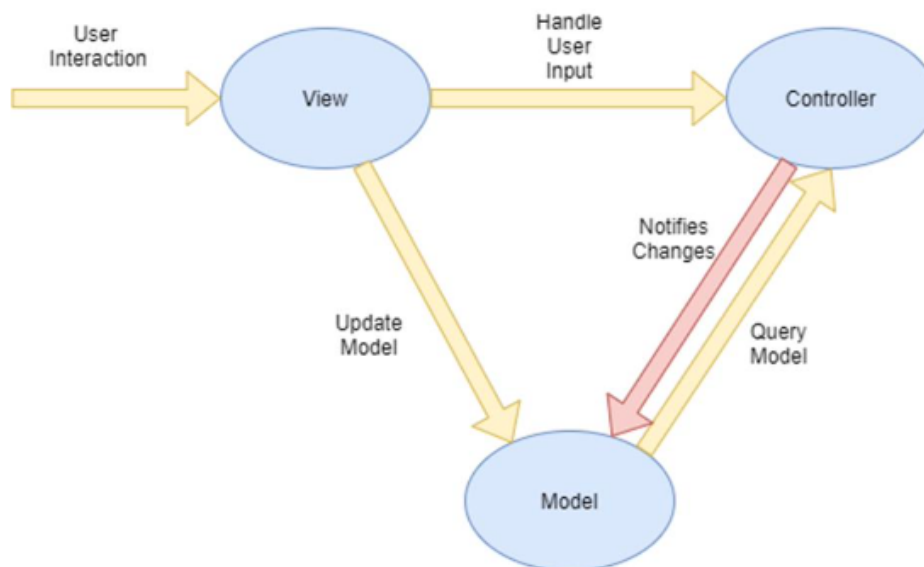
This section contains information on the design decisions that went into this project. The architecture patterns are outlined and explained. The entire system is shown in a package diagram and the subsystems are explained. Finally, the design patterns used in the project are discussed.

Architectural Patterns

Model-view-controller, popularly known as MVC, was the pattern that we employed. The application was separated into three sections using this structure:

- View - displays the information to the user, the user interface (UI).
- Controller - handles the user's inputs.
- Model - contains the core functionality, logic, and data of the application.

The data model, user-facing information, and control information were all intended to be contained in this MVC. Because it permits code reuse within the application, this design pattern is effective.

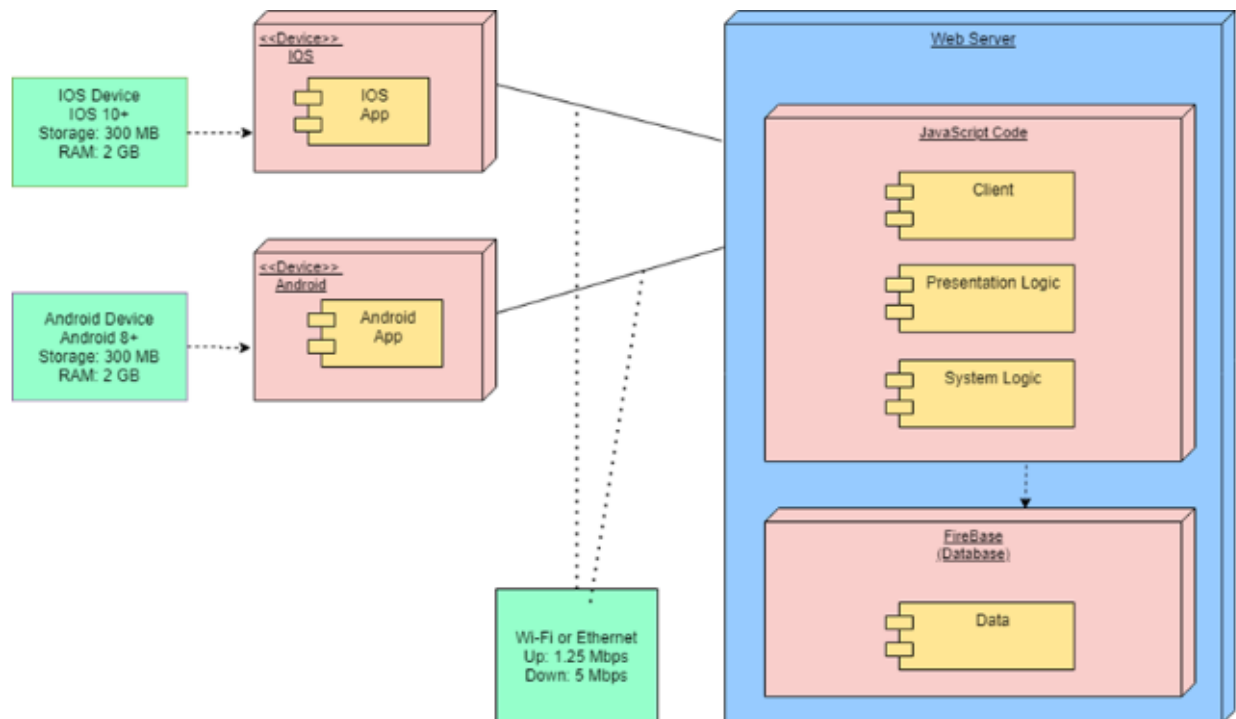


- View- displays the information to the user, the UI
- Controller- handle the user input
- Model- contains the core functionality and data

System and Subsystem Decomposition

The app was built with React Native and deployed with Expo packages and scanned a given QR code with the Expo GO app. Source code and assets are available in the src folder of the project, as well as the translation files for the English, Spanish, and Creole versions of the app. To replace class inheritance, we used React Hooks throughout the program. React Hooks is similar to class inheritance, but it has functions passing returns that are used anytime a component is called within another component.

Deployment Diagram



DESIGN PATTERNS

- Facade: The app uses a Facade design pattern to represent the UI in a user-friendly way without exposing the logic of the system to the user.
- Singleton: The app uses a Singleton design pattern to maintain only one instance of Firebase, with only one global access point to avoid instantiating the database API multiple times.
- Iterator: The app uses the Iterator design pattern to display multiple buttons, as well as display the Clinics and the Shelters.
- Chain of Responsibility: In the app several components delegate access of functions to other components which use a chain of responsibility design pattern.

SYSTEM VALIDATION

With Github as our version control system, each user story had a corresponding branch dedicated to its related changes. The changes were implemented with the assistance of IDE debugging, whether the developer opted for Visual Studio Code or JetBrains WebStorm, and we utilized React Native and JavaScript frameworks throughout the development process. After ensuring the code's accuracy, it was merged into the main development branch.

To validate our work, we followed a collaborative approach, where every pull request needed two other team members' reviews before being considered ready. During the review process, we locally ran the app using Expo on our individual devices, ensuring that the issue was resolved correctly and didn't introduce any new problems along the way. If necessary, issues were reported, and we always ensured consistency by testing on both Android and iOS devices. As the semester concluded, the development branch was merged into the release branch, and the culmination of our efforts was released to the world.

GLOSSARY

API: Short for Application Programming Interface. a set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service.

Authentication: The process of confirming if the user is who the user says it is

Cloud Functions: Cloud Functions is a server-less execution environment for building and connecting cloud services.

Dependencies: is a broad software engineering term used to refer when a piece of software relies on another one

Expo: Expo is a platform that allows you to develop and quickly iterate on applications that are based in React Native and JavaScript.

Feature: A capability that the software offers

Framework: A basic structure underlying a system, concept, or text.

IDE: Short for Integrated Development Environment. is a software application that provides comprehensive facilities to computer programmers for software development.

Product Owner: The person responsible for guiding changes and talking to developers about things that need to be modified on a software.

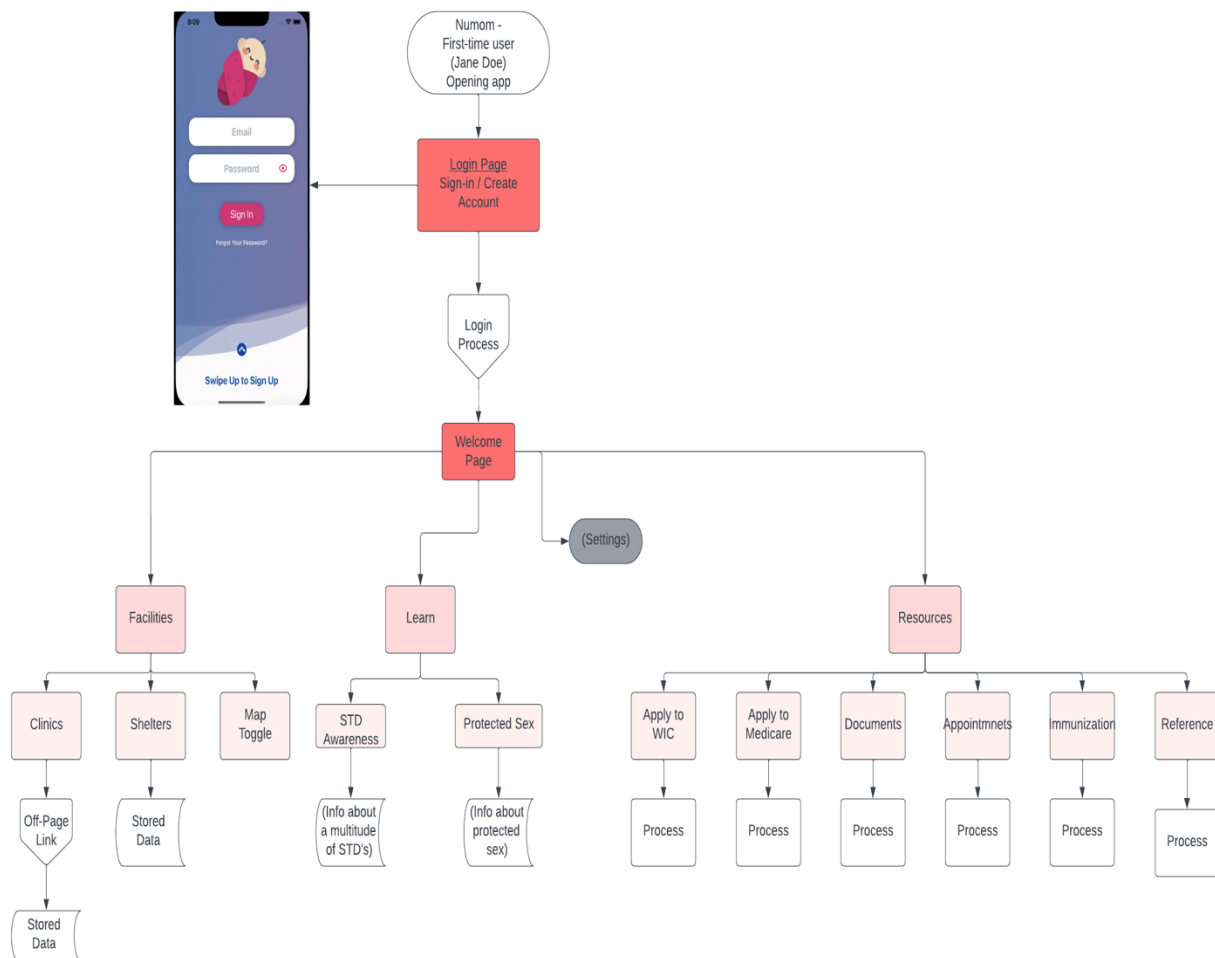
TestFlight: is an online service for over-the-air installation and testing of mobile applications, currently owned by Apple Inc. and only offered to developers within the iOS Developer Program

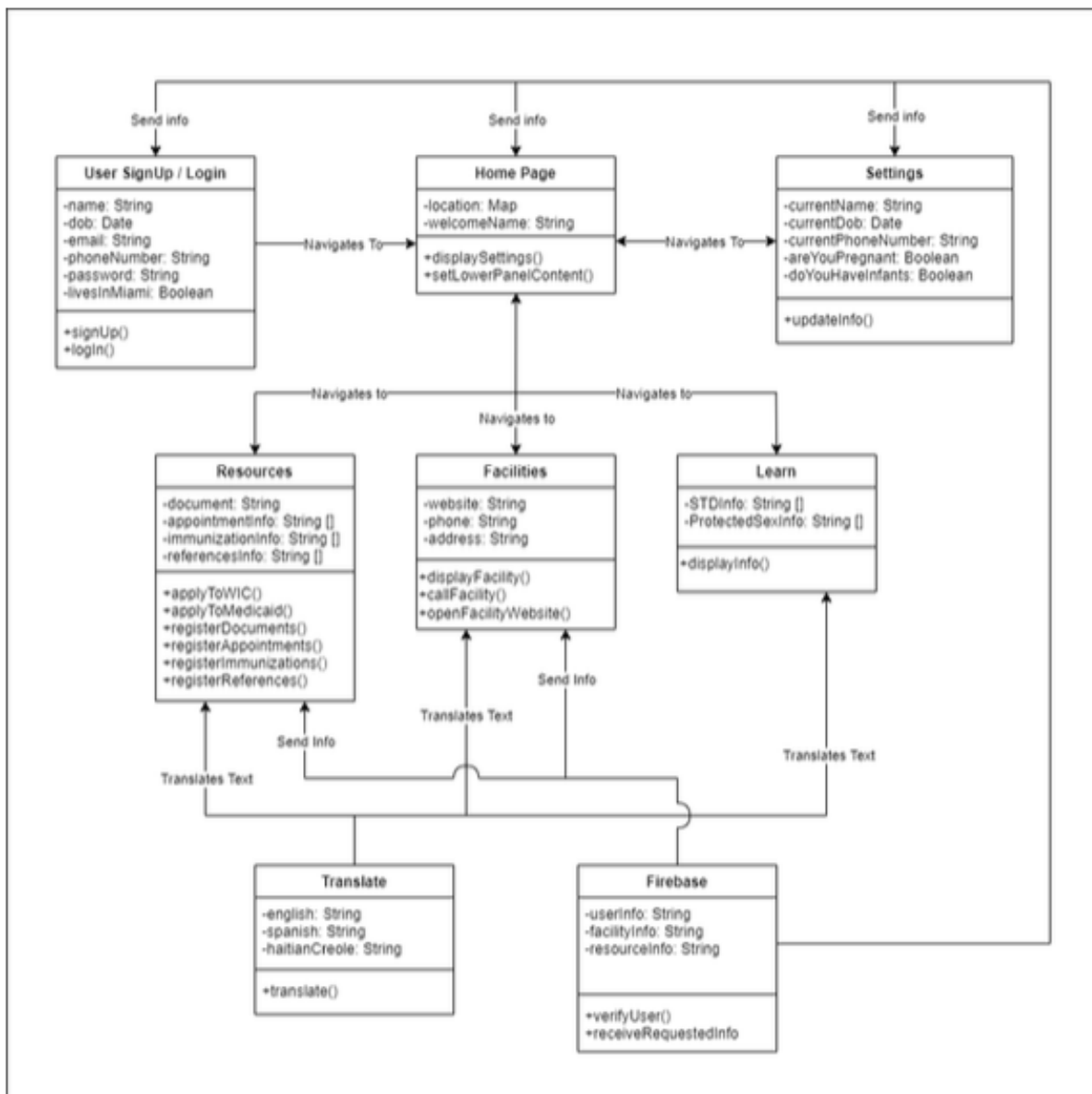
UI: Short for User Interface. Is the display on which the user interacts.

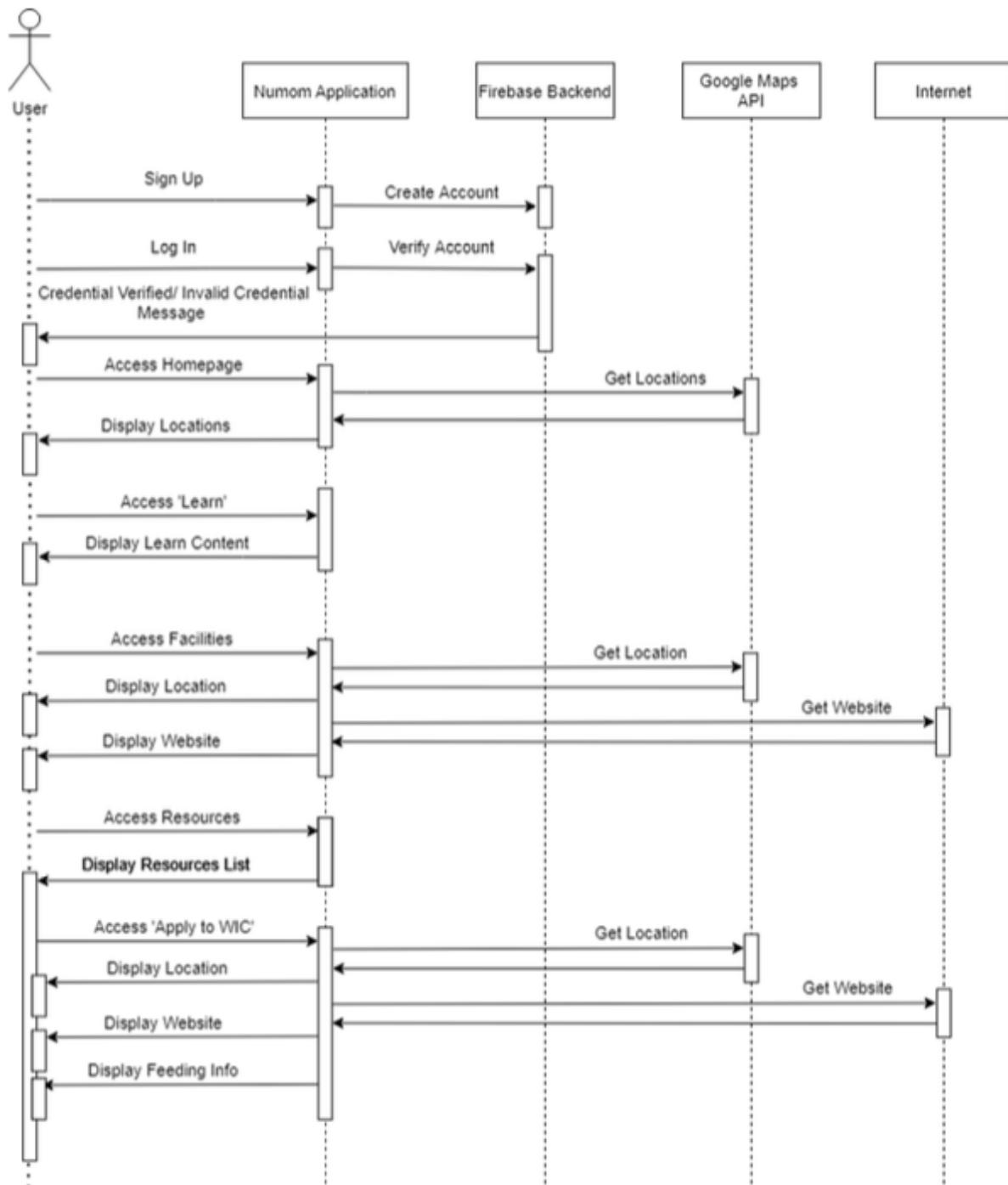
UML diagram: Is a diagram based on the UML (Unified Modeling Language) with the purpose of visually representing a system along with its main actors, roles, actions, artifacts or classes, to better understand, alter, maintain, or document information about the system.

APPENDIX

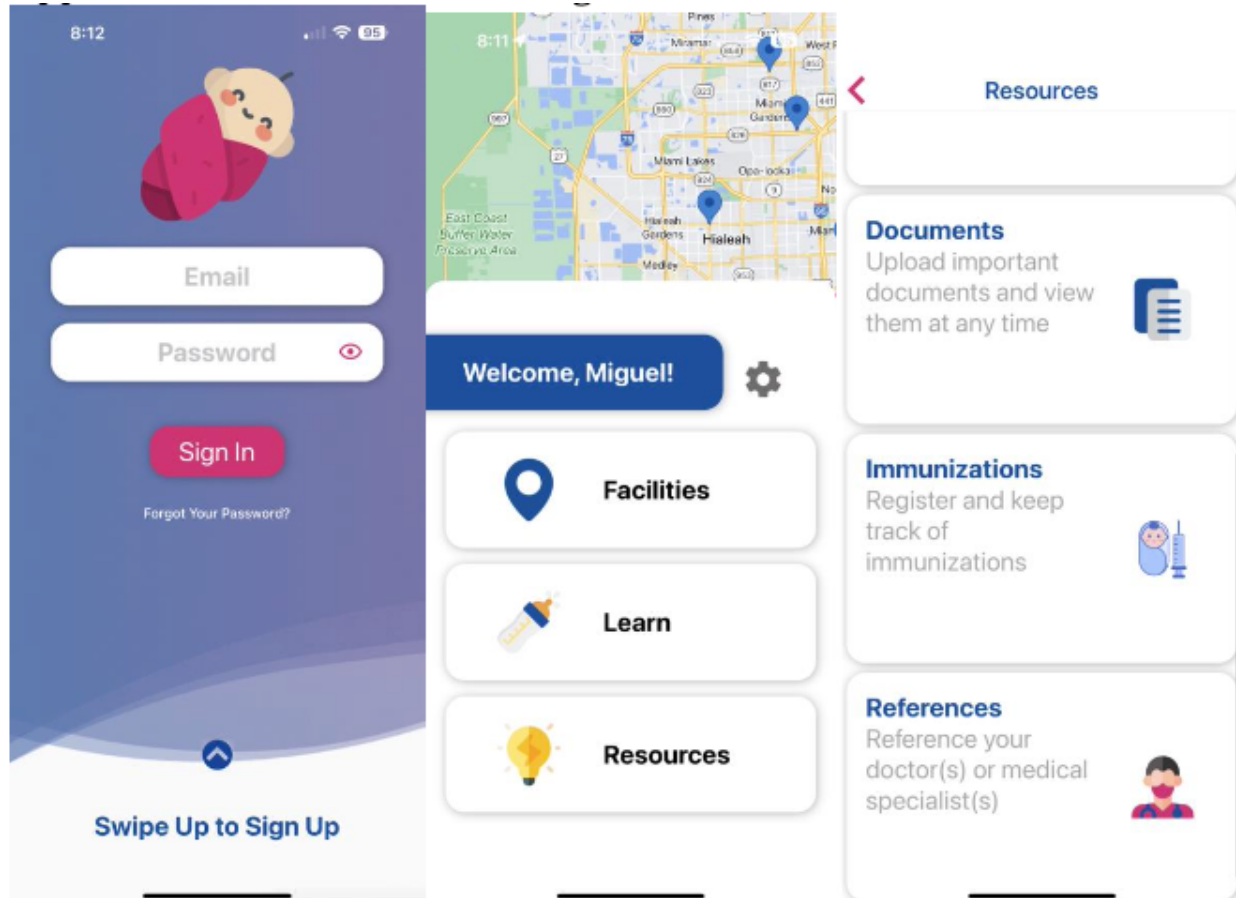
Appendix A - UML Diagrams

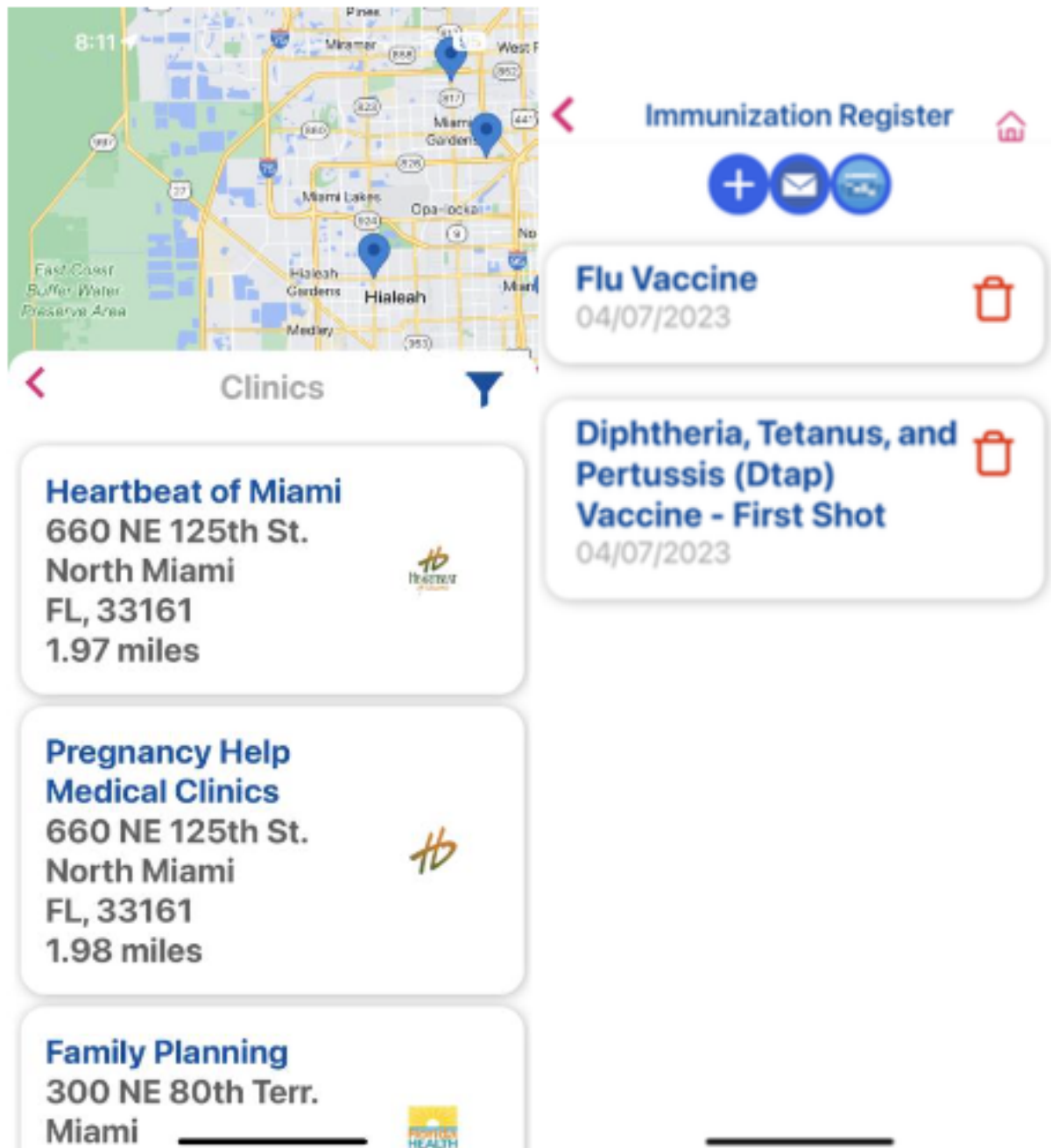






Appendix B - User Interface Design





Appendix C - Sprint Review Reports

Sprint Review Meeting Minutes 1

Attendees: Joseph Bargallo, Diego Padua, David Delgado Lopez, Roni Raad, Avraham Moshe

Start time: 7:30 P.M.

End time: 8:30 P.M.

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story: All members completed Task #1 assigned by the product owner which consisted in setting up the project, adding the database file with its unique key, and creating individual branches to submit our first pull request containing a text file with each member's email.

The following ones were rejected and moved back to the product backlog to be assigned to a future sprint at a future Sprint Planning meeting.

- User Story: No user story was rejected for this sprint.

Sprint Review Meeting Minutes 2

Attendees: Joseph Bargallo, Diego Padua, David Delgado Lopez, Roni Raad, Avraham Moshe

Start time: 7:30 P.M.

End time: 8:30 P.M.

After a show and tell presentation, the implementation of the following user stories was accepted by the product owners: All.

- User Story: All members completed Task #2 assigned by the product owner which consisted in creating a strength password that followed a specific criterion, which we had to commit and pull a new request, along with approving 2 pull requests from our members, and creating a new issue for the project.

Sprint Review Meeting Minutes 3

Attendees: Joseph Bargallo, Diego Padua, David Delgado Lopez, Roni Raad, Avraham Moshe

Start time: 7:30 P.M.

End time: 8:30 P.M.

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story #1: Add contrast to default text in textboxes (issue #633).
- User Story #2: Validating the fields in app.json (issue #632).
- User Story #3: Add date of birth restrictions in the sign-up page (issue #600).
- User Story #4: Fixed user being logged out when going back (android) (issue #618).

Sprint Review Meeting Minutes 4

Attendees: Joseph Bargallo, Diego Padua, David Delgado Lopez, Roni Raad, Avraham Moshe

Start time: 7:30 P.M.

End time: 8:30 P.M.

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story #1: Add translation for the WIC page (issue #641).
- User Story #2: Fix crash when pressing settings page (issue #645).
- User Story #3: Display map after clicking facilities (issue #643).
- User Story #4: Fixed user being logged out when going back (android) (issue #610).
- User Story #5: Problem validating json files (issue #632).

Sprint Review Meeting Minutes 5

Attendees: Joseph Bargallo, Diego Padua, David Delgado Lopez, Roni Raad, Avraham Moshe

Start time: 7:30 P.M.

End time: 8:30 P.M.

After a show and tell presentation, the implementation of the following user stories were accepted by the product owners: All.

- User Story #1: Upgrade to Expo 49 (issue #653).
- User Story #2: Be able to upload documents/images (issue #663).
- User Story #3: On tablet phone the white background does not fill the screen (issue #652).
- User Story #4: Translate the English text to Haitian Creole in ht_HT.json file (issue #644).
- User Story #5: Fix dropdown menu in Feeding page (android) (issue #648).

Appendix D - User Manuals, Installation/Maintenance Document, Shortcomings/Wishlist Document and other documents

User Manual

When the user first launches the application, they are greeted with the Login page. On this page, the user can log in to their account, and there is a "Forgot Password" button that will take them to another page where they can enter their email address to reset their password. There is also a "Swipe up to Sign Up" option, which takes users to a welcome page before prompting them to enter their name and birth date. During the signup process, the user is asked for previous information in order to gain access to the application, as well as any other information required to create an account. The app will enroll the user in the SMS messaging service during the sign-up process. The user should receive a text message shortly after creating their account.

When they log in, they are taken to the homepage, where they are greeted by the app and see five things: a map with available clinics, a cog for the settings page, a 'Facilities' tab, a 'Learn' tab, and a 'Resources' tab. When the user presses the cog, they will see account-related fields such as their phone number, date of birth, name, and answers to questions such as "Do You Live in Miami?", "Are you Pregnant?", and "Do You Have Any Infants?" They can change these at any time and save their changes at the bottom of the page. The user can log out of the website from the upper right-hand corner of the Settings page. This is the only way the user can completely log out of the app.

The user can then exit the Settings tab and return to the homepage, where they can click on the Facilities page, where they are given two options: "Clinics" and "Shelters." When the user clicks the "Clinics" tab, they will see a list of clinics sorted by proximity. The clinic's name, address, and distance from the user's current location are displayed to the user. The user can filter the list of clinics at the top of the page by distance (five, ten, and fifteen miles) or by services (abortions, free materials, and immunization). The shelters can also be filtered by distance. The user can tap on a specific location to get the location's website, phone number, and services offered if it is a clinic.

After returning to the homepage, the user may proceed to the "Learn" page. The Learn page provides the user with two tabs: "STD Awareness" and "Protected Sex." The "STD Awareness page" lists the diseases that can be transmitted through unprotected sex. The user can view information on the symptoms, the testing procedure for diagnosis of said STD, treatment for the STD, the consequences if the STD is left untreated, and when it is safe to begin sexual activity

for each STD. There is also a button that links to outside government sources if the user wants more information.

The "Protected Sex" section emphasizes safe sex and makes use of female condoms as a safe sex resource. At the top of the page, there is a brief explanation of what a female condom is and a picture of one. On this page, the user can choose between two options: "Female Condom Do's and Don'ts" and "How to Insert and Remove a Female Condom." The "Female Condom Do's and Don'ts" section instructs the user on how to use female condoms properly, essentially what to do and what not to do. The Dos are listed at the top, while the Don'ts are listed at the bottom. "How to Insert and Remove a Female Condom" walks the user through the process of inserting a condom step by step. This page explains how to use condoms, care for them, and dispose of them properly.

The user can then exit the Learn tab and return to the homepage. When the user clicks on the "Resources" tab, a list of tabs appears, including "Apply to WIC," "Apply to Medicaid," "Appointments," "Documents," "Immunizations," and "References."

When the user navigates to the "Apply to WIC" page, he or she will see a "Checklist," "Feeding," "Locations," and "Website." The Checklist page allows the user to enter the following information needed to apply for WIC: "Family members" - Each member applying for WIC; "Proof of Income of all family members" - Salaries, child support, alimony, foster care payments, interest withdrawn, unemployment, and so on. The Feeding tab informs the mother about the feeding guidelines for infants aged 0 to 12 months. By scrolling, the user must select the correct age range for the infant. Each age range includes information on infant food options and alternatives, and each food option has a graphic icon showing what types of foods pertain to it. When the user reaches the bottom of the list, additional information on foods to avoid for infants and important notes for the mother are provided. The Location tab displays a list of WIC facilities in the user's general vicinity and can be filtered by distance like the other maps. The Website tab takes you directly to the WIC home page.

The "Apply to Medicaid" tab will take the user to a page that includes a link to the Medicaid site, a checklist of items to bring to their Medicaid appointment, and a locations tab that contains nearby Medicaid offices, like the "Facilities" tab, but for Medicaid locations.

By going to the "Appointments" tab, the user may be able to add and remove appointments, as well as rename them. The user can add appointments by clicking the plus (+) sign at the top of the page. Once entered, the data is saved in the Firebase system and is ready to be viewed. In

order to sync their appointments, the user will be prompted for access to their device's calendar. To delete an appointment, simply tap the trash can icon next to the appointment details.

The "Documents" tab works similarly to the "Appointments" tab, with the main difference being that the user can upload an image, crop it, and then click "OK." The user will then be presented with an input box in which to name the file. These files will be immediately saved in the cloud via Firebase and can be viewed on the documents page.

Users are greeted at the top of the "Immunizations" page with three buttons: a plus (+) sign to add to the Immunization Register, an envelope to send an email of the immunizations listed on the page, and a calendar icon. By tapping the plus sign, the user will be taken to a page where they can enter the type of immunization their child received, the dosage, the date, and any other information. The envelope generates an email for each immunization listed on the Immunization Register using the user's primary email address. Finally, the calendar icon will take the user to the "Immunization Schedule," where they can view their child's immunization history and check off any new immunizations. The list is arranged according to the infant's age, starting at birth and going up to 2 months, 4 months, etc. There is a list of immunizations received under each age group. The Immunization Schedule's list of immunizations is automatically checked off as the user adds immunizations to the Immunization Register. This gives the user a simpler alternative for keeping track of their child's immunizations.

The "References" tab is the user's last option. At the top of the page, the user will see a plus (+) sign where they can enter details for a financial or medical reference. Once entered, the data is immediately available for viewing on the references page after being stored in Firebase. Every reference has a trash bin button, like the "Appointments" tab, allowing the user the ability to remove the reference.

Installation/Maintenance**Step 1:**

Install git on your computer <https://git-scm.com/downloads>

Install Node.js (comes with npm) <https://nodejs.org/en/>

Step 2:

Download Visual Studio Code from your browser through:

<https://code.visualstudio.com/download>

Step 3:

Open Visual Studio Code and select get from version control; from the dropdown, select git. A link will be requested where you will input the following link:

<https://github.com/edumorlom/moms-infants-healthy.git>

Step 4:

After the project is cloned in your computer you will be able to access it from your command line interface. After that, go to your project from the terminal by using “cd” and going to the folder where the project is in.

Step 5:

Install all the backend node dependencies and expo by running the following commands in the root directory:

```
npm install --global expo-cli
```

```
npm install && expo install
```

Step 6:

You must now download the firebase api key file and place it into the /src directory in your local repository. In order to obtain this file, you must contact NuMom Lead Mentor, Eduardo Morales for it at edmorales.97@gmail.com

Step 7:

Install the expo go client on your mobile device (or install an Android/iPhone simulator on your computer):

iOS: <https://apps.apple.com/app/apple-store/id982107779>

Android: <https://play.google.com/store/apps/details?id=host.exp.exponent&referrer=www>

Step 8:

Once everything is completed, use the command within the root folder “npx expo login” in order to login with the Credentials of the expo account with permission. This will be provided by your mentor if they do not give your expo account access.

(Moving forward with expo 49 the command “expo start” will no longer work use “npx expo instead”)

A window will open in your default browser with a QR code to be scanned with your phone. The application now will show up in your phone on the application of the expo client.

Step 9:

Once the expo login is set up, use the command “npx expo start” in order to start expo.

A QR code will appear to be scanned with your phone. The application now will show up in your phone on the application of the expo go client.

Step 10 (optional):

You can run expo on a virtual device on your computer, which allows further testing on additional devices. View the following links to get started for either iOS or Android:

iOS: <https://docs.expo.io/workflow/ios-simulator/>

Android: <https://docs.expo.io/workflow/android-studio-emulator/>

Shortcomings/Wishlist

- 1- Add animations and/or other UI improvements so that the user experience becomes more engaging and visually appealing. Animations can be incorporated for various interactions such as button clicks, page transitions, or loading screens, adding a touch of interactivity that enhances the overall feel of the application.
- 2- Consider micro-interactions to add subtle animations to smaller elements like icons, buttons, or notifications. These micro-interactions not only make the app feel more alive but also provide immediate feedback to the user, enhancing the sense of responsiveness.
- 3- Add the renaming of documents that have been uploaded in the documents page.
- 4- Adding more information that prenatal mothers on the dangers to them during their pregnancies.
- 5- Improving the visual design of the homepage now that the map is hidden upon logging in.
- 6- Addition of more languages to the app to be included for translation.
- 7- Better optimization for the Android version.

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