FP7 – Project Report

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Executive Summary

With the Covid-19 pandemic still raging, the world is facing unprecedented times. This has affected every part of our daily lives and drastically changed how students are receiving an education. The goal of this project was to develop an application that would make students feel safe coming to campus through the use of daily wellness checks and contact tracing to notify them if they may have been exposed to the virus. Following the human-centered design process, we interviewed representative users to understand what this app could do to make them feel safe attending in-person classes. Using this information, we created prototypes for our UI that were iteratively designed and evaluated to create our final prototypes which also underwent the summative evaluation process. The results of this process, including the app design, evaluation details, and high-fidelity prototype are contained within this report.

Introduction

Due to the ongoing global Covid-19 pandemic, the health and safety of the public has become a topic of great discussion. Many measures have been put into place to reduce the spread of the virus, such as curfews, mask mandates, and limits on how many can gather in one place. For universities, managing the pandemic is a difficult task. How can we reduce the transmission of the virus while continuing to effectively educate students? In response to this question, we have designed a mobile application for all Northeastern University faculty, staff, and students called Protect the Pack, which is a Covid-19 tracing application that allows users to track their required test results and check relevant statistics related to the virus. .

The app was designed to be used by any person working or studying at Northeastern. During the initial design process, we developed a contextual inquiry, observational protocol, and interview questions. We identified and interviewed three potential users, and then used the data collected from the interviews to create a Work Activity Affinity Diagram (WAAD). From there, we developed user personas to help us better understand the needs of our users, which enabled us to assemble a list of requirement statements and tasks for the application.

Using the requirement statements and tasks, we were able to create usage scenarios and low fidelity sketches of our app's interface. We sought user feedback on these sketches and then developed a medium fidelity prototype based on that feedback. After finalizing the medium

fidelity prototype, we conducted a formative evaluation of the prototype using a cognitive walkthrough. From the results of the walkthrough, we updated our usage scenarios and refined our medium fidelity prototype.

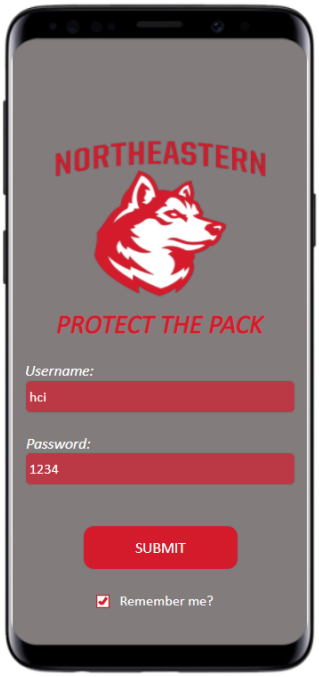
From there, we further developed on our ideas to create a high fidelity prototype, and created a summative evaluation protocol. We asked our users to complete the tasks required by the app, and observed them as they did so. Based on that, we were able to determine the efficiency of our design.

We believe this application design will be useful for those affiliated with Northeastern University in their endeavors to protect themselves and those around them from the pandemic. By using this app, users will be able to keep tabs on the safest actions to take and places to go, which should provide some guidance during these times.

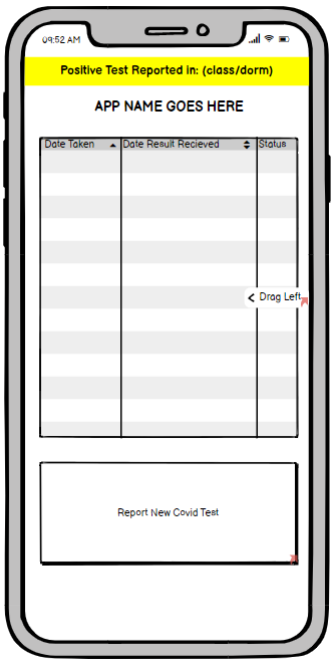
Interface Description

The design for the Covid Tracking App was made with three specific components.

The General Screens: This section includes the login screen, home screen, and settings screens. The home screen allows users to access the additional functions with three distinct buttons. It also allows the users to access settings to change profile contact preferences.

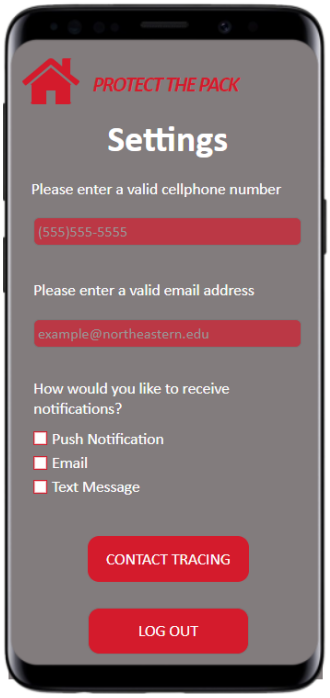


A: Login Screen

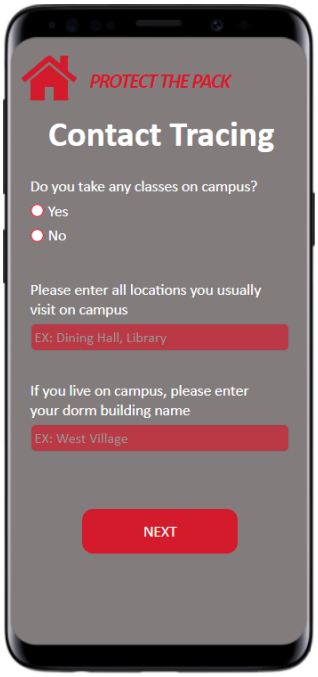


B1: Medium Fidelity Home Page

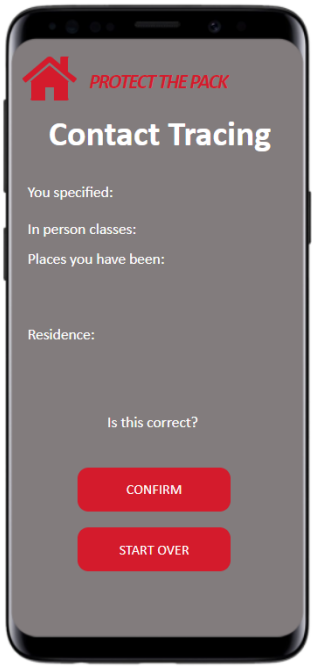
B2: High Fidelity Home Page



C1: Settings Page



C2: Contact Tracing



C3: Tracing Confirmation

(A): The login screen features the app's name "Protect the Pack" and its logo with it. It also includes a "remember me" option which saves login information to the phone.

(B1-2): The home page screen features five buttons on it, three for the main features, one for profile settings, and another for a "escape button" to the home page.Another important feature was keeping log of previous test results, and allowing for their results to be displayed on the Home page.

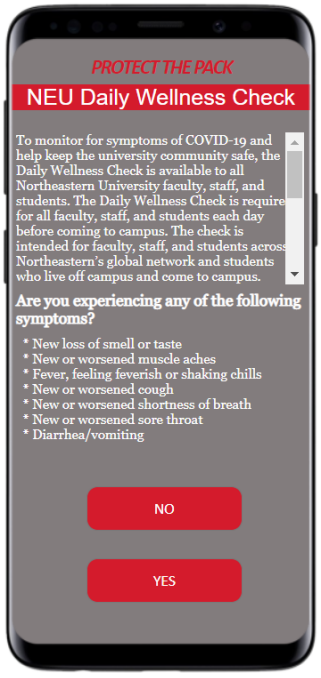
We chose to use common theme buttons, such as a house for our "home escape" button and gears for "settings", since these are industry standards.

(C1): The first settings page allows the user to set preferred contact info of both phone number and email address if it changes. They can also choose how to receive these notifications, whether by email, text, or push notification.

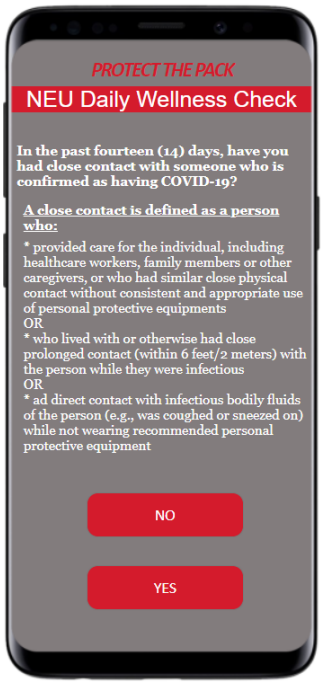
(C2): The second settings screen helps to track users locations and if they are an on campus student. This allows students to report as being an on campus student or not, and to report where they take classes or other places they visit.

(C3): The third settings screen is a confirmation screen of the user's choice of being an on campus student, and where their classes are or they visit.

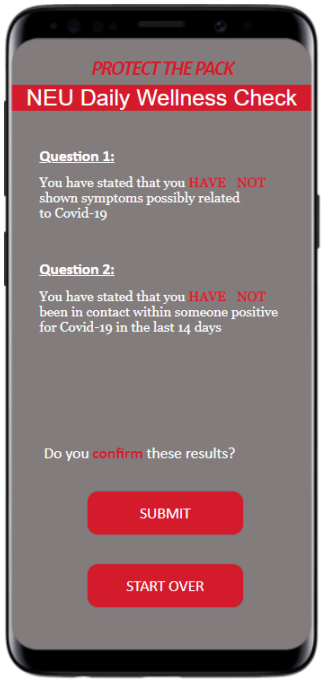
The Testing Screens: This section includes the main features of reporting a test and completing the Daily Wellness Check.



D1: Daily Q1

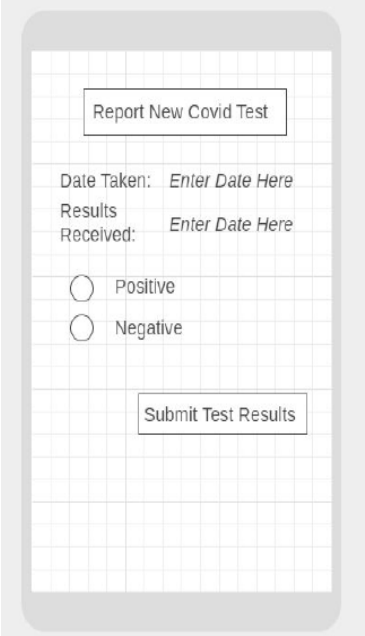


D2: Daily Q 2

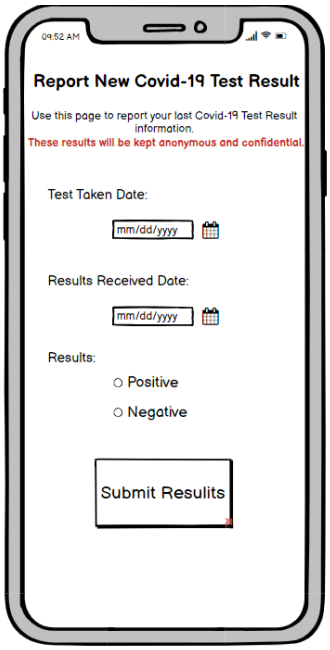


D3: Daily Confirm

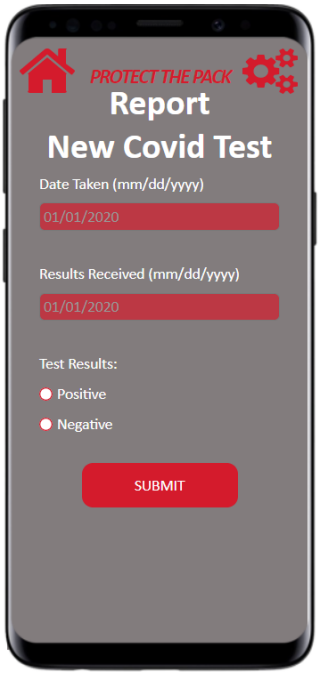
D4: Daily Complete



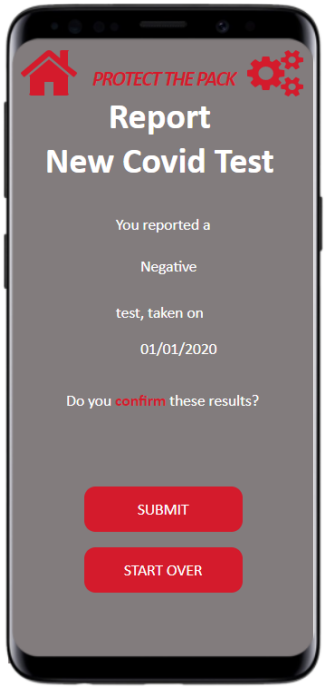
E1.1: Low Fidelity Report Test



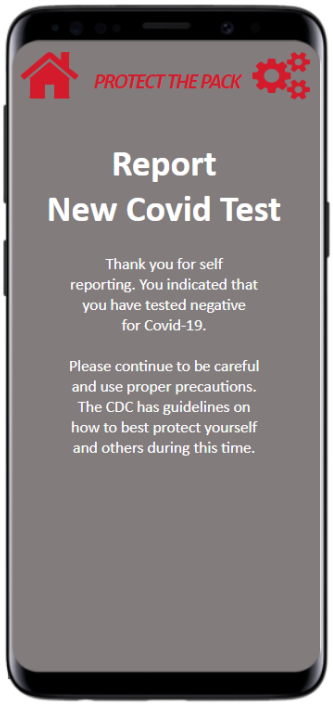
E1.2: Medium Fidelity Report



E1.3: High Fidelity Report Test



E2: Report A Test Confirmation



E3: Report A Test Complete

(D1): The first Daily Wellness Check page consists of the first Daily Wellness question, where the question title is enlarged. The following text describing the question is lowered to a 12 point font, for eligibility on the screen. It was also a design choice to put the negative answer above the positive one because in this case “no” is the positive case of not being affected by the virus.

(D2): The second Daily Wellness Check page consists of the second Daily Wellness question, where the question title is enlarged. The following text describing the question is lowered to a 12 point font, for eligibility on the screen. It was also a design choice to put the negative answer above the positive one because in this case “no” is the positive case of not being affected by the virus. There is also a scroll menu of text explaining as to the reasoning of the Daily Wellness Check.

(D3): The third Daily Wellness Check page is the answer confirmation page, where the questions are highlighted, and the user’s answers are given in capitalized, color letters to help ensure they know what they answered. A final colored word for confirm is given in the confirmation sentence to help set the important action apart from other words, as with CRAP styling. The two buttons below allow users to confirm their submission, or start over if they answered incorrectly.

(D4): The fourth Daily Wellness Check page is a confirmation of Daily Wellness Check submission, with the QR code that allows users to continue on with a test on campus. It also states in bolded letters if they may come on campus depending on their prior answers. For

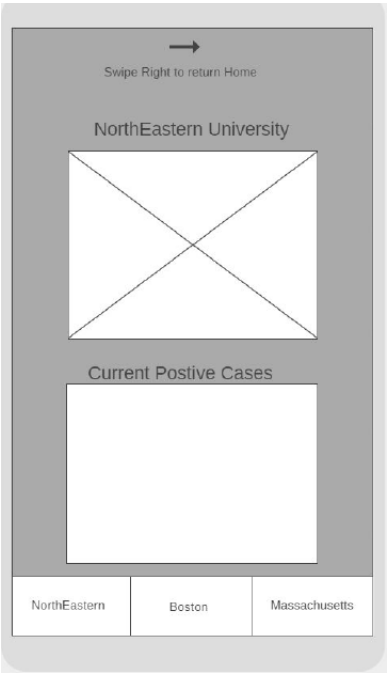
design reasons, the home “escape” button is the only way back home as it helps to increase the recognition as the main home button.

(E1.1-1.3): The first Report a New Test page asks for the date the test was taken and the date the results were received, as well as the radio buttons for positive and negative results. These are for tracking when and how often users take a Covid test so they can view their results at any time.

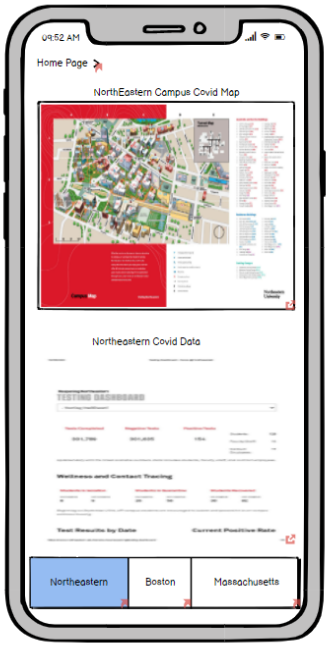
(E2): The second Report a New Test page is a confirmation page, confirming that the user input the data on the first screen correctly. It allows the user to re-enter their data if they entered it incorrectly, or submit what they entered as the correct data.

(E3): The third Report a New Test page displays a different confirmation message depending on whether the user tested positive or negative for Covid-19. For negative results, the message encourages the user to remain careful and use proper precautions. For positive results, the message directs the user to CDC guidelines as to how to handle their diagnosis.

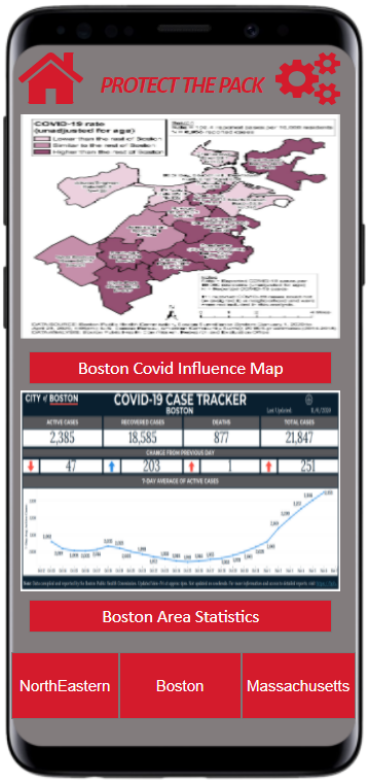
Covid Data Tracking: This section was created as an additional feature to set our project from others. The purpose of this section is to report to the user the general statistics of the Covid-19 virus on NorthEastern campus, the City of Boston, and the State of Massachusetts. The attached maps and statistics would be clickable links leading to the sites where the data was extrapolated from.

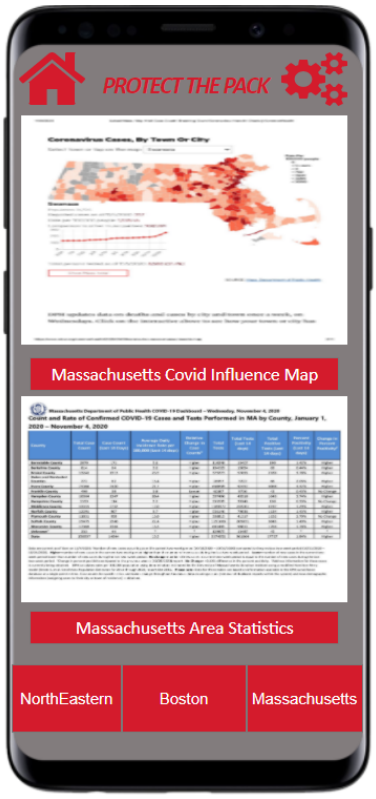


F1.1 Low Fidelity Data Tracking



F1.2 Medium Fidelity Data Tracking





F1.3 High Fidelity Campus F2 High Fidelity Boston F3 High Fidelity State

(F1.1-1.3): The NorthEastern Covid Data Tracking Page gives users an idea of how Covid-19 is affecting the boston campus of NEU by displaying a map of viral influence as well as a statistical breakdown of cases on campus.

(F2): The Boston Covid Data Tracking Page gives users an idea of how Covid-19 is affecting the Boston area by displaying a map of viral influence for the city as well as a saticial breakdown of cases in Boston.

(F3): The Massachusetts Covid Data Tracking Page gives users an idea of how Covid-19 is affecting the state of Massachusetts by displaying a map of viral influence for the state as well as a saticial breakdown of cases in Massachusetts.

High-Fidelity Prototype

https://cdqel7.axshare.com

Summative Evaluation Methodology

1. Evaluation Objectives

In conducting this usability test, we were aiming to gain insight into the following by observing tests users interacting with the application:

- How quickly can users finish each task, relative to “experienced” users
- If they can complete each task listed
- If the app needs to present any additional instruction for its use
- If any major changes are needed due to task misunderstanding or incompletion

2. Tasks / Scenarios

Test Scenario:

You are a student of NorthEastern University. Deciding to be safe and smart, you download the Covid Tracking App sponsored and created by NorthEastern University. First, you will need to sign in the application. Second, an automatic Daily Wellness Check will open for you, as you have not completed it for today. Follow the questionnaire and answer the questions before submitting your Daily Wellness Check. After this, you notice that you need to set your notifications settings to ensure you understand when you might have been at risk. Going to setting, you will set your notifications preference, and enter your phone number along with your class schedule. Now returning to the home page, you decide to Report a New Covid Test Results you have received. Continue to Report a Covid Test Result, you will follow the questionnaire and answer them, before submitting the final questionnaire. Returning to the home page again, you will now decide, before logging off, you want to check the Covid Tracking Data for the school, the city of Boston, and the state of Massachusetts. After checking the data, you decide you are done and log off.

Task List:

Logging In:

You will type in your school username for the app

You will type in your password

If you wish to, you may click “remember me” for faster logging in next time

You will press the “login” button

If you entered the credentials correctly, you will be taken to the home screen

If you entered the credentials incorrectly, you will be asked to re-enter their credentials

Daily Wellness Check:

You will open the application for the first time in a given day and are prompted to complete the daily wellness check.

You will read question 1 and press either the “yes” or “no” button based on what is appropriate.

You will read question 2 and press either the “yes” or “no” button based on what is appropriate.

You will then review your answers and select either “submit” or “start over” based on what is appropriate.

You will be shown relevant information based on your responses.

You can access the results of your daily wellness check through a button on the homepage and view an associated QR code

Reporting a Covid Test:

You will press the “Report New Covid Test” button on the home page

You then will fill out the box for the date the test was taken

You then will fill out the box for when your results were received

You will press the radio button for either “positive” or “negative”

You will press the “Test Submission” button

You will review your test submission and press either the “submit” button or the “start over” button

You will receive relevant information based on the result of your test

Contact Tracing:

If you have not already done so, you will be prompted to give a valid cellular phone number that can be sent notifications when positive test notifications need to be sent to you.

If you have not verified your phone number through a text message, a text message asking for phone number verification will be sent to you, and you will be required to press the link in the message to verify your phone number.

You will enter whether or not you take classes in person or online on daily basis for when a class has happened

You will enter other locations you have visited on campus during the day, noting time period when possible

You will be able to enter the dormitory you live in if applicable

Notifications:

You will receive a notification if anyone in your residence hall or any of your classes has tested positive for Covid-19

You will receive a push notification, text message, and email about any positive tests. You will also see an automatic popup upon opening the app

You can set your notification preferences

Viewing the Covid Influence:

You will use a finger to “swipe” left, revealing a new page Northeastern covid influence statistics (and possible map)

You will then press the “Boston” button to change to Boston Covid Influence stats / map

You then press the “Massachusetts” button to change to Massachusetts Covid Influence stats

You will then press the “Northeastern” button to change back to Northeastern Covid Influence

You finally will use a finger to “swipe” right to exit page

3. Participants

We recruited three participants for the usability test who are all part of our key demographic of Northeastern Students.

Name	E-mail
Mercedes Lamb	lamb.m@northeastern.edu
Vanessa Chatman	chatman.v@northeastern.edu
Tristin Munley	munley.m@northeastern.edu

4. Usability Metrics

We used three core usability metrics for evaluation: task-based efficiency, task completion ratio, and user satisfaction.

We defined Task-Based efficiency as the amount of time it took for a sample user to complete various tasks within the application. To measure this data, we timed example users performing various tasks in the application. These values will also be compared to times of expert users by measuring the times on these tasks taken by the development team.

Task-completion ratio is defined by the proportion of test users who were successfully able to complete a task. This was measured by recording whether or not sample users were able to complete given tasks without additional help or prompting for observing researchers.

User satisfaction is defined as a user's overall experience with using the application. In order to measure this at the end of the evaluation users were given the System Usability Scale questionnaire. In combination with this, users were also given a questionnaire to answer after completing each task in the summative evaluation. The SUS and post-task questionnaire used are both included in the appendix of this report.

5. Procedure

The evaluation was conducted over Zoom. Test users were given a link to the high-fidelity prototype and then asked to share their screen for researcher observation. After briefing the test user, we asked them to attempt to complete various tasks within the application and presented a post-task questionnaire after completing each one. After having the user go through each task, we closed with any final comments and asked them to fill out the SUS questionnaire. A numbered list of the process is included below.

1. Briefing
2. Log in
3. Daily wellness check
4. Set Contact Tracing Details
5. Report test
6. Explore covid data
7. Questionnaire

Results

The following table gives an overview of the data observed from usability testing. Additional information on each metric is included in the following sections.

Task	Usability Metric	Measure	Benchmark	Target	Observed
Log In	Effectiveness	Task Completion Rate	-	80%	100%
	Efficiency	Time on Task	5.33s	80%, or greater	8s
	Satisfaction	Task-Based Usability Rating	-	4 out of 5 or greater	
Daily Wellness Check	Effectiveness	Task Completion Rate	-	80%	100%
	Efficiency	Time on Task	9.66s	80%, or greater	85.67s
	Satisfaction	Task-Based Usability Rating	-	4 out of 5 or greater	
Set Contact Tracing Details	Effectiveness	Task Completion Rate	-	80%	100%
	Efficiency	Time on Task	17.33	80%, or greater	59.67s

	Satisfaction	Task-Based Usability Rating	-	4 out of 5 or greater	
Report Test	Effectiveness	Task Completion Rate	-	80%	100%
	Efficiency	Time on Task	16.66s	80%, or greater	40s
	Satisfaction	Task-Based Usability Rating	-	4 out of 5 or greater	
Explore Covid Data	Effectiveness	Task Completion Rate	-	80%	67.66%
	Efficiency	Time on Task	19s	80%, or greater	80s
	Satisfaction	Task-Based Usability Rating	-	4 out of 5 or greater	
Overall	Overall Usability Scale	System Usability Scale	68	80 or greater	

Task Completion Rates

Participants were observed to see if the various tasks within the application could be completed without additional prompting from observers. The table below displays these success rates.

Participant	Log In	Daily Wellness	Tracing Details	Covid Data
P1	✓	✓	✓	X
P2	✓	✓	✓	✓
P3	✓	✓	✓	✓
Success	3	3	3	2
Completion Rates	100%	100%	100%	66.6%

Time on Task

Researchers using smartphone stopwatches recorded the amount of time it took for a participant to complete a given task.

Table data reported in seconds

Task	P1	P2	P3	AVG
Log In	13	6	5	8
Daily Wellness	186	26	45	85.67
Set Contact Tracing Details	90	36	53	59.67
Report Test	60	28	32	40

Explore Covid Data	150	51	39	80

Task-Based Usability

After completing each task within the application, participants were asked to complete a brief task-based questionnaire. Results are recorded in the below table with columns being labeled according to the element of usability the given question asked. Questions can be found for reference in the appendix.

Mean Task Rating

Task	Mental Demand	Physical Demand	Temporal Demand	Performance	Effort	Frustration
Log In	1	1	1	10	1.33	1
Daily Wellness	2.33	1.33	2.33	10	1	1.33
Set Contact Tracing Details	2.66	1.33	2.66	8.33	2	1.33
Report Test	1	1	1	10	1	1.33
Explore Covid Data	1.33	1.33	1	9.66	1	1.33

Overall Perceived Usability

Upon completing the usability test, in order to gain a measure of Overall Perceived Usability participants were asked to complete the SUS questionnaire. SUS ratings are recorded in the table below by question. This questionnaire can be referenced in the appendix section.

User	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
P1	3	4	3	2	4	5	3	4	3	4
P2	1	1	4	1	5	3	4	1	5	1
P3	5	1	5	1	4	1	5	1	5	1
Avg	3	2	4	1.33	4.33	3	4	2	4.33	2

Usability Issues

The following usability issues were identified while conducting the tests based on user feedback. Screens are referenced through labels given to them in the Interface Description of this report.

Issue	Screens	User Remarks
Red color used is too harsh and does not stand out enough against background	All	Red is shocking. Brightness hurt eyes
Difficulty reading daily wellness disclaimer	D1	Statement was long and smushed

Contact tracing page requires additional explanation	C2	Purpose of page is unclear
No back button on contact tracing page	C3	Can't go back on this page without going through home
Poor conceptual model for settings page	C1, C2, C3	The things found under the gear are not what I would expect from a settings page
Notification settings labeling	C1	This page should be called Notification Settings instead of just settings to make it more clear
Contact tracing confirm page poor formatting	C3	Page feels very sparse and text is not justified
Report Test result page poor formatting	E1.3	Page feels very sparse and text is not justified
Date received is not part of confirm page for reporting test	E2	N/A
Link on report result page is uniform with rest of text	E2	Couldn't tell text contained link until accidentally moved over it
Inconsistent label placement on Covid data pages	F1.3, F2, F3	Labels seem strange because they're inverted from rest of app

Discussion

Based on the results of our usability tests, most issues with the interface are on an aesthetic basis and do not directly impact the functionality of the application but the overall user experience. One set of pages, however--the contact tracing settings--was observed as being unclear in its purpose and having a poor conceptual of what would be expected under a settings style page.

Issue	Screens	Severity	Planned Changes
Coloration	All	High	Tweak red color to be less harsh and increase contrast with background
Contact tracing page explanation and conceptual model	C1, C2, C3	Medium	Refer to the section as something other than “Settings.” Add additional information for the page.
Contact tracing confirm and report test result confirm layout	C3, E1.3	Medium	Adjust placement of text to be less scattered and create baselines for justification
Date received missing from report confirm	E2	Low	Add this field to confirmation page for test reporting
Link on report result page is uniform with rest of text	E2	Low	Change link text to be seperate color and underlined

Inconsistent label placement on Covid data pages	F1.3, F2, F3	Low	Invert label and image placements

Conclusions

Users managed to complete most tasks in a reasonable amount of time. There were issues regarding layout and UI which we intend to address in our final prototype. Users were quick to comment on the coloration of the design, which was expected since we were not certain that the colors used were right for what we wanted. Overall, the main features worked as intended albeit minor confusion over some details such as the exact reason for covid tracing data.

In terms of conducting the user test sessions, the process went smoothly and we did not find that there was anything we needed to change with our evaluation process.

Appendix

Post-Task Questionnaire

On a scale of 1 - 10, **1 being low/poor** and **10 being high/good**, please answer the following questions per task attempted.

Mental Demand (Low-High)

How mentally demanding was the task?

Physical Demand (Low-High)

How physically demanding was the task?

Temporal Demand (Low-High)

How hurried or rushed was the pace of the task?

Performance (Poor-Good)

How successful were you in accomplishing what you were asked to do?

Effort (Low-High)

How hard did you have to work to accomplish your level of performance?

Frustration (Low-High)

How insecure, discouraged, irritated, stressed, and annoyed were you?

SUS Questionnaire

On a scale of 1 - 5, **1 being Strongly Disagree** and **5 being Strongly Agree**, please answer the following questions about the application.

1. I think that I would like to use this system frequently.
2. I found the system unnecessarily complex.
3. I thought the system was easy to use.
4. I think that I would need the support of a technical person to be able to use this system.
5. I found the various functions in this system were well integrated.
6. I thought there was too much inconsistency in this system.
7. I would imagine that most people would learn to use this system very quickly.
8. I found the system very cumbersome to use.
9. I felt very confident using the system.
10. I needed to learn a lot of things before I could get going with this system.

Prototype used for evaluation

https://cdqel7.axshare.com

Observation log

Tasks	Screens Visited	User Reactions	Notes
Log in			
Daily wellness			
Set contact tracing details			
Report test			
Explore Covid Data			