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COVID Navigation - User Centered Application

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EXECUTIVE SUMMARY

Coronavirus (COVID-19) continues to cause death and illness across the world. As of December 7, 2021, the COVID-19 pandemic had resulted in 265,194,191 cases and 5,254,116 deaths worldwide, including 48,702,375 cases and 781,265 deaths in the United States [1]. However, research related to COVID applications based on user needs, especially following a human-centered approach, is limited. This paper describes a human- centered design approach to creating an application to recognize and fulfill user needs, particularly those under direct or indirect exposure to COVID-affected patients. Thus, in this study, we focused on the challenge that we framed “How might we design an application suitable for users to make them feel safe about their daily surroundings during COVID-19, especially when traveling to different places”.

This work uses a human-centered design approach to develop a COVID application that allows users to access the latest COVID-19 information quickly and accurately and feel safe in their daily choices. The method includes conducting user research, determining target audience needs, and investigating current dashboards and applications. The next step involves generating ideas and defining users’ goals to address the design challenge using brainstorming, affinity diagrams, surveys, and interviews. The ideation stage led to creating a storyboard and personas to support gathering insights, brainstorming ideas, and finding solutions for the identified problems. Lastly, an iterative prototype (smartphone app) and a testing process for low-fidelity and high-fidelity prototypes help analyze users’ satisfaction and effectiveness. The preliminary results showed that a user centered COVID application with all the information that users seek in one place would help them make more informed decisions, particularly for traveling to different places

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1. INTRODUCTION

The SARS-CoV-2 virus causes Coronavirus Disease (COVID-19). It affects different people in different ways, i.e., most people infected with the virus have mild to moderate respiratory symptoms and recover without the need for medical attention. On the other hand, some get critically unwell, require medical assistance, become seriously ill, or die at any age [2].

Coronavirus spreads through droplets, and, i.e., when an infected person breathes, talks, laughs, sings, coughs, or sneezes, virus particles are discharged into the air. It involves larger droplets falling to the ground in seconds, but small infectious particles can remain in the air and accumulate in indoor places, particularly in areas with inadequate ventilation [3].

“Prevention is better than cure,” and having a knowledge of how to prevent the disease is needed to fight against the disease. In this current COVID pandemic, there is a need for an application that allows users to view the situation around them. Although government regulations and guidelines of staying at home, wearing a mask in crowded outdoor settings, and for activities with close contact, home disinfection to reduce transmission, vaccinations, etc., helps the user keep themselves safe [4]. In addition, knowing COVID-19 information and cases to make informed day-to-day decisions and get back to normal. This COVID application aims to give a personalized experience for a user with the information at their fingertips, including the data of cases, vaccinations, testing centers, etc. It allows one to keep track of COVID data.
In todays' era, people need to step out of their homes for their day-to-day activities. One primary concern that a user thinks is "If it is safe to travel?" or "If people around me are vaccinated or not?" These questions led to the foundation of this work. This study aims to give the users the ability to check the COVID stats near them, assess the severity of the situation, and make an informed decision if it is safe to travel to a particular location. In addition, this application provides users direct access to information regarding the vaccination status, testing centers, and the questions such as "If a user is eligible to get a vaccination shot" or " How can one identify if they are affected by COVID-19?".

Preliminary research and review of the available dashboards in the market give the insights, limitations, advantages, and drawbacks associated with each design. Some designs show the list of areas with the positive cases and percentage of vaccination in a selected area. In contrast, others allowed users to navigate through the dashboard and check the statistics for each area. However, there is limited research on COVID-19 application based on a human-centered design approach specially tailored to meet the needs of the target users.

This design provides the users a personalized view of the COVID situation around them, check an area before they leave, report their symptoms, search for testing centers and vaccination centers around them. In addition, data collection includes the local hospitals, testing centers and only through self-reporting from the users.

2. RESEARCH OBJECTIVE

COVID-19 applications have been popular ever since the pandemic in March 2020; however, none of the applications have all the information users seek within one platform, such as vaccination information. This research aims to provide the latest COVID-19 information quickly and accurately to the general population that allows them to feel safe in their daily choices. This study is framed on the design problem “How might we feel safe about our daily surroundings during COVID-19 especially when it comes to traveling to different places?”. It starts with comparing previous COVID-19 dashboards/applications, doing preliminary interviews with various users, and brainstorming hierarchy of information to accommodate all users’ needs.

3. METHODS AND RESULTS

The human-centered design strives to analyze and understand users' behavioral patterns to create more intuitive, easy-to-learn applications. In a wide range of real-world applications, this strategy can considerably improve the feasibility of various next-generation systems [5]. To achieve our research objectives, we incorporated five phases of the human-centered design process methods, a part of Stanford Design School’s thinking model (Hasso Plattner Institute of Design). It includes empathizing, defining, ideating, prototyping, and testing, which is as follows:

1. The empathizing process helps understand and identify the target audience and the users’ needs for developing a COVID application.

2. Defining process determines users’ goals, needs, and design problems with the collected information.

3. Ideating helped generate and brainstorm solutions for the identified problems by sketching.

4. Prototyping involves exploring and developing the design of a new application based on ideation sketches.
5. Lastly, prototype testing with users to analyze users’ satisfaction and effectiveness

3.1 Empathize

To understand the target users' needs for the COVID app, this step involves interviewing three people from the targeted user group, i.e., parents, students, and doctors. It includes asking participants to share their experiences on how COVID-19 affects their lives and day-to-day decisions. The questions center around their perception related to COVID; for example, "Do you believe having quick access to covid related information will be beneficial to your everyday life?". This aids in understanding if designing a system to tailor an all-in-one COVID hub to diminish any apprehensions related to the pandemic may be beneficial to the target users or not. The interview results suggest that users will benefit on a day-to-day basis by having a diversified functional COVID

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All the interviewees, at one point, stated that being aware of how COVID was spreading around them is an important aspect they would like to see represented within this app. In an interview, when asked, "Do you believe having quick access to COVID related information will be beneficial to your everyday life? An interviewee's response is, “Yes, because I will be sure of my surroundings.” Thus, a significant aspect of this app revolves around actively seeing the state of COVID cases and vaccination rates primarily around the user, while also giving them data on a larger scale.

3.2. Define

Empathizing helps identify users' needs and the features to include in the application. Preliminary research led to an understanding of the limitations in current COVID dashboards and applications, followed by brainstorming different ideas and components for the proposed design. Designing the covid application requires defining the target users followed by a google sheet survey to understand and note the users' age, needs, opinions, and level of concern about COVID.

Analyzing the survey results helped identify potential users, including teachers, medical professionals, parents, travelers, and students. The next step involved interviewing parents, medical professionals, and students to dive deep and understand potential users' needs and requirements in a dashboard. The online and virtual interview results led to a clear understanding of the potential users' obstacles when trying to look at COVID status. Next, secondary research narrowed down the users. It explored the question, i.e., "Who can benefit the most from a covid app?" This encouraged the brainstorming process and affinity mapping to share ideas and suggestions.

To further understand the users, researchers asked the following questions to the potential users:

- How often do you google "covid cases"?
- Do you wonder how many people around you are vaccinated?

- Do you believe having quick access to covid related information will be beneficial in your day-to-day activities?

- How often do you base travel plans, or daily decisions based on the number of COVID cases in your area?
  Survey results from 108 participants shows that:

- 74% of participants wonder about people around being vaccinated

- 75% of participants believe that having quick access to covid related information will benefit.

- 74% of participants find it easier to take information throughout the visual representation.

- 85.2% of participants use private vehicles as a method of transportation.

- 55% of participants make travel plans or daily decisions based on the number of COVID cases around them.
  These findings lead to the selection of target users, including travelers, uber drivers, and HVAC technicians.

3.3. Ideate

In the ideation process, the design research team gathers to discuss the results of the surveys and interviews to create a storyboard and personas. This technique helps designers to keep their goals and perspectives. Personas are a valuable tool for designers to keep the demands of the target user group in mind during the design process by creating empathy for users, allowing for more focused design with a limited number of memorable models, and improving communication [6]. At the start of the ideation process, the team decided to work individually and discuss the exploration results. Each team member shares ten sketches with alteration, with no restrictions on methods selection or the amount of detail required.

Next, the scribble sketching allows the research team to present quick ideas with different iterations in a short period. It is beneficial for encountering possible problems and solutions: these sketches are made using digital drawing pads quickly, allowing font, size, and color change. After submitting the drawings, the design research team gathers to discuss the results. The team looks for connecting patterns, similitude between concepts, combining ideas, and new suggestions in the discussion. In the end, concept selection is based on the best approach to solve the research problem.

The design team began another round of sketching ideation with the selected concepts. This time the designer uses ten plus ten methods to represent the idea. Unlike last time, the designer presents ten layouts of different pages of the same concepts. It includes

more detail, accuracy on the features locations, possible color, and icons selection. After submitting concepts, the team selects one final concept and discusses potential improvements on this concept before taking further steps. New integrated ideas include features such as “share my location,” “QR code,” “my vaccine,” “delete my data,” and “my health.” Every team member made suggestions on features, allowing the app to go beyond expectations and agreeing on a common consensus on the concept, features, color patterns, and design style. The next step is to design and develop the prototyping fully, where the whole design team works together on the same platform to develop the prototype using Adobe XD.

3.4. Prototype and Test

Upon completing the ideation and determining what features would become the most important for this application, the team developed a high-fidelity prototype. The prototype has two critical components; navigation, which involves how the user would be able to use the application for traveling from destination to destination, and COVID-19 related data, which provides information such as the users’ vaccination record, COVID symptoms (if any), and current COVID associated statistics for the users' current location.

The first main feature of the application is navigation. It includes three essential elements: Daily confirmation that the user does not currently have COVID.
Assisting the user with navigation between two points.
Finally letting the user know if they might interact with a current positive COVID-19 case.

By confirming that the user does not currently have an active case of COVID in Layout 1 (Figure 1), they can proceed to the search function. If the user does state that they have COVID, the information is then sent to the database, allowing a red dot to show up in an approximate location on the map, and is then prompted with directions to follow.

The navigation section of the map is straightforward. The user searches for a location, selects the correct location, and then chooses the mode of transportation before receiving directions. However, when the user first clicks on the search bar, they are met with some commonly searched for locations, as well as COVID data for a predetermined area in Layout 2 (Figure 1). Upon determining the location, the application provides the count of active COVID cases on the route, along with the other information, including the date of reporting and the user details in Layout 3 (Figure 1).
The second main feature of the application is storing the user’s COVID-related data, both vaccination records, and monitoring any symptoms if the user is exposed to an active case. The user can upload their vaccination records, and their QR code in Layout 4 (Figure 1) to show proof of vaccination if required. They can also track any symptoms by inputting them within the interface, choosing from a list of predetermined symptoms in Layout 5 (Figure 1). It allows them to know precisely when they began displaying any symptoms, and how long it will be before they can no longer spread COVID.

A testing stage begins after the high-fidelity prototype development. Participant's selection is made based on the user profiles, continuing the narrative of who would use this application. It includes participants reviewing the application, completing a walkthrough while being observed, and completing a survey. During the observation period, the participant walks through the application as if it is a fully functional app, navigates to the nearest vaccination clinic, and input their symptoms into the database. Next, the participants fill out a simple survey, including questions such as "Did this application has all of the functions and capabilities you expected it to have" and "Was the app intuitive, or did you need help with it." It provides feedback and discovery of what worked for the current prototype and identifies features that need improvement.

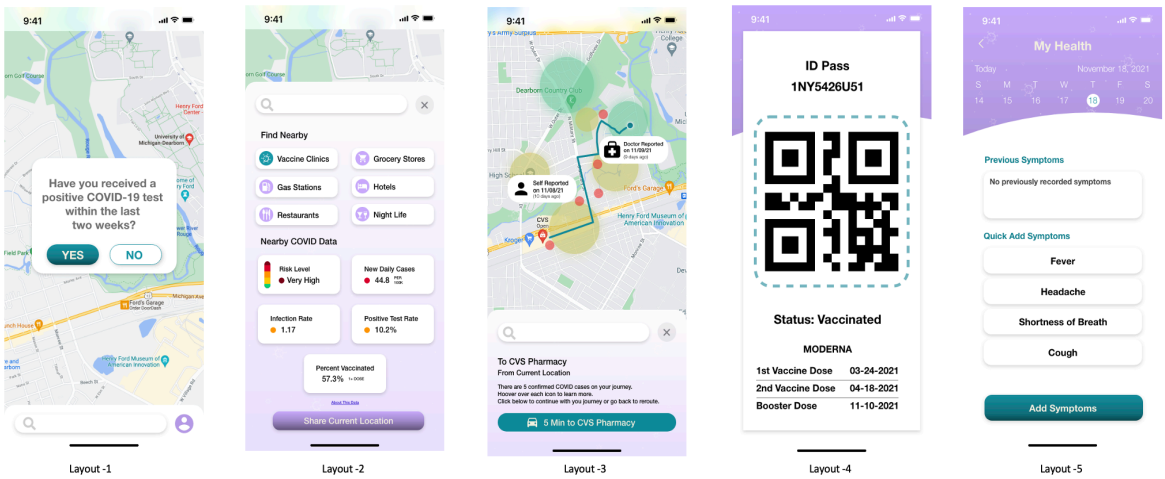

Figure 1: Respective layouts from the proposed COVID application Prototype

4. DISCUSSIONS AND CONCLUSIONS

Usability and feedback surveys led to the collection of nine responses. The participants included in the usability testing are people who either fit user personas or people of convenience based on location. The intent is to ask people if they enjoy traveling or have to travel frequently for work, as the app is designed mainly for people who have to travel frequently. Results show roughly 55% of participants' primary goal to use the application is for traveling purposes, 22% of participants are uber drivers, who will use this app for work, 11% of participants are concerned parents who want to make sure their children are safe. Lastly, 11% of participants stated they would use the app for other reasons. Population age distribution in this study includes 78% of participants in their 20's and 22% of participants in their 50s which counts for five male participants and four female participants.

Now, for usability testing, all participants agreed the app was simple to use. The results indicate that participants completed a task efficiently using the app. In addition, the app is easy to learn, intuitive, and finding information is straightforward. Also, participants' feedback stated that an initial tutorial could be helpful with a slightly more organized home page. The app encompasses all the features required by a user, thus removing the need for using multiple apps.

This project faced many limitations, including a small sample size, lack of a representative target population—limited access to different categories of people to fit the user persona. This research work and the resulting prototype consist of the general population based on location, i.e., more data collection from people in different places and with varying ranges of age will help support the findings. In addition, due to time constraints, multiple iterations were not conducted after the first usability test. The next step would be to apply the feedback to the application and perform another round of usability testing.

With the rise in COVID-19 and many of its variants that affect us today, there is a need for a single-stop application that gives live updates on COVID-19 data and statistics and serves as a navigational tool, and stores users information, including the vaccine records. The resulting research-based COVID-19 prototype using human-centered design allows users to be updated on the COVID-related information near them and make informed traveling decisions using a one-stop app.

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