

Principles of Human-Computer Interaction

ITIS 6400

Project Report

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Introduction and Motivation:

Taking medication as prescribed plays a significant role controlling conditions and improving health. As much as 30-50 percent of people with chronic diseases fail to take their medicine without missing out doses. This is a severe problem. One of the leading and arguably innocent reason for this issue is forgetfulness. Because of failure to take medications adequately, each year billions of dollars in addition to overall medical expenses are spent for the hospitalization and repeated physician visits. This problem predominantly persists in the more elderly population because of their inability to manage self-manage their prescription medicine at home. Another reason for people to avoid medication is side effects. Often the side effects are preventable and manageable with a fair amount of medical guidance. So, a system capable of timely reminding people of their medication and providing the appropriate information on their prescription can substantially avert this problem.

User Problems:

Various reasons for skipping medication. Forgetfulness is one of those. Within ten days of prescribing medicine, one in three patients tends to miss doses (according to govt report). According to studies, 57% of the people with long-term conditions stop taking their medicine within six months. In case of elderly population, various medications that are prescribed lead to forgetting and make errors while taking their medication resulting in potential consequences. Studies found that little aid and information helped the elder to take their medication correctly and tackle the side effects of the drug.

Other reasons for people to skip their medicine are being troubled by the side effects, having difficulty swallowing their medicine and just not believing that medications would help. These problems mainly arise because of information gap about their condition and side effects of their drug.

Design Goals:

- Provide efficient emergency and medical contact facility
- Track various health parameters, medical record, and preferences of users.
- Allow users to set reminders for medical consumption and record them.
- Tablet replacement notification.

Usability Goals:

- Set reminders to consume the medication.
- Contact doctors for medical queries and alert hospital, ambulance, doctor or family in case of emergency.
- Record pre-existing diseases and allergies.
- Refill medication alert

Design Journey:

Data Gathering:

Data gathering is a central part of establishing requirements, and of evaluation. The purpose of data gathering is to collect sufficient, accurate, and relevant data so that a set of stable conditions can be produced.

Potential Users:

- People with medical condition
- People taking supplements
- People are consuming medicines daily.

Data Gathering Techniques:

Online Survey:

Google forms were used to conduct the study.

https://docs.google.com/forms/d/e/1FAIpQLSd5ROFUIYZLfgnQ-ZxNOTLdDu031o1yiIW4_a9FJCkLfRujEA/viewform?usp=sf_link

Interview Questions:

- How often do you consume medicines?
- Where do you store your medications?
- How do you remind yourself to take the medicines?
- Do you use any health tracking app?
- Does your health tracking app satisfy your need?
- How much quantity of medicines do you buy at a time?
- Where do you purchase your medicines?
- Do you think online delivery is a convenient option?
- How often do you forget to take your medicines?
- What do you do when you skip a dosage?
- What kind of reminder do you prefer?
- What features do you expect from a reminder application?
- Would you like to reach out to family/friends using the application?
- Have you ever experienced or gone through an emergency?
- Do you have a contact of urgency and how to reach them?
- How you keep a record of any allergies or medical condition?

Need Finding:

List of potential needs:

Analyzing the data gathered from the online survey, interviews and participant observation, the following requirements were identified:

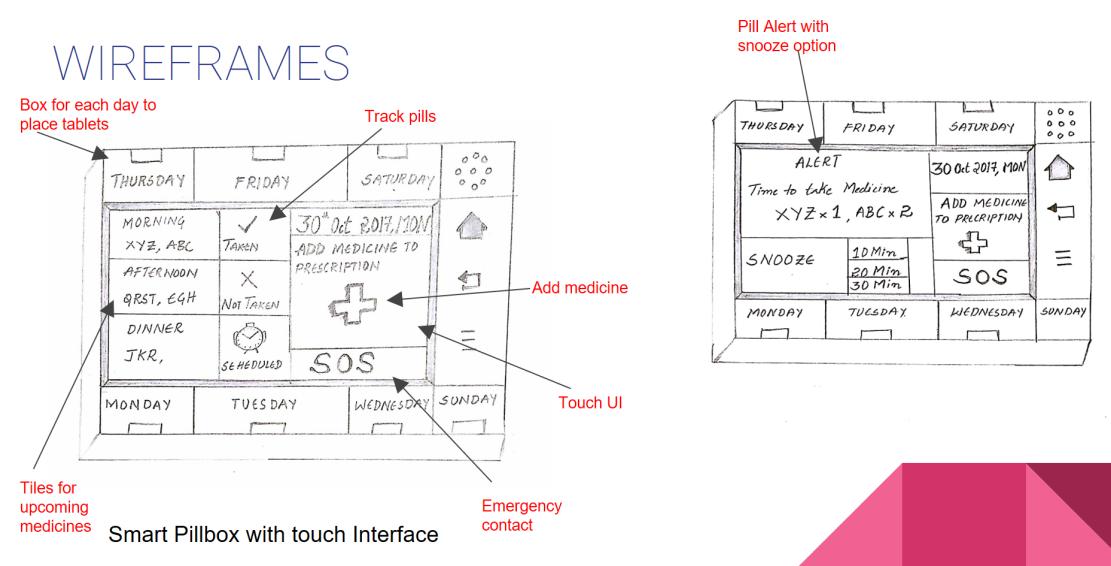
- Application doesn't have facility for emergency contact
- The app can't track if the person took medicine for real. This is just by the notification and decided wholly based on user input. There will be many cases where user hits "Taken" button but forgot to take medicine.
- Apps don't provide natural medication upload methods like taking a picture and uploading the medicines.
- The application is not able to record pre-existing diseases and allergies.

- Applications don't have the facility to take note of side effects of medication. The side effects usually decided by the content/ composition of the medicine. The service of providing the content is not provided.
- Can't contact a doctor or medical practitioners from the application.
- Applications can't track the health
- Difficult to manage medical records over the years.
- Application is not able to subscribe for repeated ordering of medicines

Designing alternatives:

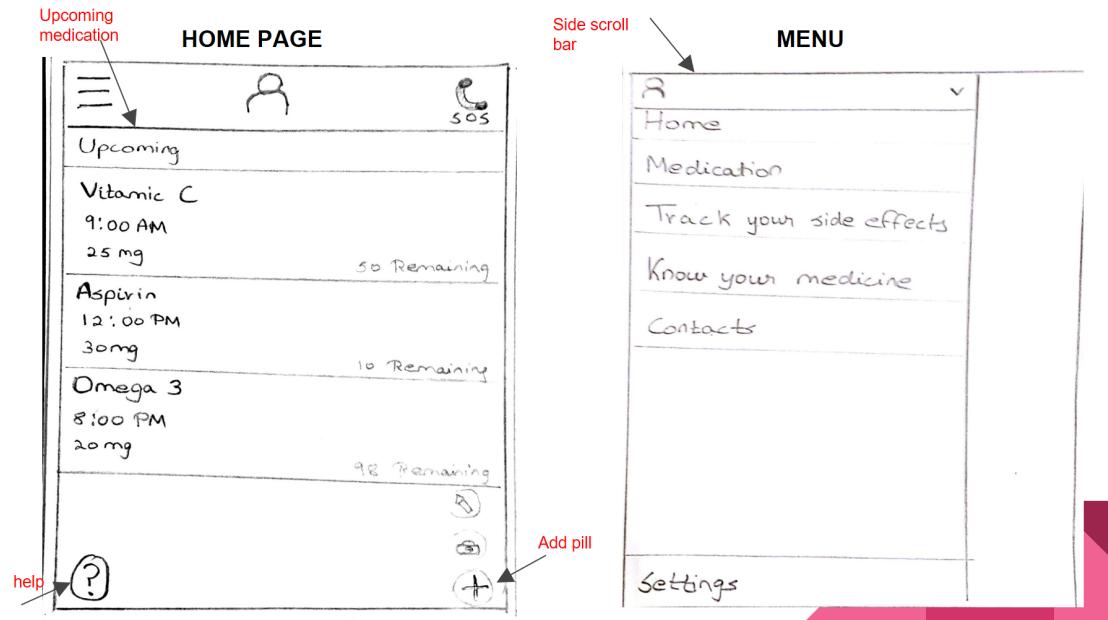
DESIGN CONCEPT - 1

Smart Pill Box with Touch Interface

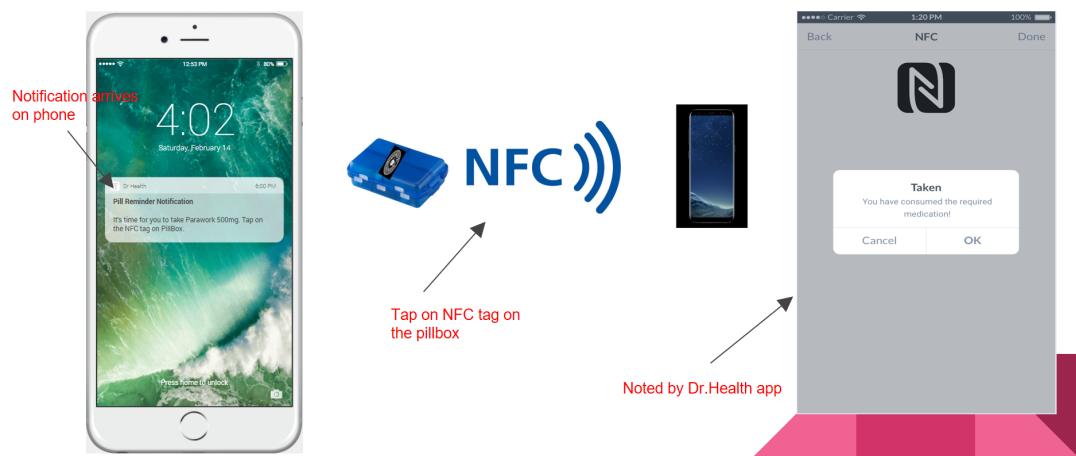


DESIGN CONCEPT - 2

Mobile Application with NFC technology



Pictorial representation of how it works



DESIGN CONCEPT - 3

SmartWatch with Website

Wireframes

Add medicine page

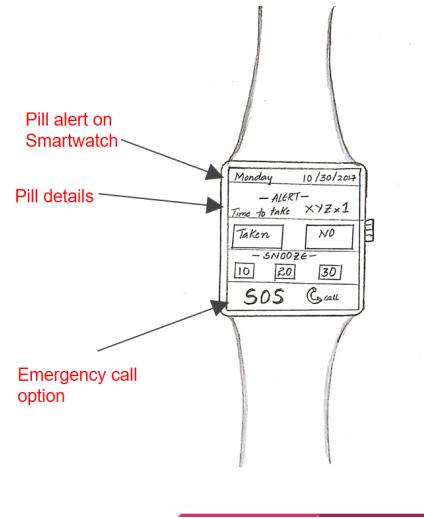
USER NAME: Dr. HEALTH
HTTPS://www.DrHealth.com/Homepage/addmedicine.jsp

MEDICINE DETAILS

MEDICINE NAME: AMOXICILLIN
MEDICINE TYPE: ANTIBIOTIC
QUANTITY: 50
DOSAGE: Morning, Afternoon, Dinner

ADD MEDICINE TO PRESCRIPTION * Required

Insert details



Why Smartwatch with Web application?

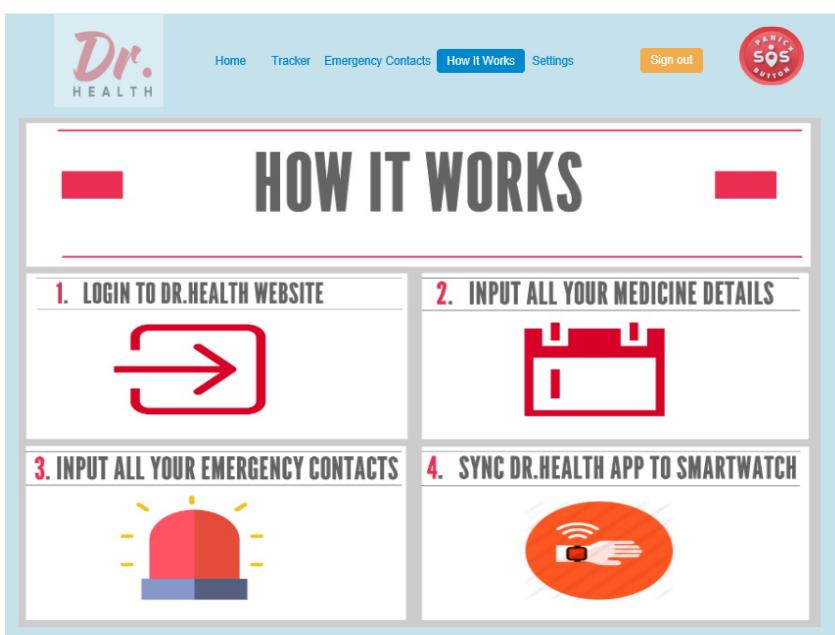
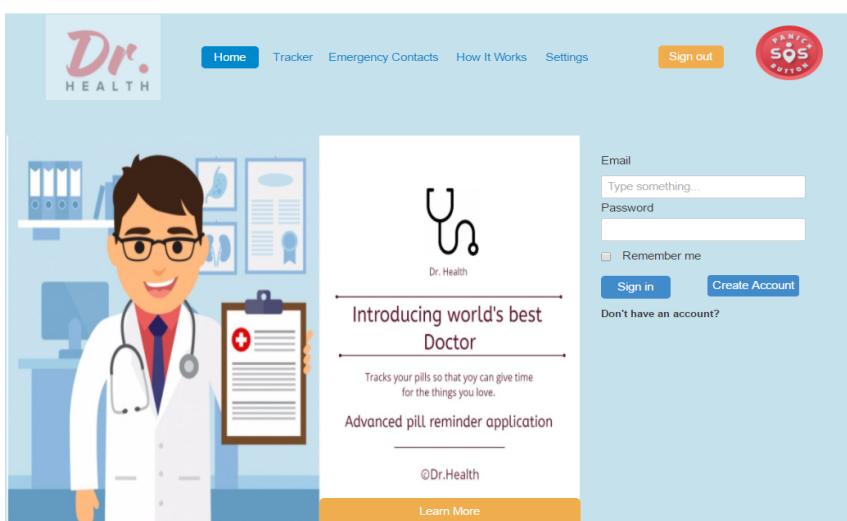
- Smartwatch is more comfortable to use and compact. It can work without a smartphone.
- The design goals are highly satisfied using a smartwatch.
- Visualization of data can be represented better on a web page.
- The web application is cost-effective, easy to learn.

Features of our application:

- Provides efficient emergency and medical contact facility. Users can contact their emergency contacts through their smartwatch /website using Dr. Health application. The emergency contacts need to be fed into the system at the time of completing their profile with Dr. Health.
- Allows users to set reminders for medical consumption and record them. Dr. Health integrates with the smartwatch by syncing all the details from the website to the smartwatch. Users need to login to the site and provide their medication details and its schedules. Dr. Health arranges their plan in order and displays notification reminders for them on their smartwatch.

- Tablet replacement notifications. Users will provide some tablets/pills available while setting up reminders in Dr. Health. Dr. Health counts the number of pills taken from the day the reminder has been set up and starts giving reminders when the tablet is about to run out.
- The website paired with smartwatch gives the flexibility, availability, and compactness. The site can be accessed from any mobile/computer. Smartwatch and reminders blend with each other perfectly. Reminders on a smartwatch are harder to ignore and makes users take the pill.

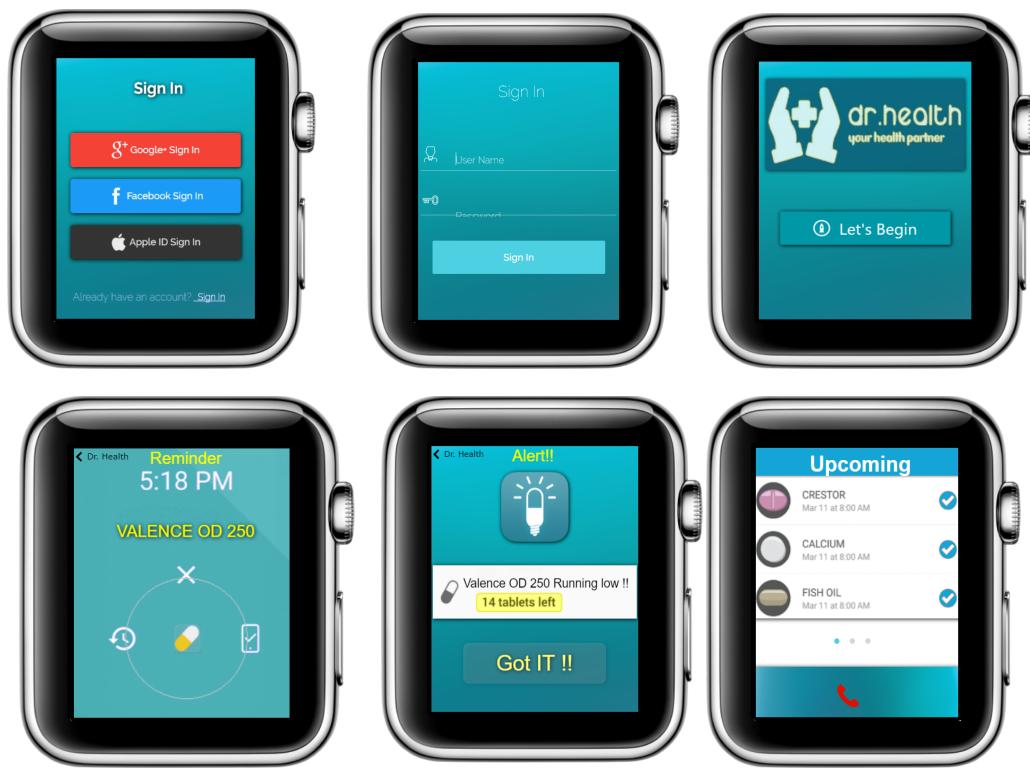
High Fidelity Images of Design:



The screenshot shows the Dr. Health mobile application's interface. At the top, there is a navigation bar with links: Home, Tracker, Emergency Contact (which is highlighted in blue), How It Works, Settings, and Sign out. To the right of the sign out link is a red circular icon labeled "PANIC SOS BUTTON". Below the navigation bar, the main content area is titled "Contact Information". It displays two contacts in a list format:

- Full Name: Tharika Ganesh
Relationship: Sister
Contact Number: 3477204830
- Full Name: Dr.John Watson
Relationship: Physician
Contact Number: 8777604730

Each contact entry includes an "Edit" button on the left and a "Delete" button on the right. At the bottom of the contact list is a green "Add Contact" button. The overall background of the app is light blue.



Heuristic Evaluation:

The team employed heuristic analysis with a set of users and other designers to evaluate and validate the effectiveness of the design.

Severity Scale:

- 0 – not a usability problem
- 1 – cosmetic problem
- 2 – minor usability problem
- 3 – primary usability problem; essential to fix
- 4 – usability catastrophe; must fix

No of Participants: 5

The design was evaluated using Jakob Nielsen's Heuristic analysis:

1	ISSUE: “Refill Now” Message appears as a button HEURISTIC VIOLATED: Match between system and real world SEVERITY: 3 CRITIQUE: Don't use button form if it's not clickable; highlight the message differently.
2	ISSUE: Edit option is missing from the schedules HEURISTIC VIOLATED: User control and freedom SEVERITY: 4 CRITIQUE: Unable to edit the scheduled reminders
3	ISSUE: lines used for differentiating the categories in tables HEURISTIC VIOLATED: Aesthetic and minimalist design SEVERITY: 2 CRITIQUE: The sequences used are not required to distinguish the types it's better to use white spaces instead
4	ISSUE: Once SOS is sent, the user cannot later indicate contacts about their status. HEURISTIC VIOLATED: User control and freedom SEVERITY: 3 CRITIQUE: There is no way for the user to indicate the emergency contacts about their status if “SOS” is issued.

5	<p>ISSUE: “Date till it lasts” is not an appropriate title for</p> <p>HEURISTIC VIOLATED: Match between system and the real world</p> <p>SEVERITY: 2</p> <p>CRITIQUE: Using different wording will make the heading clearer to the user.</p>
6	<p>ISSUE: No “add reminder” in home button</p> <p>HEURISTIC VIOLATED: Flexibility and efficiency of use</p> <p>SEVERITY: 3</p> <p>CRITIQUE: The user cannot add reminders from the home page, they can add only from the tracker's page.</p>
7	<p>ISSUE: “Learn More” button on the introduction page is same as “How it works” Tab</p> <p>HEURISTIC VIOLATED: Consistency and standards</p> <p>SEVERITY: 2</p> <p>CRITIQUE: The user encounters with a “learn more” option in the introduction page before signing in but once signed in, it is available in the “how it works” page.</p>
8	<p>ISSUE: The “delete account” option doesn't get confirmation from the user.</p> <p>HEURISTIC VIOLATED: Error Prevention</p> <p>SEVERITY: 4</p> <p>CRITIQUE: The user could accidentally delete their account and lose their information stored.</p>
9	<p>ISSUE: The “how it works” page doesn't provide detailed description</p> <p>HEURISTIC VIOLATED: Help and documentation</p> <p>SEVERITY: 2</p> <p>CRITIQUE: The document doesn't give information on the website and where to find options.</p>

Pilot study:

Question 1. What hypotheses would you be evaluating in your experiment?

Users will be able to track the medications easily. They can monitor the medicines from the homepage of the website or the smartwatch.

Question 2. What are the independent variable and the dependent variables for this experiment?

Dependent variables: accepting or rejecting the medication reminder

Independent variables: viewing/ tracking of medication.

Question 3. Is your experiment design a within-subject or between-subject design? Why did you choose this?

Our experiment design is a within-subject. This is because we are not going to split the participant group for testing our hypothesis.

Reason: It does not require a large pool of participants. A similar experiment in a between-subjects design would need twice as many participants as a within-subjects design. A within-subjects plan can also help reduce errors associated with individual differences.

Question 4. For each of your dependent variables, indicate how you would plan to measure this in this experiment.

Based on the response from the user given on the smartwatch. It is marked as taken or not taken using this condition.

Question 5. What analysis do you plan to run on your data?

We'll do T-Test for analysis. We'll check the P-value, and if the P-value is more significant than 0.05, then we'll reject the hypothesis.

Question 6. Write down the script that the facilitator will speak to the participants.

- 1) Check the smartphone for reminder
- 2) Choose either select or reject this reminder.

User Study:

TASK 1 – Sign up to Dr.Health

1. What hypotheses would you be evaluating in this task?

Users like to learn about the application before signing up for it.

2. How are you going to measure it?

Check the number of users who click “learn more” option before signing up against the number of users who don’t.

3. Write your script that you will tell your user for this task.

1. Go to Dr.Health website.
2. From the introduction page, click “create account” button
3. Fill the form with appropriate details.
4. Click “Sign up” button when completed.

TASK 2 – Issue SOS Alert

1. What hypotheses would you be evaluating in this task?

Notifying emergency contacts in emergency is easier through smartwatch

2. How are you going to measure it?

Will compare the time taken to spot and send “SOS” through smartwatch and website.

3. Write your script that you will tell your user for this task.

Using Website

1. Go to Dr.Health website.
2. Login using user credentials.
3. Once logged in, click the SOS button

4. Confirm the alert message.

Using smartwatch

1. Go to Dr.Health application
2. Login using user credentials.
3. Once logged in, click the SOS button
4. Confirm the alert message.

Data collection and results:

Each of us in the group paired up with a person from another team and collect data on the two tasks. Each student received data from two students from two different groups.

GROUP 1

USER	TASK 1	TASK 2
User 1	The user clicked “Learn More” before signing up.	User spotted “SOS” in 6 seconds on the website.
User 2	The user directly clicked “create an account to sign up.	User spotted “SOS” in 3 seconds in the smartwatch.
User 3	The user clicked “Learn More” before signing up.	User spotted “SOS” in 8 seconds on the website.
User 4	The user clicked “Learn More” before signing up.	User spotted “SOS” in 2 seconds in the smartwatch.

GROUP 2

USER	TASK 1	TASK 2
User 1	The user clicked “Learn More” before signing up.	User spotted “SOS” in 10 seconds on the website.
User 2	The user directly clicked “create an account to sign up.	User spotted “SOS” in 3 seconds in the smartwatch.
User 3	The user directly clicked “create an account to sign up.	User spotted “SOS” in 2 seconds in the smartwatch.
User 4	The user clicked “Learn More” before signing up.	User spotted “SOS” in 2 seconds in the smartwatch.

Cognitive Walkthrough:

Cognitive walkthrough technique allowed us to simulate a user's process and check if the goals are achieved. It also examined if the actions lead to the next correct move. It focuses on identifying specific user problems in a high-level of detail. Through our cognitive walkthrough exercise, we were able to focus on particular action rather than evaluating the whole system. It helped us assess the design on how well it supports user and assists the user in learning a task. It helps to form guidelines and identifies potential problems in the design.

TASK: Add a new reminder to take a pill

ACTIONS REQUIRED

1. Log in to the Dr.Health Web Application.
2. Go to the tracker page and click “add a reminder.”
3. Fill the details and click add.
4. View the reminder on the tracker page.

ACTION 1 - Log in to the Dr.Health Web Application.

a. Will users be trying to produce whatever effect the movement has?

Yes, the user needs to log in to the application to access the features provided.

b. Will users be able to notice that the correct action is available?

Yes, the introduction page provides options to log in or sign up for the application.

c. Once found, will they know it is the right one for the desired effect?

Yes, a form accepts the user credentials such as email and password to log in. Or a “create account” option is available to sign up.

d. Will users understand the feedback after the action?

The action takes them to a new web page which indicates the user that their operation is successful. The new page displays the home page information on the upcoming reminders and stock of pills to assure the users they are on the right page.

ACTION 2 - Go to the tracker page and click “add the reminder.”

a. Will users be trying to produce whatever effect the movement has?

Yes, the tracker page is available in the navigation bar which encourages the user to explore.

b. Will users be able to notice that the correct action is possible?

The tracker page displays the schedule according to the time of the day and consists a “add reminder” button highlighted in green color to add more reminders.

c. Once found, will they know it's the right one for the desired effect?

The “add reminder” button is highlighted and stands alone as the only way to add new schedules.

d. Will users understand the feedback after the action?

The action takes them to a new web page which indicates the user that their work is satisfactory. The new web page displays a form to be filled by the user.

ACTION 3 - Fill the details and click add.

a. Will users be trying to produce whatever effect the movement has?

The user needs to upload information regarding the medication they will be consuming.

b. Will users be able to notice that the correct action is available?

The application requests only essential information from the user through a form with input fields and checkboxes.

c. Once found, will they know it's the right one for the desired effect?

The form shows various input fields with proper heading and instruction to fill. Appropriate input fields are given for the user to enter input.

d. Will users understand the feedback after the action?

The action takes them to a new web page which indicates the user that their effort is successful.

ACTION 4 - View the reminder on the tracker page.

a. Will users be trying to produce whatever effect the movement has?

Yes, the user would like to view their schedule once uploaded.

b. Will users be able to notice that the correct action is available?

Once the user navigates to the tracker page, a list of schedules appears categorized by the time of the day.

c. Once found, will they know it's the right one for the desired effect?

The navigation bar highlights “Tracker” to indicate the user that they are on the desired page.

d. Will users understand the feedback after the action?

The action takes them to a new web page which indicates the user that their work is satisfactory. The new webpage displays information on the schedule categorized according to the time of the day.

Design Implication and design changes:

Based on the Heuristic evaluation there were several issues mentioned that were present in the initial design. The design changes done based on the problems are described below:

1. There were two issues explicitly indicating the placement of the “SOS button” which was present in the bottom of the page. Based on the suggestions we have decided to change the placement of the SOS button and added on top right position and as it was an SOS button we placed it on all pages. We also have added a confirmation message on SOS button so that users should not send SOS messages by mistake.

New design



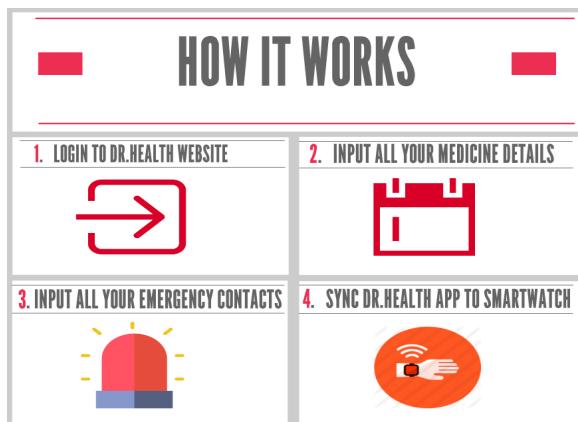
2. There was another critique telling that the placement of menu bar on the center of the screen violated the Horizontal Attention which always Leans Left. So, we placed menu bar, and its content from center to left of the screen so that user's attention will be more to the point.

New design



3. Learn more button had almost same functionality as how it works, so we removed that option and kept only how it works, and we got feedback on how it works page that it was hard to understand at first glance & was not so bright with the content. So, we redesigned that page again with a gorgeous design.

New design



4. There was one issue where they mentioned that the contrast between valuable information in the screen and the background could be improved so that we have changed the font style from San-serif to semi bold for the heading of the windows so that the user recognizes it readily.

New Design

