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MediGuardian Final Report

Project Description:

Our project is a medication regulation and intake system. We are focusing on the product domain of pill/medication dispensers that also function as a regulation system to ensure that users are on track with their medication schedule. The focus of our project is streamlining the user interface on the stationary dispensary, while also incorporating a wearable device that extends the notification system of the robot. We intend to make several processes easier surrounding the usage of the robot: user registration, changing medication schedules, and adjusting settings on the machine regarding alerts and preferences. We deemed that this was a real problem given the demographic of users in this domain is primarily elderly individuals who take a lot of medications. This population has voiced concerns about the interface of existing products, so by implementing the human-centered design on existing products, we will be able to alleviate some of the problems in the industry currently. Our design will be a generic screen interface on the stationary dock as well as the screen view on the wearable device. We will use Figma and other technologies to mock up our designs.

Requirements Summary:

The system should adhere to the following functional requirements:

Requirement	Rationale
Users have to be able to specify their medication schedule on the system	One of the main goals of the system is to automate the management of the users' medication. The main aspect of this goal is for the system to manage the users' medication schedules. To achieve this, there needs to be a function in the system for users to be able to indicate their medication schedules in the system.
The system should notify users when it is time for them to take their medication	In line with one of our main goals, the system should alleviate the responsibility of tracking medication timings from the users. This requires the system to notify users whenever it is time for them to take their medication since this would relieve users from the responsibility of manually keeping track of the time and having to remember the

	times of their medications.
Users should be able to register and prime the device completely unaided and within a reasonable time (30 minutes).	Given that the demographic of users in this domain is primarily those with chronic illnesses, cognitive impairments, and the elderly, we are aiming for an incredibly simplified user experience so that those with no technological experience can operate the device.

The system should have these non-functional requirements:

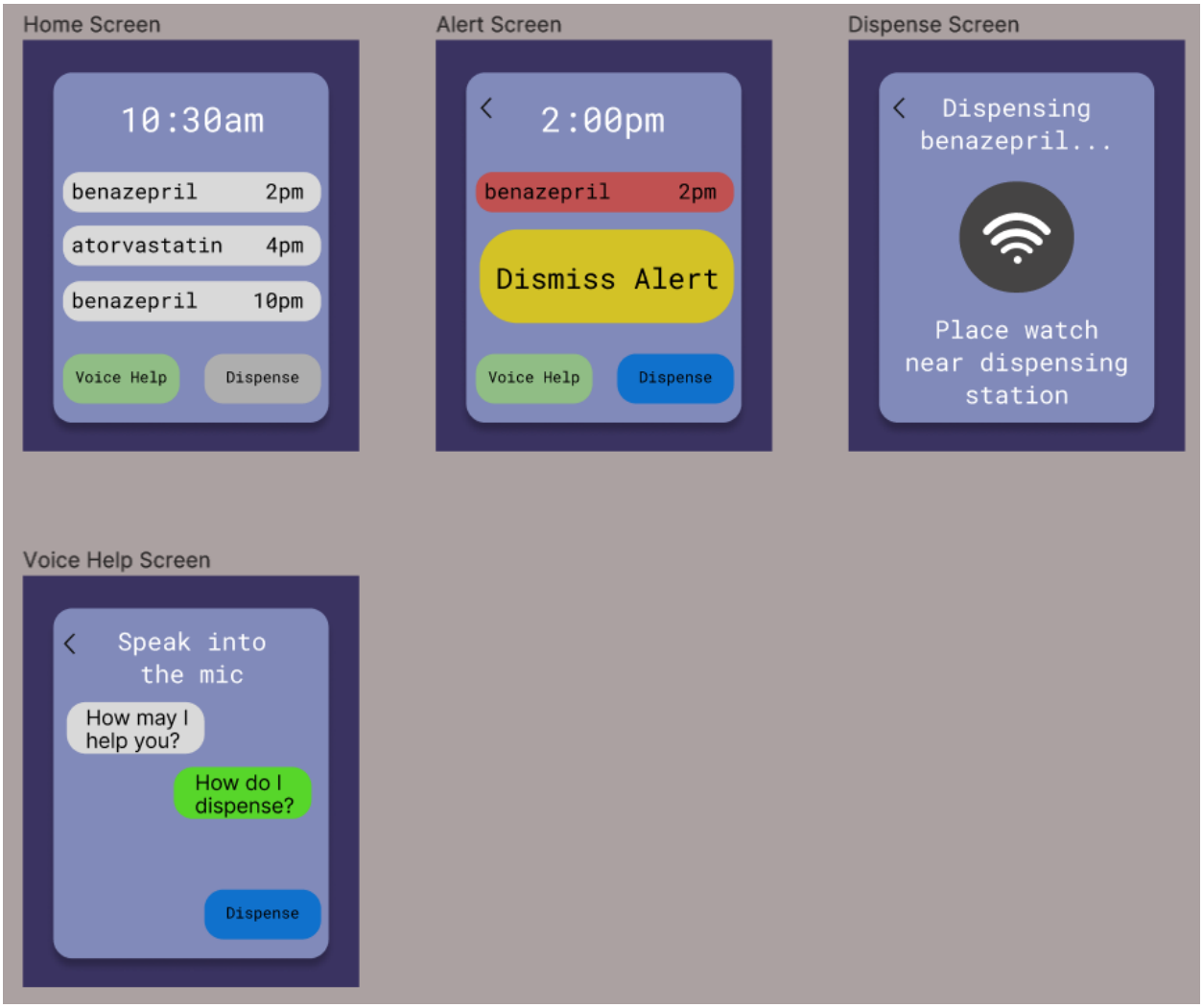
Requirement	Rationale
Simplified GUI for users with no technology experience	Given the demographic for this product, we must assume that the user may have no technological experience, could have cognitive impairments, or cannot remember how to operate the robot. Making a completely oversimplified user experience can help us avoid problems in this area.
Compatibility with either wearable technology or a software application	This non-functional requirement pairs well with the functional requirement of alerting users when to take medicine. Ideally for this product, the notifications can be extended to a device not connected to the dispenser so users can be alerted from anywhere in the home. This can be useful for users who are hard of hearing or who have other disabilities such as being blind or legally deaf.
Long battery life on wearable technology	Having a long battery life for compatible devices is pretty important when it comes to non-functional requirements for this product. Incorporating the aspect of wearable technology becomes obsolete if the device must be removed and charged frequently. Making the wearable technology fairly simple and streamlining its functionality can help with making it simple and allow for longer battery life.

Design Summary:

Our final design is a medication management system designed for individuals who struggle with regulating their medication, primarily the elderly, due to the complexity of current systems. In order to combat this complexity, our design prioritizes user-friendly features, while maintaining a functional and accessible interface. The foundation of our design is the stationary pill dispenser, which allows our users to easily set up and modify their medication schedules. The simplified graphical user interface of the pill dispenser ensures that any additional technological experience is not needed. Along with the pill dispenser, we have designed a wearable smartwatch device, which serves as an extension of the dispenser. The primary function of the smartwatch is to remind users to take their medication through notification alerts and haptic feedback. Similar to the pill dispenser, the smartwatch is designed with minimal screens and straightforward instructions and navigation in order to ensure those without technological experience can easily utilize the device. Moreover, the smartwatch device implements a voice chat feature, making it more accessible for users with visual impairments or a preference to auditory instructions. In addition, another key aspect of the smartwatch design is the authentication mechanism. This feature, which forces a user to have their smartwatch while dispensing medication, addresses key safety concerns of the overall design by preventing any accidental medication dispensing or issues with dispensing accuracy. Overall, our final design effectively implements the necessary features of a medication management system while maintaining a user-friendly approach tailored for elderly individuals.

Prototypes:

Interface for the wearable device (smartwatch)



Link for interactive prototype in figma:
https://www.figma.com/file/GmmbvVPsTNY15Gfsw6Bhpv/Untitled?type=design&node-id=0%3A1&mode=design&t=nNZy6COuTfeKhFok-1

This prototype shows how we would design the interface for the wearable device. Our focus of the wearable device is to relay the essential medication information to the user, allowing it to act as an auxiliary device that complements the main medication dispensing machine. This can be split into 2 main goals: informing users of upcoming medication schedules, and acting as a form of authentication for the medication dispensing. Due to the general lack of exposure to technology of our target demographic (elderly patients with long-term chronic illnesses), the wearable device would only have 4 main screens, to minimize the complexity of its usage. Additionally, among the 4 screens, we included a voice-activated help system, to allow users to

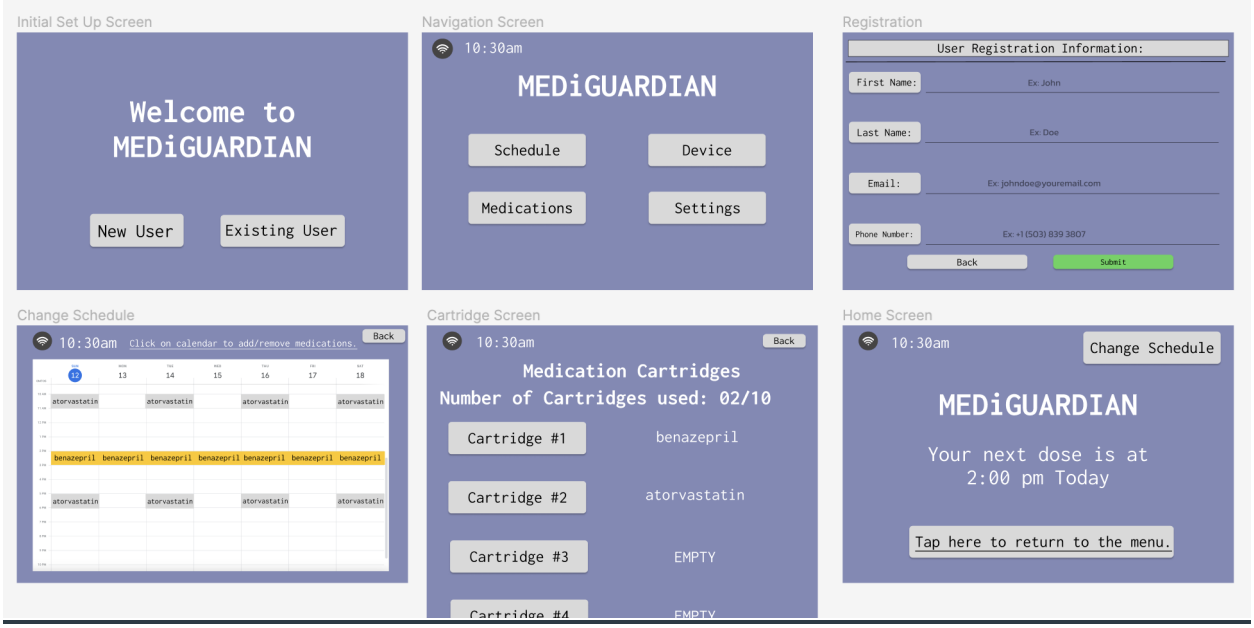
seek help regarding the usage of the device, in a straightforward manner (by talking to the wearable device), further improving the ease of usage of our device.

From the end-user's perspective, one scenario involving this prototype would resemble the following:

1) Throughout the day, the user would wear the wearable device on their wrists, with the device showing the details of their next medications for the day on the home screen.
2) When the time for their medication has reached, the wearable device would alert the user about their medication through visual (refer to the alert screen on the diagram), audio, and vibrational cues felt through their wrists.
3) The users would click on the dispense button from either the home screen (if they have dismissed the alert screen) or the alert screen, and bring their wearable devices near the main medication dispensing device to authenticate the dispensing of medication.
4) Should the user require any help using the wearable device and/or the main medication dispensing machine, they can press the voice chat button to interact verbally with the device.
5) At every other time of the day, the wearable device acts as a normal smartwatch that the user can use in their day-to-day lives.

Our rationale for creating this prototype arises from our analysis of current existing products. Through surveying online forums and research articles about the use of such tools, we pinpointed several flaws in the current existing products that we would want to address through this prototype, namely the technical complexity of utilizing existing devices, and the inability to control forms of substance abuse by potential users. We found it difficult to address both problems simply through one medication dispensing machine, and hence, decided to design a complementary wearable device as well, whose role will be to display a simplified version of the medication schedule, as well as to act a form of authentication for the dispensing mechanism so that users will not be able to carry out substance abuse.

Interface for the Dispenser:



Link for an interactive prototype in Figma:

https://www.figma.com/file/OmtbSFGgCaInRJwB5ySs7N/Medication-Dispenser-Screen-Final?type=design&node-id=0-1&mode=design&t=k86a0Gzqj8cbrVKL-0

This prototype complements the wearable device prototype. The Medication Management Dispenser UI prototype is meticulously crafted with a user-centric approach to ensure a seamless and intuitive experience. The interface comprises four main buttons—Schedule, Cartridges, Device, and Settings—each serving a specific purpose in enhancing the user's interaction with the medication dispenser. The Schedule feature allows users to create personalized medication schedules, allowing them to input specific times and dosages for prescribed medications. Cartridge functionality enables users to allocate medications into numbered cartridges, streamlining the process of organizing and identifying different medications within the dispenser. The Device section provides a comprehensive view of connected devices, establishing a synergy with a wearable device prototype designed to relay crucial medication information to the user, acting as both an informative tool and an authentication mechanism for dispensing. The Settings section encompasses configurations for Wi-Fi, time zones, sounds, and alerts, offering users control and customization over their dispenser's operational aspects.

From the end-users perspective, one scenario involving this prototype would resemble the following:

1) A user named Sarah, who has recently been prescribed multiple medications with varying schedules gets the Medication Management Dispenser.

2) Sarah utilizes the Medication Management Dispenser UI to input her medication schedules using the Schedule button, specifying the times for each dosage.
3) With the Cartridges feature, she allocates each medication into designated cartridges, ensuring easy identification.
4) The Device section seamlessly connects with her wearable device, displaying upcoming medication schedules and acting as an authentication tool for dispensing.
5) In the Settings section, Sarah configures personalized preferences, such as setting alert tones and adjusting time zones, providing a tailored and user-friendly experience.
6) Then the rest is left to the wearable device to alert Sarah to take her medications

Our rationale for the creation of this prototype is driven by the need for a user-friendly and efficient solution to medication management. The design aims to empower users in organizing their medications, staying informed about their schedules, and ensuring secure dispensing through wearable device integration. The intuitive interface, coupled with detailed configurations in the Settings section, reflects a commitment to user convenience and customization. By addressing the complexities of medication management, this prototype seeks to enhance the overall user experience, promoting medication adherence and well-being. By adopting a multi-faceted approach through both the dispenser UI and the connected wearable device, our prototype's plan is to provide a holistic solution that addresses user needs, technical challenges, and substance abuse prevention in the realm of medication management.

Evaluation Plan:

Wearable device prototype

For the evaluation of the wearable device, we would make use of the Figma mockup to emulate how the users would make use of this prototype. Since the role of this prototype in our design would be mainly to inform users about their medication information and act as a form of medication dispensing authentication, we would evaluate this prototype based on the following subset of usability criteria from our Project Deliverable 2: Friendly UI, Immediate Response, and Dispensing Accuracy,

In the evaluation, potential users can be asked to carry out several main tasks involving the wearable device and be assessed on how easily they can carry out the tasks. They would also be interviewed at the end to be asked about their general experience with the device prototype. The tasks would be the following:

1) Users will be given the Figma mockup and asked to navigate through the device, without any further details provided about the prototype, except for the instructions that will be given in the next steps.

    a) Should the users be able to carry out all subsequent instructions without any further detail or help, we would be able to conclude the ease of use of our device, allowing us to evaluate the “Friendly UI” criteria.
2) At any point during the interview, users would be asked to name the medications they have for the day, and at what time.
3) At a random point in the interview, the prototype would be changed to the alert screen, and users would be asked to dispense their medication. This would allow us to evaluate the “Immediate Response” and “Dispensing Accuracy” aspects of our evaluation.
4) Users would be shown the voice-activated help screen and asked about their opinions on its potential usability and convenience when utilizing our design.

This set of evaluation schemes would allow us to evaluate the main usability criteria as mentioned above.

Dispenser Screen Prototype

1) Users will interact with the Figma prototype to input a mock medication schedule using the "Schedule" feature. Requirements: The Figma prototype should accurately capture and display the scheduled medications. Users should find the navigation and input process intuitive.
2) Allocating Medications to Cartridges: Users will engage with the Figma prototype to assign different medications to specific cartridges using the "Cartridges" feature. Requirements: The Figma prototype should allow users to easily allocate medications to cartridges. The assigned information should be accurately reflected in the prototype.
3) Connecting Wearable Device: Users will use the Figma prototype to connect a wearable device through the "Device" feature. Requirements: The Figma prototype should seamlessly identify and simulate connection with the wearable device. Information from the wearable device should be accurately displayed in the prototype.
4) Configuring Settings: Users will navigate the Figma prototype to customize settings such as Wi-Fi, time zones, sounds, and alerts in the "Settings" section. Requirements: The

   Figma prototype should accurately capture and simulate the implementation of user-configured settings. Users should find the customization process straightforward within the prototype.

The usability criteria for evaluating the Medication Management UI prototype encompass several key aspects to ensure a user-friendly and effective design. The efficiency of the prototype is assessed by the user's ability to swiftly schedule medications and allocate them to cartridges, with the Figma prototype simulating a seamless and time-efficient process. The accuracy criterion focuses on the prototype's capability to precisely capture and display scheduled medications and assigned cartridges. Learnability is assessed through users' ease in

understanding and navigating the Figma prototype, with the goal of minimizing the need for guidance. User satisfaction is a crucial aspect, and it is measured by users expressing contentment with the overall usability and design of the Figma prototype. The simulation of connection and interaction with the wearable device within the Figma prototype should contribute positively to the user experience. These usability criteria serve as benchmarks for the effectiveness, user-friendliness, and overall satisfaction derived from interacting with the Medication Management UI prototype.

Summary and Reflections:

The primary objective of our project was to create a medication regulation and intake system, focusing on elderly users. We developed a user-friendly interface for a stationary pill dispenser and a wearable device to ensure that users stay on track with their specific medication schedules. Over time, we went through a couple of different iterations of the project, making changes based on user needs and overall feasibility. Initially, our functional requirements solely focused on automating medication management. However, we had to refine these requirements to include the user's ability to set medication schedules and notifications. On the non-functional side, we initially underestimated the importance of a simplified GUI. After user testing and feedback, we realized the interface needed to be simplified for our target users. In addition, our initial usability criteria focused on the system being both easy and efficient to use. After project iterations, we realized the importance of other criteria like having immediate responses, as well as the accuracy of the medication dispenser. These criteria were crucial, as our key goals for the project were not just to make medication management simpler, but also more reliable and accurate. The design process for the project was iterative at every stage of development. We used Figma for prototyping, which made modification and collaboration much more efficient. Moreover, we used an integrated approach with our two interfaces. Both the smartwatch device and dispenser interface were developed together to ensure both components worked seamlessly with one another. Looking back, the overall process of creating the prototypes with each other along with the evaluation plan was a long, challenging process. However, as a group, we learned valuable lessons regarding the process of project design and implementation. Through each iteration of the project, we grasped the importance of using an iterative approach to design, especially through user testing. Additionally, we learned how to effectively balance between our initial goals and the most important user needs. In conclusion, this project was a valuable learning experience for us, particularly in learning the ins and outs of user-centered design. The modifications we made along our work process in the project were crucial in developing a system that was not only technologically effective but more importantly, fulfilled the needs of our users.