# PocDoc

(Pocket Doctor)

Midterm Report:

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# I. Problem Space

## A. Context

Medication errors, lack of security, poor storage choices, and the average number of daily prescriptions for Americans are so destructive that they are causing a burden to the whole of society

- 1. Medication Error Defined
  - a. People taking too much or too little medication
  - b. Forgetting to take their medication entirely
  - c. Mixing the wrong medications together
  - d. Important fact: 1.5 Billion people injured each year from medication errors, costing the country approximately \$3.5 billion dollars annually (nationalacademies.org)
- 2. Issues of Security: Children are stealing medications from their relatives
  - a. Lids on medicinal canisters are "child resistant" but not child proof.
  - b. Between 1974 and 1992, 460 children under the age of 5 were hospitalized for medication overdose from prescriptions found in the own home.
    Interestingly, 1974 was the first year the "child-resistant lids" were put in place. (Washington Post)
  - c. The lids on pill canisters failed their first year and have failed ever since
  - d. 61% of teens said in a survey that prescription drugs were easier to acquire than illegal ones. (Partnership for a Drug free America, via cbsnews.com)
- 3. Storage Issues: Current products do not address key issues
  - a. Many seniors will dump out all their pills onto a surface then pick which ones they need. The problem is that not all surfaces will be sterile and some may contaminate their medication. Pills may also get lost in this case as well.
  - b. Currently on the market, there exist products that store and organize medications:





However, these devices do not tackle the core issues already mentioned. Regarding error: they do not tell the person which pill to take and what each pill looks like. In regards to security: these devices are no more secure than the typical pill canisters; in fact they are even less secure since that is no trick to opening them. Also, the bottom device is large, bulky, and not portable

## B. Use

Our product will focus on this problem and offer a solution by dispensing medication to the user in a way that is secure, routine, and monitored by their physician or pharmacist. Considering the interaction tasks between the device and a physician or pharmacist, coupled with their work schedules, the device will also be designed so that it is simple enough for the industry to absorb it.

## C. People

- 1. Primary:
  - a. Our primary users will be those with chronic illnesses or physical ailments that require large amounts of daily medication:
  - b. Of the USA's medicated population, there are approximately 13 daily prescriptions per person
- 2. Secondary:
  - a. It is our hope that the PocDoc could be adopted by the medical industry, thus Doctors and Pharmacists would comprise our secondary users as they could upload and maintain the data necessary to continue the effectiveness of the device.

## D. Usability and Experience Goals of the Users

- 1. Usability
  - a. **Effective** The PocDoc should aid the user by helping them load and consume the medications in exact amounts at consistent times each day. It will also have a calendar to help organize medications.
  - b. Efficient Loading medications should be simplified
  - c. **Easy to Learn** Using a touch screen, buttons must be clearly defined and intuitive. Appropriate feedback should be given for each action.
  - d. **Options/Flexibility** Color scheme, time, and the calendar should all be customizable to suit each user's preferences
  - e. **Safety**-The user's personal and medical information should be stored in such a way that it is accessible only by the user (though with some exception to their primary health care physician, i.e. new/old prescription data, etc). And their medication must be kept safe in a secure sterilized compartment

- 2. Experience:
  - a. **Enjoyability** The user will be able to be more independent and have a greater quality of life
  - b. **Helpful** The personal calendar will allow the user to take command of not only their medications but personal life as well.
  - c. **Motivating** The PocDoc will inspire users to take their medications correctly
  - d. **Inviting** The PocDoc should be aesthetically pleasing, inviting the user to pick it up and interact with it through clear and clean menus, as well as right-brained icons and pictures.

# II. Conceptualizing

## A. Designing a Representation of the Target System

- 1. Give the primary and secondary user full instruction on what medication to put in its organizer and the exact amount
- 2. Store medication in its already vast built-in medication database (new pill information can be uploaded to the device by the user's primary healthcare provider, via a USB slot on the PocDoc)
- 3. Store contact information of physicians for the user's reference
- 4. Alert the user at exact times each day using vibrational, aural, and visual alarms
- 5. Possess non-urgent alarm systems for either a wake-up alarm or for the included personal calendar
- 6. Be small enough to fit in a pocket
- 7. Be rechargeable

# B. Building Objects and Actions

There are two distinct exclusive states that the PocDoc can occupy:

- 1. When the user is being alerted to take medication, the PocDoc will streamline the process of taking medication, by walking the user through the process. The PocDoc will offer the user helpful instructions for medication when needed, such as "take with water."
- 2. When the user is not being alerted to take medication, the PocDoc will allow the user to manage the medication they currently have stored. They may see information about medicine or they may view information about physicians that have prescribed medication that is, or has been, stored in the PocDoc. They may also manage the times in which they take medication, or they may schedule appointments using the calendar.

## C. General Proposal of the Product's Objects and Interactions

- 1. Loading Medication
  - a. Use a barcode scanner, similar to ones already used by Pharmacists to organize patron data
    - 1. Once medication is scanned, all relevant data uploaded to PocDoc database
  - b. PocDoc will then ask:
    - 1. Which time each day he/she would like to take medication
    - 2. How many pills he/she must place in each compartment
  - c. Compartments for each day of the week will possess LED's:
    - 1. Container empty no flash or highlight
    - 2. LED on (but not flashing) medication loaded
- 2. Taking medication
  - a. Various alarms will go off
    - 1. Vibration, aural, visual
    - 2. Fingerprint will be scanned to ensure security
    - 3. Before user is prompted to take medication, the screen will display:
      - a. The name, picture, dosage, and physical description of the medication
      - b. Display a button for a description of what the medication treats, as well as the information pertaining to the physician who prescribed the medicine
  - b. User will take medications, corresponding compartmental LED's will flash
    - 1. As the medication is taken, the touch screen will prompt the user with a question, asking them if they have taken the medication
    - 2. If "yes," compartments will stop flashing
    - 3. If answer is "no" or user forgets specific interval:
      - a. Screen will flash, the alarm will sound at a higher pace, and the device itself will vibrate, as to alert the user
- 3. Medication Database
  - a. Will have all known medications for reference
  - b. New medications can be added through Dr or Pharmacist via USB
- 4. Miscellaneous
  - a. Possess a personal calendar
    - 1. Remind the user of personal dates (birthdays, etc), Dr. appointments, medication schedule
  - b. Wake-up alarm clock
  - c. Be small enough to fit in pocket
  - d. Be rechargeable

## III. Identifying Needs and Establishing Requirements

## A. Target Audience and Their Needs

Our target audience for the PocDoc are the elderly (late fifties and up). We chose this demographic because they make up a huge portion of the medicated population (40% according to Reuters), contributing heavily to the national average of daily prescriptions (approx. 13) per individual (Reuters), and they are more consistently medicated person to person.

For our initial questionnaire, we interviewed one elderly couple, the woman being 81 years old with 9 prescriptions, and the man being 79 years old with 4 prescriptions. Both of them gave us feedback on how they consume their medications, the amount they take each day, and the ideal size of the item. Both owned mobile phones. They both preferred a small device that can be stored in a purse or pants pocket. And they both informed us that when they take their medications, they pour them out on a counter and take the allotted amount for that time by picking them up, as opposed to pouring them from the pill bottle into their hand.

## B. Requirements Analysis

## 1. User Requirements:

- a. Since the elderly user base that we interviewed was not against the appearance of a cell phone in order to hold their medication, we continued our brainstorming to incorporate the various features into a cell phone-shaped device. However, there were some caveats that we had to keep in mind as we were designing the device. The device had to perform the following:
  - 1. Hold at least a week's worth of medication, via separate compartments
  - 2. Have a touch screen
  - 3. Possess visual menus, including visual representations of the medication
  - 4. Be secure
  - 5. Be easy to use, considering the primary audience

## 2. Functional Requirements:

- a. After our user requirements were crystallized, we began to think of the function requirements that would have to be present in order to support the user requirements. The functional requirements that are needed are the following:
  - 1. Complete database of prescription drugs still in use, as well as enough memory to install future updates, such as drug trials
  - 2. Possess a barcode scanner for obtaining information from pill bottle barcodes
  - 3. Fingerprint scanner, to secure the device and the medication
  - 4. Built-in rechargeable battery that can be recharged daily through a charging station. At least a 12-hour charge time is required
  - 5. USB port for transferring database updates

- 6. LCD anti-glare touch screen interface
- 7. Customizable alarm system for both vital and non-vital functions, such as medication and personal, respectively, that alert aurally, visually, and with vibration
- 8. Seven compartments, each for a day's medication, each able to hold 13 prescriptions
- 9. Be small portable enough to fit in a purse or pocket, around the dimensions of an iPhone (4.5 inches by 2.4 inches by 0.48 inch, or 115.5 by 62.1 by 12.3 mm)
- 10. Ability to be synchronized with another PocDoc should there be more daily medication requirements

## 3. Usability Requirements

- a. Effective: The PocDoc provides the user specific instructions on how to load each type of medication, as well as how they should consume the medication (in what dose, amount and at what time) using different color schemes, alarms, and LED lights. It will also use plain language that any user can understand
- b. Efficient: The PocDoc will allow the user quick yet detailed access to medical and personal information, as well as help expedite the user's experience of taking medication. The user will no longer have to remember every aspect of their treatments as the PocDoc will store and provide all such information to them.
- c. **Easy to Learn**: The PocDoc will have logical progression for each task, as well as use icons that make sense to their function. On screen arrangement will be simple, yet reflective of the PocDoc's main task
- d. **Options/Flexibility:** Medication intervals, alarms (and respective alert types), and calendar will be fully customizable for the user so that the device will enhance and respect their personal life and schedules. The device will be able to sync with a second PocDoc, should the user possess more than the allotted 13 prescriptions.
- e. **Safety:** The physical body will not possess any sharp edges or corners that may injure the user during use, it will also protect the user's personal and medical information with the fingerprint scanner (since each person has a different fingerprint). The fingerprint scanner will also lock and protect the medication from anyone else's reach, particularly those of children, as well as keep the medication guarded from unclean surfaces.

# C. Task Scenarios

An elderly woman has thirteen prescriptions she must take every day, each pill of a varying size and color. As she must remember which times she has to take each pill per day, she doesn't always recall if she has taken the right medication (as he whole supply for each prescription is in one container), nor if she has taken the right amount. She has had friends who died of an overdose, so she is afraid of having the same thing happen to her. She buys a PocDoc, which she enjoys because it is small and portable, instructs her on which medications to load, how many times to take them, and what they are for. She also likes how she can choose which times are best for her, since she is helping plan a birthday party for her grandson, and doesn't want to get distracted during meeting times with his mother. The PocDoc reminds her to take a pill after her meeting, since its side effects include drowsiness, of which the PocDoc reminds her. She also appreciates the small size as it fits easily into her purse. Overall, her fear of overdose has dissipated since she always has proof for herself that she is taking her medication directly.

An elderly man has nine prescriptions he must take per day. Despite his age, he is quite tech savvy, having owned several cell phones in the past. He currently owns an iPhone, which he especially enjoys because of its size and touch screen. Because he is comfortable with electronic devices, he buys the PocDoc to help him remember when to take his medications. Because he must take one medication before breakfast, it is imperative that he wake up and take his pill at least thirty minutes before he eats. Because the PocDoc has a personal alarm function, he is able to wake up at a precise time, medicate just as precisely, and enjoy breakfast at the same time as his wife (instead of making her wait!). Before when he took medications, he would pour it onto a surface and pick up whichever ones he needed. He found this method frustrating as he was not sure if the surface was clean or sterile, but necessary as he saw no other alternative. That is why he enjoys the PocDoc, since it puts each pill into a day's compartment where he can just pick one out, and not have to worry about losing any either. While he does have to carry around another device, the PocDoc is not excessive in that it simply replaces all the pill canisters he had to carry with him before, conveniently all in one location.

# IV. Design & Prototypes

# A. Concept Design

The main concept of the PocDoc relies on its aim to reduce medication errors by its easy to understand functionality, efficient instructions for users, and securing the medication in an innovative approach. Other so called 'pill organizers' such as integrated wheel-shaped dispensers or compartmental systems have achieved their aim in organizing the medications for the users; however, they lack any provisions in reducing medication errors and eventually reducing adverse drug reactions.

# 1. Product Concept Explained in Detail

By examining the conceptual design of the device, we thought of various functions of the device should be provided that would allow the user to interact with the device in a positive fashion as defined by their goals, but also supported by the functional and conceptual requirements. The concepts that we wanted to integrate into our device was as follows:

- a. The ability to add medication to the device that was as accurate as possible. In order to do this, the information would not be entered by hand, but rather, by the barcode scanner or a USB cord that would link up with a database with information provided by physicians and drug manufacturers. The user will add the medication themselves, so there must be a way for them to know where to put medication, and at what amount. Once the medication has been added, the user may select the times that are the most convenient for them to take the medication during a particular day.
- b. Information about the medication, as taken from the database. This information includes: a picture of the medication, side effects of the medication, what the medication is prescribed to treat, and who prescribed that medication. A record of given medication would also be saved.
- c. The ability to modify when medication may be taken. When the user adds medication, they set times that are convenient for them. However, should the user want to modify those times, or even days, that option should be available to them, as well as simple. Should the user have to move medication from one day to another, they should be alerted to do so, so as to avoid being without medication for one day—and subsequently having a surplus for another day.
- d. The ability to keep records of physicians available, so that the information may be easily accessed in case the user must contact said physicians. Also, records of medication given by physicians that are currently stored within the device, as well as previous medication that said physician has prescribed to the user, will also be available to the user.
- e. The ability to schedule personal appointments through a calendar feature. A day, time, and description will be mandatory, but an alarm will be optional.

# 2. Low-fidelity Prototypes

a. Sketches and Illustrations



Click

Cancel

"assume user set start date to 10/15/2009 and end date to m1/31/2010

Original first sketches



**Revised Sketches** 





## b. System Architecture

## B. High-fidelity Prototype 1. Digital Illustrations









Epinephrine: take one pill, twice a day, with water Fri Oct. 16, 2009 10:00 am 05:00 pm	Dr. Michael Adams
Cancel Done	Add
Office address: 123 Doctor	Weekly Medicine Schedule
St. Indianapolis, IN 41234	Sunday o
madams@clarian.org	Monday 5
Phone: (317)123-4567	Tuesday b
Medication Prescribed	Wednesday 5
Acrisia Ibuprofen	Inursoay D
Prescription History	Friday 5
Aspirin – 10/09/2008-present	Saturday 1

# 2. Explanation of Interaction and Interface Design Components

The PocDoc is a handheld device approximately the size of an iPhone. The flat non-reflective and swiveled-table-top large LCD touch screen holds the main interaction menu system, while the seven separated compartments in the back contain the actual medications taken on each day of the week.

Taking all of the user requirements and functional requirements into mind, as well as the sketches that we had designed, we began to refine the various elements of the device into processes that could be completed by the user to incorporate the various functional aspects that we had defined. The product itself consists of a main menu that had seven different available functions:

- a. A search feature that allows the user to do a quick search on any given item, such as medication information, calendar events, or physician information.
- b. A Medication menu that shows the user all of the medication that is currently stored within the device. The "medications" contain two components: a picture of one of the pills, as well as the name of the medication. The picture/name combination would be clickable, taking the user to a new screen with information about that medication, such as side effects, what it treats, who prescribed it, its prescription history, when it is to be taken (specified by the user), as well as how many more were left within the prescription as well as the PocDoc.
  - From this menu, the user can add medication to the list, via either a barcode scanner located on the PocDoc or from a USB port/cord combination that would connect the PocDoc to a computer.
  - 2. The user may also change the intervals in which they take medication. The option is available to them to change an entire interval (for example: moving all medication taken from Monday at 9:00am to 8:00am), or to edit the time for a particular medication (during a time when two medication are to be taken, moving one of them to an hour later). Should the user move medication from one day to another, they are prompted to take pills from the "old day" and move them to the "new day."
- c. A Physician menu shows the user information about physicians that they currently see on a regular basis. The page for each physician gives contact information for the physician, as well as medication that the physician currently prescribed, as well as the prescription history from that physician. This is different than the prescription history available from the Medication menu, because this is from the physician's perspective (Dr. Smith prescribed Ibuprofen and Aspirin), while the history from the Medication menu is only pertaining to that medication (Ibuprofen was prescribed by Dr. Adams, then Dr. Smith).
  - i. From the Physician menu, users can add or edit physician information. The barcode scanner is used to scan business cards that the physician possesses, or the information can be entered manually via a keypad, should that option be chosen. Should there be any medication that is present within the PocDoc that is not "assigned" to a physician and said physician is scanned into

the PocDoc (for example, Epinephrine was prescribed by Dr. Smith but Dr. Smith's information was not stored in the PocDoc), the user must assign the medicine to the physician, so it can be tracked via the prescription history.

- d. A Clock menu is available that allows the user to manipulate time settings (a 12 hour clock or a 24 hour clock, for instance), as well as to view their weekly medication schedule. The medication schedule can be edited from this point, or from the Medication menu—the links both go to the same spot. The icon itself for the clock menu shows the current time.
- e. A Calendar is available that allows the users to add appointments—personal or otherwise—into the PocDoc. The user may view the scheduled appointments for a specific day, as well as the medication that they take during that day (and at the specific time). The user may edit or add appointments, in which case they set the time of the appointment and they type in a description using the keypad that appears when they touch the textbox to enter the information. The user can also assign an alarm to the appointment, such as vibration or having an external light flash.
- f. A settings menu is available to allow the user to customize settings that are available within the PocDoc. An example is the ability to choose whether a 12 hour or 24 hour clock feature is appropriate. This feature is also offered by the time settings, in which case, the actions performed are universal, so the user has multiple paths to perform this task.
- g. Finally, a sleep button is offered to the user which puts the screen into sleep mode. In order to wake up the PocDoc, the user just touches the screen.

## V. Evaluating the Design

### A. Usability Study

- 1. Interviews
  - a. For our usability study, we first briefed our interviewees on the concept of the product that we were going to test, as well as a brief description of the entire product, since they were only going to interact through the top half—which contained the touch screen—via PowerPoint. Since our product was primarily for elderly users, we conducted a usability test with two classmates, and two elderly individuals over sixty years old. We also timed the users to see the total time it would take the elderly users and our classmates to complete all of the tasks. We did not tell the users that we were timing them, because we did not want them to feel pressured to complete the tasks quickly. We wanted them to have time to absorb all of the information present on the screen and conceptualize how that would relate to completing the tasks that we had prescribed for them.

- b. During the test itself, we had five tasks that the user would perform on the product. The tasks were:
  - 1. Adding a medication to the product
  - 2. Adding physician contact information to the product
  - 3. Changing the times in which medicine is scheduled. This included changing the alarm time for one day, as well as editing the time for an individual medication
  - 4. Adding an appointment to the calendar
  - 5. Taking medication

As the users would perform the tasks, we were available to answer questions that they may have about the design, as well as to write down any concerns that we observed, or were observed by the user. On particular screens in which we had our own concerns about the layout or if the purpose was being communicated to the user, we would stop timing the user and take a few minutes to pique at the screen they were viewing to assess that screen. Upon the examination of the screen, the timing would resume. When the task was complete, the user would signify that they had completed the task by either saying "that's it" or taking their hand off the mouse and reclining in their chair and the time to complete the task would be recorded. Needless to say, it was easily communicated that they had completed the task and were ready to move on to the next one. When all five tasks were complete, we presented the user with a post-facto questionnaire that assessed their own observations about the product. The questions that we asked were:

- 1. What did you feel about the main menu?
- 2. Was it clear what all the icons represented?
- 3. Was it clear what was clickable?
- 4. How did you like the color scheme? Was it neutral, or overtly masculine or feminine?
- 5. With each task, did you feel a sense of progression? Why or why not?
- 6. Did each step feel logical?
- 7. Would you recommend this device to a friend or loved one in its current state? Why or why not?
- 8. If you were the designer, what would you change?
- 9. Is one week enough for keeping medication?
- 10. Would you prefer a vertical layout or a horizontal layout more?

The results of the questionnaire were examined, and together with the observations of us and the users, various improvements were envisioned, which will be discussed later on.

# 2. Internal Walkthrough

a. For our internal walkthrough, one of our team members performed a similar usability test. Therefore, all the tasks were performed and checked, all the technical problems were noted, and possible improvements for each task were noted. Our expert user first performed all the tasks and timed how long each task took to be completed. The next step was to check all the slides in terms of the layout of each slide, and how clear it would be for patients to conceptualize the task at hand, and how the layout could be improved to complement that task. After all the tasks were completed, all the concerns for layout and hierarchy of slides were written down. These results were documented and discussed with other team members. Following completion of the internal walkthrough, a flow chart was constructed to detail the possible path the user would take to complete each of the tasks that we had given to them.

# B. Assessment of Findings

Upon completion of all the tasks, all of the observations made by us, as well as the users, were examined in the context of the tasks they were associated with, as well as for the entirety of the device.

# 1. Elderly Users

The elderly users thought that the main menu was intuitive, clear, and fairly straightforward, and that the icons viewable to them were self-explanatory and not problematic. The only concern was that the clock feature could be digital instead of analog. They both thought that it was clear what was clickable, and in the instance that it was not clear, it was a problem in PowerPoint and not with the device itself. One of the users thought that changing time was a repetitive issue. In terms of the color scheme, both elderly users thought that the color scheme itself was neutral, but they would have preferred more color, because it may have made some of the layout less confusing. Another suggestion was having an option to change the color scheme. The elderly users each agreed that the sense of progression for each task was visible, logical, and that the device itself was easy to use to complete the task. It was commented that it was not immediately clear what they had to do to fill up the device with their medications, but it was nice in that there was no particular order in which they had to do the task. Both said they would recommend the device for friends or loved ones, especially those with multiple medications, but there was the caveat that it may be better suited for the more tech-savvy elderly as opposed to those that may be intimidated by technology. There was an interesting comment about the hierarchy of the main menu, suggesting that "Physician" be located above "Prescription", as the physician prescribes the medication. There was also a suggestion that the compartments that store medication should slide out from the bottom of the device, one at a time, which would emphasize the screen more and be less fussy. It was also suggested that when a user takes medication, it should be clear what it treats. Both elderly users agreed that one week was enough in terms of storing medication in the device, because it was a good compromise between being a nuisance of filling the device daily and having to fill it for a lengthier period of time. One user wondered if a pharmacist could fill the device with medication, but since that would have to be done on a weekly basis, it may be less convenient

since they would have to see the pharmacist 4 times a month. Both users preferred the vertical layout and thought that the device itself was ergonomic.

# 2. In-Class Interviews

Our classmates' observations were slightly different, but mostly on par with the observations of our elderly users. Both thought that the main menu was simple and clear, and that the purpose of each icon on the main menu was easily represented. One user commented on the multiple-path approach to complete one of the tasks. Each agreed that it was clear as to what was clickable, but one commented on the lack of consistency between using arrows versus buttons to cycle through days. Both users commented on the color scheme, saying that it was "too plain" and that they would have preferred some more color in the layout, especially when a task was completed. There was an agreed upon sense of progression within each task, and that each step itself felt logical. There was clear agreement that the device, in its current state, should not be recommended to friends or loved ones, because it felt unfinished and that a senior citizen with poor eyesight or arthritis may have trouble using it. One commented that, if they were the designer, they would change the color scheme, whereas the other user would market it to younger individuals. Both felt content with the device storing a week's worth of medication, but it was observed that some senior citizens may take a lot of medication, thus it may be challenging for them to keep all of the medications within the device. Each agreed that the vertical layout was preferred over a horizontal layout.

The times for the expert user, as well as for the elderly users and classmates are provided below, with the expert user's notes on the tasks:

- a. Adding a Medication to the PocDoc
  - 1. Time for Expert: 1 minute, 7 seconds
    - **Note**: For the sake of putting 2 pills in each compartment, possibly inactive "Done" button in slides 10-22
  - 2. Time for classmate A: 1 minute, 15 seconds
  - 3. Time for classmate B: 47 seconds
  - 4. Time for elderly user A: (not supplied)
  - 5. Time for elderly user B: (not supplied)
- b. Adding Physician contact information to the PocDoc
  - 1. Time for Expert: 33 seconds
  - 2. Time for classmate A: 26 seconds
  - 3. Time for classmate B: 25 seconds
  - 4. Time for elderly user A: (not supplied)
  - 5. Time for elderly user B: (not supplied)
- c. Changing the times in which medicine is scheduled
  - 1. Time for Expert: 1 minute, 25 seconds
    - Note: Update the "Medication Schedule" button after hitting medication info on homepage to slide 43.
  - 2. Time for classmate A: 1 minute, 45 seconds

- 3. Time for classmate B: 1 minute, 42 seconds
- 4. Time for elderly user A: (not supplied)
- 5. Time for elderly user B: (not supplied)
- d. Adding an appointment to the calendar
  - 1. Time for Expert: 1 minute
    - Note: After Slide 73, showing splash massage (feedback massage) including Sam's birthday has been saved to PocDoc. Or having slide 79 before slide 74
  - 2. Time for classmate A: 1 minute, 5 seconds
  - 3. Time for classmate B: 1 minute, 58 seconds
  - 4. Time for elderly user A: (not supplied)
  - 5. Time for elderly user B: (not supplied)
- e. Taking medication
  - 1. Time for Expert: 43 seconds
    - Note1: Possibly showing a massage that acknowledges the patient took the medication for example Thank for taking your pill
    - Note2: Referring "Prescribed by Dr. Smith" button on slide #84 to a copy of slide#33 but with "homepage" button and "back" button
  - 2. Time for classmate A: 27 seconds
  - 3. Time for classmate B: 1 minute, 55 seconds
  - 4. Time for elderly user A: (not supplied)
  - 5. Time for elderly user B: (not supplied)
- f. Total time to complete tasks:
  - 1. Expert: 4 minutes, 48 seconds
  - 2. Classmate A: 4 minutes, 58 seconds
  - 3. Classmate B: 6 minutes, 45 seconds
  - 4. Elderly user A: 12 minutes
  - 5. Elderly user B: 12 minutes

The number of users who commented on the color scheme was rather astounding. While we were designing for a more neutral approach in which color-blind individuals would not have to struggle through the interface, the option of manipulating color could easily be implemented. We have a Settings menu that is accessible from the main menu, and even though it is not used for any task that we had given to our users, the opportunity to place a "change color scheme" option in that menu would alleviate the issue that our users had with the lack of color. One elderly user commented on the "hierarchy" of the buttons, so it would be possible to add a "change button layout" feature to the Settings menu to alleviate this, as well as to give users their own sense of customization for personalization.

There was a lack of consistency with changing days and dates when filling the device with medicine, as opposed to manipulating the days as to when a medication schedule could be changed. To remedy this, a more-consistent approach of incorporating arrows to change the day would be useful. Considering the fact that the user who commented on this issue said "oh, there are my arrows" when that part of the task was reached, it seems clear that the presence of the arrows was a more-familiar approach to that user. Along the same lines as consistency, the multiple-path approach to complete the tasks was more of a convenience to the user, but it may be more useful to eliminate the lesser-used path so as to not confuse the user (both classmates preferred the same path over the other one), especially since only one task had multiple paths to take.

Through the multiple revisions of the interface of the device, we strived to provide the user with feedback as to what they had to do in a process to progress through it, so for the user who commented on the ambiguity of filling the device with medication, some visual feedback would have been useful for them, and it would also be easy to implement. Along the same path, when the user scheduled an appointment in the calendar, showing that it had been saved before allowing the user to assign an alarm to remind them of the appointment would let them know that the information itself was saved immediately after they clicked the "Save" button. Further along the same path, since one user commented that it would have been nice to have had a confirmation button for when they had taken medication, as it would serve the purpose of setting a concrete "finish" point, adding that button would provide (or linked to a screen that provided) a "finish line" comment to the user, such as "thank you for taking your medication." This feature could also be toggled in the Settings menu since it may be more useful to some users than to other ones, or as the user evolves while using the product, they will not have any use of the feature so they could disable it. Also, having access to information on what a medication treats would be as simple as adding a button that links the user to a screen that lists that information.

One of the elderly users thought that changing the time was a repetitive issue, and as we were reviewing this point, we started brainstorming ways of making this less of a challenge. One way was to have an "apply to all days" button that would be accessible when the user was setting times for taking medication. Another idea was to have checkboxes that would signify the days to which the user would assign days, so that certain days could have certain times. An "all days" checkbox would also be available. The days that medicine would be available to modify would be designated by the information provided to the user from the scanning of the pill bottle, so if they only had to take a medication three days a week, the "all days" option would only apply to three days, not seven. After all the days in which medication was to be taken had times assigned to them, the "Done" button would become clickable (all other times, it would be inactive).

Two of our users commented on the technology issue of the device itself. As such, we would either change the market to which we were "advertising" the device, or we would have to make it more user-friendly so that elderly individuals would be more open to having an alien device telling them when to take medication. We may have to implement audio-based feedback, which was not present within our PowerPoint-based prototype. Unfortunately, there

is a line that would have to be drawn between users who are tech-savvy enough to use the device and those that never would due to that issue, which we would have to respect. Finally, there were a few issues present within the PowerPoint itself, such as links that did not work. In such a case, the slide itself would be updated. Even though it does not affect the "essence" of the device, these "technical difficulties" presented problems for our users and by correcting them, it would have allowed the user to have a more streamlined experience when interacting with the prototype.

# VI. Appendix

## A. Initial Product Abstract

The basic idea of our product is an automatic pill dispenser that gives our primary user (the elderly) their medication for each interval during the day. Our goal is to design a device that helps reduce the margin of error that often occurs when taking pills out of a typical plastic canister. In fact, in order to replace the old canister model, we must make it small so that it can fit in a typical pants pocket and/or typical purse. The alert system should be both vibrational *and* aural in case the user sets the device on a table or desk. Despite the common loss of hearing associated with old age, many elderly simply turn up the alarm volume, so an aural alert should be just as good as vibration, as long as we make a volume option. We also concede that because it will be a portable device, it will need to be recharged. Thus we propose to have a charging station, ideally placed on a nightstand or at bedside, with the option of using the device as an alarm clock. Though the main purpose of the design is to dispense exact forms and exact amounts of medication at equally exact intervals, we also want the product to be convergent with time keeping, a personal calendar, and alarm clock.

# B. Additional Paper Prototype Sketches



## Ansari, Sleppy, Walsh





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## C. Additional Interactive Prototype Screenshots



First Interactive Prototype

## PocDoc

















Revised Sketches



## D. Resources

### Reuters

http://www.reuters.com/article/pressRelease/idUS178123+28-Jan-2008+PRN20080128 nationalacademies.org http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=11623

Washington post

http://www.highbeam.com/doc/1P2-786448.html

### **CBS News**

http://www.cbsnews.com/stories/2009/05/07/earlyshow/health/main4998006.shtml