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COSC 448
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Design Activity Report
Designing for seniors needs

1. Introduction

This report consists of three design prototypes inspired by seniors needs, summarizing research from past class presentations, user personas to visualize needs and the individuals that might be living with these challenges, and a QOC analysis to provide design solutions in the situation where we do not have access to real users for decision making in the design phase.

Three seniors needs identified for each design

1. Need for staying safe (Silvr wander / fall detection necklace)
2. Need for social connectedness / combat loneliness (Landline Telephone)
3. Need for independence (Wayfinding mobile application)

Links to Wireframe, QOC Diagram Boards

- Landline telephone, Wayfinding app board
- Silvr necklace board

2. User Personas

2.1. Persona: Valerie Smith

Name: Valerie Smith
Age: 75
Job: Retired
Location: Victoria, BC Canada
Description: Valerie is an active, young at heart 78-year-old woman who loves to get outside. She has mild alzheimers and would love to be able to maintain her independence while staying safe.

2.1.1. Goals & motivations

Valerie's main goal is her ability to maintain her independence at home with her daughter. She absolutely loves taking light fitness classes at her local YMCA, enjoys being outdoors and staying active. While outdoors and within her community, staying safe is a priority to Valerie.

2.1.2. Frustrations

Valerie's pain point revolves around her mild alzheimers. She often has troubles with making sound judgements and often finds planning her day to day life overwhelming. As she loves to get out and do activities, she often wanders and gets lost, forgetting her way around. Unfortunately, her daughter who acts as her caregiver, has another part time job serving and cannot always be by Valerie's side to prevent her from getting lost which puts Valerie in unsafe situations without a device to help her. She often forgets or doesn't want to bring her phone while out for walks or doing her activities, and doesn't have a lot of money to spend on other devices.

2.1.3. Devices they currently use

Valerie owns an iPhone 8 smartphone but cannot perform complex tasks on her mobile device. Besides her mobile smartphone, Valerie owns a tablet in which her daughter has set up TV programs and art applications that she enjoys using.

2.1.4. Potential solutions

Wearable Silvr necklace has ‘wander’ detection with exceptions: programmable radius so they can walk or do activities outside - notifies if they’ve wandered and their current location to both user and caretaker/family.

2.2. Persona: Jon Smith

Name: Jon
Age: 84
Job: Retired
Location: Vernon, BC Canada
Description: Jon is a user who prefers traditional technology to contact his family and peers. He has mild dementia and a hearing problem and lives in a nursing home and often feels isolated and lonely. He has stated he would like something familiar that could help him keep contact with his loved ones and peers.

2.2.1. Goals & motivations

Jon’s main goal is his ability to maintain his social interaction via phone. He loves to socialize and loves calling up - and having game nights with his friends whenever he feels lonely. Maintaining this active social life is important to Jon. Additionally, Jon’s family is important to him, and so having access to communication with his family members is crucial to his mental health.

2.2.2. Frustrations

Jon’s pain points relate directly with his hearing disability and dementia. Having a hearing problem makes it hard for Jon to hear the television, conversations with peers in person as well as on the phone, which makes Jon feel like he's missing out on companionship at times. To make matters worse, Jons dementia also takes a toll on his emotions. His subtle loss in memory causes Jon to forget names and daily tasks. Sometimes, his friends and family aren’t always able to visit and are unreachable or far away which adds to Jon’s frustrations. Finally, Jon is hesitant to learn how to use new technologies and devices. His

mentality towards emerging tech is ‘if it’s not broken, don’t try to fix it’.

2.2.3. Devices they currently use

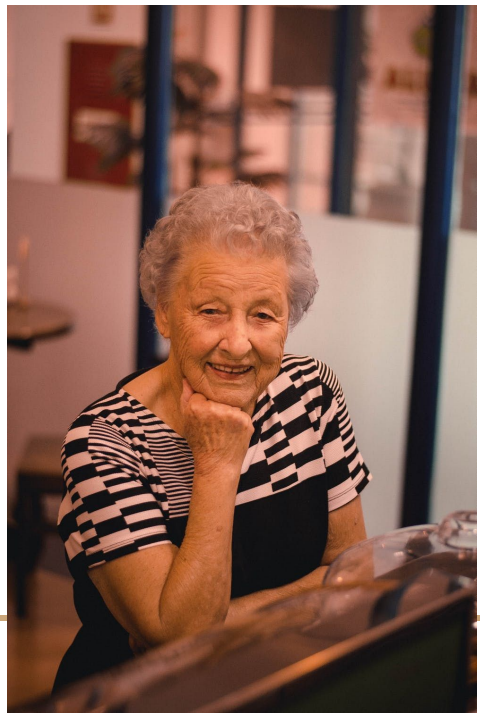
To help Jon hear, he has a hearing aid he uses to communicate. Jon currently uses a traditional analog desk phone that includes a receiver with a touch tone keypad and a speaker similar to the one pictured above. Moreover, he uses an LCD television with a remote control.

2.3. Potential Solution

Traditional telephone with an interface which allows for imagery buttons for users with cognitive disability and captions for users who are hard of hearing. Voice commands, the option to save calls for later are also potential solutions.

2.4. Persona: Rose Husak

Name: Rose Husak
Age: 83
Job: Retired
Location: London, ON Canada
Description: Rose is a lively, socially active woman living in London Ontario to be near family members. She has several social groups she takes part in, including a book club and a dinner club. As a result of Roses’ decreased mobility, she often uses a scooter to get around town.



2.4.1. Goals & motivations

As a result of Rose's socially active lifestyle and her mobility issues, Rose's goals are to keep as much independence as possible. Her home has smart and assistive technology such as voice commands for her security systems, and installed a specialized shower that makes it easy for her to get in and out of. When she's out of the house, that's where she runs into problems. Not everything is designed for people with mobility problems. Rose enjoys living with her partner and her goal is for them to live without a caregiver and outside of residential care so they can do things for themselves for as long as possible.

2.4.2. Frustrations

As mentioned above, Rose's mobility causes her to need assistive devices such as a mobility scooter and a walker. Rose lives close to town and loves to walk or take her scooter around town, but finds it frustrating when she runs into a sidewalk with a steep curve, or buildings with stairs and no ramps. There isn't a lot of information available to plan her trip prior to leaving, and as a consequence sometimes she would rather stay home. These difficulties often make Rose feel isolated and left out of social activities.

2.4.3. Devices they currently use

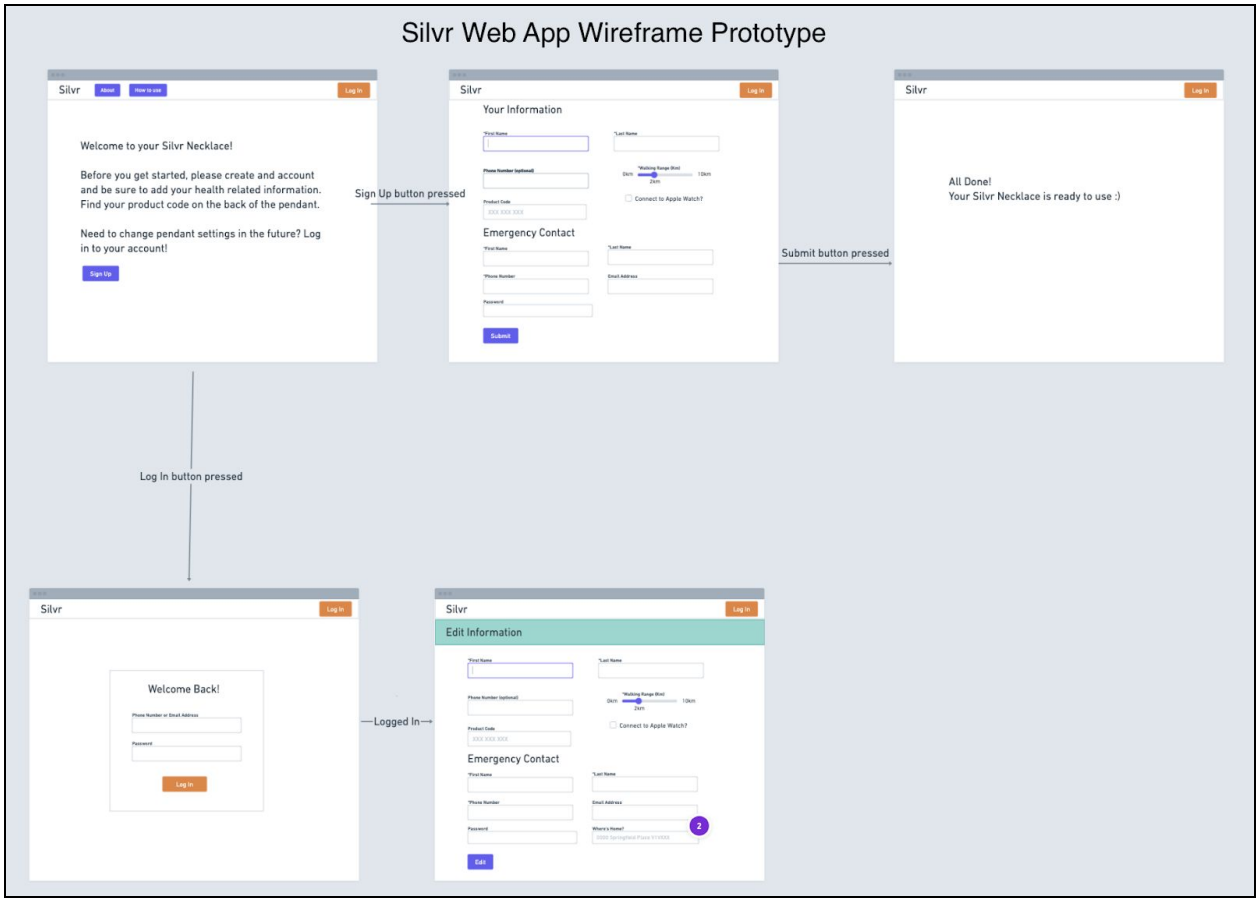
Rose owns an iphone 11 and is always knowledgeable with the latest smart technology. Her smart devices at home include an assistive shower, a Google Home with programmed commands to her security system, lighting system and more. Finally, she has an Acorn Stairlift to assist her in getting up the stairs on her own.

2.4.4. Potential solutions

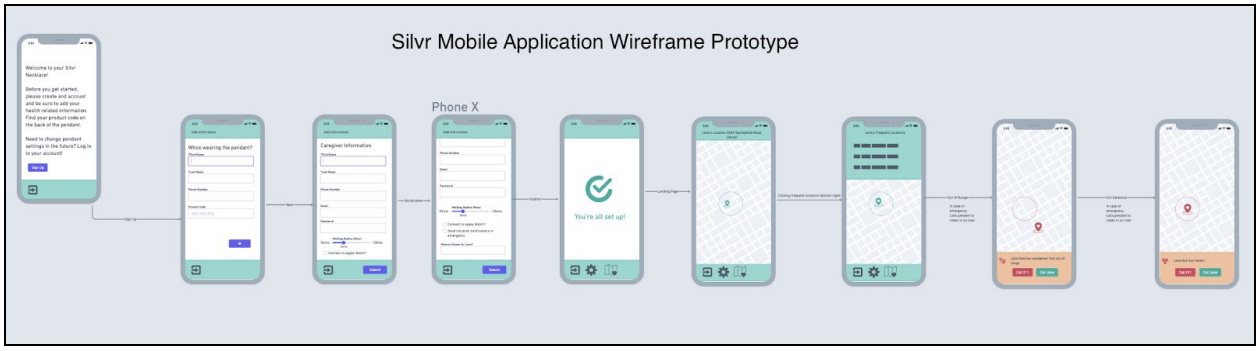
Potential solutions for Rose is a proposed wayfinding application with accessibility information displayed to the user. This application warns the user about what kind of issues they could run into on their route and the best route to take based on their variable disabilities.

3. Wireframes

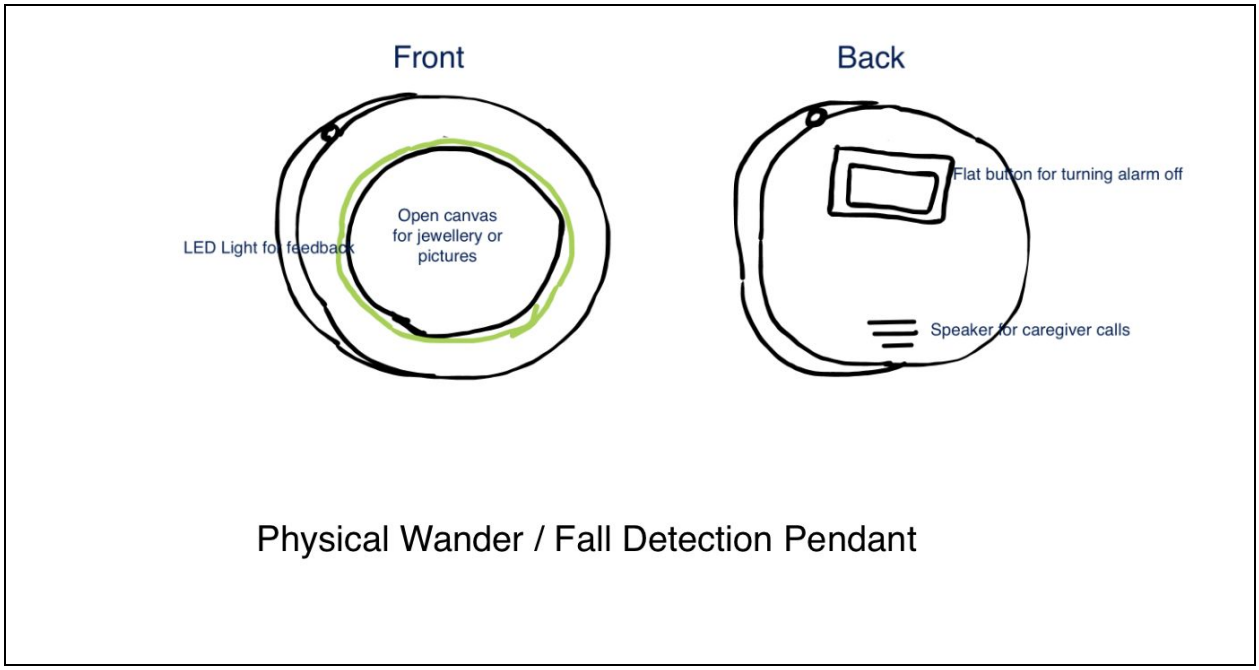
3.0.1. Silvr Pendant Wireframe Prototypes



3.0.1.0.1. Web Application low fidelity prototype for editing / adding user information

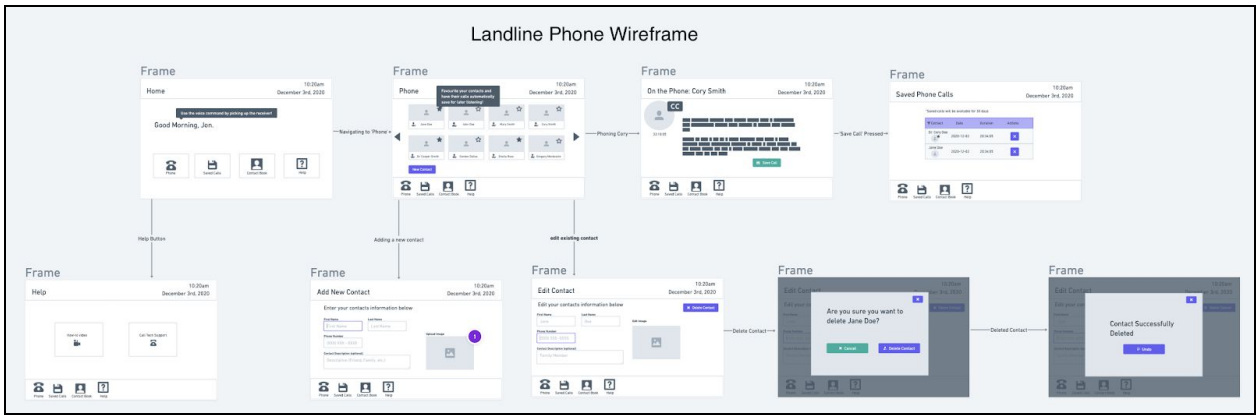


3.0.1.0.2. Mobile Application low fidelity prototype for editing / adding user information, monitoring user, viewing alerts



3.0.1.0.3. Fig. 3.0.1.3 Physical Silvr Pendant Mockup

3.0.2. Landline Telephone Wireframe Prototypes



3.0.2.0.1. Landline Phone interface wireframe

3.0.2.0.2. Landline phone physical mockup

3.0.3. Wayfinding Mobile Application Wireframe Prototype

[3.0.3.0.1. Wayfinding mobile application wireframe]

4. QOC Analysis

4.1. Silvr Pendant QOC Analysis

4.1.1. Design

This pendant design was inspired by the need of a safety device for seniors that is stylish - taking away the negative stigma of wearable medical devices and ageing, with the need for seniors to stay safe and taking pressure off the caregiver in situations outside of caregivers supervision. My design assumes the user is cognitively impaired but still wants the freedom to continue to live their day-to-day life and stay active. This pendant acts as a wander detection monitor and a fall detector, allowing users to wander within a programmable radius - giving off various forms of feedback whenever a user is in an emergency situation (wanders off beyond set radius) and allows caregivers to 'call' the pendant and make sure the user is safe. Main features of this device include

- Pendant
    - Vibration, sound and LED light for feedback wander / fall detection
    - Button on the back that turns alarm off (in case of false alarm)
    - Back button also acts as a 'walkie talkie' pressing and holding to communicate once a caregiver calls the pendant.

    - Open canvas on the front for jewellery or inserting an image of loved ones
    - Lightweight leather necklace strap
- Web App
    - No downloads necessary - main purpose to program the pendant and add / edit personal info
    - User needs access to the internet
- Mobile App
    - Geolocation monitoring to visualize users location and monitor if user is within programmed radius
    - Saves users frequent locations radius is relative to where the locations user frequents
    - Allows for push notifications to caregivers mobile devices
    - Emergency contact options (allows caregiver to call directly to pendant)
    - Same input functionality as the web app to input add or edit information
    - User roles will be in place to make sure user doesn't edit important information by accident

4.1.2. Problem

There are several problems taken into account when designing this wander / fall detection medical pendant. Problems identified are;

- How does the pendant provide feedback to the user in emergencies? (Fall or wandering off)
- Sending feedback to caregiver / emergency service in an emergency
- System to provide useful information to caregiver
- Materials to use
- Simple interface

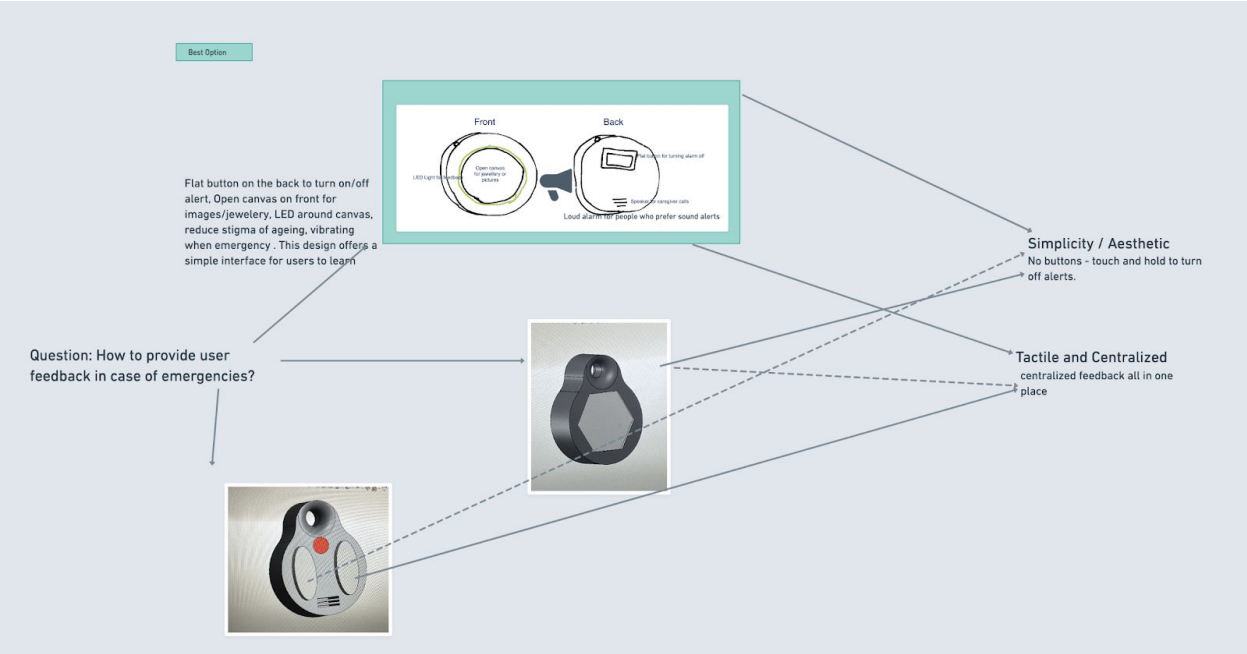
4.1.3. Questions

- How does the pendant provide feedback to the user in emergencies? (Fall or wandering off).
- How will users enter their information?
- How does the system effectively provide information to caregivers?
- How does the system notify caregivers of emergencies?
- What materials would users be more comfortable wearing?

4.1.4. Analysis Question #1

- How does the physical pendant provide effective feedback to the user in emergencies? (Fall or wandering off)

Solution: Simple pendant interface with LED, Vibration and sound feedback



4.1.4.0.1. QOC diagram for “How to provide user feedback in case of emergencies?”

4.1.5. Rationale:

Two different design options were created; the first being a pendant with buttons on the front to turn the system off and an LED light to provide feedback in case of wandering or falling. This design was analysed and found to be tactile and centralized (all feedback is in one place) but despite this, the least simple design, with a cluttered design that may stigmatize users as they age and have a need for this medical device.

The second design was created with this criteria in mind, being a simple interface on the front with an open canvas for jewellery or photos of loved ones, and an LED feedback surrounding the open canvas. The button to turn the system off and the speaker for caregivers will be placed on the backside of the pendant. Keeping the front interface aesthetically pleasing and simple, this de-stigmatizes the user and provides a simpler design that minimizes confusion on how to use the interface.This interface also has vibration in case of falls or wandering and a loud alarm that can be programmed in for extra feedback.

4.1.6. Analysis Question #2

- How will users enter their information?

Solution: Web App and Mobile App option

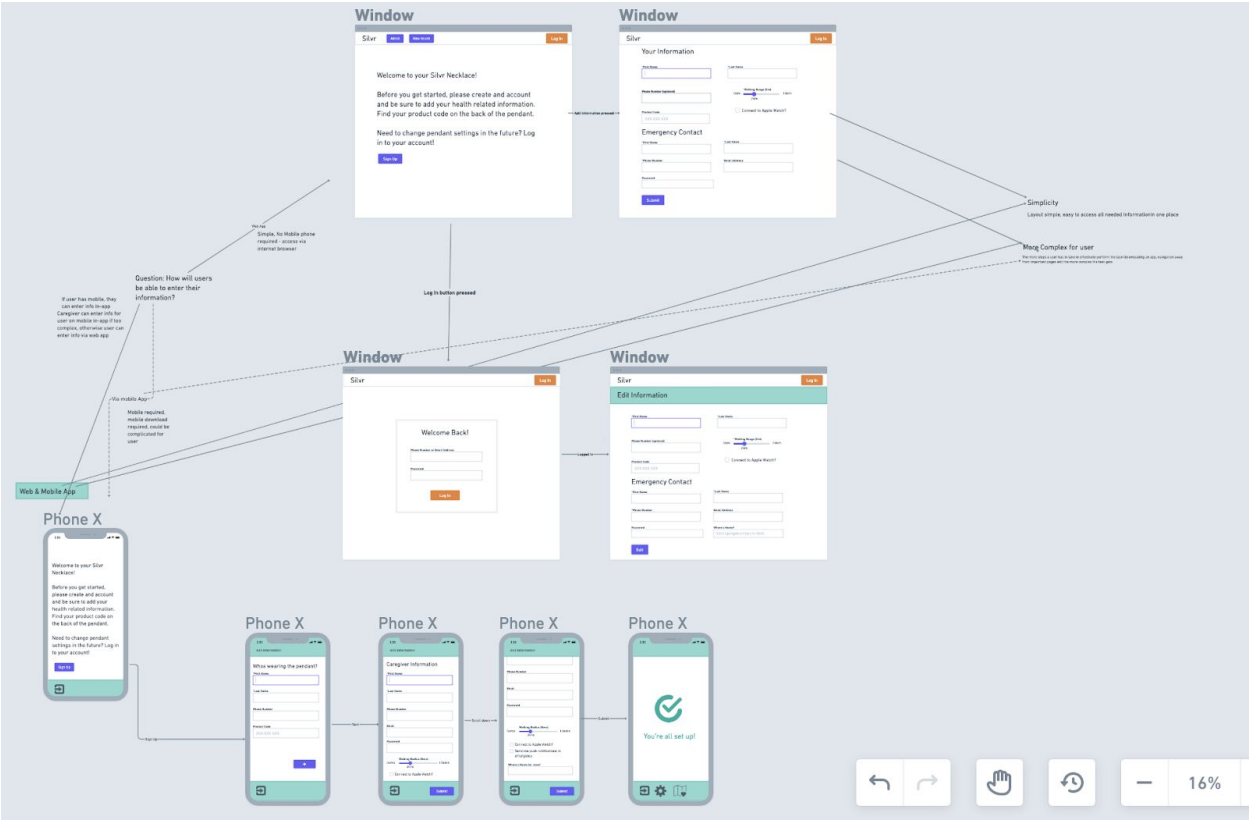


Fig. 4.1.6 QOC diagram for “How will users be able to enter their information?”

4.1.7. Rationale:

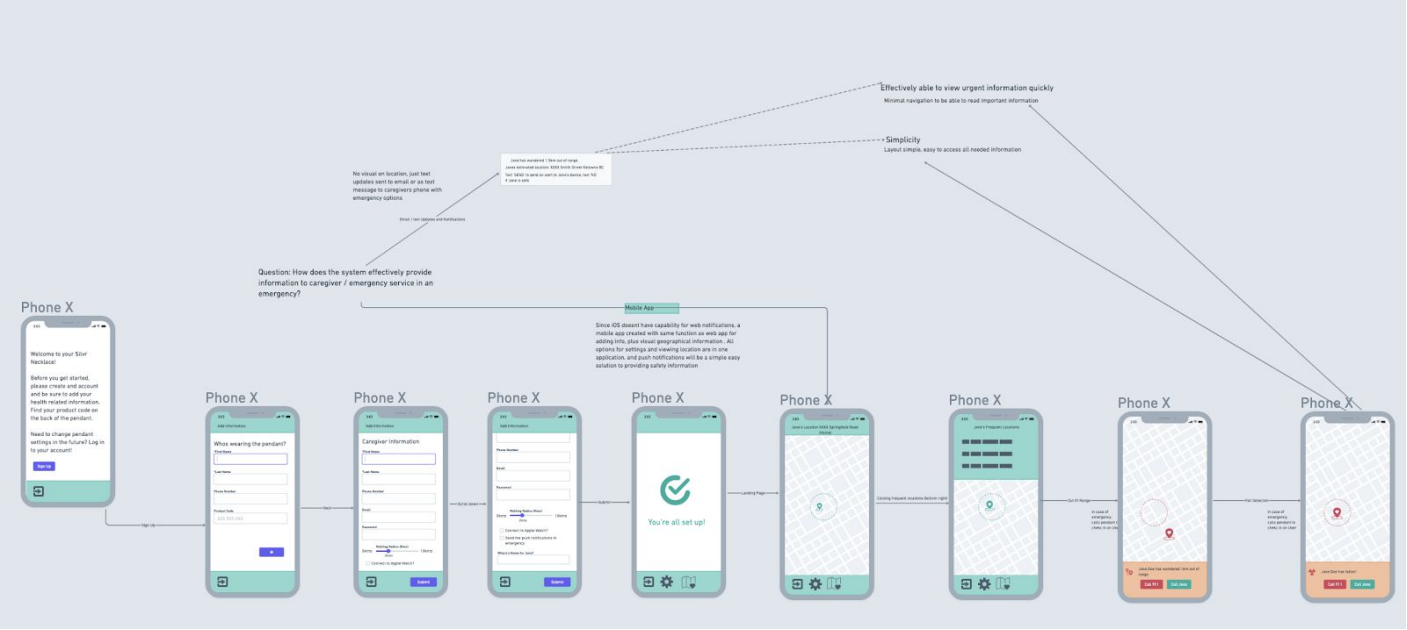
Three options came to mind when creating the system that users have to enter their information and customize their settings. First and most logical solution was to build a web app that can be accessed if the user has internet connection, from their browser. This is a great solution for simplicity - most seniors using this system are not going to have access to a mobile device or prefer not to carry one, so having a system they can access from the internet is a good solution. When it comes to the caregivers, they might want something more convenient to use on their mobile devices - which is where the second solution- a mobile application comes in. This solution is great for caregivers with access to a mobile device and provides more flexibility and convenience for efficient updating and monitoring. Although because a mobile app requires downloading and is more complex for a user to learn, this solution only seems viable for a caregiver to manage. The third solution is a combination of both, so the user and the caregiver can use the system as they please. The two user roles, caregiver vs pendant user will have different updating privileges and provides a solution that both users can efficiently use based on preference. I have chosen

to design the third solution and create a simple mobile application that is built into the monitoring system. The web app will be created as the same style but can be accessed without having to download or have access to a mobile device.

4.1.8. Analysis Question #3

- How does the system effectively provide information to caregiver?

Solution: Mobile app with push notifications



4.1.8.0.1. QOC diagram for “How does the system effectively provide information to the caregiver / emergency service in an emergency?”

4.1.9. Rationale:

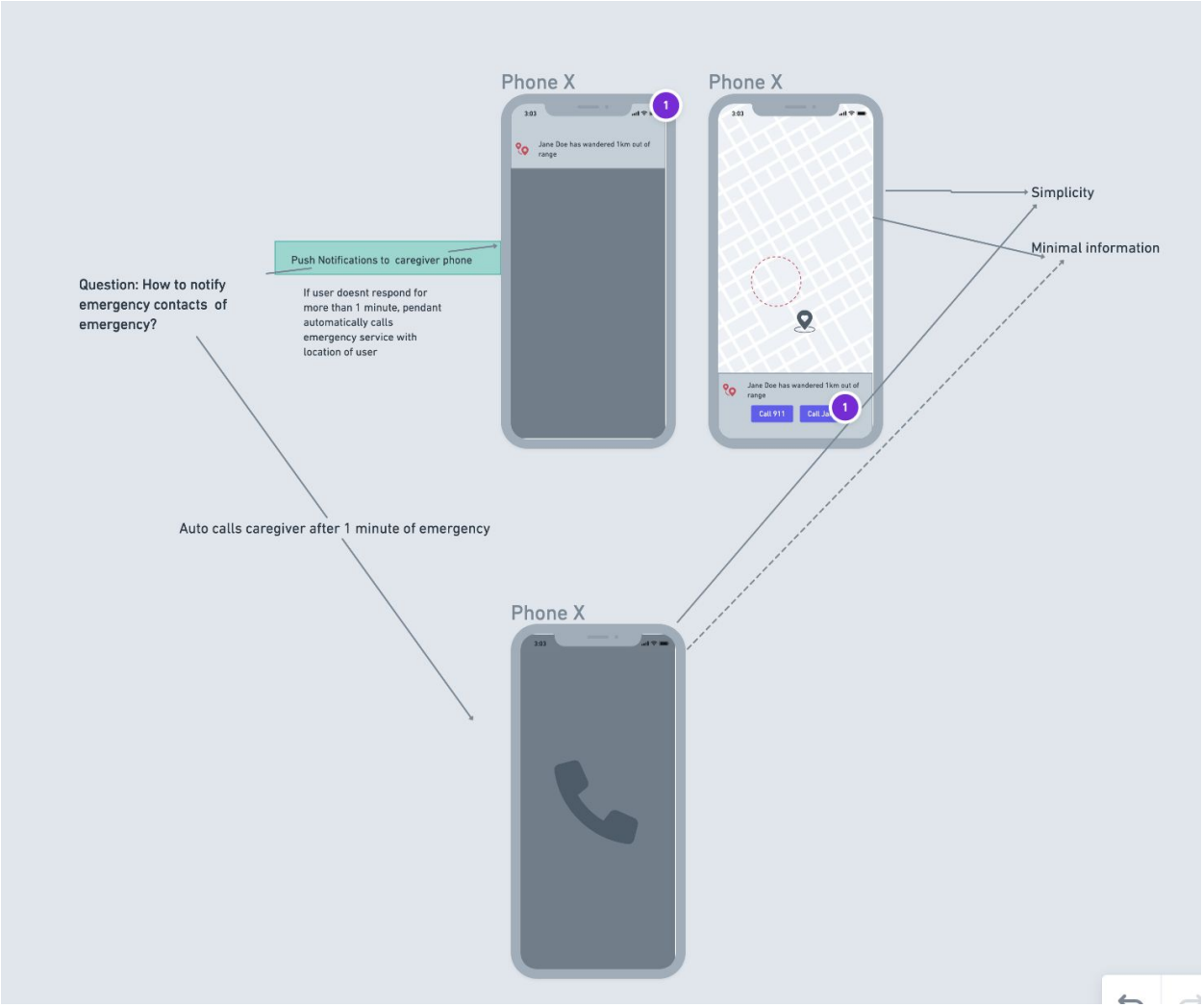
Two options were considered for the problem of providing the monitoring information to the caregiver. The first option was to email updates and information to the caregiver. Providing emergency information and options via email means there would be no visual information for the caregiver to view, all information would be provided in copy. Although this would be a simple solution, the caregiver wouldn’t be able to effectively view this important information quickly and requires some navigation to get to the full information. The second option was to build this information into a mobile application. This question is related and linked to providing notifications and hence a mobile app can directly send push notifications to their mobile device in case of emergencies. The mobile app is simplistic in

the fact that it provides visual information (geolocation and where they are within radius), and options on what to do in the specific emergency. This app would have compatibility of contacting the user via pendant or contacting emergency services, as well as monitoring their location, and viewing frequent locations they go to. This is the most viable solution to implement and this design was chosen as a consequence.

4.1.10. Analysis Question #4

- Related to question 3, how does the system notify caregivers of emergencies?

Solution: Auto calls and push notifications



4.1.10.0.1. QOC diagram for “How to notify emergency contacts of emergency?”

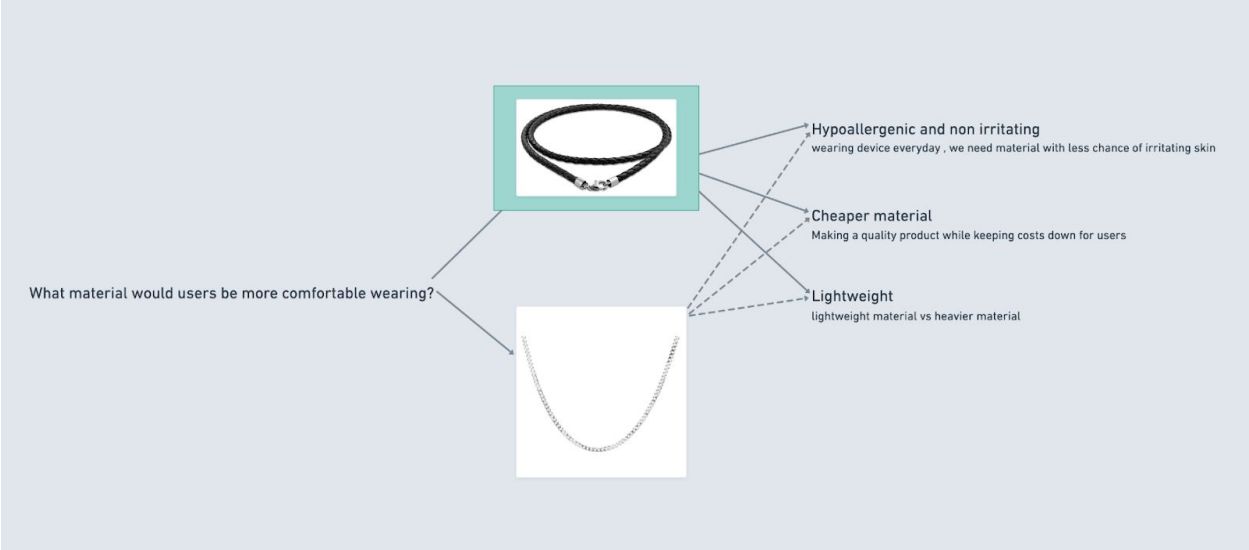
4.1.11. Rationale:

I designed question threes’ solution before I came to this question, so my obvious solution was to immediately send push notifications to their mobile device when creating the app. The other solution would have been to have the pendant auto call either the caregiver or emergency services in emergencies. The problem with the auto calls is that the caregiver is given minimal information about the given emergency. The best solution is push notifications , and when clicked navigates to the app - giving geolocation information and emergency call options. As a happy medium , I implemented a feature that auto calls emergency services if the user doesn’t respond, and caregiver doesn’t provide action to the push notification after 1 minute.

4.1.12. Analysis Question #5

- What materials would users be more comfortable wearing?

Solution: Leather Strap



4.1.12.0.1. QOC diagram for “What materials would users be more comfortable wearing?”

4.1.13. Rationale:

Something that I had trouble designing was the material to be used that the user could comfortably wear while still providing an affordable solution as a whole. Titanium chain was my immediate thought in designing the product, as it is hypoallergenic but titanium lacks affordability as the labour costs can make titanium cost as much as white gold material. With this in mind, my second solution is to make use of leather straps. Leather is

hypoallergenic and less irritating than metal material, and cheaper to produce. Lightweight as to apply the least pressure on the neck, leather was chosen as the necklace material.

4.2. Landline Telephone QOC Analysis

4.2.1. Design

According to the U.S. Task Force on Research and Development for Technology to Support Aging Adults, there were 50 million reported cases of dementia in 2017. To cater to the needs of seniors with dementia within nursing homes, specifically identifying the need for social connectedness and combating loneliness for the senior population that may be living in residential care. This design consists of a landline telephone with a traditional receiver, and a modern touch screen interface in which users can interact with. The main features of this prototype that look to solve some of these needs are

- voice commands to give system instructions
- image based phone system instead of a numeric keypad
- an emergency 911 button outside of the touch screen interface
- the ability to save important calls to reference later
- ability to 'favourite' a contact to auto save their calls
- closed captions for hearing impaired users
- technical support / tutorial videos for users who may be struggling to use the system

4.2.1.0.1. Physical mockup of landline telephone

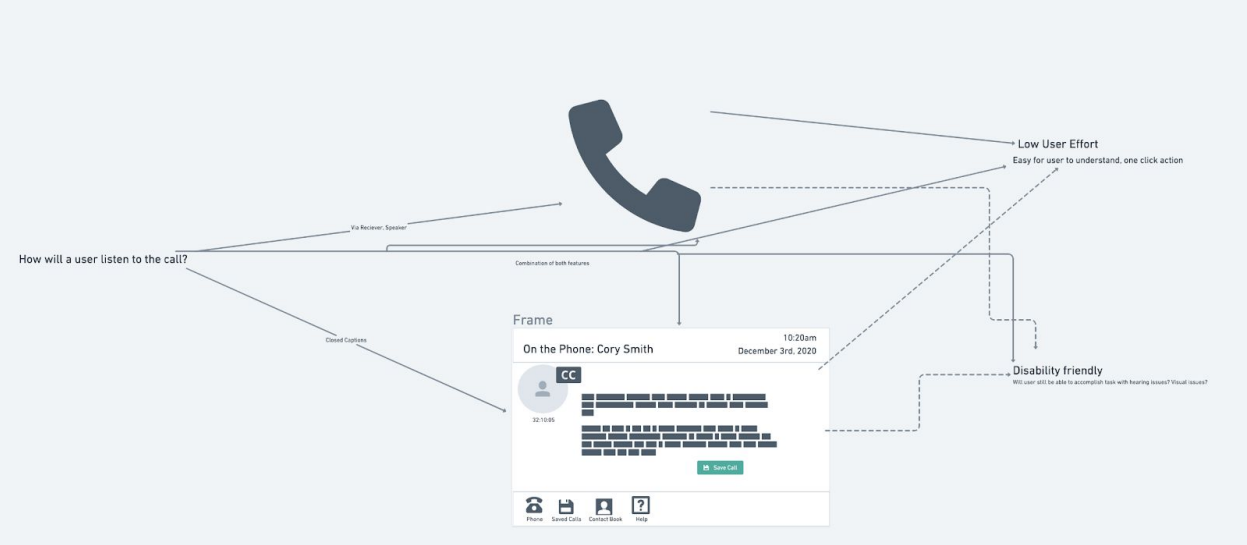
4.2.2. Design Problems

- How will a user reference a past call?
- How will a user delete a contact?
- How will you choose a number to call?
- How will a user listen to a call?

4.2.3. Question #1

- How will a user listen to a call?

4.2.4. Solution: Traditional receiver, speaker phone and closed captions



4.2.4.0.1. QOC diagram for “How will a user listen to a call?”

4.2.5. Rationale

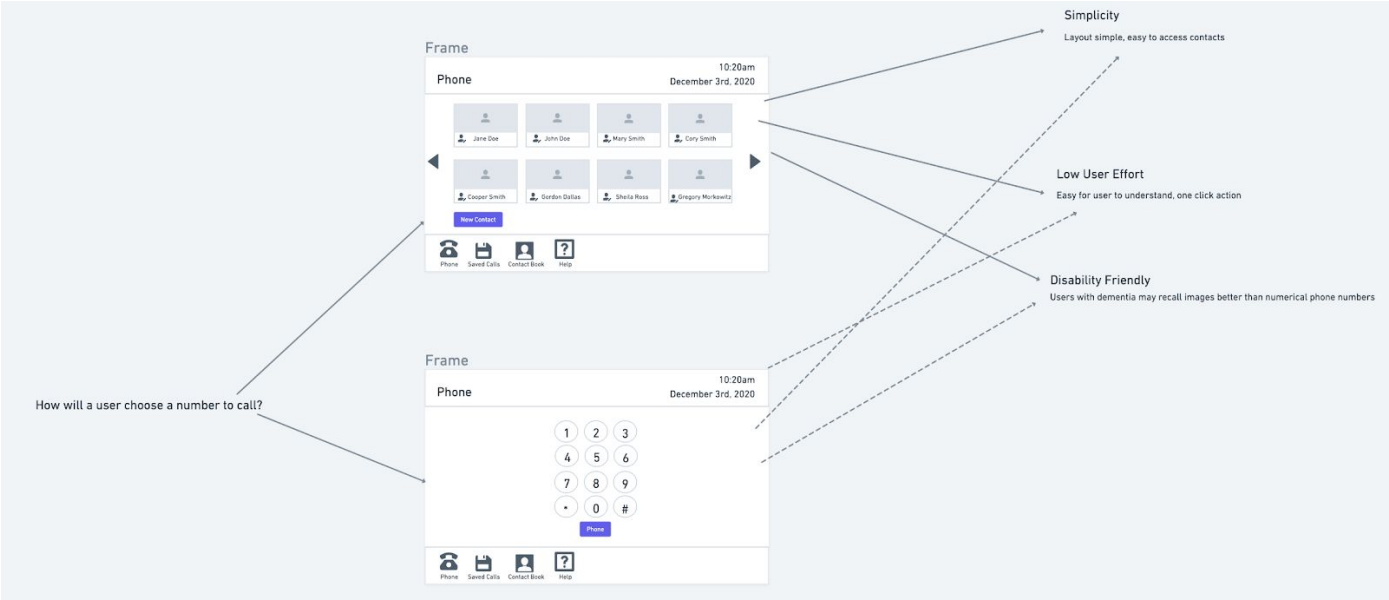
The first design option includes a traditional receiver and a speaker for recognition, low user effort to learn.This design has a couple caveats, including not designing for users with various disabilities. Users that are hard of hearing will find this solution unusable at times and wont be able to accomplish the task of listening to their calls as easily. As a solution to this problem, a closed caption interface where users can read the conversations coming in as well as listen to them through speaker or receiver, accounts for users with hearing or visual disabilities . This provides the user an easy to understand solution that is user friendly.

4.2.6. Question #2

- How will the user choose a number to call?

Fig. 2 QOC Diagram for “How will a user choose a number to call?”

4.2.7. Solution: Top Wireframe - Image based calling system



4.2.7.0.1. QOC diagram for “How will a user choose a number to call?”

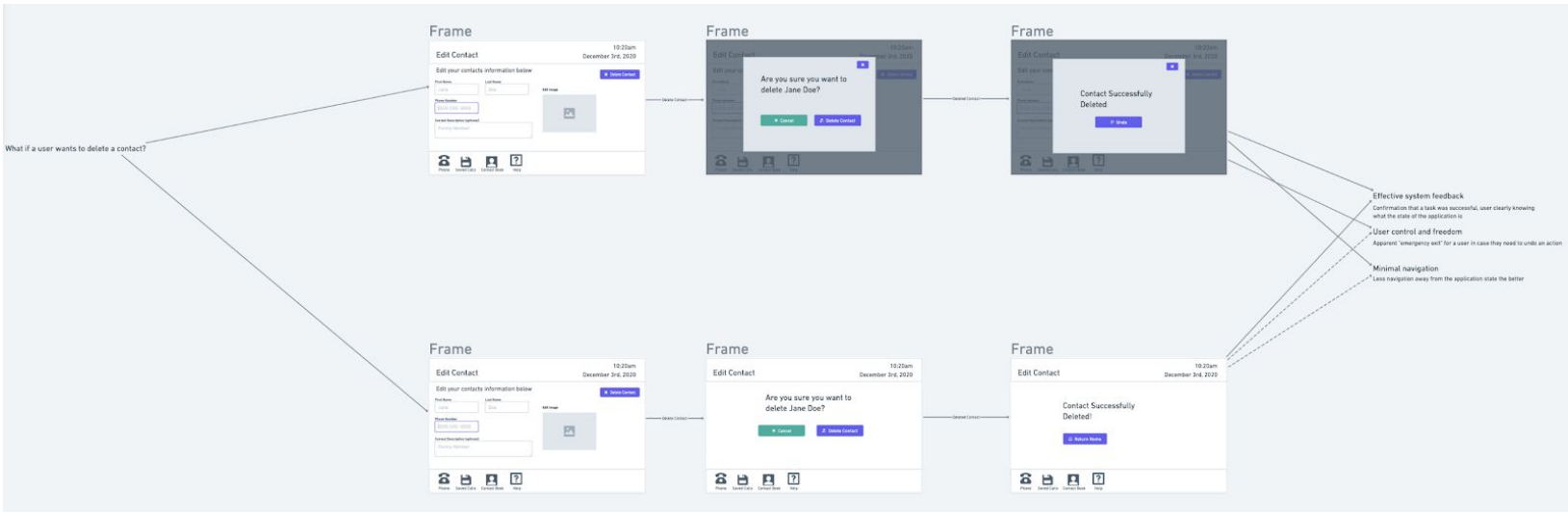
4.2.8. Rationale

I am designing a landline phone for seniors with dementia, so the major design dilemma would be deciding how to design a system to make it easy for the user to call and connect to their family members and peers. Dementia patients often have troubles remembering phone numbers and names. A numeric keypad interface is an option, but this would cause unneeded stress and issues for users. The next option and my final solution was to build a ‘contact’ book that is visually focused so users can recall faces rather than names or numbers (which is proven to be more effective in users with dementia). This interface would be simplistic, easy for users to use as on click/touch will provide the user access to call the person of interest. This solution will include voice activated commands if the user prefers to vocalize instruction

4.2.9. Question #3

- How will a user delete a contact?

4.2.10. Solution: Top wireframe - modal action with undo button and feedback



4.2.10.0.1. QOC diagram for “What if a user wants to delete a contact?”

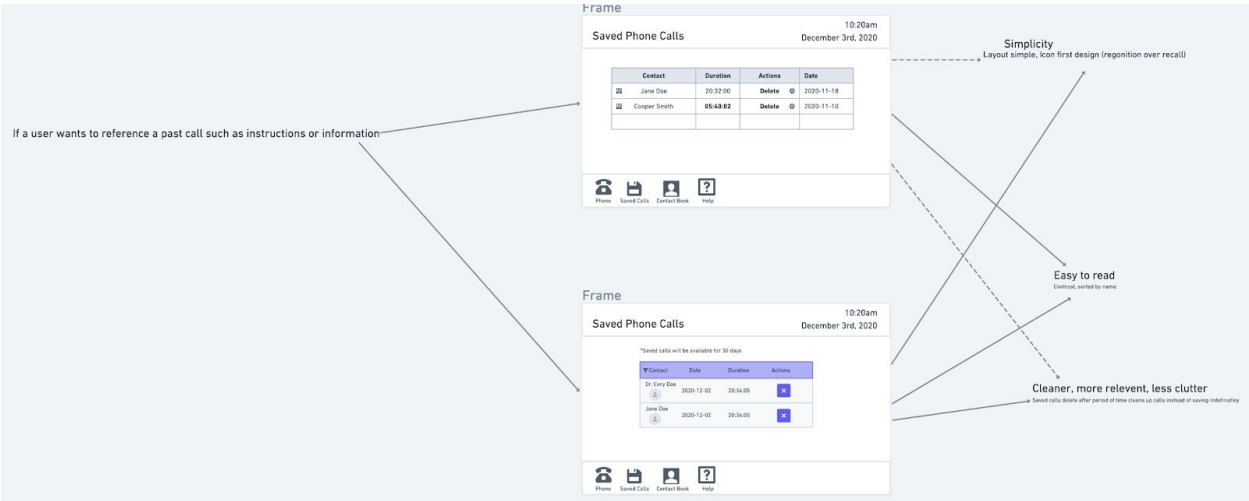
4.2.11. Rationale

Referencing some of Jakob Nielsons 10 usability heuristics, system feedback and user control and freedom were at the top of my design logic. Designing to provide users confirmation that they have successfully deleted a contact and an emergency exit in case deleting a contact wasn’t their intention. The first design (bottom wireframe) included system feedback but was lacking an emergency exit (undo button) providing users more control. This design also lacked easy navigation, as instead of a modal it was designed as navigating to a new page. My final solution was a redesign - instead of navigating away from the page, a modal pop up is implemented and when a user deletes, they have system feedback on the same modal with an undo button. This design provides a solution to the navigation issue, user control and freedom, and finally provides efficient feedback to the user indicating successful deletion.

4.2.12. Question #2

- How will a user reference instructions or information within a past call?

4.2.13. Solution: Bottom Wireframe- Icon-first design sorted by name rather than date



4.2.13.0.1. QOC Diagram for “If a user wants to reference a call such as instructions or information”

4.2.14. Rationale

My first design was a simple table (top wireframes) that sorted calls by date with the option to delete the saved call. Although a simple solution, this solution was lacking consistency with the visual focused interface I was trying to accomplish. As mentioned earlier, users remember visual faces more than they remember names, and this also goes for the use of icons over words for button designs. I needed a solution that addressed these issues within the first design as well as something that was easier to read and a cleaner aesthetic. I have decided to implement the bottom wireframe design with the added contact image, sorted by name as a name is probably more important when looking for a call than the date the call actually came in. For example, if the user got a call from their doctor a month ago and needed information from that call, they would have more success looking for their doctor's name rather than the date. The next issue this solution addresses is the icon-first button design on the delete button. Users have an easier time recalling icons and their meaning than using words.

4.3. Wayfinding Mobile Application QOC Analysis

4.3.1. Design

Independence took the top spot in functional abilities that were most important to older populations (Emerging Technologies to Support an Aging Population, 2019). Some seniors may also have mobility issues that challenge this need for independence. Taking these variables into account, I designed a wayfinding mobile application to help maintain independence in older adults who suffer from physical disabilities / mobility issues. The main features on this application include

- Ability to input accessibility information on locations
- Uber-like rating system for locations
- High contrast path information indicating accessible routes vs non accessible routes
- Text-to-speech directions
- Wheelchair or walking direction mode
- Emergency options in case user cannot safely access location / gets lost

4.3.2. Problem

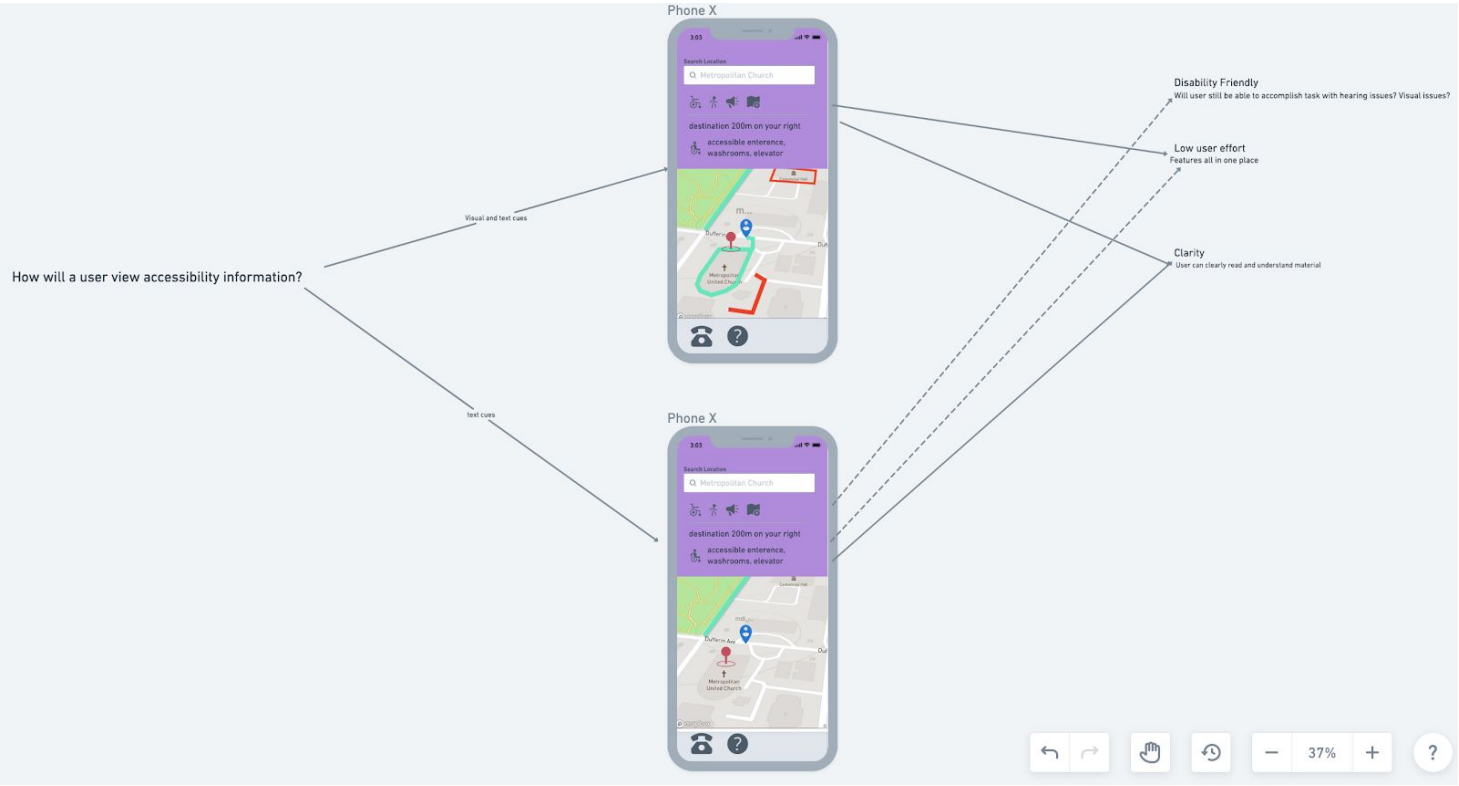
Wayfinding for seniors with a physical disability. How to design a system for users to navigate their way around town, keeping their independence and finding their best route to their destination.

- How will a user view accessibility information?
- How will a user recall they're at the right destination?
- If a user is lost or cannot access a location, what steps can they take to successfully arrive at their destination?
- How will a user add information about locations?

4.3.3. Question #1

- How will a user view accessibility information?

4.3.4. Solution: High contrast directions indicating safe and accessible routes for user



4.3.4.0.1. QOC diagram for “How will a user view accessibility information?”

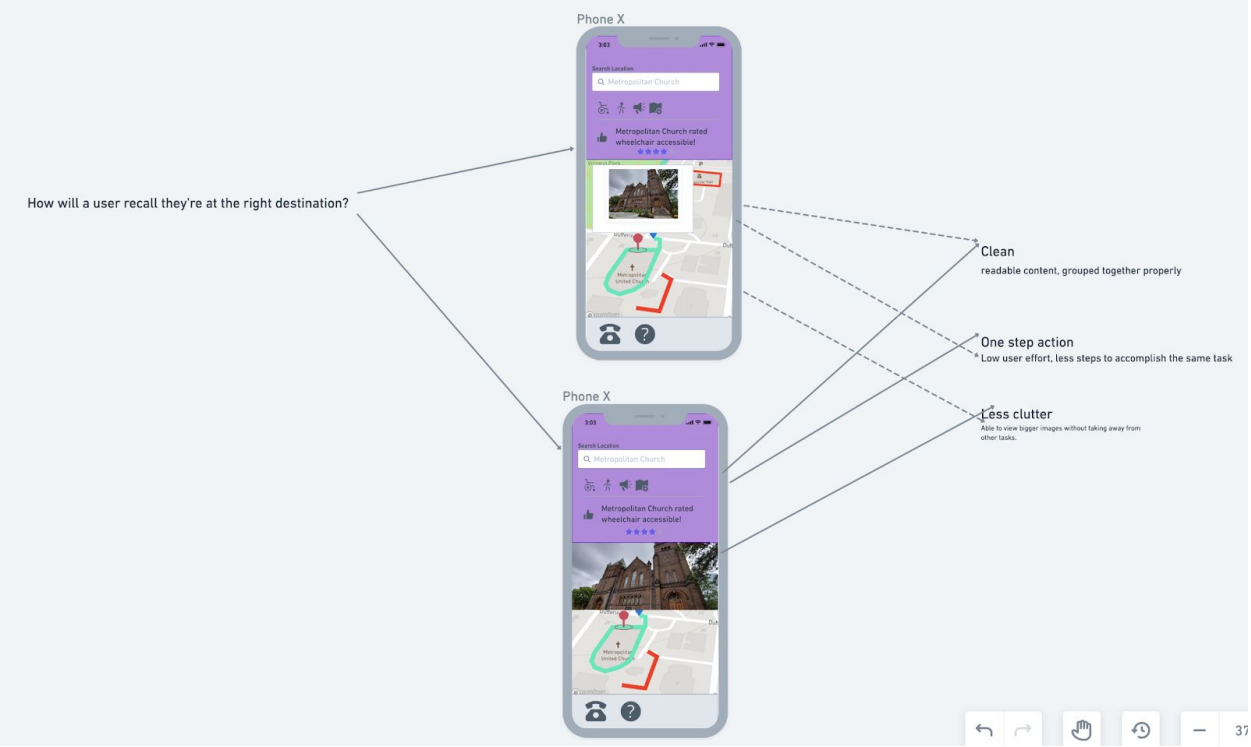
4.3.5. Rationale

Designing a wayfinding system for users with disabilities to use in order to get them safely to their destination requires a lot of variables. The problems I chose to address in this design was first if the user could successfully accomplish the task with visual or hearing disabilities. Providing text-to-speech information is a must for this application. The first option provides a one way directional interface with text to speech (bottom wireframe). Although this is a good solution for people with visual disabilities, this doesn’t address the ease of use within the actual wayfinding map. The final design option (top wireframe) includes contrasting coloured routes indicating which areas of your route wouldn't be disability accessible and which routes would be. With this solution, users can clearly see what routes they need to take in order to arrive without accessibility issues.

4.3.6. Question #2

- How will a user recall they're at the right destination?

4.3.7. Solution: Full width image information



4.3.7.0.1. QOC diagram for “How will a user recall they’re at the right destination?”

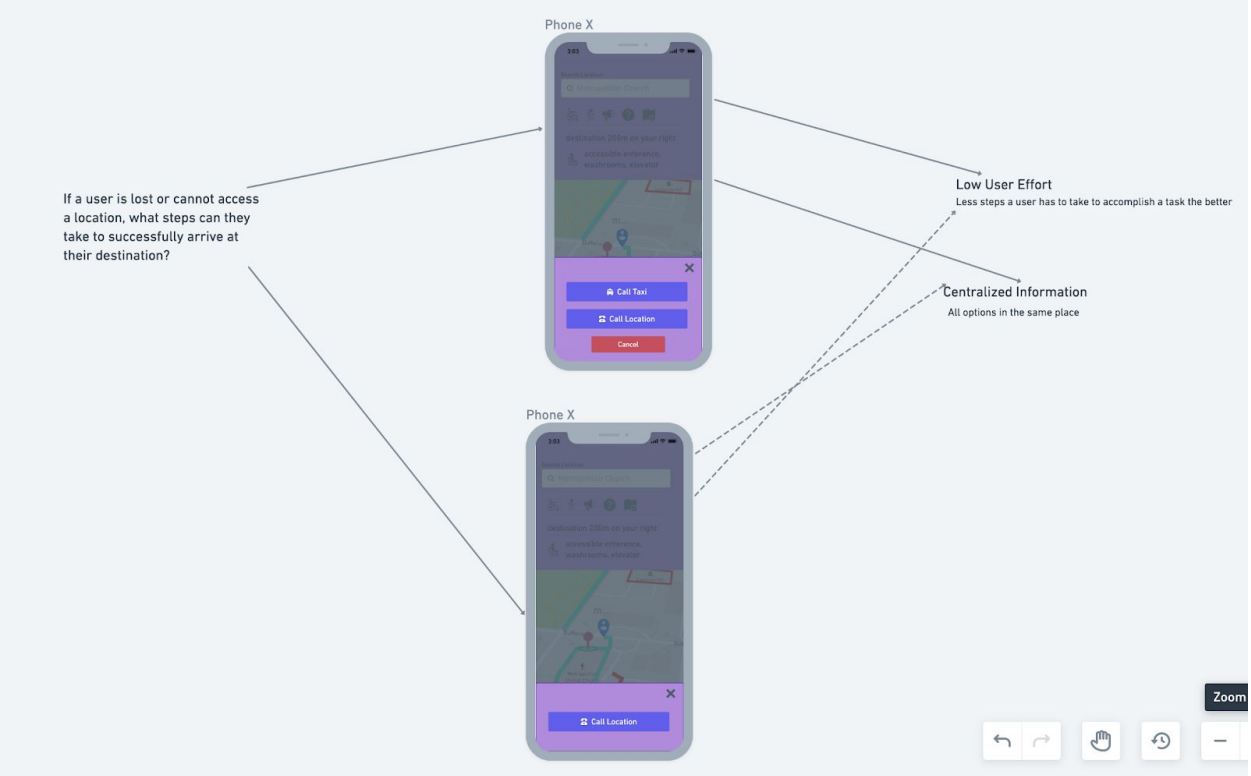
4.3.8. Rationale

A potential design problem for me was the fact that the user might not know whether they were at the right destination when they arrive. A solution to this problem could be to provide an image of the location so they can reference it and compare it to where they are. One option was to tap on the pin and provide a small info window with the image inside. The problem with this is it isn’t intuitive and requires the user to learn that this is the action to take to accomplish this task. Another issue is it makes the wayfinding interface cluttered and unappealing. The final option and the solution I chose was to provide a full width image in the same location as the directions. If they want to get rid of the picture, they just swipe up to ‘hide’ the image. This solves the aesthetics issue by providing the information in the same place as the rest of the location information. The full width image allows for a larger picture and a cleaner look, and the location and actions are more intuitive to use.

4.3.9. Question #3

- If a user is lost or cannot access a location, what steps can they take to successfully arrive at their destination?

4.3.10. Solution: Call taxi and call location buttons



4.3.10.0.1. QOC diagram for “If a user is lost or cannot access a location, what steps can they take to successfully arrive at their destination?”

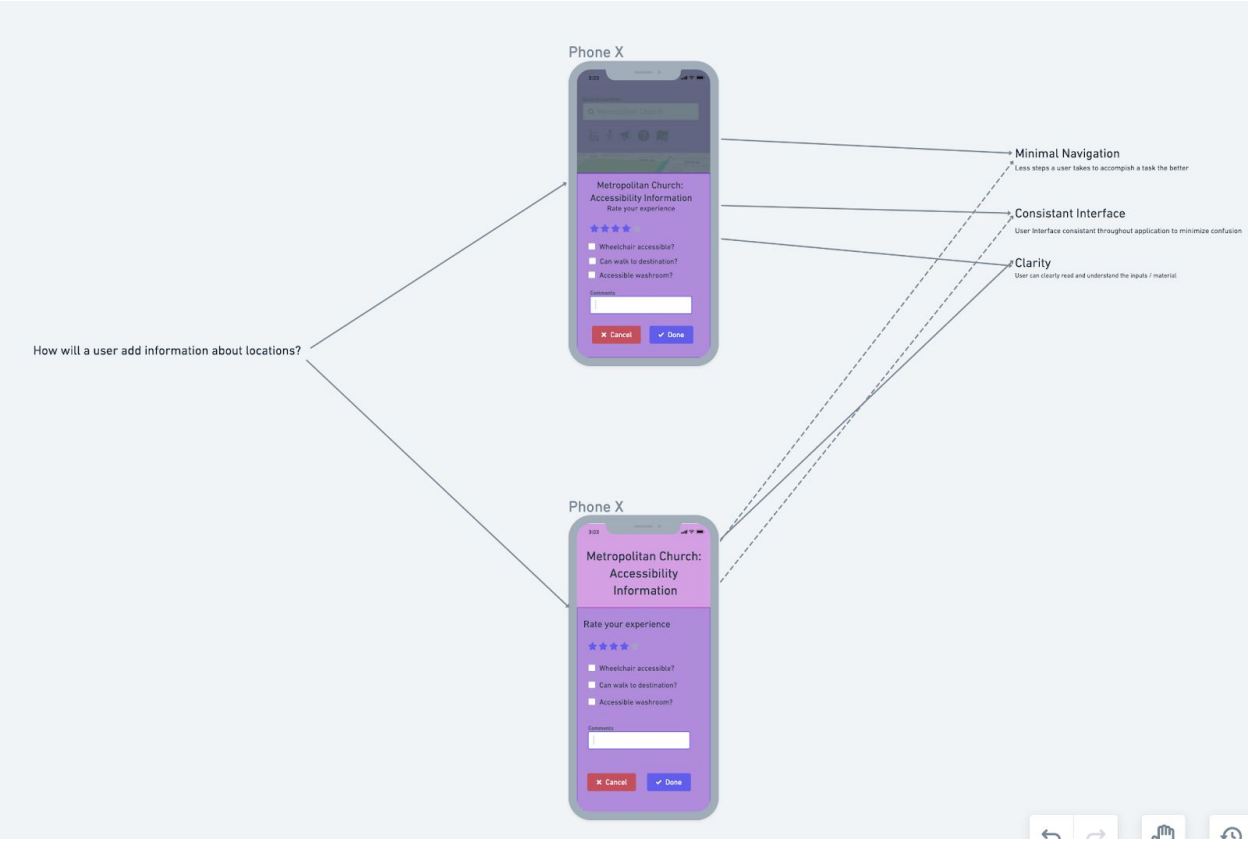
4.3.11. Rationale

My two designs to address this question included the need to call the location to confirm information. The first design only included this option, and didn’t account for any other possible solutions if the user was lost. If in the case of the user getting lost, the user has to navigate away from the app and decide what to do or who to call for help. I decided my final solution would be to add a call taxi button in addition to calling the location that calls the nearest taxi service for the user, allowing the user to stay in-app while providing the user the help they may need- this information is all in one place.

4.3.12. Question #4

- How will a user add information about locations?

4.3.13. Solution: Modal to input information (top wireframe)



4.3.13.0.1. QOC diagram for “How will a user add information about a location?”

4.3.14. Rationale

My two designs consisted of a form page, and a modal page. The easiest solution that would provide minimal user navigation, and keeping consistent with the rest of the applications design was to provide a modal for the form input. The bottom wireframe would have been less user friendly than the modal, given a user has to navigate away from the page to accomplish a task that could have been a modal. On top of this, the full page form is not consistent with the rest of the actions within the app (as most actions I chose a modal design to provide information).

4.3.15. Aside: Future Outlook For Wayfinding App

A feature that I would have liked to add to my prototype would have been an ‘AR street mode’ in which the map could switch to an AR version with the contrast routes and directions within the AR view.