Project Deliverable C: Conceptual Design, Project Plan, and Feasibility Study

GNG2101 [A03] – Professor Hanan Anis

Submitted by:

Team A2

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1 Introduction

In this document, Team 2 establishes the numerous objectives that are set to be completed. To work efficiently the group has assigned each individual team member with tasks that best suit their skills. A project plan was set out to ensure that every task is completed by the set deadline. The group had submitted each of their conceptual designs that were analyzed to find the advantages and drawbacks of each design. With each design in mind a common trend was spotted to help roughly design the prototype, leading to 3 final conceptual designs. The final design was chosen with respect to their problem statement and the client's needs.

2 Conceptual Designs

Team 2 formulated the flowchart depicted in **Figure 1**. The flowchart represents a functional decomposition of a device that has been based off of the needs listed in Deliverable B. This created a basis upon which the team, then, brainstormed various concepts and ideas. Creating a functional decomposition of the device allowed them to better understand the purpose and goal of the device.
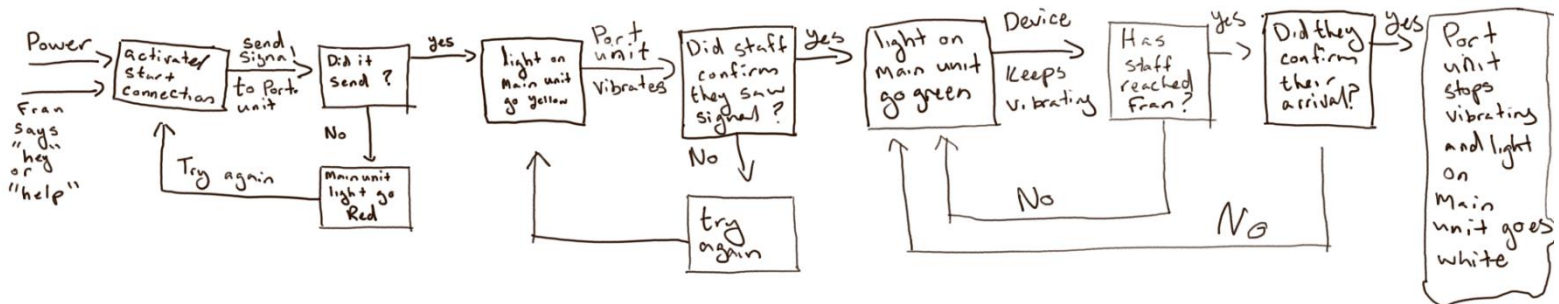
Figure 1: Functional Decomposition

2.1 Brainstorming

Next, the team set out to brainstorm as many concepts as possible, in order to ensure all possibilities were taken into account. And so, individually each member created the following concept ideas/drawings:

Ayesha's Ideas:

As seen in **Figure 2**, Ayesha came up with three ideas. All of her ideas consist of two units: a stationary, "Main Unit" and a portable, "Portable Unit".

The first of her concepts is as follows:

The main unit is wall mounted next to the client's bed. This unit has three main features; a light to indicate the status of the machine and portable device; a "confirmation" button, that the staff must press in order for the portable unit to stop buzzing; and an external microphone that can be mounted to the bed's head rest. Next, the portable unit is a small rectangular device that the staff will carry. This device also has three features: A light to indicate the devices status; the capability to vibrate when triggered by the main unit; and a clip for the staff to put on their body.

Her second concepts:

This set up is also very similar to concept 1, however, instead the main unit is not wall mounted but would need to be placed somewhere like a side table. The main unit, also, has a built-in microphone instead of an external one and receives the confirmation signal through a proximity sensor instead of a push of a button. The portable unit is the exact same as it was in concept 1, except now it does not include a side clip.

Her third and final concept:

Her final concept is unique with respect to notification method. The main unit is the exact same as the second concept except now it is mounted on the client's bed frame. This main unit, however, also include ceiling lights to notify Fran, instead of built-in ones. The purpose of these lights is to ensure that Fran is always able to view the indicator. The portable device is the same as the first concept.
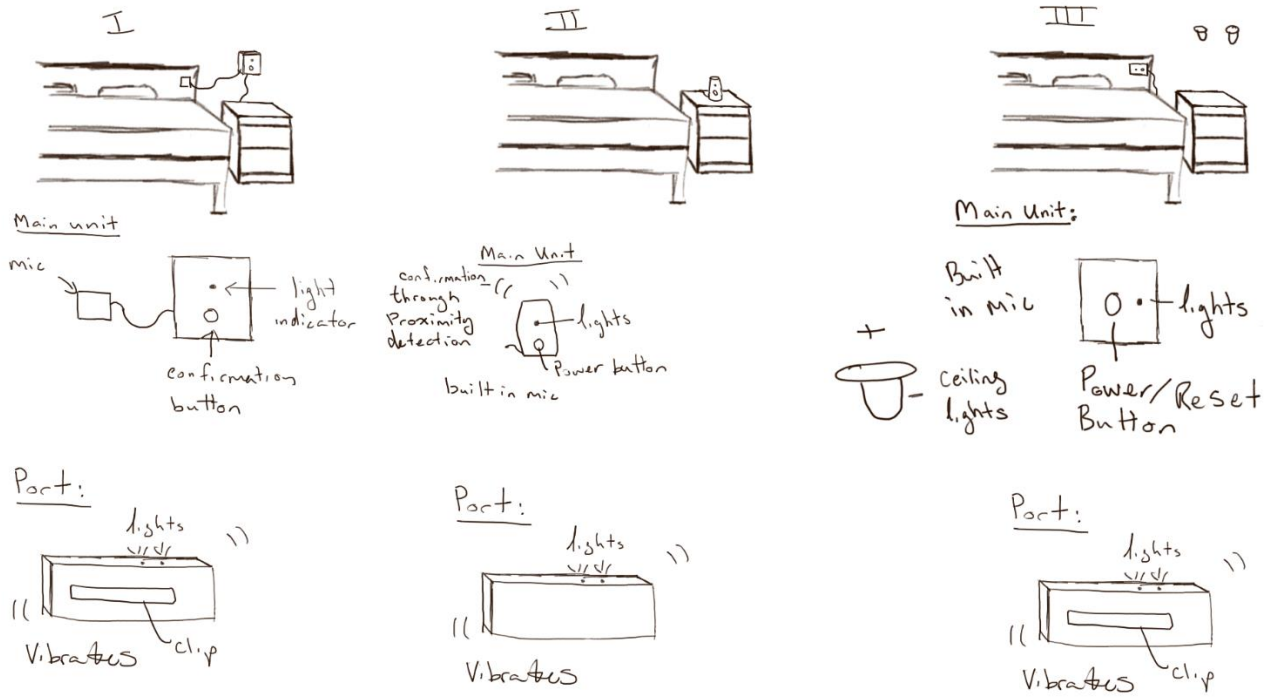
Figure 2: Ayesha's Concepts

Alessandro's Concepts:
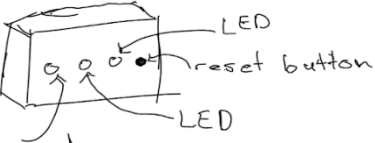
As seen in **Figure 3 – 5**, Alessandro's three concepts also consist of two units: a stationary, 'Main Unit' and a portable, 'Portable Unit'.

His first concept:

The main unit in this concept is wall mounted above Fran's Bed. This unit will be powered through an outlet, house a microphone, 2 LEDs and a reset button. One of the LEDs will be used to indicate that the device heard Fran calling for help and other will indicate whether or not the device is connected to the internet. The reset button will be pressed by the staff when they have assisted Fran and it will stop the secondary unit from vibrating. The secondary unit will vibrate when the microphone in the main unit picks up Fran saying, "help." The secondary (portable) unit will have a power button, and an LED. The LED indicates that the device is functioning properly. This device will be battery powered.

Main Unit:
- Wall mounted

LED
reset button
LED
microphone

-1 LED is to indicate the device heard
Fran the other is to indicate if
the device is connected to wifi
plugged into wall
reset button is to pressed by
staff when they assist Fran
and will stop the vibrating of the
portable unit

Portable Unit:
LED
power button

- will vibrate in order
to notify staff
- LED will indicate if the
device is charged
- Battery powered

Figure 3: Alessandro's First Concept

His second concept:

This concept consists of a main unit that will sit on Fran's dresser that is located near her bed. This unit will house a microphone, an LED, and a reset button. The unit will be plugged into the wall. The LED will be used to indicate that the device heard Fran calling for help. The secondary unit will be mounted in the kitchen and function similarly to a doorbell, chiming periodically until the reset button on the main unit has been pressed. The secondary unit will also have an LED to indicate that it is functioning properly. It will be powered by a wall outlet.

Main Unit:
- Sits on dresser located near Fran's bed

mic   LED   reset
                button
                          - LED will indicate
                            that the device
                            heard Fran
                          - battery powered
                          - reset button is to pressed by
                            staff when they assist Fran
                            and will stop the vibrating of the
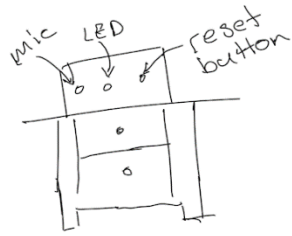   portable unit

2nd Unit:
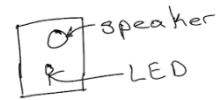
                    speaker
                  LED

- speaker will chime
  like a doorbell when
  mic picks up Fran's voice
- LED will indicate that
  the device is active
- wall mounted
- plugged in
- located in kitchen

Figure 4: Alessandro's Second Concept

His third and final concept:

The main unit in this system will be mounted to the ceiling of Fran's room, it will house a microphone, and 2 LEDs. This device will be battery powered. One of the LEDs will indicate the device has power, the other will indicate if whether or not Fran was heard by the device. The secondary unit will be a similar in size to a phone and will chime when the microphone in Fran's room picks up her voice. It will have a reset button in order to stop the chime, in the event the staff is helping another person. These devices will use Sim cards in order to communicate.

Main Unit:
- located on celling

mic   o   o   LED

           LED
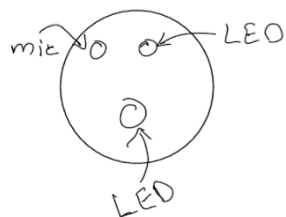
- LED to indicate that
  Fran was heard the other
  is to indicate that the
  device is active
- battery powered
- works using sim card

Portable Unit

reset
button

- chimes in order to notify
  the staff
- the reset button stops the chime
- battery powered
- uses sim card
- charges using wireless charging

Figure 5: Alessandro's Third Concept

As seen in **Figure 6**, Aunonto's three concepts also consist of two units: a stationary, 'Main Unit' and a portable, 'Portable Unit' (receiver).

His first concept: Side Table Design

This design was made for the client's side table and is shaped like a tissue box. This design features a built-in microphone, a light to signal when the call has been sent and a built in Wi-Fi receiver to connect to the handheld receiver given to the staff. The handheld receiver is built in a rectangular box to minimize the use of extra equipment. The receiver has a built-in rumble pack to vibrate when a call has been received as well as an LED light to notify the workers. It uses a battery and can be charged with a micro USB charger. Its shape allows it to fit into one's pocket and as long as it is connected to Wi-Fi, it will receive the call anywhere.

His second concept: Wall Mount Design

This design is made to be wall mounted and plugged into an outlet. This design consists of two LED lights, one to notify that the call has been sent and the other is to notify Fran that help is coming. It is bigger in size to ensure durability as well as add room for a better microphone. The handheld receiver is designed in a curved shape similar to a TV remote. This allows it to fit in any pocket easily and to fit in one's hand comfortably. To have the smaller size, the rumble pack was taken out and replaced with an onscreen display saying "Help needed" whenever Fran requests for help. It also includes an LED light to notify when help is needed.

His third and final concept: PA System on Dresser

This design is made to be put on Fran's dresser and to be plugged into the wall. This design features a PA system similar to ones in schools and an off button which can be pressed by the staff to reset the system. This system is activated by the voice of Frans, with the trigger words of "help" or "hey". The receiver on the staff end is a plugged-in machine similar to the one on the dresser. This is to be

plugged into the common room for the staff. They can communicate to Fran to know exactly what she wants prior to coming into the room, leading to a more efficient use of the staff's time.
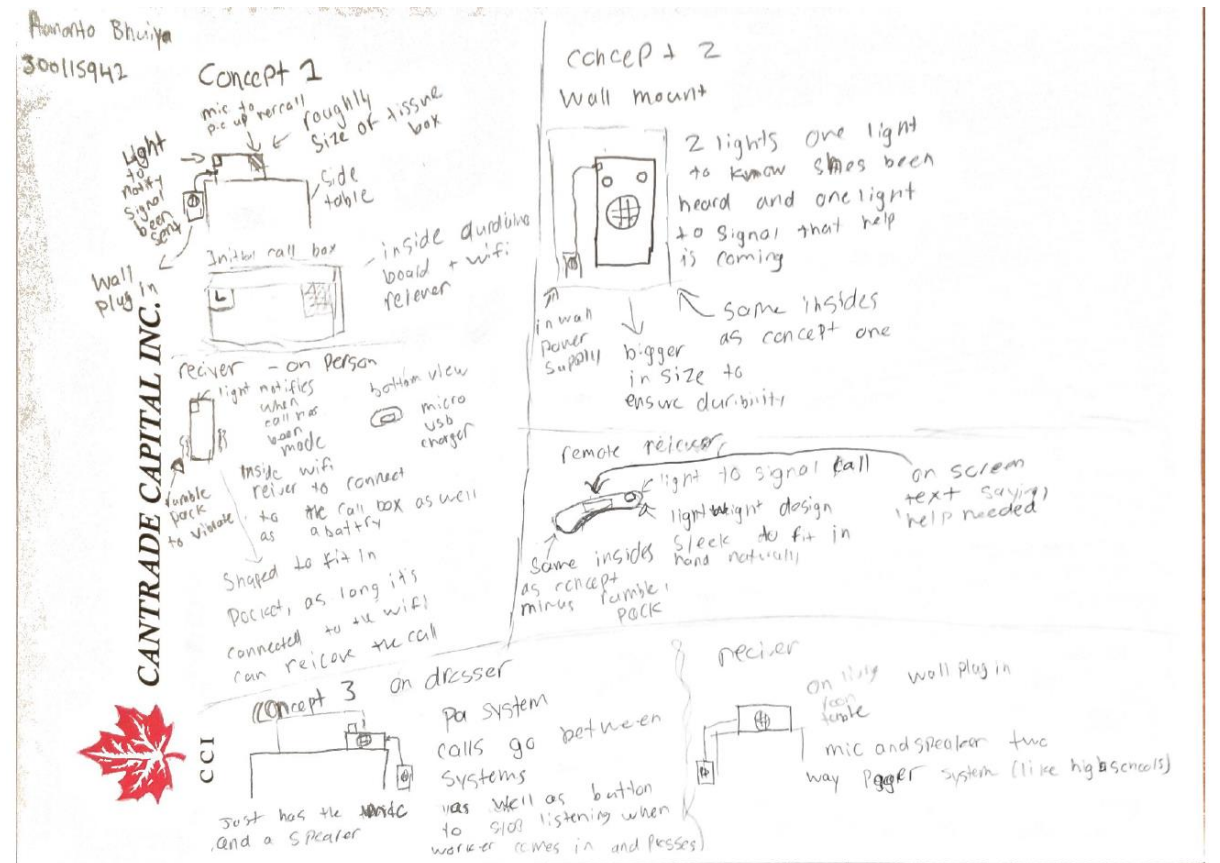
Figure 6: Aunonto's Concepts

Dieudonne's Concepts:

As seen in **Figure 7**, Dieudonne's three concepts did not follow the same scheme as the others:

His first concept:

This first design places emphasis on the portability and usage of the device. Both the staff and client device would be worn on the person to ensure the signal is heard. The client device would be worn similarly to a watch with 3 top facing indicator lights to acknowledge the user. The staff device would clip onto a belt or similar and would vibrate on signal. A reset button would be placed front facing as well.

His second concept:

The second design still keeps to the focus of ensuring the client is heard, while removing the wearability of the device. The client device would be placed on a nightstand and would use an extendable mic to clip onto the bed near the client. As for client acknowledgement, a sound (a beeping noise) would be used instead of the lights in the first design. The staff device would be worn around the neck but remain similar in build to the first design.

His third and final concept:

This concept revolves around a radio like machine that will sit beside Fran's bed. This device will house a microphone, speaker, 3 LEDs, and a button. When the microphone hears Fran saying help it will turn on the speaker which will play a chime. The first LED is used as a power indicator, the second is used to show Fran that the device has heard her, and the third is to signal that the device is now playing the chime. The volume button is pressed to turn off the chime when the staff assist Fran.

Figure 7: Dieudonne's Concepts

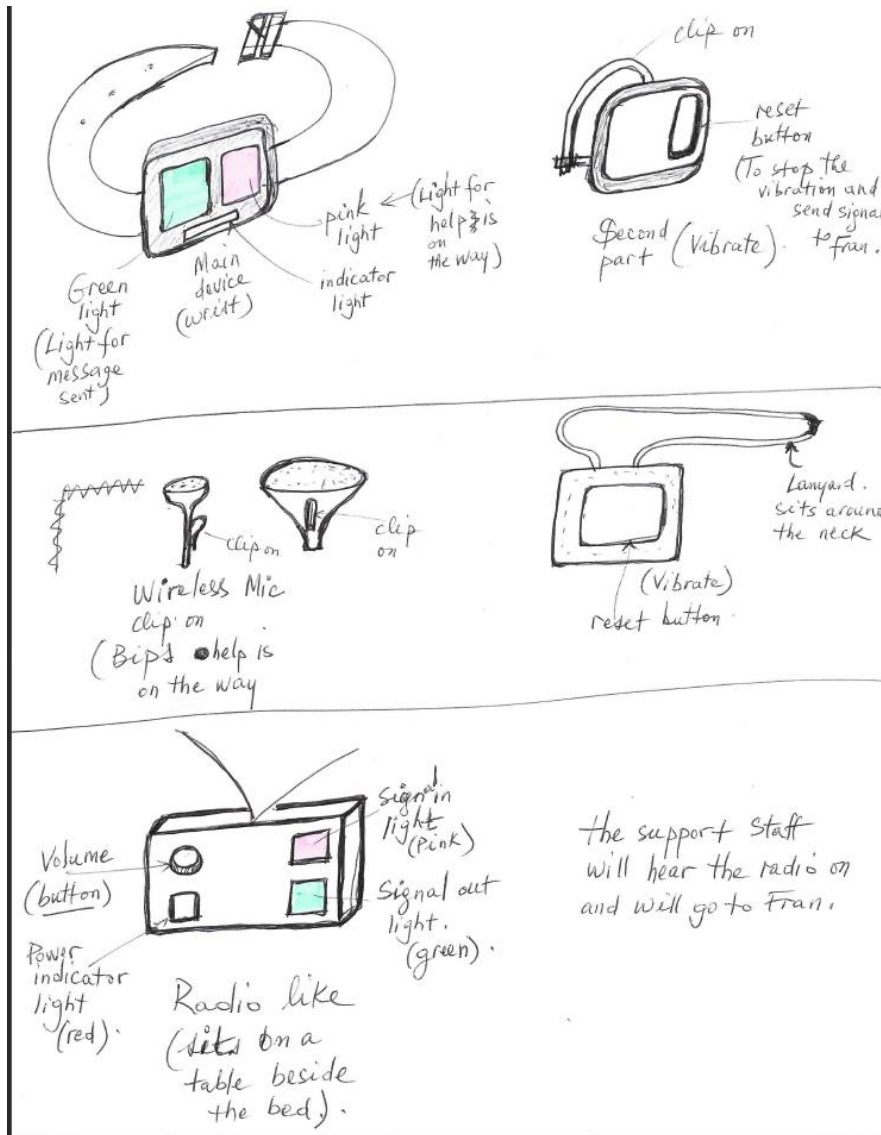## Ethan's Concepts:

As seen in **Figure 8**, Ethan's three concepts also consist of two units: a stationary, 'Main Unit' and a portable, 'Portable Unit'.

His first concept: Audio Focused Design

The focus of this design was to maximize the chances of our device successfully picking up the client's voice. Using a sloped face for the microphone allows for a larger audio device to be used for the

area given. This design also includes a simple and efficient design for the staff's device. Overall, the design includes the use of 2 lights, and 3 buttons and is the most complex of the 3.

His second concept: Build Efficiency Design

The focus of this design was to simplify our ability to create multiple devices at once. By keeping the staff and client devices to similar dimensions, multiple devices can be created at the same time using the same processes. To allow for this, the devices would use a smaller microcontroller (pi zero or other) so that the staff device would not be too large to wear. A detachable base mount could be included so that the staff device may be placed on a surface without falling over. As well, all modules, such as the buttons, are placed on the front of the device to help with the device's durability. Overall, this design is the medium between the complexity of the 3 designs.

His third and final concept: Simplified Research and Development Design

For this design, the focus was on ensuring that the device could be created in a timely manner whilst keeping the functionality. Both devices are box shaped to simplify the fabrication process. Other parts of the design, such as the clip, are more angular in shape making it easier to cut out of metal/3d print. The design also includes easier access to the internals of the devices for easier development and maintenance. Buttons and other modules are kept external to minimize the cuts required into the base structure. Overall, of the 3 designs, this one would be the simplest to create. However, it does lack the elegance and some of the functionalities of the other two designs.
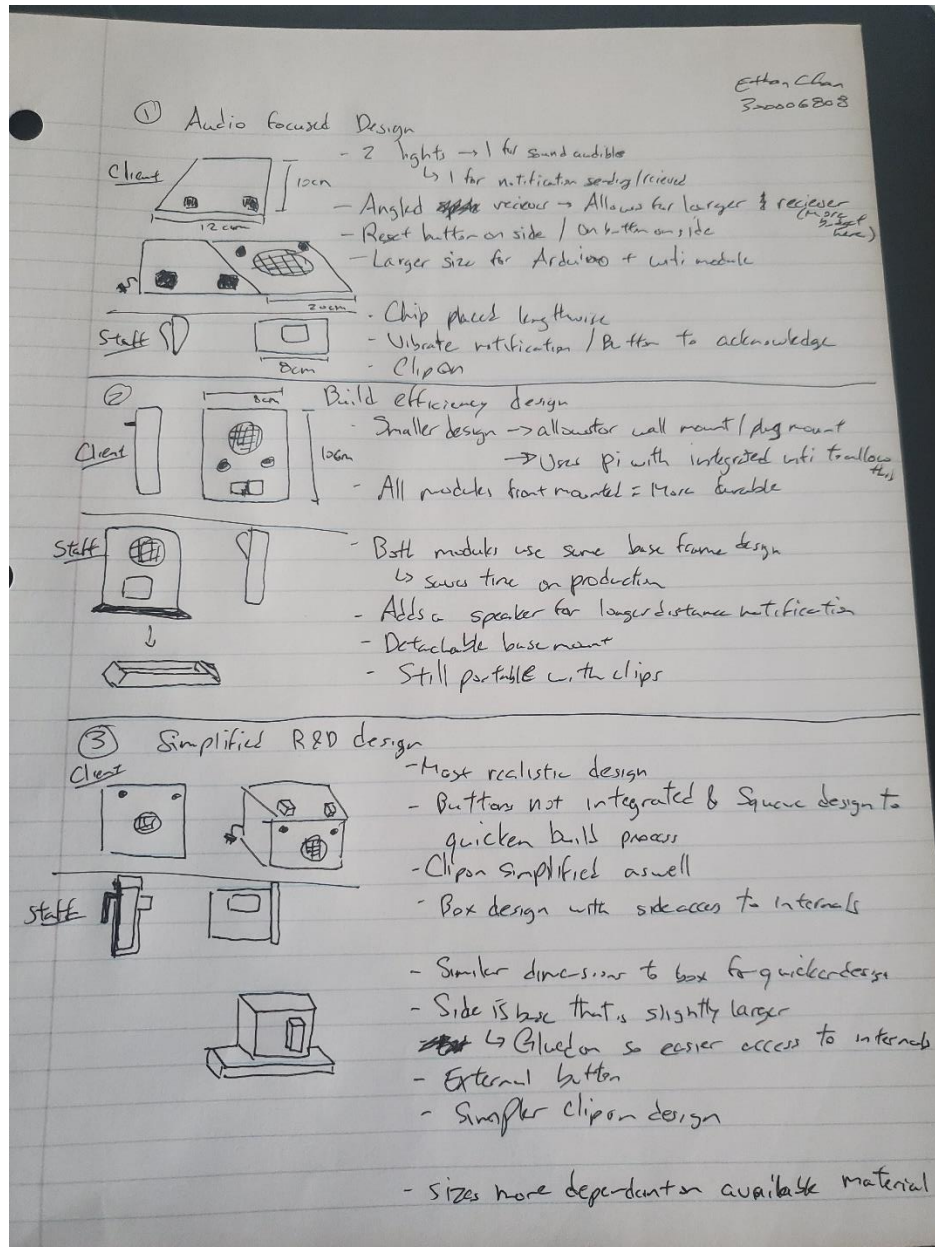
Figure 8: Ethan's Concepts

2.2. Final Conceptual Designs and Analysis

Team 2 analysed their conceptual designs and created the following 3 final concept designs. When

analysing the concept designs, they noticed the following trends and advantages:

I. Most designs consisted of 2 units: a main unit and a portable one.

II. The portable unit was always small and had the one or more of the following three notification modes: sound, vibration and light.

III. The main unit had some form of indicator that can be viewed from a bed.

IV. The main unit had some type of microphone.

V. The main unit was either mounted or on the side table.

Based on these trends and the needs expressed by the client, the following 3 concepts were curated:

Concept 1:

This concept (**Figure 9**) was found to be the best of the 3, it fulfills the needs listed by the client and the trends listed above. In this concept the main unit is on the side table and has 5 features: 3 small lights on the front to indicate the status of the machine; a power button; a larger rectangular "confirmation" button that the staff must press upon arrival; a large light on top to act as a indicator for Fran; and 2 options for microphone configuration. The large light will be a multicolour light to communicate the status of the signal and if help is on the way. The microphone can be built two ways: internally or externally. An external microphone will be closer to Fran and may pick up better audio, however, may get in the way. An internal microphone will not interfere with Fran; however, it may not reliably pick up her voice. Since, this depends on the volume of Fran's voice, the microphone configuration was left as an option that will require further investigation. The main unit is also powered through an outlet.

Next, the portable unit is a rectangular prism in shape and has the following 6 features: a "Ok" button on the top, to signify that the staff are on the way; 2 small lights to indicate the status of the portable unit; an indented reset button; a pocket clip; a hole for a lanyard; and a USB port for charging purposes. The purpose of the "Ok" button is that once Fran calls for help, the main unit sends a signal to the portable one and putting on a yellow light. The portable unit then starts to vibrate and once the staff push the button, the light on the main unit goes green informing Fran that help is on the way. Despite pushing the "Ok"

button, the portable unit will continue to vibrate until the staff come to the room and push the "Here" button. This entire process is to ensure that Fran is aware of if whether or not help is coming, at all times. The reset button in indented in order to ensure that the device does not accidently shut down, as this may be a safety concern for Fran, who is dependent on it. The pocket clip and lanyard hole are there in order to make the device as easy to carry as possible. The portable unit will run on a chargeable battery, communicate with the main unit over Wi-Fi and use vibration to notify its users. As per Fran's request, both devices will be hot pink in colour.
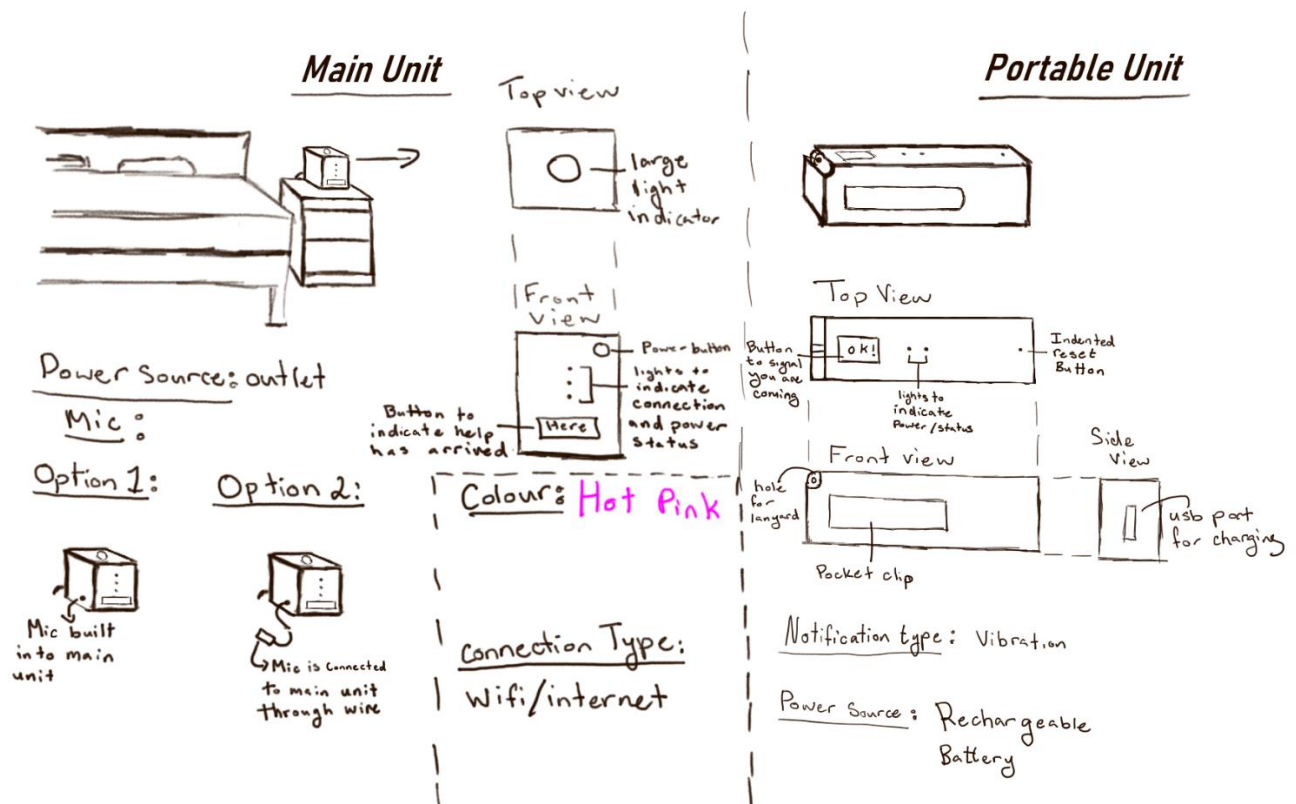
Figure 9: Final Concept 1

Concept 2

The second concept (**Figure 10**) also consists of a main and portable unit. The main unit functions very similarly to the main unit in the first concept. The only differences are that: the device is wall mounted; has an external microphone that is mounted to the bed frame; The large

light is placed in the front; and uses proximity sensors in order to verify if help has arrived, instead of a button. The portable unit is also very similar to the one in the first concept. This unit, however, does not include a pocket clip, lanyard, indented reset button, "Ok" button, and USB port. Instead it includes a basic power/reset button; a wrist band; and wireless charging. Furthermore, this device uses sound to notify its users instead of vibration. The biggest difference in functionality between this concept and the previous one is that there is no "Ok" button. The purpose of removing this function is to reduce the number of steps that the staff will have to take in order to run the device (as stated in the needs). Finally, the 2 units communicate with Bluetooth LE in comparison to internet. Again, both devices are hot pink.
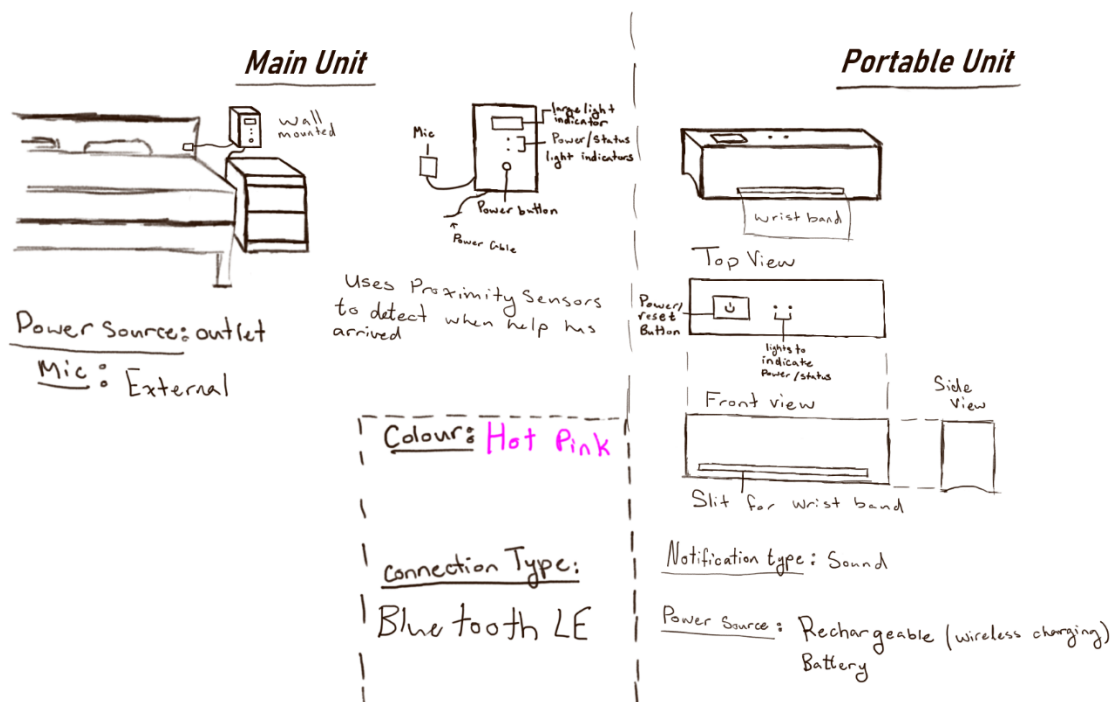
Figure 10: Final Concept 2

Concept 3:

The final concept (**Figure 11**) is a combination of the two concepts above. The main unit is a mount/side table hybrid, with a projector like device on the table that has a large indicator light and a built-in microphone. The wall mounted portion features 2 small lights to indicate the machines status, a power button. This is the most minimalist of the three concepts as the portable device in this concept is a store-bought pager. The idea is to make a main unit that can effectively communicate with a store-bought pager. This means that the notification types increase to sound, light (screen) and sound. The devices would communicate over the internet or through a SIM card. This concept was found to be the costliest due to the involvement of a third-party device.

Main Unit Front View

Wall mounted — Power/connection Status lights
— Power button

light indicator (multi-colour)

Power Source: outlet
Mic: in-built

Colour: Hot Pink

Connection Type: Wifi/internet or Sim

Portable Unit

Store bought Pager

Screen

In this case the main unit will be Made compatible with a store bought Pager.

This model has no Confirmation function

Notification type: Vibration, Sound, lights

Power Source: Rechargeable Battery

Figure 11: Final Concept 3

Of the three concepts Team 2 found that concept 1 fulfilled the needs the best due to its wide array of functionality and design. It offered the most while requiring the user to change the least.

3 Project Plan

The project plan remains relatively unchanged as we received no feedback from the TA who marked our Deliverable A. The changes that were made to the project plan were increased detail in the subtasks for prototype 1. It has now been broken down into Software and Hardware, each of which is broken down further into their own subsections. As well as, increased detail in the deliverables each of which has now been broken down into subtasks relating to what is necessary to complete in that deliverable. For example, prior to these changes Deliverable K had no subtasks associated with it now broken down into what the final presentation will be on. The tasks were also assigned to members based on their strengths and weaknesses, as well as their preferences. With this plan, Team 2 hopes to stay on schedule for their future deliverables and project development.

Please refer to the .mpp file and screenshots on the following pages for the Gantt chart.

Task	Duration	Start	Finish		Resource
Initiation					
PD A: Team Contract	5 days	Wed 20-09-09	Tue 20-09-15		Alessandro
Planning					
Setting Project Scope & Goals	4 days	Wed 20-09-16	Sun 20-09-20		Ayesha
Budget	21 days	Sun 20-09-20	Fri 20-10-16		Aunonto
Communication plan	12 days	Wed 20-09-16	Thu 20-10-01		Ethan
Risk Management plan	12 days	Thu 20-10-01	Fri 20-10-16		Dieudonne
Project plan (PD A & PD C)	16 days	Wed 20-09-09	Wed 20-09-30		Alessandro
Execution					
PD A: Client Meeting preperation	5 days	Wed 20-09-09	Tue 20-09-15		Ayesha
Client meet 1	1 day	Tue 20-09-22	Tue 20-09-22		Aunonto
PD B	0 days	Thu 20-09-24	Thu 20-09-24	2	Ethan
Needs identification and metrics	1 day	Wed 20-09-23	Wed 20-09-23	11	Dieudonne
Benchmarikng and specifications	1 day	Wed 20-09-23	Wed 20-09-23		Alessandro
PD C	**1 day?**	**Thu 20-10-01**	**Thu 20-10-01**	**12**	**Ayesha**
Introduction	1 day	Wed 20-09-30	Wed 20-09-30		Aunonto
Project Plan Update	4 days	Fri 20-09-25	Wed 20-09-30		Alessandro
Conceptual design	4 days	Fri 20-09-25	Wed 20-09-30		Ayesha
Feasibility Study	4 days	Fri 20-09-25	Wed 20-09-30		Ethan
Lifelong Learning	4 days	Wed 20-09-30	Wed 20-09-30		Dieudonne
Conclusion	1 day	Wed 20-09-30	Wed 20-09-30		
Client meet 2	1 day	Tue 20-10-06	Tue 20-10-06		Alessandro
PD D	**1 day?**	**Thu 20-10-08**	**Thu 20-10-08**		**Ayesha**
Project Plan Update	1 day	Tue 20-10-06	Tue 20-10-06		Alessandro
Detailed design	0.5 days	Fri 20-10-02	Fri 20-10-02		Aunonto
Prototype 1	**3.5 days?**	**Fri 20-10-02**	**Wed 20-10-07**	**25**	
Software	**3.5 days?**	**Fri 20-10-02**	**Wed 20-10-07**		
Wifi Module	3.5 days	Fri 20-10-02	Wed 20-10-07		Ethan
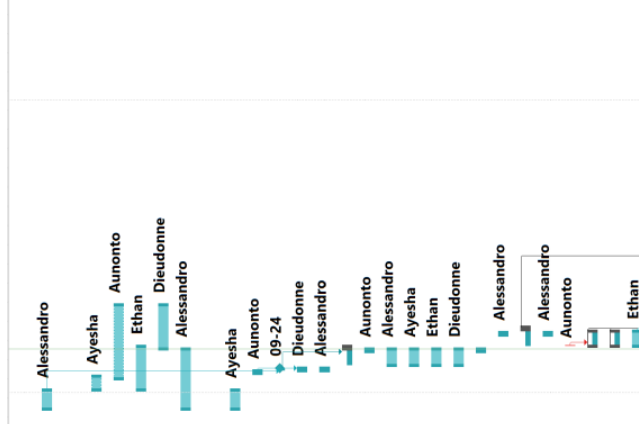
Task Name	Duration	Start	Finish	Predecessors	Resource Names
Wifi Module	3.5 days	Fri 20-10-02	Wed 20-10-07		Ethan
Messaging Module	3.5 days	Fri 20-10-02	Wed 20-10-07		Ayesha
Speech to Text Module	3.5 days	Fri 20-10-02	Wed 20-10-07		Aunonto
⊿Hardware	3.5 days?	Fri 20-10-02	Wed 20-10-07		
Electronics	3.5 days	Fri 20-10-02	Wed 20-10-07		Alessandro
⊿Housings	3.5 days?	Fri 20-10-02	Wed 20-10-07		Dieudonne
Main Unit	1.5 days?	Fri 20-10-02	Mon 20-10-05		
Portable Unit	1.5 days	Mon 20-10-05	Tue 20-10-06		
Testing	1 day	Wed 20-10-07	Wed 20-10-07	26,27,28,29,30,31	Ayesha
BOM	1 day	Fri 20-10-02	Fri 20-10-02		Aunonto
PD E: Project progress presentation	1 day	Thu 20-10-15	Thu 20-10-15		Ethan
Client meet 3	1 day	Thu 20-10-01	Fri 20-10-02		Dieudonne
⊿PD G	1 day?	Thu 20-11-05	Thu 20-11-05	23	Alessandro
Summarize Client Feedback	0.5 days	Fri 20-10-30	Fri 20-10-30		Ethan
Based on Client Feedbak Develop a New Dessign	0.5 days	Fri 20-10-30	Fri 20-10-30	41	Alessandro
Project Plan Update	1 day	Tue 20-11-03	Tue 20-11-03		Alessandro
⊿Prototype 2	4 days	Fri 20-10-30	Wed 20-11-04	36,42	Ayesha
Sub-task related to prototype 2	2 days	Fri 20-10-30	Mon 20-11-02		Aunonto
Sub-task related to prototype 2	2 days	Tue 20-11-03	Wed 20-11-04		Ethan
Testing	1 day	Thu 20-11-05	Thu 20-11-05	44,45,46	Dieudonne
⊿PD I	1 day	Thu 20-12-03	Thu 20-12-03	40	Alessandro
Design Day Pitch	2 days	Tue 20-12-01	Wed 20-12-02		Alessandro
Project Plan Update	1 day	Mon 20-11-30	Mon 20-11-30		Alessandro
⊿Final prototype	19 days	Fri 20-11-06	Wed 20-12-02	47	Ayesha
Sub-task related to final prototype	10 days	Thu 20-11-05	Wed 20-11-18		Aunonto
Sub-task related to final prototype	10 days	Wed 20-10-21	Tue 20-11-03		Ethan
Design day	1 day	Thu 20-12-03	Thu 20-12-03		Dieudonne

	Duration	Start	Finish		Resource
Monitoring and Control					
Project objectives	61 days	Thu 20-09-17	Thu 20-12-10		Dieudonne
Quality of Deliverables	61 days	Thu 20-09-17	Thu 20-12-10		Ayesha
Project performance and cost	61 days?	Thu 20-09-17	Thu 20-12-10		Ethan
Schedule Status	61 days	Thu 20-09-17	Thu 20-12-10		Alessandro
Closing					
PD J: User manual	0 days?	Thu 20-12-10	Thu 20-12-10	48	Alessandro
Title Page, Table of Contents, List of Figures, List of Tables, Bibliography, and Appendices	1 day	Wed 20-12-09	Wed 20-12-09		Aunonto
Main Body	2 days	Tue 20-12-08	Wed 20-12-09		Dieudonne
Conclusion	1 day	Tue 20-12-08	Tue 20-12-08		Ayesha
Introduction	1 day	Tue 20-12-08	Tue 20-12-08		Ethan
PD K: Final Presentation	0 days?	Wed 20-12-30	Wed 20-12-30	114	Aunonto
Design Choices	1 day	Fri 20-12-11	Fri 20-12-11		Alessandro
Trials and Tribulations	1 day	Fri 20-12-11	Fri 20-12-11		Ethan
Project Summary	1 day	Fri 20-12-11	Fri 20-12-11		Ayesha

4 Feasibility Study

To begin the feasibility study, the group first developed our understanding of the uncertainties and risks associated with the project. By scrutinizing the specifications that the group had previously developed, the group was able to investigate the tolerability of the uncertainties and risks that were listed. Further required research, and proposals were developed in the case of these happening. Below, the risks and uncertainties are listed with an explanation and proposed solution following.

4.1 Risks

The price of a sufficiently sensitive mic for our clients needs exceeding budget.

Due to our client's condition, a sensitive mic that records at low dB will be required. The easiest solution would be to test equipment as soon as it was received. However, due to current world issues, recordings will be used in place.

Recognition software is unable to decipher the necessary words.

Considering the client's condition, age and the time of use (mostly nighttime), the client's speech is likely to be unclear. To ensure the proper activation words are deciphered, multiple different translation software will be tested using given recordings.

4.2 Uncertainties

Microcontroller board, programming language, and method of speech to text used for the project.

The type of board to be used for the project is still being discussed due to budgeting concerns. Due to this, the board to be used is still unknown. Related to this, the language used, and method are unknown as well due to the two being reliant on the type of board. To remedy this, the group will discuss with the project managers of the issue and a decision will be made before our software development is scheduled to start.

Longevity of proposed software solutions.

For the speech to text software, an outside source will be used for the translation function as development of this by the group is not feasible. However, a decent portion of groups (such as Microsoft azure) that provide this service use a subscription-based model. Further research will be done on this to explore the possibility of a software that is free. If this is not possible, the group will discuss this issue with the client.

Structural material

Whilst it has been agreed upon by the group that the prototypes will likely be 3d printed, contingencies should be made in the case of current world issues preventing access to the university's labs. Possible alternative 3d printing locations, and possible scrap wood locations will be researched.

4.3 TELOS

To further analyze the feasibility of this project, TELOS was used within our group discussion. Below are the points that were made under each area.

4.3.1 Technical

Expertise of all group members was taken into consideration. To ensure all tasks were within our group's areas of expertise, the designs were simplified to minimize the number of different machineries that would be required to prototype. For example, the shape was kept cube-like for the main device so that either: only one device would be required to shape the metal into the desired shape, or only a 3d printer would be required with no needed filing. As well, to ensure that all tasks will be completed successfully, each member of the group submitted a description of themselves, akin to a resume. The members were then divided into either hardware or software groups, depending on skill level and preference.

4.3.2 Economic

As both the benefit (customer satisfaction as opposed monetary gain) and cost (to be declared in deliverable D) of the project were not fully available at this point, a dissection on possible budgeting options was considered.

It was agreed upon by the group that the budget would be split as:

$50: 2 microcontrollers

$30: microphone

$10: LEDs and buttons

$10: other miscellaneous parts

The budget was broken down this way to help ensure that the device is sensitive enough to discern the client's voice. As well, a majority of the budget was placed on the microcontrollers as they would ideally have Wi-Fi-capabilities should we wish to use services like Microsoft azure. The frame would be 3d printed so the only other concerns include the circuitry which is included in the remaining $20.

4.3.3 Legal

As the device to be created is to be used for personal use only, and will not be marketed, a majority of laws pertaining to electronic devices like this one do not apply. As for the remaining laws, the bulk of them relate more to safety concerns relating to the device. Of course, the safety of the client/consumer is paramount so all laws and legalities are being and will be obeyed.

4.3.4 Operational

Due to the current world event, a portion of the university's student population is currently studying outside of Ottawa. As this project requires in-person development for parts of the process, this situation can affect this project. Thankfully, only one member of the team resides outside of Ottawa. This member was placed on the software team as remote work would not affect productivity pertaining to this team. As well, due to our dividing of groups based on technical skills, for a majority of this project it is unlikely any training or learning will be required to complete any of the tasks.

4.3.5 Scheduling

To minimize risks in this project, the group is scheduling tasks and other parts with margins for error. For example, all work associated with the deliverables was scheduled to be finished a minimum of a day prior to submission to allow ample time for the person in charge of the deliverable to format and edit it prior to submission, as well as give people an opportunity to ask for assistance if needed. To further help with task scheduling, not all members of the group are working on a task at all times. Spaces are left open to ensure that if one member is unable to complete a task in time, that another member is there to help. The schedule is constantly updated as well through the two group meetings held every week.

Overall, the risk and uncertainties of the project were considered and accounted for. The TELOS model was used to help study the feasibility of this project and the group's usage of it is shown above. Overall, the project was considered viable as risks and uncertainties had answers to them, and all sufficiency queries from TELOS were answered.

5 Lifelong Learning

Deliverable A, or the contract that binds the team, was very important in setting the team's goal of delivering a high-quality product to our client through a team effort. It was used to establish procedures that enabled the team to function as a unit in order to achieve our common goal. These procedures helped in the creation of rules such as the time, agendas and record keeping guidelines for our meetings, our methods of communication, and decision-making policies within the group. With these rules in place, the team then set high expectations that required the high standards from each member of the team, and the strategies to achieve these standards. Team participation and personal accountability are as well very crucial to having a team that works in harmony like a well-tuned system, and the result can be shown in the timeliness of the team's deliverable deliveries first and then in the project's final product.

Team 2 learned more about the project after completing deliverable B which centered around the client's needs. After an interview with the client, the team translated the client and her support staff's statements into a list of client's needs, and the needs were then prioritized. After the analysis of the ranked needs, team 2 then formulated the following problem statement: "The client requires a set of devices that can discreetly and effectively enable her to communicate with her support staff through voice activation. The device should be low maintenance and function over a variety of distances. This statement clearly gave to the team not only an idea of the magnitude and type of the problem to be solved but also orientated the team's focus to finding a solution to the right problem.

Based on the client needs and the problem statement, the team established a list of metrics to accurately quantify a given trait of the product to be designed. The team then conducted some research in order to explore some benchmark products related to our project, and the team found out that Boomer Emergency Response System, SecurMedic, Philips Lifeline and Doorbell are the few benchmark products available, and these products are already in the market. Even though we did not find any specifications for these benchmark products online, the team generated a few specifications for our

products based on our client needs and the teams pre-existing knowledge. However, these specifications are not final because as the team develops the product, a few adjustments will take place in order to design the most effective device.

Deliverable A and deliverable B are interdependent. The contract in deliverable A and client needs, problem statement, metrics, benchmarking and target specifications in deliverable B have all provided to the team the insight needed to conceptualize the product to be designed. Deliverable A set up the rules that continue to bind the team harmoniously together, and deliverable B through client meeting, data collection and analysis has given to the team a better understanding of the problem at hands, and the ability to create some product concepts. However, in deliverable B the team failed to provide specification data for the benchmark products found in the market because of the unavailability of this information online, and the team is determined to continue to improve itself in the effort to deliver a top notch product for the client.

6 Conclusion

Overall, the group meetings and studies done have allowed us to consolidate our ideas into a reasonable proposal. Objectives have been matched with reasonable due dates, and the group has been split up to allow for efficient work. As well, risks and uncertainties pertaining to the project's development have been established and accounted for. With these in mind, the developed plan will allow us to complete multiple prototypes to be presented on Design Day.