Project Deliverable B: Design Research of Needs and Benchmarking

Submitted by

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Abstract

This week, Night Call Bell team successfully carried out all the tasks according to the plan. Team members conducted a video conference with our client, Mrs. Fran and her assistant Mrs. Fleur, to understand their specific situation, basic information, product requirements, views and feedback on previous products. At the same time, the team members worked together to complete the information collection of the existing mainstream competitors on the market and the finished products of other groups. Finally, the team collates and analyzes the information collected.

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Acronym	Definition
NCB	Night call bell
LED	Light Emitting Diode
USB	Universal Serial Bus
CFC	CallForCare

1 Introduction

In order to understand the needs of our client for the Night Call Bell project, we met with our client this week. The communication with her and her and her staff make us realize the situation that Ms. Fran was in. Indeed, she is an elder female with a disability where her fingers and arms are not very flexible, and, she has difficulty pronouncing words fluently and loudly. For safety reasons, her nursing assistant, Miss Fleur, needs a device that can acquire urgent information in time. They also showed us the previous devices done by the other groups, each of which has its own advantages, but there are also some problems that cannot be ignored. Miss Fleur hopes that we can make improvements based on them. Hence, in this report we tried to understand existing designs that help us determinate the needs for this project, we perform the benchmarking before developing an existing test plan.

2 Prioritized Needs

2.1 Raw Needs from Conversation

From the conversation with Ms. Fran and Miss. Fleur, we have acquired the following information:

Ms. Fran can't move her arms and also, she is unable to use her hands. Based on this situation, we rejected the idea of the "emergency button" set before and turned to voice activated.

Ms. Fran also has trouble projecting her voice which means she could not speak words clearly. Therefore, this situation requires our products to have the sensitivity to distinguish sound. The smallest cry for help can be detected and recognized.

The room of Ms. Fran is sometimes filled with complex background sounds, such as conversations and TV noise. Therefore, our products must have good ability of recognizing her voice from background noise.

Miss. Fleur told us the previous products used battery or USB to provide power. She thought those ways both were not reliable enough. She wanted our product to be powered by a fixed power supply.

Miss. Fleur told us the network connection there is not really stable, thus she wishes our product could work even without internet. The previous products use to utilize local network or WIFI to

connect signal which means they might lose their function when the network connection is unstable. Concerning this case, we asked her about the distance between the two users and got the answer that it would not be more than 10 meters from the bedroom to the kitchen. Considering this distance, a Bluetooth connection may be the best choice.

Ms. Fran requested that when she calls for help, there had better be a light on the device to indicate that her call for help has been accepted. So, we decided to install LED on our emitter. As for the receiver, Miss. Fleur requires that it is best to have both lighting and audible reminder functions.

For the size of the device, Miss. Fleur hoped that the transmitter is not too big, preferably on the nightstand, the same size as a night light. And the receiver should be as small as possible, and it is best to put it in your pocket or wear it on her wrist like a watch. So, it won't interfere with her working around the house.

At last, we asked her about the budget issue and got the message that they haven’t thought about that.

2.2 Prioritized and Specified Needs

After group meetings and discussions, we classify the needs mentioned above into three categories according to their priority, from the most important to the least important. 1 means the most important and 3 means the least.

Those needs which are categorized as 1 are the those thoroughly determine the attributes and functions of our product. And the needs which are categorized as 2 are those would not affect the functions of the product, but would affect the actual operation experience of our product. At last, the needs which are categorized as 3 are those would not affect the functionality and operability of the product. They may have an impact on the appearance of the product.

Needs	Priority
The device can quickly identify the voice of our client.	1
The device's ability to recognize sound will not be affected by background noise.	1
The device can quickly send alarm information to the staff.	1
It is best that the device can run without a network.	1
The operating device does not need to be borrowed through other devices such as mobile phones and computers.	1
The size of the transmitter is suitable for fixing on the table, and the size of the receiver is suitable for keeping in the pocket.	2
The device uses fixed power sources and sockets to provide power	2

The receiving end is prompted by optical signal and sound signal, and the transmitting end only uses optical signal.	2
The device has a good plastic package, preferably waterproof	3

Table1: Prioritized Needs

3 Critical Metrics

After summarizing the needs, we summarized these evaluation criteria according to these specific needs. This criterion will be used not only to evaluate the existing products in the market, but also to define the scope of our design.

	Metrics	**Unit**
1	Total Cost	Cad
2	Weight of Receiver	g
3	Volume of Receiver	cm^3
4	Volume of Emitter	cm^3
5	Power Source	V, A
6	Alarm Duration	s
7	Alarming Noise Loudness	dB
8	Alarming Light Brightness	cd

Table2: Criteria Metrics

4 Existing Products and Benchmarking

4.1 Competitive products

Medical Guardian

Figure1:Medical Guardian

For this product, when someone press the button, the signal is sent to the base station, then they alert the monitoring center. It is a two-way communication, and the wearable can be replaced by a voice activated wall button. This system covers up to 1300 ft from the base station to contact the 24/7 monitoring center and it costs 1$ a day[1].

Mobile Help

Figure2:Mobile Help

The mobile help is a 2-way communication where when we can press on the help button, the staff or nurse will a family member neighbor or emergency services. The emergency monitoring services works 24/7 and they have the Wi-Fi and Bluetooth enabled. This device is 4G compatible and have an easy-to-read touchscreen display. The cost is 599.40$ per year[2].

Life Station

Figure3:Life Station

This device is a two-way communication. When the user presses on the button, it directs the call to the service center that will bring help. This system works up to 500ft away and is waterproof. The system also has a fall detection sensor. It uses 4G LTE cellular network to communicate with the monitoring center that works 24/7. the costs start from 20$ per month[3].

In the other hand we have the CallForCare[4] that some university of Ottawa students designed. This system uses a voice recognition to call the nurse. When the client says “Hey” or “Help” to the design, it alerts the nurse with light and sound. For this system there is no feedback that will tell the client help is on its way. Also, it is unspecified the maximum distance the system could still works.

We also analyzed the NicaBell design. They have used a voice sound activated system. This system noticed the user that help is on its way. To alert the nurse, there is a buzzer that increases by the time and when the nurse is not awake, the sound will be activated.

The last design we analyzed was the SmartTech system. This system looks a lot like the other two. However, this system uses radio frequency that allows it to work up to 80 meters.

4.2 Benchmarking

Our team summarized and analyzed the data of several related products with high market share, and carefully studied the data and instructions of the previous team. Then we finally summed up into this table:

	Medical Guardian	**Mobile help**	**Life Station**	**Nica Bell**	**CallForCare**
Cost/cad	1.3/day	2.1/day	0.9/day	90	120
Weight(Receiver)/g	N/A	110	null	40	142~425
Volume(Receiver)/cm^3	20	N/A	null	65.5	72~256
Volume(Emitter)/cm^3	200	500	a button	N/A	384~2040
Power Source	socket	socket	battery	battery	battery
Alarm Duration/s	N/A	N/A	N/A	5	5
Noise Loudness/dB	N/A	N/A	loud	60	60~70
Light Brightness/cd	No	N/A	No	110	normal LED

Table3: Benchmarking Table of Products

We need to explain some points. After meeting with the customer, we have decided to use Bluetooth connection, so we do not use the signal range as an element of the table. And the customer requires the signal emitter to be as silent as possible, so the loudness of the transmitter is not an element. Finally, the service life of the product is closely related to the situation of the SD card, which is usually random and uncontrollable, so it is difficult to consider it as an element.

5 Specify Metrics

Our team analyzed the benchmarking table and had a general plan and goal for our product design. At the same time, we also modify some numerical ranges appropriately according to our existing design ideas.

	Range	**Ideal Parameter**
Cost/cad	90～120	110
Weight(Receiver)/g	110～425	200
Volume(Receiver)/cm^3	72～256	100
Volume(Emitter)/cm^3	500～2000	750
Power Source	socket or battery	socket
Alarm Duration/s	5	5
Noise Loudness/dB	60~70	60
Light Brightness/cd	110	110

Table4: Target Specification

6 Test Plan

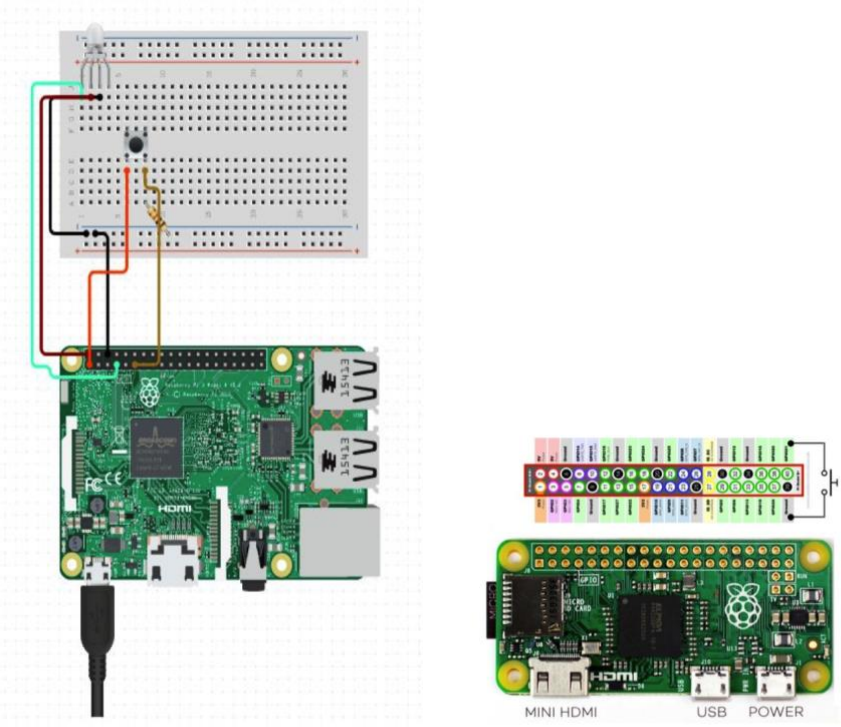

Figure4: Prototype of CFC Team

After collective discussion by the team, we decided to use the product design of the GNG2101 CallForCare team for test evaluation and optimization. The reasons are as follows：

The product of the CFC group belongs to the ones with a high degree of completion among the design of students. They completed a series of tasks from product design to packaging.

The members of our team are familiar with the modules and language used in the CFC product, so the cost of learning is relatively low.

CFC team's user manual shows their detailed design ideas with pictures and texts, which can help us better understand the functions and design of each part of this product.

Therefore, we will spend some time studying the user manual and experimental design of the CFC team. At the same time, the three aspects of the device will be optimized: voice recognition, connection mode and product package volume.

7 Conclusion

In this week's team task, we completed a video conference with our customers, which is very helpful for us to sort out the product features and design ideas. At the same time, we have analyzed and sorted out the needs of our customers and confirmed the priority and importance of each function. This points out the direction for our skill learning. We also investigated the existing related products on the market, analyzed and processed their data, which is of great help to our experimental design. We have made it clear that the range in which the data for each part of the product should be most reasonable. Finally, after a group discussion, we chose an existing product for research, and the team members also put forward their own ideas for improvement, which pointed out the way for our next stage of action.

In the next week, we are going to finalize the decision of the product development board and hardware equipment, as well as further specialty skill learning.

Reference

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[2] https://www.mobilehelp.com/, [Online]

[3] https://www.lifestation.com/, [Online]

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