SECP1513 TECHNOLOGY AND INFORMATION SYSTEM

Section 11

School of Computing, Faculty of Engineering

Universiti Teknologi Malaysia

Design Thinking

Group Name: SANDBOX

Product: CAREBIT Bracelet, CAREBYTE jacket

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CONTENT

No.	Title	Page
I.	**Introduction**	3
II.	**Methods**	
III.	**Design Thinking Evidences**	
	1.0 Empathy	4
	2.0 Define	
	3.0 Ideate	5
	4.0 Prototyping	6
	5.0 Testing	7
IV.	**Reflections**	10

I. Introduction

The health condition and safety issues of elderly are always concerned by a lot of the young generation, who are the juniors in a family. Especially with the undergoing Covid-19 epidemic situation, solving these problems have become even more imperative. Because of no visiting and physical contact rules, family members can hardly know what is going on with their parents. So we have decided to create Carebit, a bracelet, and Carebyte, a jacket, which come with an application relating to our assigned topic, input and output. The bracelet and jacket can be used by the old folks, while the application contains the movement, light, temperature, and other information that can be installed on the family members' phones. Therefore, the family members can remotely know how their parents were doing, and also be notified when there is an accident happening. More details will be explained in this report.

II. Methods

We applied the 5 phases of design and thinking into this project - empathy, define, ideate, prototyping and testing. In the empathy part, we had conducted some interviews through video meeting platform. For example, Whatsapp, Webex, and Zoom. Then, we arranged our group meetings time to share the information we each got, and defined the needs as well as the challenges faced by the interviewees. For ideating, we used Janboard to operate our brainstorm. After that, we summed up to two suitable solutions to demonstrate our prototyping. Finally, we separated the works of testing those two prototypes, showing how each of them worked. In completing these phases, we used a lot of application like PowerPoint, Words, Viamaker, Adobe Illustrator, Google Drive, Filmora, and Power Direction to facilitate our process.

Meeting Information
Venus: Whatsapp group
Attendance: Yi Qiu Chen, Lai Ting Ying, Song Ji Yoon

Date	Time	Meeting agenda	Result, Action taken, PIC
27/10/2020	12:00 PM	We discussed which doctor should we interview.	Result: PM Dr Murtadha Bin Mohamad
02/11/2020	7:00 PM	We discussed the questions for interview.	Result: "Have you ever designed any input or output devices that helps people?"
03/11/2020	10:00 PM	We joined the interview online meeting. And we discussed to determine our users and questions for user's interview.	Result: Doctor answered with his experinece. We decided our users as old folks, and we made 3 questions.
07/11/2020	5:00 PM	We decided which method to interview the users.	Result: Interview by videocall and video - Lai Ting Ying, Song Ji Yoon Interview by message - Yi Qiu Chen
08/11/2020	6:00 PM	Discussion for problems and solution. Brainstorming using Jamboard.	Reslut: Problem - Old folks staying alone could may have problems of safety and health, Solution - device to detect their movement and app to show the status
09/11/2020	5:30 PM	We decided the solution.	Result: Bracelet, Jacket device which includes sensors and interact with app
11/11/2020	8:00 PM	Meeting for prototype, test part	Result: PIC of bracelet - Lai Ting Ying, PIC of jacket - Yi Qiu Chen
12/11/2020	10:30 PM	We checked the video of prototype, testing. We divided the part for report.	Result: checked by Lai Ting Ying, Yi Qiu Chen, Song Ji Yoon
14/11/2020	11:00 PM	We checked the video of prototype, testing. Short meeting for report We checked the final video	Result: checked by Lai Ting Ying, Yi Qiu Chen, Song Ji Yoon Checked the report by all PIC of final video - Song Ji Yoon
15/11/2020	5:00 PM	Meeting for last checking for report, video	Result : Checked by Lai Ting Ying, Yi Qiu Chen, Song Ji Yoon

Figure 1: Meeting Minutes and Task for Each Member

III. Design Thinking Evidences

1.0 Empathy

Questions
✓ Do you have old folks at home? ✓ Is there anything that you are worried about them? ✓ Is there anything that you want to suggest or think that will help the old folks?

Figure 2: Questions for clients

First of all, we had interviewed PM Dr. Murtadha Bin Mohamad in the online Webex meeting. The doctor shared his experience, which was the project of a robot that could detect people by using the sensors when there was a fire in the building and transmited the data to a computer so that the fire brigade could know the location of the people in the building.

Second, we had interviewed three clients who had old folks living alone and all of our clients were worried about their old folks for the following reasons such as falling, an emergency happens, and sickness. In addition, we determined our users as stated below:

- Age : over 65
- Who lived alone
- Who had disease and physical weakness

2.0 Define

From the interviews of clients, we found out that old folks who lived alone could have a lot of cautions and problems, which could be classified as safety (fire, falling, emergency), and health (Covid-19, sickness). Therefore, came out with a solution that can solve this problem.

At the same time, we got an idea of detecting sensors from the interview of PM Dr. Murtadha Bin Mohamad. We decided to produce devices that could detect fire, falling, and any emergency that related to health by using the sensors and an application that showed the old folks' daily movement.

3.0 Ideate

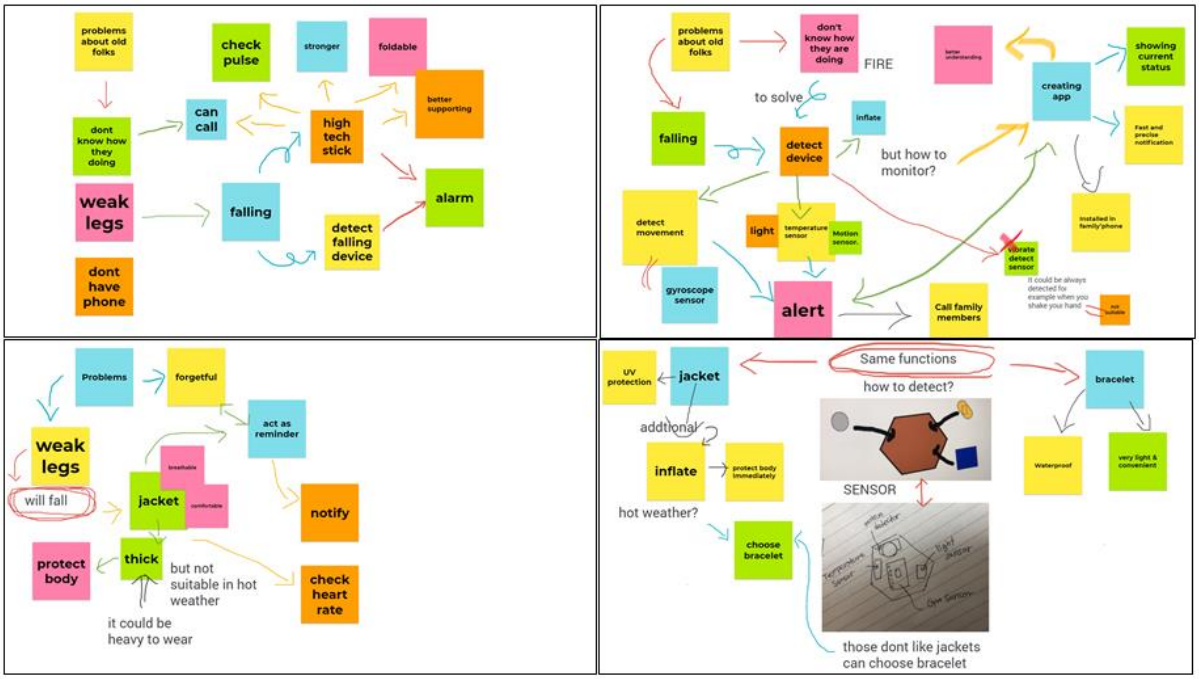

Figure 3: Brainstorming using Jamboard

We brainstormed for the solutions, type of devices to produce, and the important functions of the devices. In the beginning, we came out with three kinds of devices, which were high-tech stick, bracelet, and jacket.

After the brainstorming and discussion, we noticed that high-tech stick was not suitable for old folks who used a bath chair for their movement. Also, we decided to produce two devices, which were bracelets and jackets, to fulfil the clients' needs and for the old folks' own preferences. For example, they might prefer the jacket over the bracelet because of the comfort. For the functions of the devices, there was a variety of sensors such as gyroscope sensor, motion sensor, light detect sensor, temperature sensor, and vibration detect sensor and so on. However, we decided to put essential sensors (temperature sensor, light detect sensor, gyroscope sensor) only in the device to reduce the weight. Last but not least, we decided on the application functions such as contact number function, showing current status and location as well as the precaution videos of accidents like falling.

4.0 Prototyping

There were 2 types of main sensors, one to be put into the jacket and another to be built into the bracelet and they were slightly different in terms of the size and the number of components used. For the bracelet – Carebit, we had a smaller main sensor that was built of a few different types of sensors. For example, it consisted of sensors for detecting light, temperature, movement and velocity. On the other hand, the jacket – Carebyte was slightly bigger as it consisted of one more device, which helped to inflate the jacket. When the sensor detected falling, the jacket would be inflated, protecting an old folk from getting serious injuries. The main purpose of having the light sensor in both prototypes was to ensure the safety of old folks better. When there was no movement or change in light intensity detected more than 12 hours, it could mean the user was in danger.

Figure 4: Main Sensor

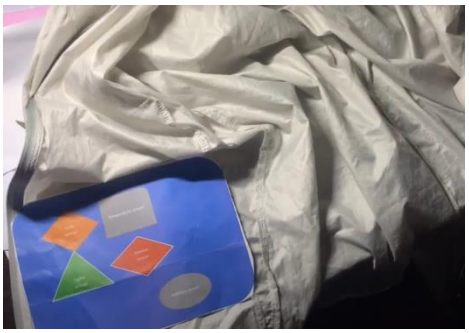

Figure 5: Sensor Attached to Jacket

For users' convenience, the bracelet was designed to be waterproof while the jacket provided the ultraviolet (UV) protection. In order to bring the performances of these prototypes to a higher level, application was designed, which could be installed by a family member of the old folk on the phone. There was a setting in the application, where the family member could connect his or her phone to the device. The application would be showing the graphs of the old folk's activities, therefore the family could check on him or her from time to time. The location of the old folk would also be shown in the application. When there were unusual activities detected by either the bracelet or jacket, for example extremely high temperature around the old folk, the family would be alerted by receiving a call as well as a notification.

Moreover, there was a contact book, which provided different contact numbers. For instance, should an emergency happen, the family member could call an ambulance using the number provided in the book. The family could also seek help from the service centre if there was a problem in the application.

Figure 6: Features in the App

Furthermore, the family could look for more information and the guides in this application. In “More Information”, he or she could search for the videos or articles that would help the old folk. There would be some useful videos and articles recommended for the family as well.

Figure 7: More Information and Guides

5.0 Testing

To demonstrate these prototypes, we had made the testing videos. Firstly, we connected both Carebit (bracelet) and Carebyte (jacket) to the application. For Carebit, we had a user wear it and had proved it to be waterproof. Then, it detected that there was no unusual activities successfully even when the user tried to sit down, shake her hands and run. However, once she fell down, Carebit detected it to be abnormal and called the family of the user immediately. The movement graph in the application also showed that the user was in danger. Carebyte was tested in the same ways and it gave the same results, but when the user was detected to be falling, it was inflated quickly to protect her as shown in Figure 11.

Figure 8: Movement Graph Shows Good Status before Falling

Figure 9: Movement Graph Shows Danger after Falling

Figure 10: Carebyte before being Inflated

Figure 11: Carbyte after being Inflated

In order to test the temperature sensor, we had the users stand under the boiling sun wearing the Carebit and Carebyte. The temperature graph in the application was still showing a good status as shown in Figure 12 despite the high temperature. Yet, if the temperature was extremely high (exceeding a certain limit), for instance there was a fire in the house, the family would be alerted and could send rescue as soon as possible.

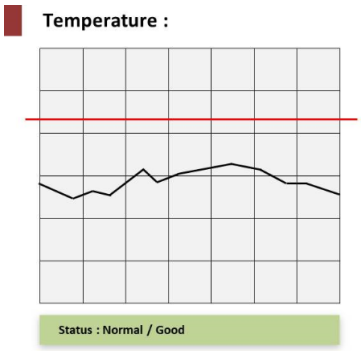

Figure 12: Graph Showing a Good Status under Hot Temperature

The light sensors in both Carebit and Carebyte were functioning properly as they detected the change in light intensity when the users walked from indoor to outdoor. Nevertheless, when there was no change detected in either movement or light intensity for more than 12 hours, the graph would show the user might be in danger as shown in Figure 14.

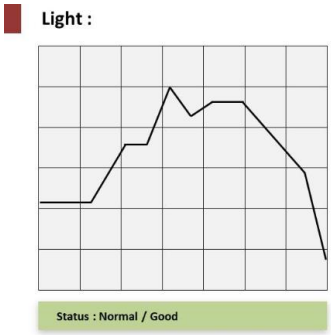

Figure 13: Graph Showing Changes in Light Intensity

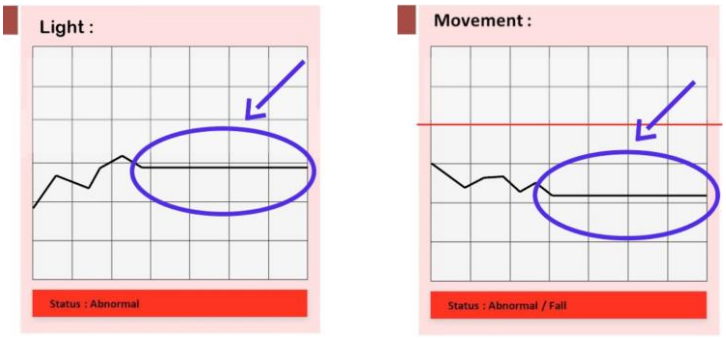

Figure 14: Graph Showing Danger When No Change in Light Intensity or Movement for More than 12hrs

Eventually, we tested "More Information" feature in the application. The user was able to search for some useful videos and information for helping the old folk better. There were also some recommended videos for the user to watch.

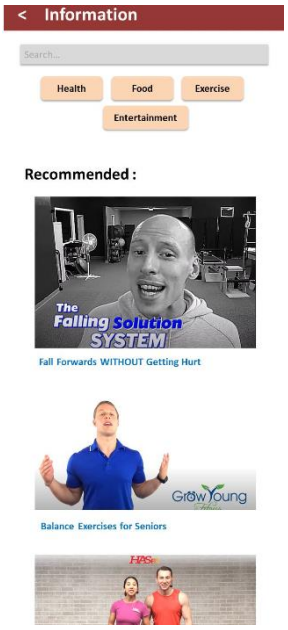

Figure 15: More Information for the Users

IV. Reflections

Yiqiu Chen:

My goals regarding this course are to learn more about current technologies and their implementation in our daily life. By understanding how these technologies work, we can hopefully invent new devices or improve the existing ones when there are new features needed. My dream for this program is to make sure the seniors are safe and healthy, and they can access help when it is necessary. Also, we hope this program can ease some young people's pressure from worrying their parents that staying alone. This design thinking allows me to make our dream come true organised. It is the guideline for designing things that are targeted for specific users. There is still something we need to improve to enhance our influence in the industry. For example, we may ask for more expertise to precise our main feature. We also need to consider the weather for certain areas in choosing the material of the jacket.

Song Ji Yoon:

Our goal is to solve the old folks' problem that old folks and families of them are having.

Following the process of design thinking, we can easily get in charge of the program by following the design thinking process. Also, we could understand why the interview with users and experts is important for the product (solution).

From what I experienced, our product (solution) could be more specific and precise when we have more interviews from our users and also if we have more ideas from brainstorming. Thus, I will focus on these two parts to improve my potential in the industry.

Lai Ting Ying:

I want to learn more about the technology world and I hope that I could be a part of the groups, who have passion for improving well-being.

This project has helped me in understanding and implementing the design thinking skills, which could assist me better in the future, especially if I ever wanted to create a real product. Computational thinking can also be involved in doing a project, where we can break down a complex problem into smaller and simpler parts to solve.

In order to improve my potential in this industry, I would improve my knowledge about Internet of Things (IoT) as it provides effectiveness, productivity and efficiency to our lives.