UNIVERSITI TEKNOLOGI MALAYSIA
SCHOOL OF COMPUTING
FACULTY OF ENGINEERING

TECHNOLOGY AND INFORMATION SYSTEM
(SECP1513-04)

Group members:

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Topic: Communications and Network

Name of Lecturer: Dr. Goh Eg Su

Subject: Technology and Information System (SECP1513)

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INTRODUCTION

With the astoundingly technological advancement in this modern era, communication and networks are of critical importance on a day-to-day basis in every Homo-Sapiens' live. They enable people who are even halted by tall mountains or deep oceans to stay connected with each other on all occasions. For instance, the abundant communication systems such as e-mail, video conferencing and so on create a global network to get people sharing information and data between sending devices and receiving devices, such as computers or smartphones with just a few clicks in a few seconds when they are attached to the connection devices, namely modem, or so. Meanwhile, the communication system goes hand in hand with the computer networks. There are various kinds of network, for example, Local Area Network (LAN), Wireless Local Area Network (WLAN), Wide Area Network (WAN) which are more commonly used.

In term of LAN, it is a computer network that interconnects computer within close proximity such as residence, school, or so; In term of WLAN, it functions similarly as LAN, linking two or more devices within a limited area, however, it can be connected through wireless communication therefore it provides the users the ability to move around within the covered area and remain connected. Whilst in term of WAN, it is a telecommunications network that be used to transmit data over a long distance and between different networks. (Retrieved from Wikipedia)

In the course of Technology and Information System (SECP1513) session 2020/2021, we were granted an assignment, which is also known as "Design Thinking Report". To further illustrate on this topic, design thinking can be defined as a fundamental approach for one to create solutions with a view to overcoming issues that we confront in our daily lives. In this era with sophisticated inventions, the students are incumbent upon the capability to identify various problems, thinking of the solutions and eventually executing the solutions. It is strongly related to one's life as every mankind will encounter unpredictably critical situations on a daily basis. In other words, design thinking is the combination of mindful thinking and designing solutions. Everything considered, design thinking process consists of five stages which are empathizing, defining, ideating, prototyping and testing in order to tacking a problem.

DETAILED STEPS AND DESCRIPTIONS

DATE	ACTIVITIES
25 OCTOBER 2020	● Briefing by Dr Goh about the assignment. - We were assigned as a group and instructed on the topic given with the criteria, we needed to achieve in order to complete the tasks given.
30 OCTOBER 2020	● Meeting up with the members to discuss more on the topic given. ● Brainstorming ideas to draw and draft on the questions that will be asked to the IT staff and technicians regarding to our topic.
2 NOVEMBER 2020	● We selected the question that is possible to ask in the interview session. ● Meeting with the members to renew the draft before the interview.
3 NOVEMBER 2020	● Interviewing the IT staff and technicians using online platforms (Google Meet). ● Taking important notes from the interview. ● Recording of each session was given in the group. ● Checking the outcomes on the interviews recording
6 NOVEMBER 2020	● We identified all the problems and found the possible solutions that we got from the interview recordings. ● We discussed and designed the prototype of our project. ● We distributed task to each member.

13 NOVEMBER 2020	● We tested the prototype by using Google Forms to get feedback from the users. ● We finalized our prototype. ● We started editing our video.
16 NOVEMBER 2020	● We completed the editing and compiling of our report, slides and videos. ● We wrote the reflection of ourselves in the report. ● We uploaded the videos on Youtube Design thinking video: https://youtu.be/SZNkiFqi-jE • We submitted our assignment.

Table 1: Detailed Steps and Descriptions in Design Thinking

DETAIL DESCRIPTION (PROBLEMS, SOLUTIONS AND TEAM WORKING)

A network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data. An example of a network is the Internet, which connects millions of people all over the world. Others name of the internet is World Area Network (WAN). This allow users to find, gather and share information in a short time.

Based on the interview with the IT staff, we had identified a few problems. The problems are mainly about the coverage area which are low coverage area and slow internet.

Components / Details / Problems	Solutions
Low coverage area The geographic area within which a carrier provides service. The area within which a phone will complete calls using that carrier's network, or partner networks. Low coverage area meaning the area is not actually cover by carrier provides service. The area still have the service but in lower speed.	**Using Dispersed Wifi Router** This system has the potential to solve issues of limited Wi-Fi and poor connections. This system currently consists of two routers. The first is the main router, similar to what most Internet users are used to. The second router is the key to the system, as it wirelessly connects to the Internet signal and spreads it through the house. **Using Pro Smart Repeater** With the Pro Smart Repeater, you'll be able to extend your private Internet space for over 8,000 feet (1.5 miles). It is high Power, Professional Range 600mW amplifier + High Gain directional antenna that provide extreme WiFi coverage over long distances. The Optional External Antenna Provides is an external antenna port for connecting an optional outdoor high

	gain antenna for more range options **Using Personal Mobile Router** This router working with a user's data-enabled SIM card, the router works by providing fast, reliable Internet connectivity whenever the device is within range of a cell tower. This router allows multiple users to connect at the same time to enhance the breadth of connectivity.
Slow internet The internet has speed that be used to classified it weather it is a fast or slow internet. The internet that less than 25 Mbps are too slow to consider as broadband. With this speed, user will get buffer when streaming video, difficulty to connect multiple devices and the other internet connectivity issue.	**Using Rapid Internet Router** It can quickly and easily be hooked up to your current modem and is fully compatible with the WiFi adapter, so it is more than capable of allowing you to take full advantage of 5G Internet speeds. this router system is designed to help you get the most out of your online experience.
UTM outage internet outage is inevitable. One of the caused is network congestion. In UTM there are a lot of people using internet. When too many people using internet on same network it caused connection fails altogether.	**Using Automatic Internet-Reset Plugs** It will automatically detect Wi-Fi connection, reset the router if Wi-Fi fails. The smart wifi plug connects to the strongest internet connection in your area. This device saved your time and frustration and help you get back online anytime.

Table 2: Detail Description (Problems and Solutions)

After we have identified all the problem, we decided to do online meeting via google meet to draft and brainstorm the idea to solve the problem regarding the coverage area. Based on the problem, we found some possible the solutions which are using additional device like **Dispersed Wifi Router**, **Pro Smart Repeater** and **Personal Mobile Router** for the problem low coverage area meanwhile for slow internet, we found that users should add devices like **Rapid Internet Router**. The solution that we planned are based on the interview session with the IT staff of UTM.

The most critical problem that we face while doing the research are we cannot meet face to face with each group member. This is because of the pandemic COVID-19, we need to learn at home by online platform plus each of us stay at different state. Next, our group member had their own understanding about how to write the report. This made our group discussion became long because we need to clear the understanding problem first. What we do was asking other group about report writing and the real format. Lim also ask our senior about the format to prevent our report became wrong.

In terms of team working, we had successfully created a great understanding within each group members. We distributed the task equally and we help each other if any group member need help about the task given. Thankfully, each of us participated and responded actively to make sure this project become successful. In addition, everyone gave their great idea passionately.

We are conducting our online meeting

Our opinions regarding this problem statements and the solutions

Muhammad Afiq Aizzat

I can relate with all the problems the interviewee had stated. Even though it might not be from UTM, I'm pretty sure everyone have dealt with slow internet connection, no signal coverage and the outage of internet service somewhere in their life. In my opinion, the problems are really important and we should think thoroughly on how to overcome it. This is because internet is something we all need to have in our everyday life. Without it, there will be very limited things we can do. Especially during this pandemic of COVID-19, not having internet access means that you wouldn't be able to attend online classes or work from home. Personally, I think our solution that we come up with will be able to overcome these issue. This is because our solution is realistic and able to achieve from the prototypes.

Afaf Binti Azman

The interviewee had stated some problems through out the interview session where the problems or challenges he's facing are very understandable since now is the era of technology. However, there will always have a solution for any problems. In my opinion, the solutions we picked is the best to overcome the problems. It is important for us to highlight the problems we are facing, gather information and try the best to overcome it. Team working is also very important through out the assignment. It will be incomplete if any of the group members does not cooperate or did not give their best in it. For me, the most important thing is tolerance when the group member is discussing or want to decide in anything for the group. Last but not least, we have to work as a group and give our best to deliver a good outcome.

Nor Fadli bin Ahmad

Now, I realize there are a lot of problem regarding the internet. Even though our group are focusing on UTM, but all of these problems are also happening to the people outside the UTM. Based on the solution that me and my group find out, I suppose that is the best solution for the network that have problem like in our list. I know it is too much because the device is

not cheap at all. Nevertheless, it is depending to the user if they want the highspeed internet or not. By the way, I am also sure, there are another solution than our suggestion. So, I think all of us must keep studying about the technology because technology grows faster than us.

Lim Yeu Chen

As the interviewee mentioned, there were several encounters which we will meet in our daily usage of the modern technology. Somehow the modern technology is a mixed blessing. It leaves an impact especially on people who are living in rural area. The limited coverage area of network is actually amongst the issues of the development of our country. This can be best exemplified by the circumstance now under the pandemic. Some of us are facing the network problem for the online classes, however, in order to overcome it, we can use some devices to do so though it may cost us highly.

DESIGN THINKING EVIDENCE

STEP 1: EMPHATHIZE

To complete this step, we need to interview the experts or staff from the CICT unit. The interview sessions were conducted via *Google Meet*.

1) **Time/Date:** 3.30 p.m. / 3 Nov 2020

   Name: Mr. Mohd Zahari Bin Zainal Abidin

   Work Field: Network Admin

   Experience: 17 years working in UTM

Questions and Answers:

1. How many years has Mr. Mohd Zahari worked in UTM?

   Mr. Mohd Zahari has served in UTM as a network administrator for 17 years already.

2. What important role does database management have networking in UTM?

   Database management in UTM network. What is database? It's our information we come up in one place and we manage them. What happen we have a system, but don't have database? That system would be a waste because nothing comes out of it. Same goes to network.

3. What are the greatest challenges to get a good communication and network?

   From the student's perspective, one of the things they want is a fast network. One of the issues is UTM is a very big university and area. UTM has 7 big colleges, big faculties and so on. When the location is big, the challenge is how to communicate network from UTM Digital to until the last location in the area. Next, ICT technologies are very fast. Today we use 4G and come out with 4G technology, equipment etc. But, after finished analysis, infrastructure to upgrade our network to 4G, now it come out with 5G. Lastly, budget is one of the challenges we face since UTM is a government university, the budget is very tight. So, the network cost is very high due to demand.

4. What is the responsibility as a network administrator and the problems faced?

In UTM, for UTM Digital have many departments such as network department, network security, data centre, software application support and many more. For UTM network administrator, the responsibility is we design network architecture. How to upgrade our network, how to expand our network and how to come out with a new variety for our network. Next is to maintain our network, the technology, the application and so on. Equipment, whatever in data centre for the network purpose is our responsibility. Another responsibility for a network administrator is about security. Our network has been monitored from network security department but for our side, we have the switch, core switch, router etc. all the equipment, we must get, maintain and set the security for all of the equipment. The problem faced is how to communicate or maintain our hardware can be access by 5G technology.

5. Why does UTM have their own VPN service?

VPN stands for Virtual Private Network. UTM have a system application such as e-learning, software and my utm portal. All of the system, we divide by two categories; Internet and Intranet. Internet is global for example, my utm portal. Meanwhile intranet is a system for the inside UTM only can use. The reason is because the international students might have their e-learning or e-library blocked by their internet service provider or government.

STEP 2: DEFINE

In this phase, we need to identify the problems the interviewee have based on the interview so that we could brainstorm suggestions to help us find the solution.

Problems from empathy step:

1. The reachability of network coverage in UTM is restricted due to how big UTM is, so some students in some part of the campus will be out of reach.

2. Once in a while, there are outage of UTM Wi-Fi and it became even more crucial need to submit their tutorial, assignments and reports in the e-learning. It also became difficult during studying and teaching because most lecturers put their materials online and need to have internet access during their class. Besides that, this can also happen when their lecturer were doing quiz online which will affect their whole assessment.

3. When a lot of students connect to the UTM Wi-Fi, the internet becomes unreliably slow where it might take even minutes to do a simple google search. Slow internet connection will make everything online inefficient and waste a lot of time.

STEP 3: IDEATE

In this phase, we do an online meeting via *Google Meet* to brainstorm some ideas to bring satisfaction for the user regarding the system unit. During the meeting, we list down some of the best solutions for the problems and based on the list, we only choose some of it that we think could bring better results with a high quality for our prototype.

Brainstorm process:

1. Devices that can increase the network coverage
2. Devices that can amplify internet connection
3. Devices that can automatically and autonomously activate the power reset button on the internet network so that less outage will happen

Based on the information that we had gathered from the previous task, we had come with three general ideas. We narrowed down the detail of ideas and characteristics on some features of our incoming prototypes.

Firstly, to solve the first problem, we came up with the prototype called **Dispersed Wi-Fi Routers**. Basically this device solve issue related to limited Wi-Fi connection and poor connections especially due to walls that's blocking the distant room. What this device does is, it will act as multiple routers all around the room which would be connected to the same modem, which will make the path to reach the Internet signal better. Besides that, we also came up with the prototype called **Pro Smart Repeater**. What this device does is, it will be able to extend the Internet for up to 2.4 km just from this device alone. This will make it enough to reach some parts the usual UTM Wi-Fi cannot reach while also being reliable. We also came up with the prototype **Personal Mobile Router.** It work exactly the same as a normal router would, except that you can bring it anywhere. It also provides fast and reliable Internet connection as long as the device is within range of a cell tower. It being portable means that the users that are outside of UTM network coverage can still be connected to the Internet.

Meanwhile, to solve the second problem, we came up with the prototype called **Rapid Internet Router**. The function of this device is to amplify the connection of the router that it is attached to. If the router is capable of running 5G internet connection, this device will help make full use of the feature while also making it have a reliable and stable internet connection. UTM could make use of the amplified internet connection it has to offer.

Lastly, the prototype to solve the third problem that we came up with is **Automatic Internet-Reset Plugs.** It is designed to autonomously and automatically activate the power reset button linked with your Internet device. This is to prevent us from wasting our time when the modem turned off suddenly, and us having to wait for it to be back up. This is especially bad when some users are still using the Internet at the time to do important tasks. With this device, it can activate power reset button and cycles the power until the connection is up, thus saving our time and reduce our frustration. This is especially useful in UTM where outages happen once in a while but when it happens, it would cause a commotion from the users that had inconveniences and problems due to it.

STEP 4: PROTOTYPE

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

In the stage of prototype, we show prototypes to give insight to the viewers on how it looks like and the general idea on how it can solve the problem. The prototypes are based on the problem the interviewee gave and they are tested by receiving feedbacks from the potential users.

STEP 5: TEST

Figure 6: Google Form Testing of Prototypes

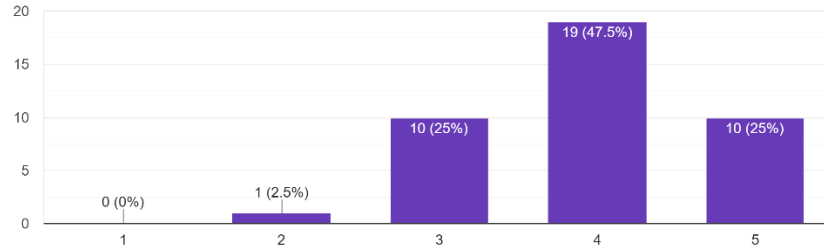## RESULTS

DISPERSED WIFI ROUTER
40 responses

Figure 7: Dispersed Wifi Router Feedback from Responses
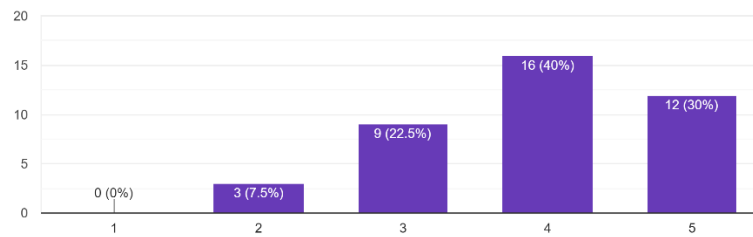
PERSONAL MOBILE ROUTER
40 responses

Figure 8: Personal Mobile Router Feedback from Responses
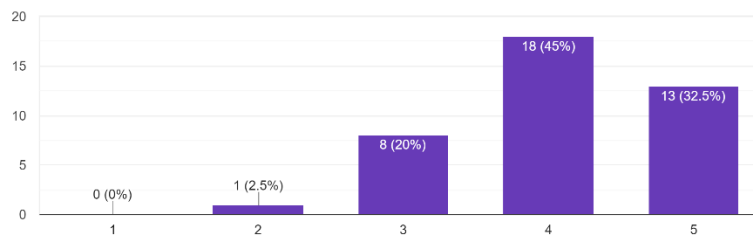
RAPID INTERNET ROUTER
40 responses

Figure 9: Rapid Internet Router Feedback from Responses

AUTOMATIC INTERNET-RESET PLUGS
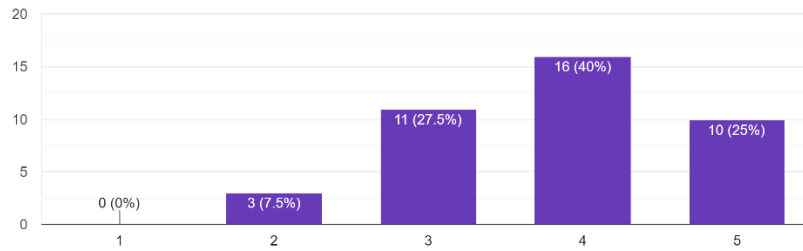40 responses

Figure 10: Automatic Internet-Reset Plugs Feedback from Responses
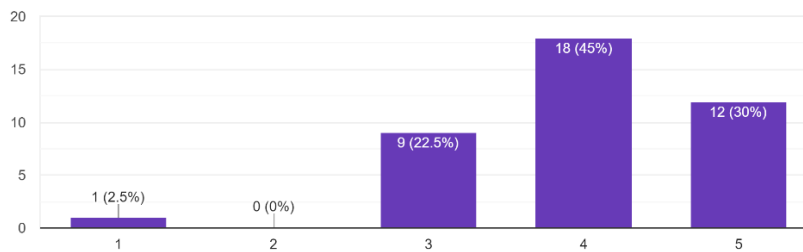
PRO SMART REPEATER
40 responses

Figure 11: Pro Smart Repeater Feedback from Responses

How would you rate our idea from 1 - 10?
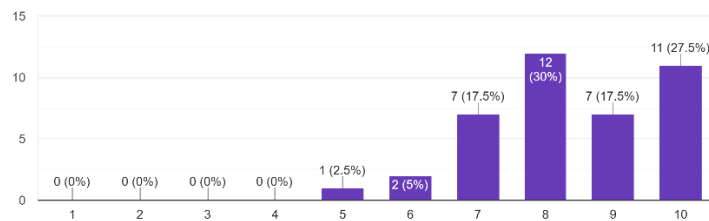40 responses

Figure 12: Overall Prototypes Feedback

This stage of testing is where we distribute the google form (Figure 6) to the potential users of the mentioned prototypes. Five prototypes were tested using a scale from 1 (definitely no) to 5 (definitely yes) while also enquiring user feedback on overall prototypes. We had collected 40 responses from UTM students and staff. The maximum rating is 5 while the lowest rating is 0. From Figure 7, it is observed that the average rating it have is 3.95. Figure 8 shows a

rating average of 3.93. Figure 9 shows a rating average of 4.08. Figure 10 shows a rating average of 3.825. Figure 11 shows a rating average of 4.00. Last but not least, Figure 12 is a rating of user feedback on the overall prototype and it average in 8.38.

As we can see from the results, all the prototypes that we suggested have received positive feedbacks and it can be viewed as the solutions to the problems that we had been working on.

REFLECTIONS

Nor Fadli bin Ahmad

My goal in this course is to ensure the better understanding about computer and technology for myself. I am pretty sure this course is the correct way for me because it also focusing on security which is the most important things in this world nowadays. This design thinking project has taught me how to conduct a project in an organise way.

After design thinking project, my goal become clearer and I can see what I need to do and I want to be in the future. I also know how to interact with other people and my groupmate properly. Now, things like leadership, cooperation, brainstorming I can see how the process is going clearly.

In order to achieve and gain something in this industry, I need to explore more on anything that related to it. I want to increase my skill in coding and about computer hardware and software. As the result, I can be more prepare in advance for my task given in the future. Besides this computer skill, I also need to develop and improving my attitude since it also one of important part in industry. I will develop my time management so that I can adapt my real outside world. Now I have clearer sight for my future and I will work hard to contribute with the society.

Muhammad Afiq Aizzat bin Mohtadzar

My goal related to this course is to work as an IT security specialist in a prestigious company after I graduated. It is a job where I'm responsible of building and maintaining digital productive measures on intellectual property and data that belong to my organization. It's also a job where I'm responsible in helping my company contingency plans in case information gets hacked from our networks and servers while also troubleshooting problems when they arise.

Design thinking impacts my goal in term of how I view things. Now when I see a problem I will see it as a design thinking process and think accordingly which is empathize, define, ideate, prototype and test. Most importantly, I would need to take into account my future colleagues' opinions because of the problem I'm trying to solve need to have a mutual agreement with them or it wouldn't be adequate.

What I'm planning to do to improve my potential in my industry is I would work on my soft skills because those are essential skills to make sure my design thinking become feasible. Of course, I would also need to work on my hard skills more than an average person would because the competition would be greater in the future than it is now. This includes but not

limited to learning on more programming languages, expanding fundamental knowledge and involving myself in more internships for experiences.

Afaf Binti Azman

I used to see how technologies evolve since it was the peak of time where people starting to realize that technology plays an important role in their life. Since I was a kid, I love the idea of how technology really important to the people. I always wanted to learn more about Information Technology but unfortunately, I could not get the opportunity. Now, I am a Computer Network and Security student where I will be learning so many things about IT. Pursuing my studies in this course already open the door to my future. My goal is to be an excellent student and work at a big company where I will learn more deeper about IT.

Design thinking teaches me on how to solve a problem in a proper procedure. It points out on important things you have to do in order to solve a problem. With the procedure, solving problems will be much easier and save a lot of time. One of the important things is what the people need at the time being. What it can do to help the people in need to make their life easier? Design thinking also teaches me about teamwork. Teamwork is very important where all of the group members have to take part in the project. The project will be a failure or incomplete if only certain members do their part. Giving in idea also is part of the teamwork where all of the members voice out their opinion. Therefore, I already learn bit by bit on important things I need to have before going deeper in my course.

Before pursuing in the industry, I need to improve my technical and soft skills such as communication and critical thinking. Next, I have to do more reading and research to gain more knowledge where it can be very useful whenever I need it. These knowledges will not only benefit me in the industry, but also it can turn me into a successful person in the future.

Lim Yeu Chen

As for my goal in this course, I aspire to become a person who can make prominent contribution to the society in the scope of computer science. Gone are the days we have to do everything without any modern invention, especially the electronic device. We should acutely aware that the virtual communication is going to be the trend in the oncoming centuries. Subsequently, I have to get full use of my time studying in this course with a view to catching up the tremendously swift development of the technology and information system. Owing to computer science is a competitive scope in this modern era, thus I have to learn more relating knowledge through participating extra activities and listening to the professionals' talks to widen my horizon and acquire valuable experience.

Throughout this design thinking project, I have learnt enormous skills to accomplish a report. For instance, I learnt to engage in a interview, distributing tasks among group members, recording and editing videos, brainstorming innovative ideas and so on. It provides a platform for me to experience on how to work as a team with my groupmates, how to effectively voice out our opinions and executing them. The most interesting part is, due to the pandemic condition is getting severe day-to-day, my groupmates and I making good use of communication devices to discuss on how to complete the report via Google Meet and Telegram. We have a time to know what the hardship is while using these virtual communication systems and how to solve it.

All in all, I have known my shortage if I demand to be a successful computing engineer in future. Not only on how to schedule my time, work out an executable plan, make decision and manage emotions, I have learnt effective speaking and listening as well. To conclude my reflection, I have to engross myself in more aspects of computer science for a great boost in my job in future.

CONCLUSION

In conclusion, our group has solved the problems the interviewee had by using the method of design thinking process. Design thinking process, which involve the five steps Empathy, Define, Ideate, Prototype and Test is widely and generally used to solve any problem efficiently while also making it clear for those who read about it. By using this method, we can improve our critical thinking skill, problem solving skill and also our communication skill. In regards with our topic, communications and network, we should be able to understand the problems revolving around it, its importance and its effects when some problems occur. Our group have given our own insights and solution to work around it and hopefully it will become of use.

TASK FOR EACH MEMBER

PICTURE	TASK
	LIM YEU CHEN • Slide editor • Report editor (Introduction) • Video editor • Reflection • Presenter
	MUHAMMAD AFIQ AIZZAT BIN MOHTADZAR • Slide editor • Report editor (Design thinking evidence) • Reflection • Presenter
	NOR FADLI BIN AHMAD • Slide editor • Report editor (Detail description (Problems, Solutions and Team working)) • Reflection • Presenter

	AFAF BINTI AZMAN • Slide editor • Report editor (Design thinking evidence) • Reflection • Presenter

Table 3: Task for Each Member

REFERENCES

1. Joey Haar (2016, August 22) Dispersed Wifi Router. Retrieved November 10, 2020, from https://www.trendhunter.com/trends/netgear-orbi

2. Rahul Kalvapalle (2016, May 6) Automatic Internet-Reset Plugs. Retrieved November 10, 2020, from https://www.trendhunter.com/trends/power-reset

3. Michael Hemsworth (2016, January 25) Personal Mobile Routers. Retrieved November 10, 2020, from https://www.trendhunter.com/trends/portable-wifi-hotspot

4. Omar Yusuf (2011, October 25) Pro Smart Repeater. Retrieved November 10, 2020, from https://www.trendhunter.com/trends/pro-smart-repeater

5. Rahul Kalvapalle (2016, May 11) Rapid Internet Routers. Retrieved November 10, 2020, from https://www.trendhunter.com/trends/router-system