



UTM

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SECTION 02

DESIGN THINKING

TITLE: COMPUTER NETWORK

Group 11

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1.0 Introduction

Background

In this 4IR era, the Internet is one of the most significant inventions of the 20th Century. With the growing number of geographically dispersed scientific collaborations and the expanding quantities of scientific data, users are finding it difficult to attain the highest level of network performance on a shared network. The maximum quantity of data that can be sent over your network at one time is referred to as bandwidth. Users on a network transmit data across network nodes in order to access and deliver files. Data can be transferred at a quicker rate if the speed of transmission is increased. A network with increased bandwidth also allows for more devices to be connected at the same time. That is, the larger the network, the more bandwidth is needed to handle the daily data transfer.

Objective and overview of this project

As students, we are frequently faced with heavy bandwidth usage on our school's network, where internet speed is extremely poor, causing us to waste a lot of time while waiting for the page to load. High bandwidth utilization also has an impact on how quickly users can upload and download files and media. To address this issue, our team developed a multipurpose router with several novel characteristics.

About our model

"Hex-Fi" is the name of our router. The term "Hex" refers to our router's hexagonal design, while the term "Fi" refers to our model's ability to transmit Wi-Fi signals. The router can be brought along anywhere and at any time. It is wireless and portable, making it simple to use. It allowed devices to use the 8 GHz frequency band, which has a bandwidth of 1,600 MHz and is suitable for sending massive volumes of data over short distances. For devices that are supported, this can assist in reducing interference and traffic congestion.

2.0 Detail step and Description

Detail step	Description
2.1 Empathy	Empathy is a process where we conduct an interview with people that are more experienced in computer networks. This is to really understand the respondent's needs and get an idea of the problems they are facing while handling the computer network.
2.2 Define	Define is the process for us to identify the problem that our respondent has faced during their career. After we interviewed the technician and lecturer in the faculty of computing, we successfully identified their problem by understanding and analyzing their answers that are mentioned in the interview session.
2.3 Ideate	Ideate is the process where we can generate all the possible solutions to overcome the problem statements. In this stage, we have suggested a few different solutions based on the problem statements and we have concluded to choose the best solution among the other solutions.
2.4 Prototype	Prototype is the process where we choose the most suitable solution to the problem that has been identified. Then, we create a model to help us get a clear view of the solution decided. The model is made of accessible material such as cardboard and colored paper.
2.5 Test	Test is a process where we show and explain our product to the users. The prototype helps users to have a better understanding of how the problem is solved by using our model. Also, we get feedback from users during this process, which is needed to improve our model.

3.0 Detailed description

3.1 Problem

After having the interview sessions with one of the technicians and lecturer from our faculty, we found out that the connectivity inside the UTM is still not as fast as we expected it could be. This is because the usage of the connections inside the UTM is very large as everyone has at least two devices with them nowadays and some might be more than that. This will more likely cause high bandwidth of usage to happen as everyone is trying to stream and download their file at the same time.

Moreover, Wi-Fi signals will slow down due to network congestion. This is because there are too many requests for transferring data and communication are made at once over a small bandwidth capacity. Besides, this will also affect their connectivity to other devices and streaming music or videos properly.

3.2 Solution

To solve this problem, our team has produced the idea that we are going to invent a mini tri-band router which is called Hex-Fi. This router contained an 8GHz band inside and it can maximize up to 18Pbps per device. The connectivity will be a bit slower in the real world due to the environment of the user's place. This router can also accommodate high bandwidth usage which users do not need to worry about the connection when using more devices to transfer the data.

Furthermore, the router that we invented can be accessed from far with higher speed and it is very convenient to carry around, especially for students inside the UTM as it is a portable wireless router. It also has dustproof and waterproof features.

3.3 Team working

Our group has split the work in this project into separate tasks. Yee Wen will mainly focus on video editing while Yasmin is assigned to interview the technicians and lecturers at Universiti Teknologi Malaysia (UTM). Furthermore, Asyikin, Aflah, and Anis will focus on the design of our prototype and the content of the report for this project. Although we all have been assigned different tasks, we cooperate and help each other to make sure this task was successfully accomplished.

Throughout the process of design thinking, we faced some challenges. At first of the discussion, we couldn't present the issue in the computer network since there is a lot of it and we don't have any idea on how to do the prototype to solve the problem. Additionally, we also struggle with our time management because all of us have different timetables and club activities. Fortunately, each of us managed to have a group discussion and get to solve the problem in this project.

4.0 Design Thinking Assessment

4a. During the end of the project demonstration

At the end of the project, we found that design thinking was an important step-by-step process that needed to overview the problem faced by the user. Furthermore, we also need to find the best solution to solve the problem by this process. From this project, we can say that it is not easy to make new models or prototypes for problems related to the network since the technology is evolving so quickly.

4b. During the transition between design thinking phases

During the initial stages of the design thinking process, we encountered certain challenges that revolved around a dearth of ideas and difficulties in effectively managing our time due to our busyness in studies. Despite these hurdles, we were able to overcome them and finish the project as a team. We managed to get together in our free time and complete the project together.

5.0 Design Thinking Evidence

5a . The sample work by students working to solve the design challenge



Figure 5.1 : Interview in the Empathy stage



Figure 5.2 : Discussion for the Define and Ideate stage



Figure 5.3 : Prototype stage



Figure 5.4 : Test stage

5b. Record for each phase

- **Empathy**

The table below shows the questions and answers obtained from the interview.

Questions	Answers
Could you please introduce more about yourself?	My name is Nurfazrina Binti Mohd Zamry and I am currently working as a senior lecturer in the faculty of computing.
What do you think can be improved in terms of network in our faculty?	In terms of the usage, in one particular time, all classes are using the network at the same time. So, the network might be slow because of the high bandwidth usage.

Questions	Answers
Could you please introduce more about yourself?	My name is Mohammad Shamsul Fitri Hj Sulaiman. I am a JA29 assistant engineer at the faculty of computing and have served for about 16 or 17 years.
What are the challenges in managing networks in this faculty?	I think one of the challenges is technological change. For instance, nowadays, all of the students use laptops and Wi-Fi is growing fast. However, students are not satisfied with the connection of the internet through Wi-Fi, so they need to use cable to connect it.
What do you think can be improved in terms of network in our faculty?	First, speed and connection and stability of the internet. The N28 building is well established and was created in 1998. So, the network is stable and the connection is also good enough. Rarely will have network disconnection. But, N28a has internet problems. If the Wi-Fi maximum can accommodate 250 users only and all of the 250 users connect to the same Wi-Fi, the speed will become slow.

- **Define**

The table shows the problem faced by the technician and lecturer.

Problem	Description
Connectivity of the internet in the UTM is not as fast as it should be.	<ul style="list-style-type: none"> • High bandwidth usage occurs when everyone is using the internet at the same time. • One person has more than one device connected to the internet.
Wi-Fi signal will slow down from time to time	<ul style="list-style-type: none"> • Too many requests in transferring data. • Everyone is trying to download the files and stream music and video at the same time.

- **Ideate**

In our discussion, we generate all possible solutions to the problems that have been identified.

Solution	Reason
Create a new type of fiber optic cable that have a higher bandwidth usage	<ul style="list-style-type: none"> • A fiber optic cable can provide a higher speed of network but it will be costly and expensive. • Creating the cable with a recycled material may result in poor performance as it is not a good electric conductor.

Create a wireless router with higher frequencies which is 8GHz	<ul style="list-style-type: none"> • This will provide faster speeds and more stable connections. • The shorter waves make it less able to penetrate walls and solid objects. So, it provides internet at a shorter range. By making it portable, this issue won't be a problem as it can be brought anywhere you go.
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- **Prototype**

After we had a lot of discussion in choosing the best solution for the people to use to have faster connectivity to the internet, we chose to create an 8G router. These are the benefits that people could gain using our modem.

Benefit	Description
Provide faster speeds and more stable connections.	This is because it provides a higher frequency and internet at a shorter range.
Portable router	So that people could access the internet anywhere they want with a faster speed. And the router is very user friendly because it is very easy to take care of and it is small, which will not take up much space in your bag.

- **Test**

After the prototype is complete, we test our product to know if there is any improvement that can be made. Then, we demonstrate the product to the user and explain how our product can solve the problem of slow network connection.

6.0 Reflection

LAU YEE WEN:

Question	Answer
1. What is your goal/dream with regard to your course/program?	My goal is to master one or more programming languages and to build a solid foundation in coding and big data problem-solving. Acquiring new abilities and enhancing existing ones is an achievable goal that supports my work and increases my chances of career advancement. Soft skills including time management, problem-solving, and communication can also help me develop the capacity to do more effective work.
2. How does this design thinking impact on your goal/dream with regard to your program?	This project taught me how important it is for teams to collaborate because each member brings a unique set of ideas to the table. As a result, while we collaborate on this project, we need to talk with one another about our thoughts. This is because it takes more than one person to make this project a success. Additionally, this project also has an impact on building my self-confidence. I could recognize that I also possess the power to innovate using my knowledge, abilities, and creativity.
3. What is the action/improvement/plan necessary for you to improve your potential in the industry?	Some enhancements are required to maximize my potential in this industry. In my opinion, my understanding of the corresponding fundamentals of computer networks must be strengthened. The reading of the paper and my investigation were the causes. Too many terms that I am not fully aware of cause me feeling confused before I begin writing my report. My lack of foundational knowledge and expertise in this area is the main cause. Therefore, before I go further, I must methodically acquire the knowledge associated with this issue.

ANIS SAFIYYA:

Question	Answer
1. What is your goal/dream with regard to your course/program?	My goal with regard to my course is to gain more knowledge in this field which is computing. In this modern era, technology is revolving fast and there are still a lot of things that have not been discovered yet. In order to keep up with the technologies that are continuously invented, my goal is to learn as much as I can and have a better understanding of it as right now, I have only covered the surface or the basics and there is a lot more for me to explore.
2. How does this design thinking impact on your goal/dream with regard to your program?	This design thinking process has sharpened my problem solving skill. The reason is that this skill is required in order to complete this project and I am able to apply it in my daily life in the future. For instance, there are a lot of problems that my group needs to face during this project and the contribution of each member showed me other perspectives on how to solve it. Therefore, it made me realise that for every problem, there must be a solution and I should see the issue in many ways in order to solve it.
3. What is the action/improvement/plan necessary for you to improve your potential in the industry?	To improve my potential in the industry, I would improve my teamworking skills. Teamwork is essential as every project requires good communication and cooperation between team members for it to be successful. With great teamwork, any obstacles and problems that occur can be solved efficiently and the work delegation will help manage the project faster. Other than that, I also plan to read more articles about technology so that I can keep up with the technology trends and innovations.

NABIL AFLAH BOO:

Question	Answer
1. What is your goal/dream with regard to your course/program?	My goal with regard to this program is to strengthen my basic programming knowledge. This is because it is important to know the basic programming language for me to write the coding in the future. For example, C++ is one of the basic programming languages that I need to excel in terms to master other languages. Moreover, my goal is also to enhance my soft skills as it is important to deal with people in the future.
2. How does this design thinking impact on your goal/dream with regard to your program?	This design thinking has taught me to be a productive person. The reason is that being productive when doing the project with the groupmates will definitely increase the work progress. For instance, our group always held a meeting together to discuss and plan for our part in this project and share our thoughts with each other. Therefore, we can finish our project according to the time given.
3. What is the action/improvement/plan necessary for you to improve your potential in the industry?	To improve my potential in this industry, I would improve my problem solving skills. From what I have contributed in this project, I noticed that it is important for me to have a lot of ideas when doing the brainstorming process. It is also important in the industry as I need to find the best solution for my customers' problems. Other than that, I also need to enhance my time management skills. This is because it won't be a rush for me to finish up my project if I plan my time properly.

NURUL ASYIKIN BINTI KHAIRUL ANUAR:

Question	Answer
1. What is your goal/dream with regard to your course/program?	My goals for this course are to improve my programming abilities for use in the future. In addition, I wish to become proficient in a variety of programming languages and acquire knowledge more about database skills. I would like to expand my understanding and skills to stay updated with the latest trends and innovations in this industry. Moreover, I crave the opportunity to develop my soft skills regarding my course.
2. How does this design thinking impact on your goal/dream with regard to your program?	This design thinking had a significant impact on my goals by improving my communication skills also our teamwork because this process requires a conversation between my teammates and interviews with other people. The design thinking process also contributes to my critical thinking skills because I need to analyze and evaluate the problem and also at the same time devise the solution to the problem. As a result, these skills really helped me to gain knowledge in this industry by doing some research about the problems we faced.
3. What is the action/improvement/plan necessary for you to improve your potential in the industry?	I think the improvement that need to develop my potential in the industry is that I need to have better soft skills with others. These skills include time management, problem-solving, and also communication skills among others. I need to have better communication skills because discussion matters in the group or society to have a better solution. From this design thinking process, I also realized that having creative thinking in solving problems is very important to come up with an effective solution. Other than that, I need to improve on how to manage time properly to have better performance and develop self-discipline.

YASMIN BATRISYIA BINTI ZAHIRUDDIN:

Question	Answer
1. What is your goal/dream with regard to your course/program?	As technology keeps on improving day by day, I personally think that there are so many improvements that can be made so that the product can be more accurate and convenient. So, my goal in this course is to be able to create an application or AI devices for people so that all activity can be done by technology and decrease the human labor. Therefore, in order to generate and create an innovative idea for the world, we have to produce generations that are mastered in STEM and especially computer science.
2. How does this design thinking impact on your goal/dream with regard to your program?	In my opinion, design thinking has a really big impact on achieving my goal. This is because my goal or dream is quite big, therefore with the knowledge of design thinking ideas, I could break the big problem into smaller pieces. When the problem has been broken into a different phase, I could focus on what could be done first and so on. Therefore, there will be no point missed, and the outcome will be the same as I imagined.
3. What is the action/improvement/plan necessary for you to improve your potential in the industry?	Firstly, the improvement that I should do for the industry is that I need to increase my knowledge in the case study that I'm doing by reading a lot of articles and asking all the experts so that I could generate more ideas and solutions that can be improved more. Secondly, the things that I can improve are my communication and team working skills. This is because, to create something new, I have to get exposed and talk to a lot of people and ask them what problems they're facing so that I can fix it using technology and work together with my department to come up with an amazing outcome or product.

7.0 The task for each member

7.1 Work distribution table

Name		LAU YEE WEN	YASMIN BATRISYIA BINTI ZAHIRUDDIN	ANIS SAFIYYA BINTI JANAI	NURUL ASYIKIN BINTI KHAIRUL ANUAR	NABIL AFLAH BOO BINTI MOHD YOSUF BOO YONG CHONG
Tasks	Interview, Discussion, Prototype and Test Sections	Interview (Empathy), Producing Prototype and Test				
		Discussion for Define and Ideate Stages				
	Documentation and Presentation	Editing videos and videographer		Slide Presentation		
	Report	Progress Tracking	Detail step and descriptions for each phase		Detail descriptions about problems, solution and team working	
		Introduction	Design thinking assessment			
		Design Thinking Evidence, Reflection and References				
		Work distribution table and Work Progress	Merge and compile the report	Final Review and Feedback		

7.2 Work Progress

Date		15-Oct	16-Oct	17-Oct	18-Oct	19-Oct	20-Oct	21-Oct	22-Oct	23-Oct	24-Oct	25-Oct	26-Oct	27-Oct	28-Oct	29-Oct	30-Oct
Task	First meeting																
	Book appointment with interviewer																
	Interview with Dr. Nur Fazrina																
	Interview with Encik Shamsul																
	Define the problem and brainstorming solutions																
	Discuss prototype idea																
	Finished out prototype																
	Test the prototype																
	Editing video																

Date		31-Oct	1-Nov	2-Nov	3-Nov	4-Nov	5-Nov	6-Nov	7-Nov	8-Nov	9-Nov	10-Nov	11-Nov	12-Nov	13-Nov	14-Nov	15-Nov
Report	Editing video																
	Introduction																
	Detail step and descriptions for each phase																
	Detail descriptions about problems, solution																
	Detail descriptions about team working																
	Design thinking assessment																
	Design Thinking Evidence																
	Reflection																
	Work distribution table and Work Progress																
	Final review and feedback																
	Merge and compile the report																
	Duration																

Video link : <https://youtu.be/oFY8RwpXE?si=XWqiwI2SipxchUZQ>

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