REPORT DESIGN THINKING

SUBJECT: SECP1513-02 TECHNOLOGY AND INFORMATION SYSTEM

TOPIC: PROGRAMMING AND LANGUAGES

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1 INTRODUCTION

Design thinking is a process where people think outside the box to create a creative and innovative solution for a certain problem efficiently. This process has been widely practiced in all fields such as science, business, art and so on. It mainly focuses on satisfying human wants and needs and simplifying the job for humans. Hence, inventors and designers will put their heads together to come up with an idea to meet their needs. This process involves five stages all together which are empathize, define, ideate, prototype and test. The table below (Table 1) shows the five stages of design thinking.

EMPATHIZE	Empathy is the first stage in Design Thinking. It has a big role in design thinking as it will allow developers to understand the client's needs better and gain better insight which will help them think of a suitable solution. This step involves interacting and consulting with experts and clients hence an interview will need to be conducted. The information gained will enable the developers to create a satisfactory solution for the problem.
DEFINE	During the Define stage, a clear problem statement is defined. After gathering all the information from clients and experts during the empathy stage, developers will analyze and observe the problem to identify the main problem.
IDEATE	Ideate stage is where creativity plays the most crucial role. Various ideas are produced as the developers start thinking outside the box and analyze the problem in numerous new perspectives to create a solution for the problem. Brainstorming and mind mapping helps a lot in this stage.
PROTOTYPE	Prototype is the stage where all the ideas generated that have been narrowed down will come to life. Developers experiment the various ideas and produce a quick and inexpensive model of the product. After investigating the model, developers will be able to identify the best solution for the problem and have a better understanding of how the end product will work.
TEST	Testing is the final stage of Design Thinking which is known as an iterative process. After making the prototype, it will be tested. However, problems may arise in this stage. With that, alterations are made in order to fix the

	problem and create the perfect end product.

Table 1:5 Steps of design thinking

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Programming languages is a list of commands and instructions for the computer to follow to process data which will produce various outputs. Programming language enables developers to create a software program and develop online applications such as games and websites. For this project, we need to investigate and study programming and languages from every little detail such as the advantages, disadvantages and characteristics of programming language.

2 DETAILED STEPS

On the 25th of October 2020, our group was given a task to create a prototype based on our assigned topic which is programming language. After discussing a little about our given topic, we had a realization that a lot of beginner programmers gave up on learning programming because of the difficulty of memorizing command-in line interface (CLI command) and the lack of knowledge on programming. Hence, we tried to solve this problem through the Design Thinking process.

2.1 Empathize

The first step we took is by holding an interview with an experienced programming lecturer so we can have better insight on the problems faced when programming as we lack experience. The interview was held on the 3rd of November with PM Dr Murtadha Bin Mohamad by using an online platform, Webex since we can't hold a face-to-face interview session. Through this interview, we managed to ask our questions and find out the problems faced by programmers as the lecturer gave us a lot of information and input on the issues. The information gained in this interview alone has helped us a lot in the next step.

2.2 Define

After the empathizing stage, we discuss the information gathered from the interview session together through WhatsApp. In our discussion, we figured that the problem users faced in programming language that was stated by the lecturer was a bit vague. Hence, we discuss and research more on programming languages and we managed to come up with 3 problems.

2.3 Ideate

During the ideate stage, we already have a clear problem statement after listing and categorizing the problems from the last stage. With that, we took the initiative to hold an online meeting through Webex on the 7th of November so we can put our heads together and brainstorm various ideas to generate new solutions for the problems. As we gave out various ideas, we filtered and narrowed down the ideas to choose the best solution to overcome the problems.

2.4 Prototype

In this stage, we finally finished compiling all of our ideas and created a rough prototype which is a website named "Guide.io" by using Framer act on the 12th of November. We used Framer so we can have a glimpse on how the website will look and function like later. In our prototype, we decided to add various features and functions like the introduction to our website, a login and registration phase, a tracking system which can trace the product's phase, a live chat with the developers and also reviews from the users. These ideas we produced were based on the problems and information that we gained and the solutions were implemented in the prototype. After deciding the features and functions, we distributed the task among ourselves and designed the prototype.

2.5 Test

In this prototype test stage, we have finally finished designing our prototype. With that, we decided to ask one person to help us to test the prototype so we can examine its functions and features and get their opinions on our prototype to know if there are any flaws that we didn't detect so we can build a more perfect prototype.

All of the above design thinking process steps have been recorded and compiled into a video for further reference and it can also act as an evidence for our work.

3 DETAILED DESCRIPTION (PROBLEM, SOLUTION & TEAM WORKING)

3.1 PROBLEM

The problem about programming and languages that we propounded from the interview process is that developers and users often have different logical thinking for the problem. Developers tend to be more persistent in their normal workflow that they are used to for many years. The major problem for the developers is not about the skill of coding, but the skills of understanding the user requirement. The main aim for a developer to design a software is always to ease the user's life. Ample amount of time might be needed for the developers and users due to difference in perspective due to people from different backgrounds, mindsets and environments. The false expression of creativity by developers to show off their programming skills to develop complex software as professionals. This might cause issues like software incompatible for old devices/ OS and higher investment in terms of money and time. The following problem would be users needing the ability to write a user requirement specification (URS) that can be understood well

by the developers because it is the main key to create a software that suits to solve the problems. The URS is always crucial to build what users require from the system and were always written in the early stages of the validation process. The last problem would be developers needing the ability to understand the URS by the users who don't have any experience of programming. It is always important for the developers to understand the concept of user-centered design. Communication with users must always put into practice in the process of developing. They should always be open to the user of their product throughout every phase, so that they're walking on the right path of designing to gauge the wants and needs of users.

3.2 SOLUTION

After defining all the problems, a brainstorm process is then carried out in order to find out suitable ways and solutions to solve these problems. First, a developer should always keep users and their goals in mind while coding. For instance, when a formal documentation of a new feature is being written, a testing team should be formed to validate it and another development team can figure out how users interact with it in order to get the client's approval. We knew that a programmer's job isn't really done until their codes are not only written, but tested and verified to work as expected. Always keep the purposes of documentation in mind to ensure it winds out fulfilling the task. Besides, effective communication soft skills of a developer should be enhanced. It is because programming requires communication with the users. When a software is written for clients or the public, we need to know about their needs and preferences in order to ensure our product will actually be intuitive and helpful. Effective communication skills involve more than listening and saying what is on our minds. It requires asking probing questions (WHY, HOW, WHEN …) to verify that we are actually talking about the exact thing with the users or clients, and meanwhile being careful so that we can avoid using jargon in the wrong context. Always keep in mind that software development is not just about coding. Furthermore, a developer should always simplify the Graphical User Interface (GUI) to ease the use of the users and clients. It is because a good GUI eases the users to tell the computer what they want to do, for the computer to request info from the users, yet for the computer to present understandable information. Clear communication between the user and the computer is the working premise of good UI design. What makes a good GUI is a simple and clear designed interface to prevent user errors and easy to look yet provide a consistent look for the interface. Developers should always provide a feedback area to keep the user informed and provide immediate feedback and also ensure that feedback is appropriate to the task. As GUI designers today, our goal is to produce user-friendly interfaces: interfaces that really encourage the exploration without fear of negative consequences. Without any doubt interfaces of the future will be more intuitive, enticing, predictable, and forgiving if the skills and principles of making a good GUI are implied and applied in the design of GUI.

3.3 TEAM WORKING

In order to ensure the project runs smoothly, we first discussed together to appoint a leader among our group members. By voting session, we had all agreed to appoint Goo Ye Jui as our group leader. Then, we started our discussion on our topic which is programming and languages. We did some research and gathered some ideas of the topic during the first discussion. In this design thinking concept, we applied five phases to solve a problem which are empathy, define, ideate, prototype and test.

After we had understood our topic, we prepared some questions for the interviewer, PM Dr Murtadha Bin Mohamad by using the online platform, Webex due to the pandemic Covid-19. However, we barely had chances to ask all the questions we prepared as there are over 100 participants in the meeting. However, due to the strong team working and cooperation among us, we managed to secure the chances to ask some key questions and get the answers from the interviewer.

Next is the ideate phase which required every group member to brainstorm ideas on how to overcome
the problem that the users faced. We brought the ideas together by discussing in Webex and recorded the idea in a Google Docs to generate the best solution on our topic. After that, we decided to divide parts for report writing. MYZA wrote the introduction and detailed steps, Kelvin and Goo wrote the detailed description part which includes (Problems, Solutions and Teamworking.), Yong and Min are tasked to write for Design thinking assessment & evidence.

Then, we moved to the prototype phase where we had our meeting again at Webex and started
 to build our prototype using an Apps named Framer. To reduce time wasting, we divided the task to small parts and combined it into one after all. Lastly, we presented our prototype among members to evaluate whether any improvement could be made. I'm feeling blessed and appreciated as our task has been distributed evenly and fairly and each of us put much effort together in order to complete the project. We helped each other who faced problems even though it was not included in our parts.

4 DESIGN THINKING ASSESSMENT

During the process of design thinking, various information is collected and different ideas are generated. Hence assessment plays an important role to ensure that we always align with our original problem statement. This includes evaluation and analyzation of the problem to make sure that it is well solved by the solution provided.

At the very beginning stage, the empathize stage, we direct our topic as the problem faced during programming. Since we are trying to find problems faced related to programming, we decided to interview an expert who is skilled in various programming languages. Hence, we had an interview with the programming lecturers to get an insight of programming and identify the problems they are facing in programming.

Next, we move to the define phase where we analyzed the problem statements which were mentioned by the lecturers during the empathize phase. After doing some research on our own, we categorized the problems and listed them down.

We then proceed to the ideate phase. During this phase, we brainstormed ideas and solutions for the problems listed in define phase. This is when the assessment point came into its role by filtering out all irrational and unrelated ideas or solutions. In the end of this phase, we had come into agreement in choosing a best solution.

Lastly, we proceed to the prototype phase by using the solution created during ideate phase. We designed our prototype which is a website which guides a user to design his website without having any coding or programming background by connecting the user and developers via our website. We also ensure that our product is aligned with the main purpose which is solving the problem statement we stated at the define phase.

5 DESIGN THINKING EVIDENCE

- The sample work by students working to solve the design challenge

Based on our research, we found that a lot of beginners had a hard time at memorizing command-line interface (CLI command) and tend to get bored at the very beginning of their programming journey. The lack of interesting elements in a certain language such as colorful icons is one of the factors why beginners are quitting their programming journey. Hence, we decided to build an application which will make programming interesting by implementing graphical user interface (GUI) in our application and other functions to aid the beginner in starting their journey.

- Record each phase

5.1 Empathy:

Here is the list of questions we asked the respondent in the Webex meeting room:

1.How long have you been working in this sector?

2.What is a typical day like for you at work?

3.What do you like the most and least about your work?

4.What kind of problems do you deal with regarding programming and languages?

5.What kind of decision do you make for that problem?

6.What is your opinion on the current programming language you use?

7.Is there any room of improvement for the existing programming languages based on your past

experience?

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8.What is the most common programming language we use to develop software in CICT/UTM?

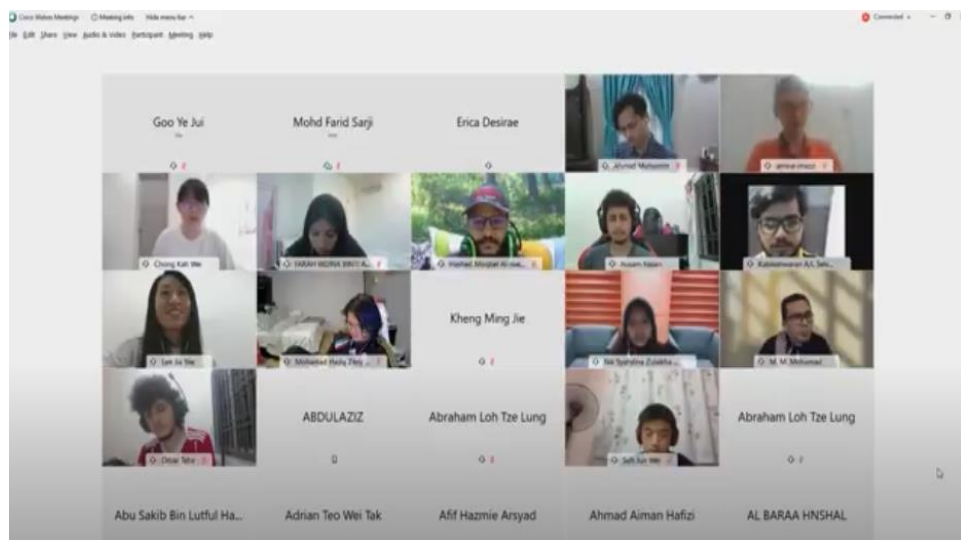9.What are the problems you have to deal with when developing this software?

Figure 1: Interviewing respondent in the Webex meeting room

Name of the respondent: PM Dr Murtadha Bin Mohamad

Work area: Information Systems

This is the link to our meeting session video with the respondent:

https://www.youtube.com/watch?v=3Z03vnzDdQU&feature=youtu.be

5.2 Define:

In this phase, we retrieved the problems from our meeting session with the respondent. In this part we discuss the problem that users need to deal with the language that they learn. The problem is not straight. We did some research to find problems, then we came up with 3 problems which are developers and users often have different logical thinking for the problem, users needing the ability to write a user requirement specification (URS) that can be understood well by the developers and developers needing the ability to understand the URS by the users who don't have any experience of programming. Diagram below shows our progress in creating problems together in google docs.
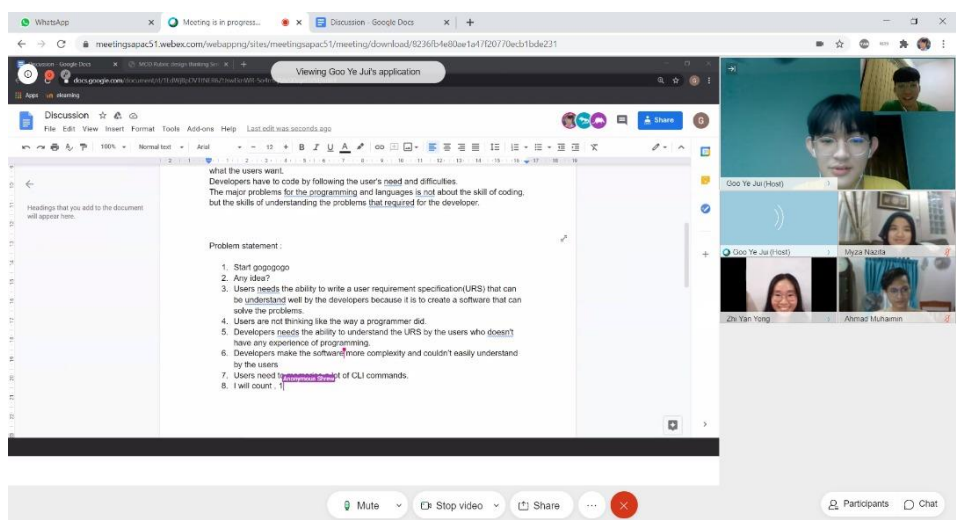

Figure 2: We typing on google docs to form the problems

5.3 Ideate:

In this phase, we have our one initiative to have a meeting in the Webex meeting room since we are still in this Covid-19 pandemic, we cannot meet in person but we can meet virtually in the WebEx room. It's hard for us students to communicate virtually only but we try our best to make it work. So, we state our ideas in google docs to find the best solution to our problems. We came up with the idea to make a website that will take user requirement specifications so that the users fill a URS that can be understood by the developer and can add some feature like the user can track the phase of the product as well. The diagram below shows our brainstorm process to our problems.
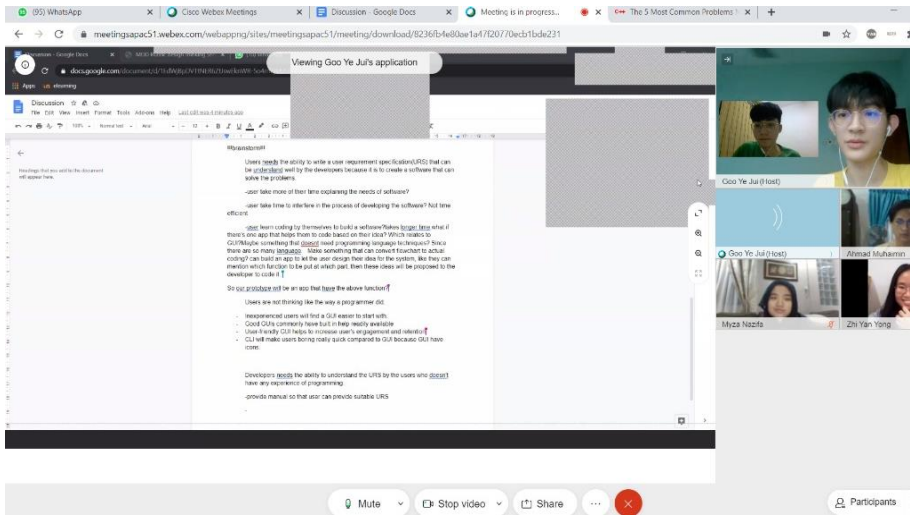
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Figure 3:Brainstorming for the solution

5.4 Prototype

In the prototype phase, we made a template using framer act as our website. Basically, the main purpose we used framer is to make our website look like a real one with a functioning interface. Then, we decide that our prototype will contain features like introduction to our website, login phase, create a new account, live chat with the developers, tracking system, product phase and review from the user. The live chat is very handy for helping the clients if they are having a hard time. We divided our tasks then we designed our prototype together. Diagram below shows some of our website interface.
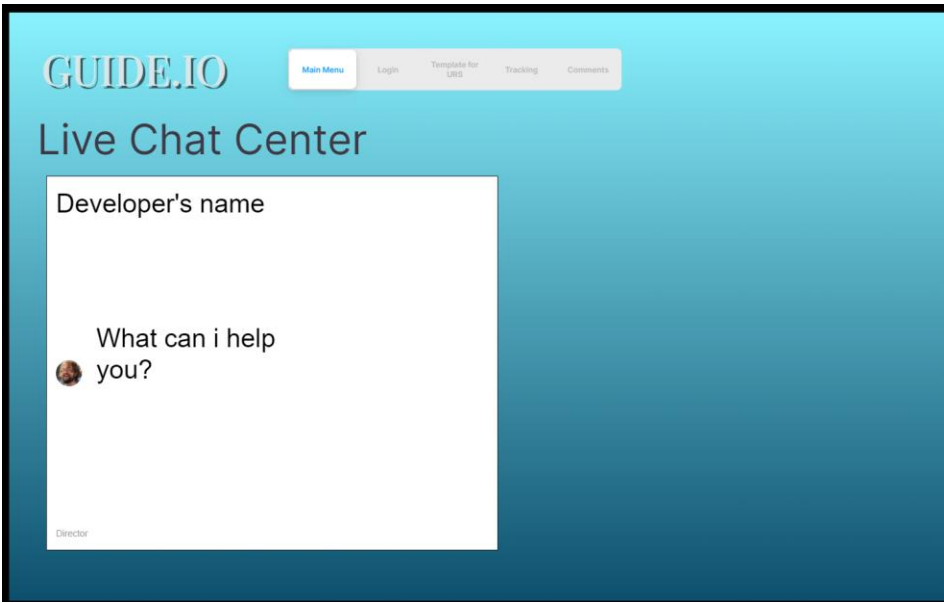

Figure 4:live chat with the developer

Figure 5:login phase

5.1 Prototype test

In this prototype test phase, we ask one person who will act as our client to test our prototype and comment about it. The respondent is a 3rd year software engineering student from UPM. His name is Muhammad Amir and he is 21 years old. He said that our website is very user friendly and others.

The link below is our session with him:

https://drive.google.com/file/d/15bxOUXz1Sri0ZfCQh-d3FFR2CbW1lvOx/view?usp=drivesdk

Figure 6:testing our prototype

6 TASK FOR EACH MEMBERS

- **GOO YE JUI**

Responsible for a part of report writing (Detailed Description), prototyping, team leading and involved in video editing.

- **KELVIN EE**

Responsible for a part of report writing (Detailed Description), prototyping and involved in video recording for the first to fourth phase of design thinking.

- **YONG ZHI YAN**

Responsible for a part of report writing (Design thinking evidence) and prototyping.

- **AHMAD MUHAIMIN BIN AHMAD HAMBALI**

Responsible for a part of report writing (Design thinking evidence), prototyping and involved as video recorder for prototype test sessions.

- **MYZA NAZIFA BINTI NAZY**

Responsible for a part of report writing (Introduction and detailed step), prototyping and involved in the interview session as an interviewer.

7 REFLECTION

7.1 GOO YE JUI

My goal/dream regarding this program is to gain as much knowledge as I can from this program and apply them in my future career. I want myself to be very prepared with all the future challenges and requirements needed. I always wanted to set up a global IT and digital transformation company like Avenga. I wish to improve Malaysia with Big Data Analytics and 5th gen of networks.

This design thinking assignment has very much impacted my ways of solving a problem. I will have the most efficient ways to solve my clients' problems following the five phases of design thinking, which is empathize, define, ideate, prototype and test. This assignment gives me a very good platform to perform these 5 phases of design thinking and I gain so much experience from it. This experience helps me to be more easily incorporated in my projects in future.

To make myself more challengeable and competitive in the industry, I should work harder on all kinds of knowledge like Artificial Intelligence, Big Data Analytics and Cloud Systems. From this assignment, I also realized that logical thinking skill is very important to solve problems efficiently and effectively.

7.2 KELVIN EE

I have a few goals to achieve regarding this course. I want to be a successful well-known Data engineer after graduating. First, I have to be well equipped with all the requirements needed for this career. For instance, I have to learn multiple programming languages like C, C++, Java and so on, understand SQL database design … In my future, I hope to gain experience from big companies like Intel, Microsoft, DHL and so on. Then, my biggest hope toward the future is to open a company and get well used to my experience.

In this design thinking project, I'm blessed and glad to gain some new friends like Yongming and Myza. We worked effectively together. We understood each of our strengths and made sure they were used. Design thinking is said to be important to me because it helps to build high order thinking skills, communication skills, team working and so on. During the project, I Learnt to accept different opinions from the group members and practice on some new computing skills like Framer.

To make myself more creative and competitive in the industry, I will work harder on all kinds of knowledge like Data Mining, Big Data Analysis and Cloud Systems. From this assignment, I also realized that high order logical thinking skill is very important to solve problems efficiently and effectively.

7.3   YONG ZHI YAN

My goal during the four years of studies in university is to learn and familiarize myself with various kinds of programming languages and also gain as much knowledge and experience for further uses in my career as a data analyst.

I had gained some experience from this design thinking project, which is the way to work efficiently as a team even though we couldn't meet up physically due to the pandemic, but we managed to conduct virtual meetings and carry out our project using Framer. This shows that there is always a solution to the problem, sometimes we just have to think outside the box.

I believe that good communication skills are important when it comes to teamwork. Hence, to make myself more competitive in industry, I have to improve my soft skills besides strengthening my professional skills in data engineering.

7.4   AHMAD MUHAIMIN BIN AHMAD HAMBALI

There are a few goals that I want to achieve after taking this course. First, I want to be a good data engineer in the future. Next, I hope I will be able to have great communication skills with other people during my job period since data engineering is not a one man job. Lastly, I hope that I will learn multiple skills such as developing an application so that I can pursuing my job in several sectors rather than focusing on one sector.

Next, I learned a lot of new knowledge and skill in the process of doing this design thinking project. First, we cannot physically meet in a person because of Covid-19 catastrophic hit the world. Therefore, we having our conversation virtually through social media such as Whatapps, Webex, and other platforms. Communication is my biggest problem since I'm a very introverted person but I break my habit and try to give as much commitment as I can. Therefore, I've learned to communicate with others and also working as a team. Finally, this project opened my eyes to technology and information, there's a lot of things that I don't know and I think this is my beginning to explore more about it.

Lastly, after finishing this project, I realized that I need to work hard to improve myself in a lot of aspects so that I could compete with others in this sector. Therefore, I adding up a new routine to my schedule such as learning Python, SQL so that I could gain more knowledge since we didn't learn python. Therefore, I hope my effort will pay off in my future career.

7.5   MYZA NAZIFA BT. NAZRY

There are quite a few goals and dreams that I hope that I can achieve one day regarding this course. The main goal of mine is to become a successful, well known data analyst who will give impact to the industry. The reason I chose this course was because I have always had a fascination on analyzing and interpreting data. It is also a goal of mine to work overseas as I have always wanted to experience new cultures and gain more knowledge from other countries that cannot be gained in Malaysia.

From this design thinking project alone, I have learnt a lot of new skills and knowledge which I can apply in my future career. Throughout the process of design thinking, I have learnt that design thinking is very beneficial for me as a student who desires to be a data analyst as it has trained me to master the skill of thinking outside the box and do some critical thinking which will be useful later in the future.

My social skills have also improved as I always had a hard time communicating with people. However, I have managed to interview someone and also communicate with my group members through this project. This project also helped me gain another skill which is teamwork skills where I had to work together with my group members. Even though we have different opinions sometimes, we managed to overcome the problem through communicating so I have learnt to accept people's opinions.

After going through all the five stages of design thinking, I have realized that to achieve my goals and become a successful person, I need to improve my soft skills and communication skills as it will play a big role in my career later. I learnt that I cannot just rely on reading and studying the syllabus to be successful but I need to know how to think quickly when in crisis and I need to know how to socialize and work with other people. Therefore, I plan on improving myself to become a more capable person so I can achieve my dreams.

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