



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

SECP1513– TECHNOLOGY AND INFORMATION SYSTEM

ASSIGNMENT:

DESIGN THINKING

SECTION : 09 – 1SECR

COURSE NAME : BACHELOR OF COMPUTER SCIENCE –
NETWORK AND SYSTEM SECURITY

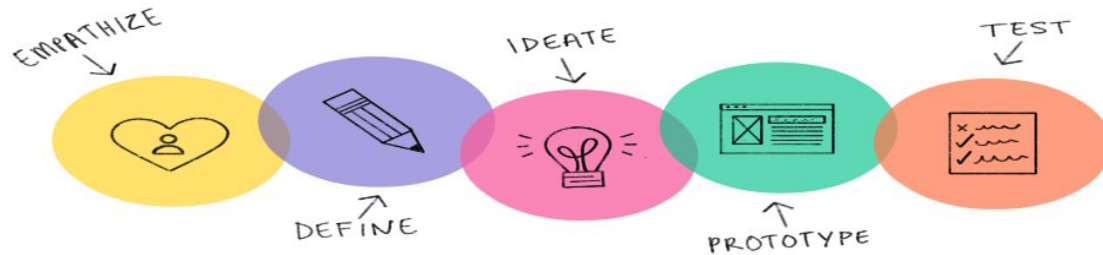
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Introduction



Five phases of Design Thinking. Retrieved from <https://uxdesign.cc/user-experience-is-design-thinking-2428a0a360c2>

Since the beginning of the mankind we have been strive to innovate, from the first tools that separate us from the animals, to the technology that allows us to defy god. We built faster, bigger and smarter. The advancement of technology allows us human to conquer our own world, explore the deepest oceans and shot for the star. Our imagination is our only limits, nothing is impossible if we can think of. When it comes to develop and creating a product, many problems arise throughout the process. Thus design thinking, which is a process for creative problem solving, will play a crucial rule in order to produce a product to really help to solve the problems facing by the majority of the targeted community. Design thinking helps develop a more organized way of thinking and improve the problem solving skill to a higher level. 5 main steps in design thinking process includes: Empathize, Define, Ideate, Prototype and last but not least Test. In this case, our team was required to give a solution to the problems faced by old or special based on programming and languages and elderly is chosen as our targeted community. In this case, our target community is old people who suffer from healthcare issues.

Programming is the activity of developing an executable computer program to solve a certain problem. It can be done by writing program using programming languages. Programmer usually will obey the system development life cycle when programming and the procedures are planning, analyse, design, implementation and maintenance. Programming language is a set of commands or syntaxes applied to write a computer program. Programming language can be classified as high level language and low level language. High level language for example

Python and Java is computer language that is more likely to be understood and read, while low level language such as machine language is more difficult to be read and learnt. Nowadays, programming languages such as Java, Python and C++ are more commonly used.

The following part of the report will discuss the phases of design thinking including empathize, define, ideate, prototype and testing, reflection and appendix.

Design Thinking explanation

1) Empathize

As a result of advancement of technology in healthcare and medical field, Malaysians are living longer as their life expectancy increases. Malaysia's life expectancy had increased by 20 years over the last six decades, from 54.3 years in 1957 to 74.75 years in 2016. 60 years old and above is considered elderly in Malaysia and is account for 9.13 per cent out of Malaysia's total population of 31 million people in 2015. As their body grows old they become vulnerable to diseases and other health problems. Some common health problems facing by elderly are hypertension, type 2 diabetes, chronic heart diseases and stroke. An interview with relative of one of our team member was carried out to find out and look into more problems and difficulties of this age group are having in dealing with these health problems.

Empathize is a phase where we trying to understand and feel what problems do our respondents have. By this way, we only can carry out the following design thinking phases based on the responses we gained. For the interview part, Low wanted to carry it out and our interviewee for this assignment which is his uncle is called Low Tao Peng, a 65 years old male. To implement this step, Low found a day where his uncle was free and had a conversation with him.

2) Define

Define is second phase of design thinking where we define the problems faced by our client from the data collected from empathize phase. After we analysed the conversation dialogue of Low and his uncle in WhatsApp, we found that main problem faced by his uncle was he easily forgets to consume medication due to aging and he was once hospitalised because he accidentally skipped medication. Hence, we decided to find a solution to solve his problem effectively.

3) **Ideate**

Ideate is basically a phase where we brainstorm as many solutions as possible and we selected the best one after some filtration. We separated our ideas into three main categories, which were “Easy”, “Intermediate” and “Radical”. “Easy” category is held for those ideas that were too simple or not related to our topic, which is programming and languages, while those ideas which were nearly impossible or unrealistic were belongs to “Radical” category and last but not least, the “Intermediate” category is suitable way that meets our topic while able to solve the problem efficiently. All proposed solution was made before the meeting and we filtered them to find the best one.

4) **Prototype**

Prototype phase is carried out right after we done the ideate phase. We transformed our product to a physical object using paper box and designed the interface that were going to appear in the product.

5) **Test**

Test is the last phase of the design thinking process where we brought our prototype that we designed and made to our client. We tried to demo the steps of using the prototype and let the user to pick it up. We also listened to the comment given by our client to improve the functionalities of our prototype.

Steps and Description

1. Empathize

Based on the conversation during the interview, we knew that:

- Low's uncle began to suffer from hypertension, heart and thyroid disease from his 40s.
- These condition required him to take medications regularly.
- He became forgetful as he grows old and sometimes he forgot to take the medication on time.
- He was once admitted to hospital as he skipped his medication.
- He almost suffered from stroke as his blood pressure is very high but luckily he was saved by the doctor and he discharged after one week.

These criteria became our main focus to be discussed on the define part. The full conversations of the interview can be viewed at the Appendix page.

2. Define

From the highlight of the conversation, we found two **main problems** that were facing by Low's uncle, which were:

1. He forgets to take medication on time easily, and
2. He refuses to be hospitalised again due to his reckless.

From there, we decided to come up with something that can:

- Remind Low's uncle to take medication on time, and
- Notify someone when abnormality was detected in the body condition of Low's uncle.



Figure 2.1 shows the interview done by our team member. The person on the left is our interviewee, Low Tao Peng while the one on the right is our team member, Low Wei Chieh.

3. Ideate

Since our client is an elderly, so we try to make our product to have:

- a) simple user interface, and
- b) easy to pick up.

These are the solution proposed by our team members and their respective vote:

Easy	Intermediate	Radical
• Hire a caretaker (1,2) • Set an alarm to remind him to take medication (1)	• Develop a mobile healthcare app (1) • Invent a smart healthcare wristband. (1,2)	• Invent a belt that can stores medication (1) • Invent a healthcare robot (1,2)

*Table 3.1: Solution proposed (Hint: 1 and 2 refers to the problems that might be solve by the idea proposed where 1 and 2 can be found on pg7 at **main problems**)*

Solution	Positive Responses	Negative Responses
Develop a mobile health care application (Proposed by Low)	4	0
Hire a care taker (Proposed by Zhao)	1	3
Invent a belt that can stores medication (Proposed by Hafidz)	1	4
Invent a smart healthcare wristband (Proposed by Liew)	4	0

Invent a healthcare robot (Proposed by Zhao)	3	1
Set an alarm to remind him to take medication (Proposed by Liew)	0	4

Table 3.2: Solutions proposed and their respective vote



Table 3.1 and Table 3.2 show the solutions proposed by all of our team members and their respective vote. After having a serious discussion, we have decided to pick wristband as our solution to solve our client's problem. There are some reasons we choose it instead of other ideas.

Rejected Idea	Reason	Shortage that can be overcome by wristband instead
Set an alarm to remind them to take medication	-The function is too limited (can only remind user to take medication). -The user might just dismiss the alarm when he is busy with his business and he or she will forget to take medication.	Wristband can be equipped with an algorithm will check user body condition and if found that the user's blood pressure, heart rate and body temperature is still the same even though it should be normal after taking medication, it will notify the

		user again and ask if the user have taken the medication.
User hire himself a caretaker	-This idea is not stick with our topic, which is programming and languages. -The care taker also cannot inform the user about his or her body condition anytime as the tool to measure blood pressure, body temperature and heartbeat is not commonly own by normal people.	The wristband can have device that can check body condition built-in.
Belt that can stores medication	-User may still forget to consume their medication even though he or she is wearing the belt. -The user may also carelessly forget to wear the belt and the functionality of this belt is totally lost. -Most importantly the user has to bow down his or her head every time he or she wants to have a look at the interface on	The wristband will detect and track the active hour the user wears it daily. If the user does not wear it on the time where he or she supposes to wear during active hour, the wristband will ring and vibrate to remind user to wear it as the measurement of blood pressure, body temperature and heartbeat are fail to be detected from user.

	the belt, thus it is not convenient as wearing a wristband.	
Healthcare robot	-The production cost is high. The market price of this robot once it is created is quite expensive, and it is hard to be commercialized among elderly. -Low portability of this robot causing it to be hard to be by the user's side. When compare it to the wristband, the wristband can replace most the functionalities in just a simple design.	The cost of a wristband is lower and it is portable.
Develop a mobile healthcare application	-Not all elderlies have a smartphone, and even if the users own a smartphone, they could not utilise to its maximum potential. -The price of a smartphone is also more expensive when compare to a wristband.	The wristband can be design where all the command can be done by holding the notch and speaking to the wristband.

4. Prototype

As what we set for the criteria in selecting the solutions, we want our product to have:

- Simple user interface which is easy to pick-up by elderlies.
- Remind our client to take the medication on time
- Some emergency countermeasure which will be triggered when something abnormal detected with his body condition.

Features

1. Basic Features:

- Show the blood pressure, heartbeat, body's temperature.
- Always show the date and time interface by default. Switching interface can be done by pressing the notch.
- Record, save and remind the medication time to user by just simply press and hold and notch at the bottom of the wristband. (At the presence of artificial intelligence in core of wristband)
- When the time to take the medication set by the user has come, the wristband will alarm and vibrate to notify the user.

2. Another feature of this wristband is when the user is detected to have abnormal body condition:

- Abnormal blood pressure readings (below 90 mm Hg systolic or 60 mm Hg diastolic, or above 140 mm Hg systolic or 90 mm Hg diastolic)
- Abnormal heartbeat (Abnormality heartbeat is defined by the wristband as the wristband will collect data from user's daily heartbeat, and the average value is calculated. Any values beyond the values is determined to be abnormal)
- Abnormal body's temperature (below 35 or above 39)

When one or more of these happened, the AI will automatically and immediately call the contact number saved for assistance (only one contact can be saved). This contact number will be requested from the user when he or she first using the wristband.

3. At the same time, the AI will track the routine of the user's time to consume medication for the first week he or she first using the wristband.

- Automatically remind the user on time, and the users do not have to manually inform the wristband to remind him or her to take medication, if the daily routine of taking medication is the same.
- Else, the users have to manually set the time to take medication from the wristband.

4. In order to make sure the user won't forget to put this wristband on, the AI will:

- Detect and track the active hour the user wears it daily.
- If the user does not wear it on the time where he or she supposes to wear during active hour, the wristband will ring and vibrate to remind user to wear it,

as the measurement of blood pressure, body temperature and heartbeat are fail to be detected from user.

5. User is busy and just dismisses the notification then forgets to take the medication later.

- AI will found that the user's blood pressure, heart rate and body temperature is still the same as it supposed be normal after taking medication.
- When this happened the wristband will notify the user again to ask if the user have taken the medication.

Programming and Languages

Most of the functionalities above are run by the presence of AI. The AI is programmed by using Python as the programming language. Python is used instead of Java, C++, C or Ruby as most of the AI system now is developed using Python. The reasons why Python are mostly used in machine learning is that:

- **Coding in python is fast and productive**

The syntaxes and the data structures are neat and simple. For example, Python can print a message by just writing “`print(“...”)`”, while Java is “`system.out.print(“...”)`”. Python can prevent lengthy coding and make the whole coding much systematic, organized and simpler. High-level data typing is also an option provide in Python which reduces the length of support code that is needed. These are the factors that contribute to its speed and productivity.

- **The availability of third party module**

Python allows the user to be able to interact with most other programming languages due to the presence of third party module.

- **Python has more diverse library compare to others**

As Python developer prepared lots of libraries for the Python user to be used, hence many functions can be made easily called for user to be used to implement AI system with better features. For example, a lengthy code to perform a certain task in other programming languages but it can be simply done import the libraries in Python.





Current time and date is shown on this interface.



User's blood pressure, heartbeat and body temperature is shown.



Interface that reminds user to take medication.



This interface is used to call the contact number saved.

5. Test

After a demo was performed by Low, our client Low Tao Peng tested the functionality of the wristband on his own. Soon, he managed to use it freely without Low's supervision. Low Tao Peng was satisfied with the product as he found that it is very practical, reliable and easy to use.



Below are the comments obtained from the response given by Low's uncle.

1. Date & Time interface

Uncle: I like it as it can view current time and date anytime I wish to view.

2. Body condition interface

Uncle: It's very convenient, very good.

3. Medication reminder interface

Uncle: It's very easy to use. I just have to press the notch and give instruction, then it will automatically remind me. This solve my biggest problem effectively.

4. AI calling interface

Uncle: Wow, I will save my wife for the contact number. It's a very useful function for me if anything happens to me. Of course, I hope it won't happen in the future.

Reflection

a) Problem encountered during project

The main problem we encountered was we stay far apart from each other and it's hard for us to meet up often. Therefore, the meeting is very important for us and we try our best to utilize the time given for us to fulfil the project. Next, we have communication problem within our team member as we are come from 3 nations, which are Malaysia, Indonesia and China. They are having problem on expressing their idea in English effectively.

First, to overcome the first problem, Liew opened a WhatsApp group and invited our entire team member to enter the group, any simple discussion will be hold at the group. About the discussion that requires face-to-face, we make it by two ways, which is stay at Student Lounge during free period.

Next, communication problem is the most difficult problem to be solved. To avoid any misunderstanding, we tried to use simple English to converse within each other. As Liew and Low are Chinese, they will communicate with Zhao using Mandarin if Zhao unable to express his idea in English. At the same time, Low will speak with Hafidz using Malay if Hafidz having trouble to understand in English. Liew also encourage all of us to speak in English as more as possible without any harassment, as this is the only way to improve their English speaking level.

b) Our goal/dream with regard to the course/program

Our main goal regards to this program is to become an expert and professional network security analyst then from there we can make a revolutionary change towards network and cyber security and increase awareness among Internet user. Since data leakage is occurring quite often nowadays, for example the incident involved the user's data leakage from Google and Facebook. It showed that security level in the Internet is actually not strong enough and there's a lot of improvement can be made. Hence, our concern is to improve the security level in the Internet and thus minimize the happening of information theft or unauthorised use and access of user's data. At the same time, we wish to invent a new strong encryption algorithm for the Internet users and let them feel protected when they are filling in their personal information through online website. Furthermore, their information and the databases should be secured at a highly confidential storage so that malicious codes or unethical hackers can never intrude them.

c) The impact of design thinking on our goal/dream with regard to our program

Design thinking is the best when it comes to an invention of a product, as it helps a lot in organize our thought and opinion in a systematic way. This allows us to set our own assumptions and perspective about the world aside in order to gain insight into users and their needs. Furthermore, it leads us to get the solution for the problems by conducting survey or interview and get ideas from people. Dare to think different is what we learnt throughout the process. Get a suitable solution for new problems and get an innovative solution for existing problems. Feasibility is also important. The sequences of design thinking process can be flexible; some procedure can be done multiple times in order to achieve the best possible result. Besides, team work without meeting each other is developed throughout the process as communications nowadays relies on social applications. At the same time, it makes things easier and efficient as we can meet up anytime and anywhere.

d) Action/improvement/plan necessary for us to improve our potential in the industry

In order to improve our potential in the industry, we definitely have to keep ourselves up-to-date to the newest information in computer science field. We can implement it by attending talk regards to IT and computer science, reading online articles and watching videos from YouTube and from other resources. We keep ourselves on the right track so that we are able to compete with others when we are working in the future. Apart from that, the purpose of learning ethical hacking is also necessary for us. We can participate in ethical hacking skill class held by CyberX society, PERSAKA club, lecturers or perhaps YouTube and workshop from IT company to gain knowledge on how to secure data from being hacked by other people. Meanwhile, we can also try to intrude our own software to determine the vulnerability of our program so that improvement of security level can be made. Last but not least, we can participate in competition related to our course to gain extra experience. It is also a good platform for us to view our standard compared to other contestants. We can also share our thoughts and ideas among each other, and of course, meet with someone who is more expert than us and ask him or her for advice to improve ourselves.

Appendix

Conversation with Low' uncle, Low Tao Peng

- Uncle: Please have a seat
- Low: Hi uncle, can you briefly describe yourself?
- Uncle: Ok. My name is Low Tao Peng, I am 65 years old right now and I am working as an economic rice hawker.
- Low: Owh. So you still working everyday right now? What is the operating time of your hawker stall?
- Uncle: Yes, I am still working right now because it is boring just staying at the house. I work from 6 a.m. to 3 p.m. and I often work during public holidays as well.
- Low: Oh I see, so you work only until 3 p.m., so what do you usually do during your free time?
- Uncle: Since my son have grown up and went to work, so during my free time I usually so buy the ingredients for tomorrow. Or else I will be sitting at the living room to watch some television programme with my wife or just scrolling through my phone.
- Low: Wow so I see that you can use a smart phone?
- Uncle: Yes, my son bought that for me. But I can only perform some simple task and use Facebook and Whatsapp. I still not fully understand how it works so sometime I still have to ask my son.
- Low: Don't worry my parents also just starting to use smartphone as well.
- Uncle: Oh and one thing, I also try to do some simple exercises during my free time in order to keep my health in good state.
- Low: Is there any reason behind this?
- Uncle: I have been having some kind of illness.
- Low: Uncle, may I know your brief history of present illness?
- Uncle: I have heart and thyroid disease since 40s. I have hypertension as well.
- Low: Uncle, how those diseases affected your daily life?

Uncle: I have to take my medication on time but now I begin to become forgetful. I remembered that I once admitted to hospital as I skipped medication and I could not do my job for few days.

Low: Sorry to hear that.

Uncle: I was lucky that time because my wife is just around me when all that happened. I was told I almost suffered from stroke as his blood pressure is very high. Since that incident, I am starting to work out. Though sometimes I still forgot to take my medication.

Low: Don't worry uncle, this is the reason why we are having this interview. I wanted to know the problems you are facing and try to find a solution to your problem. I will discuss with my team and come back again with a solution. Thank you for taking your time to have an interview with me today, it has been a pleasure.

Uncle: Welcome.

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Task Assignment

Report	Liew Wei Xian, Zhao Guodong
Video editing	Hafidz Nailul Authar
Presentation slide	Liew Wei Xian, Low Wei Chieh
Prototype	All
Interview	Low Wei Chieh
Ideate	Hafidz Nailul Authar, Zhao Guodong