SECP1513

TECHNOLOGY AND INFORMATION SYSTEM

SEKSYEN 02

TOPIC:

DESIGN THINKING ASSIGNMENT – INTERNET OF THING

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1.0 INTRODUCTION

Background:

In the current globalisation of cutting-edge technology, utilising QR code attendance systems is common in the educational field. However, the significant concern among educators is the system's vulnerability, allowing students who skipped class to exploit QR code attendance taken by their peers. Conversely, students themselves have their own worries. Have you encountered any incidents where any of your classmates have lost gadgets like laptops or tablets? Consequently, security emerges as one of the significant worries too. Thus, to solve these problems, our team decided to develop a 'smart classroom' technology named 'AttendEase '.

About us:

'AttendEase' is an Internet of Things (IoT)-based technology that includes four main elements for efficient data processing: sensors, connectivity, communication, and user interface. In brief, through the sensors such as fingerprints and face recognition on device could record the student attendance as well as monitor and record classroom activity. The user interface allows educators to control the 'AttendEase' device, with the both application and device are connected via WIFI to the cloud. This connectivity ensures educators could access the data and information of students and classrooms as well as interact directly against students through the user interface. Lastly, the students' data is initially built into the system. This enables educators to adjust lesson venues, monitor attendance and give instructions remotely when they cannot physically attend or are late for class, all through the system.

Objective and overview of the project:

The objective of this project is to solve the concerns of educators and students. In this day and age, integrity and insincerity have grown to be considerable issues among humans. Students abuse the convenience of marking attendance by skipping class while also worrying about losing their belongings. Additionally, educators struggle to swiftly determine classroom availability. These issues emphasise the need for smart classroom technology. Therefore, our system utilises fingerprints and facial recognition, which require physical operation. The camera at the top of the device could monitor the environment of the classroom and a speaker for recording and communication within the area.

2.0 DESIGN THINKING PROCESS

2.1 Empathy

Empathy is the first step in design thinking because it is a skill that allows us to understand and share the same feelings that others feel. We interviewed our lecturer, Dr Eiliyah Wong, and ask her about what problem does she faced about IoT. Through this interview, we knew that all lecturers are facing

problem of students are skipping class but with able to scan the attendance QR code which taken by their peers. Then we also asked her opinion on how we should solve this problem based on her experience.

2.2 Define

The next step is to define the above feelings and identify the main problem to be solved. After interviewed, we have a small discussion about her problem by understanding and analysing her answers that gave in the interview sessions.

2.3 Ideate

"Ideate" is a phase for us to come up with several solutions to overcome our problems. During this phase, our team are brainstorming on the ideas on how to address the problem well. We are trying to make out a completely new device for taking students' attendance. Other than that, we make an innovation in our application which is adding a 24-hour CCTV camera. We have suggested different solutions for the problems lecturers are facing based on the 3 different categories which are traditional, paper-based and application.

2.4 Prototype

In this stage, we must transform our ideas and techniques into a prototype. After we have our discussions on the design and details of our products, we started to make it out using cardboards, A4 papers, pens and so on. We draw and make the user interface for our application. And for our device which is used for fingerprints and face recognition, we make it using a cardboard to make sure it is 3D similar to the real product we are producing.

2.5 Test

Testing is a stage for us to make sure our product is good to be use without any deficiency. Testing our product by users could help us to make some improvements. We have made a video showing the steps for users so that they could follow and give us reviews or feedback. It is to ensure our product does fulfil the communities' needs and requirements.

3.0 CONTENT OF REPORT

3.1 Problems and Solutions

Target consumer:

Our product "AttendEase" addresses an essential need in educational instituions like schools and universities. It combines face recognition or fingerprint technology for attendence and a 24-hour CCTV camera, making it a 2-in-1 device. In addition, our accompanying application allow lecturers

and teachers to manage attendance, monitor students and to access CCTV recordings if needed on their own devices. This technology is suitable for installation in classrooms, lecture halls or any other places requiring attendence tracking and real-time camera.

Problem	Description	Solution
Students' attendance	Due to the fast-paced advancement in technology, we are now using QR-code for students' attendance. Lecturers will show the QR code in class and students could scan to take their attendance. Unfortunately, here comes a terrible problem: students might take pictures of that QR code for their friends who didn't even attend the class. Students tend to pretend they have attended the class but not. Since then, there are more and more lecturers who complain about students who fake their attendance by seeking help from their friends. More and more students take this as a chance for them to skip themselves from classes or any other events but already took their attendance in the systems. That is why our team introduced our devices and apps to solve this problem from continuing to happen.	Our application can let the student do the self-check-in for attendance using the face recognition or fingerprint using our device. Each device in the classroom has its own timetable from the database to know what time will enrol which class of students. Lecturers do not need to do any preparation jobs such as open a QR attendance code and share the code to students. Hence students can either scan their faces using the device in the lecture class or using a fingerprint with their thumb finger. After these actions have been taken by the students, their attendance will automatically enrol into their class for the particular course they are going to have. Thus, we can avoid students from spreading the attendance QR code to let the students who are not in the class to sign in also. Students must show up in the class to get the attendance. As we mentioned, each device has their own timetable to enrol for the students' attendance, then what if the lecturer needs to change their lecture location? To solve this, each of our devices has its specific code. Lecturer must use our application to change the location and each location in the application already assign to each device's code. Hence, it easier the lecturer's job to change to lecture location. Thus, when student's check-in in the new location, our device already gets to know the current time of the new class from the timetable because the lecturer did the changes in the application before this. Hence the attendance will enrol correctly into their class. Lecturers also can check the students' attendance by using our application.

Security concern	Recently, students always left their devices like computers, tabs or bags in classes. Cases like missing things happened frequently. But we could not really keep track or found back the specific items as there is no CCTV in every single place. The thief could just take and go immediately without any mark left behind and it is very hard for us to find it back.	Our device also can act as a CCTV. It will be widely installed in each lecture location either in a small classroom or big hall for attendance check-in purposes. Moreover, it will be functioning all the time to keep track on the security of each classroom or lecture hall in the school. Since every classroom or hall must have a computer device which is valuable, so this becomes one of the problem concerns. Not only that, but sometimes students will also leave out their laptops, tabs or bags in the class. Thus, our device can record the class all the time to avoid problem of theft or any malicious damage during the night or nobody around. Lecturers can check the CCTV recording playback with audio on our application. To track back who entered the class after the item is missing or destroyed.
Real-time camera with audio and for communication use	Here is a question for lecturers and teachers, do you ever experienced any sudden occurrence that made you could not attend your class on time? Other than that, do you ever experienced students ignore your instructions or messages in group message and they started to do their own things? To avoid all this situation happens, our real-time camera with audio is introduced.	Not only playback, but our device also provides real time camera to let lecturer check the situation in the class using our application if lecturer haven't arrived the class due to traffic jam or others sudden issues and give a further instruction specifically. Lecturers can use remote communication function in our application to communicate or give instruction directly. Not choosing to use the WhatsApp to communicate cause our device can provide real time communication then lecturers do not need to wait for students read the message and give respond. Our device provides audio releasing and accepting so lecturers can get audio responds from the application also.

Table 3.1 Detail description

3.2 Team Working

Our group have split ourselves into different tasks. Sabrina focuses on video editing while Poh Lok Yee mainly doing the prototype models. Meanwhile, Chau Ying Jia, Gui Kah Sin and Woo Cheng Shuan are focusing on report writing and presentation slides. Although we have our own tasks, we still do our tasks together as it is more efficient and easier for discussion and commenting.

At the beginning, we used to spend our time in the gap between classes to discuss about the design thinking. During the design thinking process, it become more complicated and in details, our team uses time after classes to complete our task.

4.0 DESIGN THINKING ASSESSMENT

4.1 During the end of the project demonstration

Concluding our project demonstration, inventing a product or devices for the communities are challenging. Interviews take a very crucial role for us to understand their problems in detail. It is easy to come up with ideas, but it requires significant effort to think of how it could run well and efficiently. We need to ensure all our technologies meet the communities and market needs. Collaborative discussion between teammates is important too to ensure we have a unified concept. Still, we are satisfied with our products, and hope it really addresses the communities' identified issues.

4.2 During the transition between design thinking phases

During the early time of the design thinking process, utilizing IoT to address problems was perplexing. However, after we had our discussions, we decided to build a design using IoT to solve students' attendance problem. We interviewed the experienced experts to get more information and do some research on how or what technologies we could implement in our design and products. Fortunately, we have a smooth thinking process as soon as we get to know clearly what the next step is to continue our project enabling us to complete all those tasks on time.

5.0 DESIGN THINKING EVIDENCE

5.1 Sample work by students working to solve the design challenge
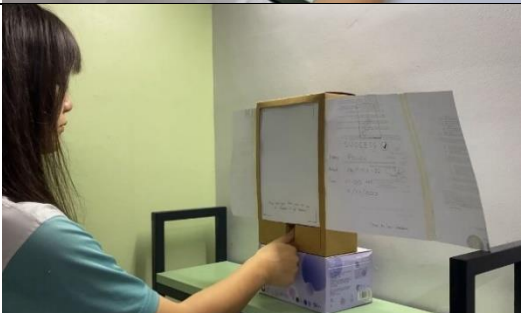
	Interview session Interviewer: Gui Kah Sin Interviewer: Dr. Eiliyah Wong About: what problem does she faced and what is the suggestion solution
	Discussion We identified her problem and analysed the solution provided
	Further Discussion We list out the possible solutions and choose the best way. Other than that, we also figure out other innovation that could be implemented.
	Building a prototype After we have decided, we built a prototype which is the device and an accompanying application.
	Testing When the product is done, we demonstrate and test our products with different users.

Table 5.1 Design thinking evidence

5.2 Record for each phase

5.2.1 Empathy

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

Questions	Answers
Good morning, Dr. Eiliyah, we are here to interviewing about the topic of internet of things for our TIS assignment.	Morning.
What problem do you face when you use IoT in daily life?	The problem is student's attendance. That's the problem because now we are using QR code attendance that's mean I have to download and students have to scan the QR code for the attendance. But the problem is when the students are not in the class but their friends can send QR code to them so they didn't join the class but the attendance is full. I want to have a way to solve this problem besides than this QR code that is more convinient and secure.
Do you have any idea to improve this problem?	Maybe a fingerprint recognition or face recognition for the students before they came in the class. They use the fingerprint to scan on the device to capture their attendance then only enter the class. As we all know, fingerprint is very secure and unique. That's why I'm suggesting this way to be implemented.
Thank you doktor for meeting with us.	You're welcome.

Table 5.2.1 Details for interview session

5.2.2 Define

The table below shows the problem faced by the respondent.

Problems	Descriptions
Respondent as a lecturer complaint about students who fake their attendance by seeking help from their friends.	Lecturers will show the QR code in class and students could scan to take their attendance. Unfortunately, here comes a terrible problem: students might take pictures of that QR code for their friends who didn't even attend the class. Students tend to pretend they have attended the class but not.

Table 5.2.2 Problem faced by respondent

5.2.3 Ideate

The table shows the possible solutions that can be used to solve our respondent's problem

Traditional	Paper-based	Application
-back to the traditional way -by calling out students' name and record his or herself	-students write down their name themselves on the papers for lecturers to refer	-by using a new application for attendance which could have added some other functions

Table 5.2.3 Possible solutions to solve respondent's problem

5.2.4 Prototype

After we had our discussion, we decided to have a new application for better experience and more convenient compared to the other two based on the reasons listed in the table below.

Ways	Reasons
Traditional	- It really takes time if we use back the most traditional method to take students attendance - Lecturers must wait for all students arrived to start calling out their names for a record - Lecturers have to call out students' names one by one - The students who attend class late have to look for their lecturers or teachers after class for attendance
Paper-based	- Students might help their friend to write their names who did not attend class - Waste of paper

Table 5.2.4 Reasons for not choosing the way to solve respondent's problem

Therefore, our team decided to develop a new technology. Students could quickly take their attendance upon entering the classroom by scanning their face or fingerprint with our device. Then, the attendance will automatically be recorded, preventing students from assisting their peers to take their attendance

and saving time. In addition, our device provides real-time CCTV too. Educators could access our application anytime to check for students' attendance or playback CCTV recordings.

The table below shows the characteristics of the 'AttendEase' application and device.

	'AttendEase'	Characteristics	Description
Existing Functions	Application	Schedule	Check the schedule instantly or simply find out where there are available classrooms when needed for class changes or additional lessons.
		Camera & Speaker	View the condition in the classroom and communicate with students when the educator is late or absent.
		Attendance	Identify the attendance rate and determine which students are absent.
	Device	Face Recognition & Fingerprint	Ensure the real attendance, as these biometric identifiers provide accurate verification.
		Camera & Speaker	Serve as a CCTV system to monitor the activity in the classroom to enhance the security of students and enable interaction via device.
Extra Functions	Application	Recording	Record video and audio simultaneously for future reference.
	Device		

Table 5.2.5 Features for 'AttendEase' application and device

5.2.5 Test

After our prototype is done, we started to demonstrate our products to our lecturer. We explained about the functions and the use of our products in details. She was quite impressed and gave us positive feedback and comments. She hoped it could really help in solving the problems lecturers met and make sure students cannot help their friends to take attendance again.

6.0 REFLECTIONS

NAME	REFLECTION

Sabrina Heng Wei Qi	a. What is your goal/ dream with regard to your course/ program? b. How does this design thinking impact on your goal/ dream with regard to your program? c. What is the action/ improvement/ plan necessary for you to improve your potential in this industry.	a. I am interested in coding since I am in secondary school. So, I wish to learn more about programming and computing information in the course I choose. Otherwise, I wish to become a person who known well in computing knowledge and apply the technique in industry. b. In my opinion, design thinking let me learn about skill of problem solving and logical thinking which are important in the program I choose. Moreover, I have learned to have a good team working with my teammate to complete the task given by lecturer. Lastly, as a group leader, I have learned to guide my group to complete all the task. c. I would like to learn more computing knowledge by other articles and research. Otherwise, I will not stop to learn after entering to industry as we need to be always up to date about computing knowledge to get better improvement. Lastly, I will involve myself in computing club to get more experience by participate in the club activity.
Chau Ying Jia		a. First of all, I wish to master and score all my subjects well. I could say that I am still a newbie in computing, but I believe I will be knowledgeable enough and capable to become a person who are good in both hard and soft skills. As our programme will have more hands-on work or collaboration with companies, I will use this opportunity to learn and gain experience. b. I learned to be creative in solving the problems I met and at the same time have discussions with my teammates. No matter how hard it is, I could still solve it with the right way of thinking. I will find out how important it is to have this design thinking skills once I started my career in the future or even just for my next projects. It might help me a lot in completing my tasks as I already have this concept in me. c. For myself, I would say that I will definitely join or attend more hands-on workshops to improve my basics or my skills. When I started to master those skills, I will try to take part in competitions too as it is also a chance for me to gain experience. In short, I will keep learning and improve myself.
Gui Kah Sin		a. I hope I can build the skills required for my career as well as be able to understand and expertly apply the knowledge I have learned for my future. The unique 2U2i program of the course is what I am most concerned about, I am sure I can gain meaningful experience through this program. b. Furthermore, design thinking helps me understand problem-solving processes better. This skill helps me to enhance the efficiency of my course's work. When it comes to my goal, it makes it clearer because I have confirmed my main problem now is to master my knowledge. c. I would like to improve my communication skills since I still lack the confidence to present in front of crowd. Besides, I would like to participate in more challenging and nurturing competitions to advance my skills and always keep up with new knowledge.

Poh Lok Yee	a. What is your goal/ dream with regard to your course/ program? b. How does this design thinking impact on your goal/ dream with regard to your program? c. What is the action/ improvement/ plan necessary for you to improve your potential in this industry.	a. Computer science is a new and exciting world for me, and I am able to access to a wealth of knowledge and resources in this 2U2i program. I wish to strengthen my basic and foundation so that I can be an expert in computer science field. b. I have enhanced my communication and problem-solving skills in this project since we are able to work in a small group. I do expose to a new sea of knowledge which have motivate me to discover more about computer science's facts and information. c. Mainly, I would like to improve my problem-solving skills by attending the extra workshop where I can do hands-on exercise. Not only that, attending the industry talks is important as I will have a clearer vision of the IT field, which lead me to the right direction. Always be curious, and passion are the long-term motivation for self-improvement; hence, I will keep learning and updating myself until I can't.
Woo Cheng Shuan		a. I wish to master all topics and subjects in my course during these four years. Since my course is going to have long term internship compared to the others, I must have good skill to let me handle the stuff in internship or in the future. These four years are the main time that I could build my foundation. b. Besides, I think this design thinking project let me know how the process is to develop and build the application and product to fulfil user's requirements. I get to know how to create problem, communication and solve with a team. c. Not only that, but I will attend some extra course to improve my IT knowledge and skills. This is because we will do many hands-on projects which is tougher than this. "Never stop learning", a quote from Mr Ninderjit that I heard from the industry visit.

Table 6.1 Invidual reflection from each group member

7.0 TASK FOR EACH MEMBER

NAME		SABRINA HENG WEI QI	CHAU YING JIA	GUI KAH SIN	POH LOK YEE	WOO CHENG SHUAN
TASKS	**Interview, Discussion, Prototype and Test**	Giving idea about Prototype	Interview (Empathy)		Prototype & Test	Giving idea about Prototype
		Discussion for Define and Ideate Stages				
	Documentation	Editing Videos	Slide Presentation			
	Report	Merge and Summary the Report	Detail Description about Problems	Introduction	Brainstorm idea	Detail Description about Solution and Team Working
			Design Thinking Assessment	Work Progress & Distribution Table		
		Detail Description for Each Phase				
		Design Thinking Evidence & Reflection				

Table 7.1 Tasks for each member

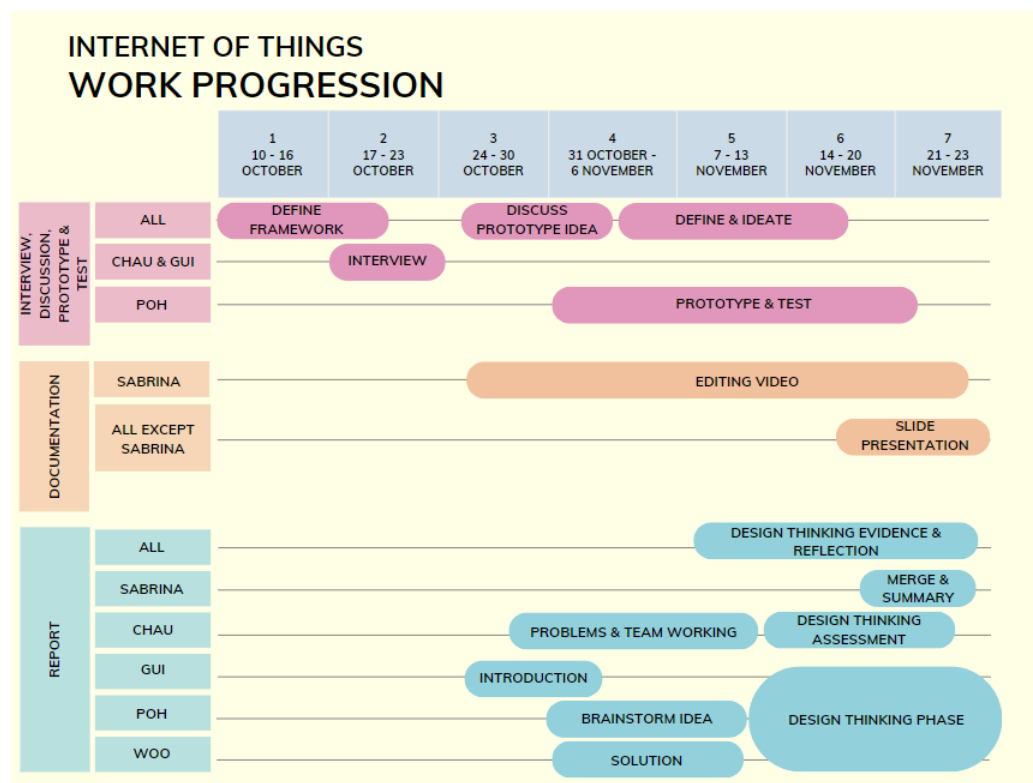Figure 7.2 Work progression

8.0 REFERENCE

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9.0 LINK FOR VIDEO

https://youtu.be/KqJsBg-bVsE