SECP1513-02 TECHNOLOGY AND INFORMATION SYSTEM

Design Thinking Project Report

Product Name: Automatic air conditioner schedule

Group Name: Santai Pro Max

Prepare for: Dr.Aryati binti Bakri

 Name : Nasaaie Bin Noriskamar Matric No : A25CS0118	 Name : Farhan Ashraf Bin Fakhrul Anwar Matric No : A25CS0059
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1.0 INTRODUCTION

To develop a design thinking project, a team required to understand the situations from every inch of aspect. This consist of the users, challenges, critical thinking, creativity and develop a prototype that must be tested to ensure the solution. Only five stages need to be implemented in order to identify the unclear problems and solve it successfully. It consists of:

1. Empathize	This is the most important phase where we collect real data from users. At this phase, we can delve into the problems and user needs. Empathy phase is the part of the team can clearly set the initial idea logically
2. Define	From the data we collected in the previous stage, we will organize it properly. An analysis required to help us fully understand and determine the main problems. At the end of this phase, our team will come up with one solid idea.
3. Ideate	This is the stage where we generate the idea after gained a full understanding from the previous two phase. The teams will exchange the opinions and brainstorm one innovative solution
4. Prototype	During this stage, we will build the idea into the physical world solution. We will design the product to visualize the idea. Many attempts need to be test by us to ensure it will successfully be working.
5. Test	We will test the products and collect feedback from users as the project will not end here.This phase is to assess our product's effectiveness and the extent to which it can assist to solve the issue. We will go back to defining stages till the issues can be resolve to the best extent possible.

2.0 DETAILED STEPS

Our group was tasked with creating a prototype on **Energy Efficiency on Campus**, focusing on classroom usage and smart energy management. After discussion, we identified that many universities use HVAC systems with a fixed "standard" temperature. To address this, we propose a system that can automatically turn off the air conditioner or adjust the temperature under certain conditions, such as when a classroom is not in use

2.1 Empathize

By emphasizing this problem, we took the first step which was making a Google Forms survey which we distributed throughout our campus to collect data and interview a few people to improve our insights and knowledge by gathering student's opinion regarding energy efficiency problems on campus.

2.2 Define

After gathering information during the empathizing stage, we discussed the key issues using the data collected. We identified two main problems with the current campus HVAC system. First, the air conditioning is often too cold because the temperature is set to a fixed standard by the university. Second, the air conditioner is frequently left on even when classrooms are not in use.

2.3 Ideate

After concluding the problem, we as a team brainstorm together, searching what kind of possible solutions or idea to that will solve these 2 problems continuously, as the saying goes, killing 2 birds with one stone.

2.4 Prototype

For this stage, we try to implement our solution, making it into a prototype. We decided to use Canva to make this prototype possible. This prototype is made to give a rough idea on how our system will work based on our finalized solution.

2.5 Test

After our prototype completed, we tested our system, it's functionality and all its features, making sure everything was functional and spotting any possible flaws and try to improve it.

4.0 DETAILED DESCRIPTION

4.1 Problem

In university, classrooms is one of the most essential places where students and lectures used as a primary place for academic engagement and knowledge increment for individuals. One of the challenges with this problem is that most campus HVAC systems work on a standardized set points for the temperature of the AC which leads to the increment of a large amount of energy wastage as the empty classes are cooled with the same intensity as fully occupied spaces.

4.2 Solution

Following the recognizing of the main problem involving the usage of air-conditioner in class, we finalized a solution after a throughout discussion. Our solution could potentially fix these issues by being more power-saving and more accessible towards occupants. Our prototype has a user-friendly app that display the classroom's setting such as the temperature. User can easily turn off the air-conditioner when there's no more occupants inside the classroom. Then, the air conditioner will automatically increase its temperature to the selected temperature in the app if there are no movement detection after the selected minutes and the room temperature is less than 24°C.This solution might be easy and simple, however, it is a great alternative and effort in saving energy from each responsible individual.

4.3 Team Working

Teamwork is a primary role in ensuring this projects to work successfully as it requires each perspectives in finding the best solution this. This is important to break any obstacles of the project. First thing that we decided is to choose the design thinking topic that we prefer, which is the 'Energy Efficient on Campus'. After that, we proceed with group meetings to discuss about the solution for this matter. We then implemented the five phases empathy, define, ideate, prototype and test for the problem. Then, we continue to produce our questions of Google Form to gather enough informations.

In this team, we assign each individual with different tasks according to each expertise. We continue discussing about the collective problem-solving methods. These meetings allow us to address any complex issue regarding about the assignment and keep producing solutions. Our teamwork resulted in a complete project and final prototype finished.

5.0 DESIGN THINKING ASSESSMENT POINT

Our assessment in design thinking project plays a crucial role to ensures that our project remains beneficial in improving the energy efficient system in the campus as in simultaneously remain the comfort of each occupant.

In the Empathize Phase, we did a research on designing a system that maximises the efficiency of an energy inside of a classroom. Therefore, we proceed with distributing Google Form survey to understand more about this issue. Other than that, we conducted an interview with individuals that regularly used these setting to gather more opinions.

Then, we move to the Define Phase where we as teammates continue to analysed these problems that was given by the interviewers and surveys participants. During this phase, we documented all problem statements to gain a clearer understanding and to help illustrate potential solution ideas.

We proceed with Ideate Phase. In this phase, we brainstormed for the solutions. With group discussion, we investigate the continuous usage of air-conditioning inside the classroom and find the best system to maximises energy efficiency. Finally, we choose the solution that effectively addressed user needs and aligned with the project objectives.

In the prototype phase, we designed an automatic system that can control both the temperature and the air-conditioning timing. However, this system operation does not frequently turn on when detecting motion and off when there's none. The main reason for this is because the repetitive motion of turning on and off will increase more the usage of energy instead of decreasing it. Thus, we proceed with the idea that the air-conditioning will consistently in low temperature to prevent overcooling of the room itself. This is called the Standby mode.

Finally in the Testing Phase, we interact with the prototype itself and marking down its operational capacity and continue to improve the prototype until we satisfied with the result.

6.0 DESIGN THINKING EVIDENCE

a. Discussing with group members to ensure each member fully understands the assignment. Sharing opinions to determine the best solution for the design thinking. Divide task among group members and including a timetable to make sure the task can be done on time.

Diagram 1: First group discussion

b. i) Empathy Phase

In this instance, student data must be gathered to confirm the actual circumstances pertaining to campus energy efficiency. We conducted an online survey using a Google Form and conducted some informal interviews with the students. This study aims to identify the problems and to determine what digital tools may be used to increase campus energy efficiency.

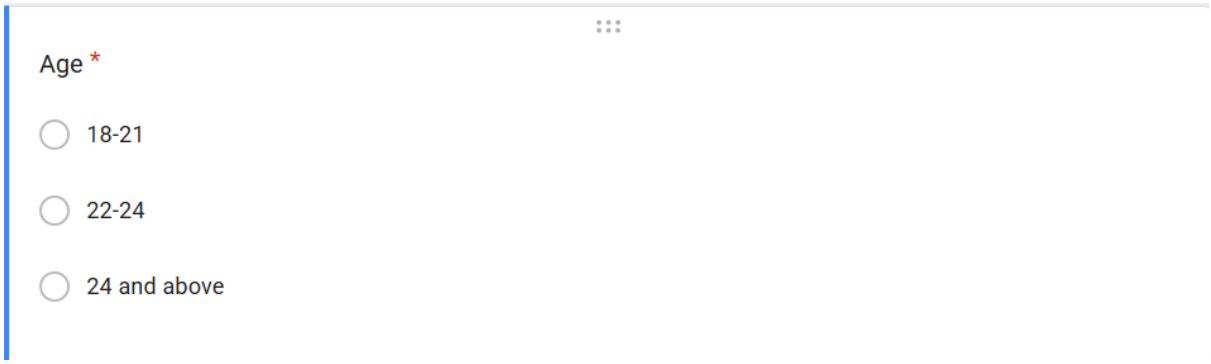


Diagram 2.1: List of question on Google Form

Based on your observation, how often are classroom facilities (lights, air-conditioners, projectors) left operating when the room is unoccupied? *

- Very often
- Often
- Sometimes
- Never

Diagram 2.2: List of question on Google Form

How would you rate the effectiveness of current classroom energy management (lighting, air-conditioning, equipment usage)? *

- Very effective
- Effective
- Ineffective
- Very Ineffective

Diagram 2.3: List of question on Google Form

To what extent do you agree that current classroom energy usage can be improved to reduce wastage? *

- Strongly agree
- Agree
- Neutral
- Disagree

Diagram 2.4: List of question on Google Form

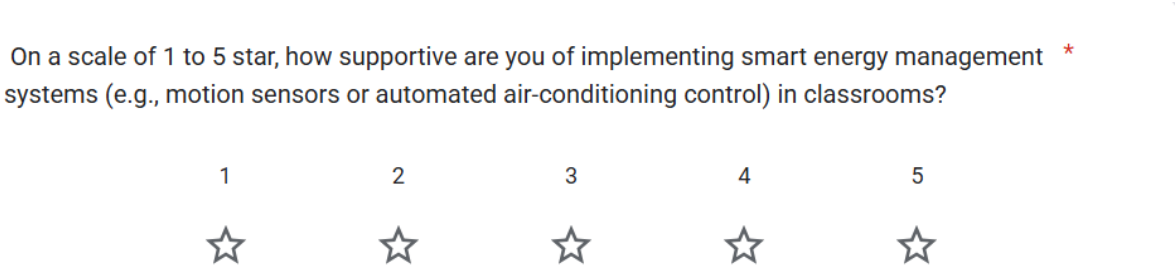


Diagram 2.5: List of question on Google Form

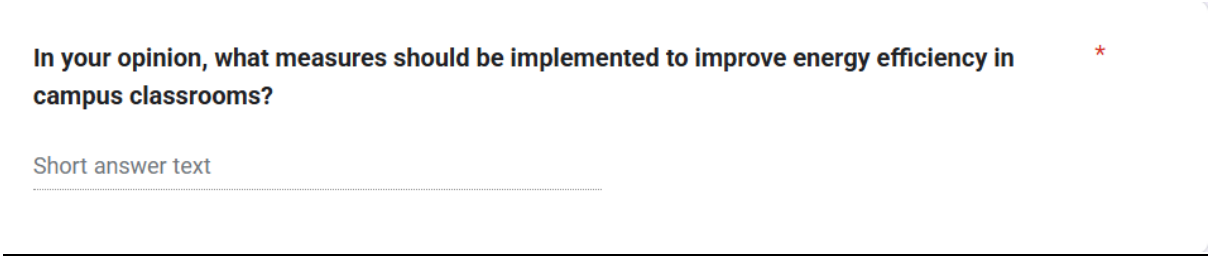


Diagram 2.6: List of question on Google Form

Diagram 3: Interview with UTM student

Diagram 3.1: Interview with UTM student

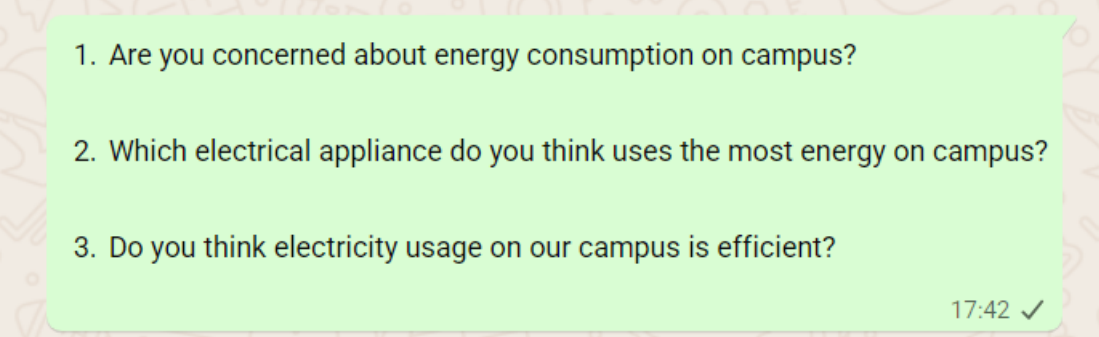


Diagram 4: The questions of the interview

ii)Define Phase

In this phase, we collected all the information we got from the google form.

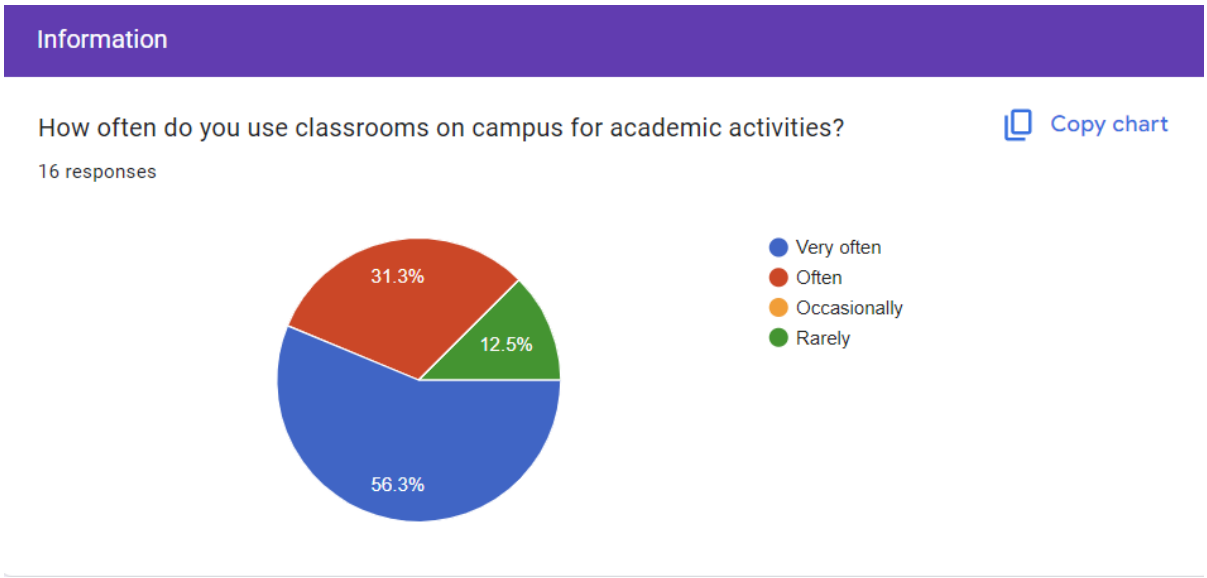


Diagram 5 : Survey form

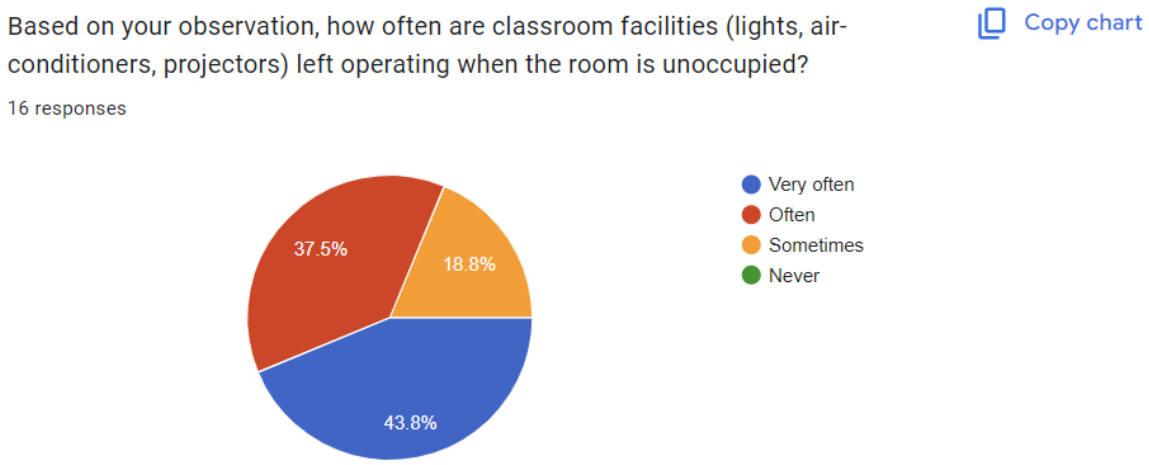


Diagram 5.1 : Survey form

Which of the following contributes most to energy consumption in classrooms? Copy chart

16 responses

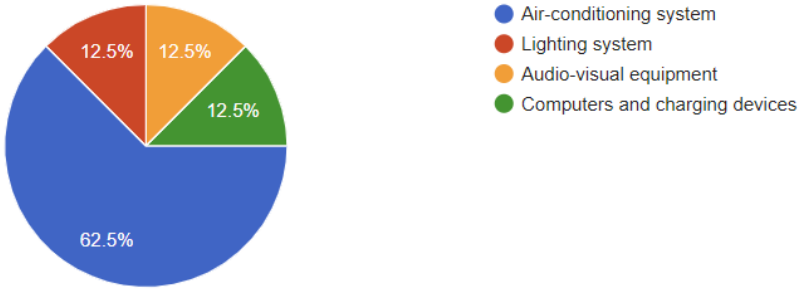


Diagram 5.2 : Survey form

How would you rate the effectiveness of current classroom energy management (lighting, air-conditioning, equipment usage)? Copy chart

16 responses

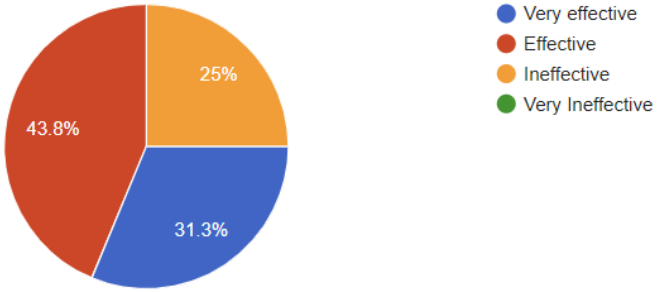


Diagram 5.3 : Survey form

To what extent do you agree that current classroom energy usage can be improved to reduce wastage? Copy chart

16 responses

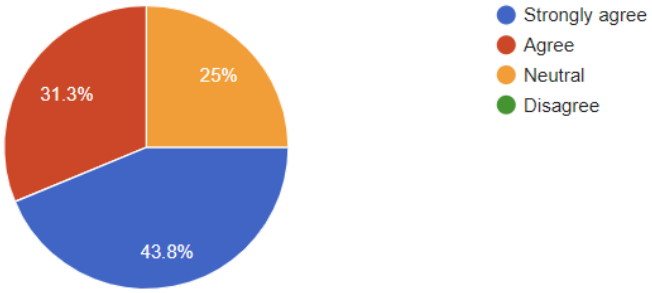


Diagram 5.4 : Survey form

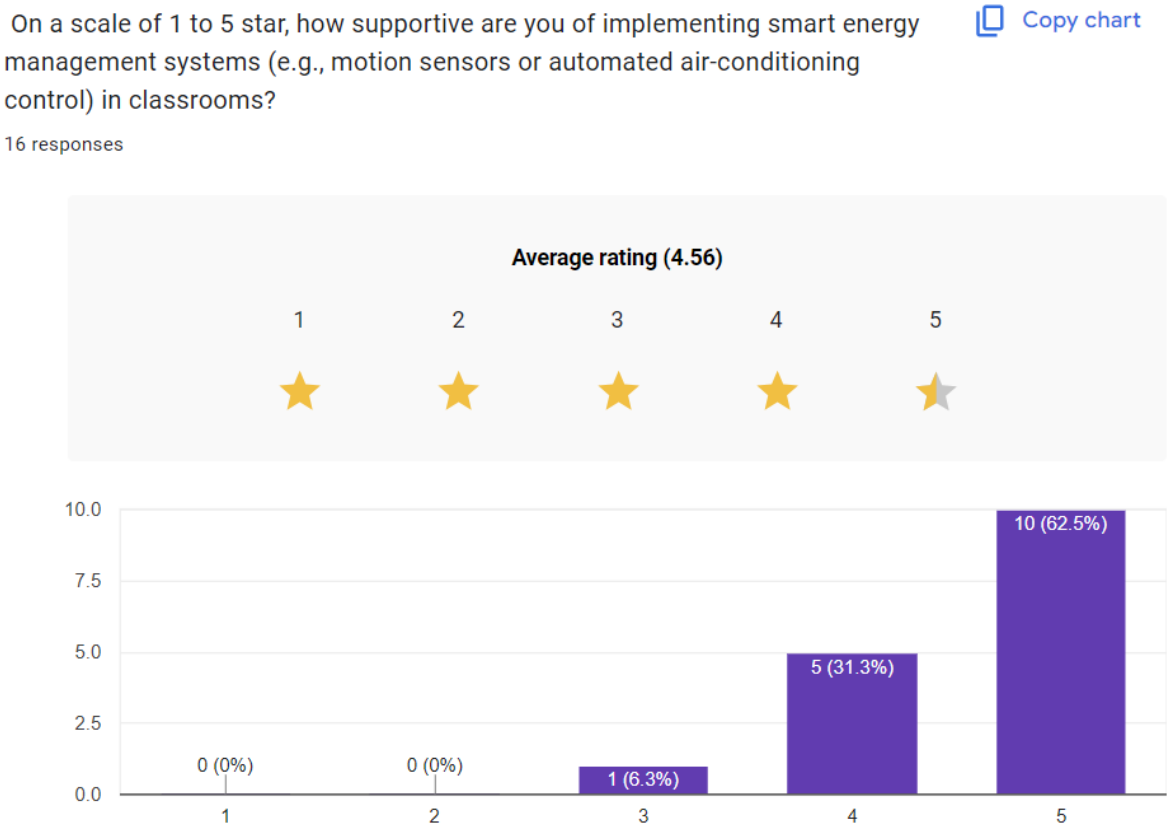


Diagram 5.5 : Survey form

In your opinion, what measures should be implemented to improve energy efficiency in campus classrooms?

16 responses

Scheduling of all the electronics at when they on and off

Less use energy

Sensor

Use solar airconditioning

control the usage of electric like aircon, computer, and light

Automation initiative

sensor

apply energy efficient equipment

Campus claUse LED lighting, smart thermostats and ensuring lights and equipment are turned off when rooms are not in use.

Diagram 5.6 : Survey form

In your opinion, what measures should be implemented to improve energy efficiency in campus classrooms?

16 responses

use green technology

Turn off when not in use

using motion sensors timer based on timetable

-

Smart Lighting & Responsive Controls Lighting can account for up to 30% of a school's electricity use. Moving beyond simple LED bulbs to "intelligent" lighting is a high-impact move. • Occupancy & Vacancy Sensors: Instead of relying on the last person to flip a switch, sensors should automatically dim or turn off lights when a room is empty. • Daylight Harvesting: Classrooms with large windows should use sensors that automatically dim artificial lights when natural sunlight is sufficient. • LED Retrofitting: Replacing old fluorescent tubes with LEDs cuts energy use by roughly 50–75% and improves the quality of light for student concentration.

Yes

Upgrade facilities to a more energy saving versions of equipments

Diagram 5.7 : Survey form

Interview Questions and Answers

1. Are you concerned about energy consumption on campus?

Participant 1 : “Yes, I am concerned about energy consumption in this campus because energy is being used every single day.”

Participant 2 : “Yes I am. because high energy consumption can lead to a high cost to our campus.”

2. Which electrical appliances do you think uses the most energy on campus ?

Participant 1 : “I think air-conditioning is the reason because as we all know, every class in UTM has air- conditioning.”

Participant 2 : “I think the highest consumption of electric is an air-conditioner.”

3. Do you think electricity usage on our campus is efficient?

Participant 1 : “I think it's somewhat efficient but there’s a room for improvement.”

Participant 2 : “I don’t think so. Because there are PC or air-conditioner that does not turn off when there are no one in the room.”

Video link :
https://drive.google.com/file/d/1p-87Hcz6lsMqzmDXh6z-j1rOoBYd10Yu/view?usp=drivesdk

iii) Ideate Phase

In this next phase, we continue to brainstorm to find and choose the best solution for this problem. We decided to make an automatic system for the air conditioning to only switch on when it detects presence of occupant inside the classroom such as temperature sensor and motion sensor to maximises energy efficiency.

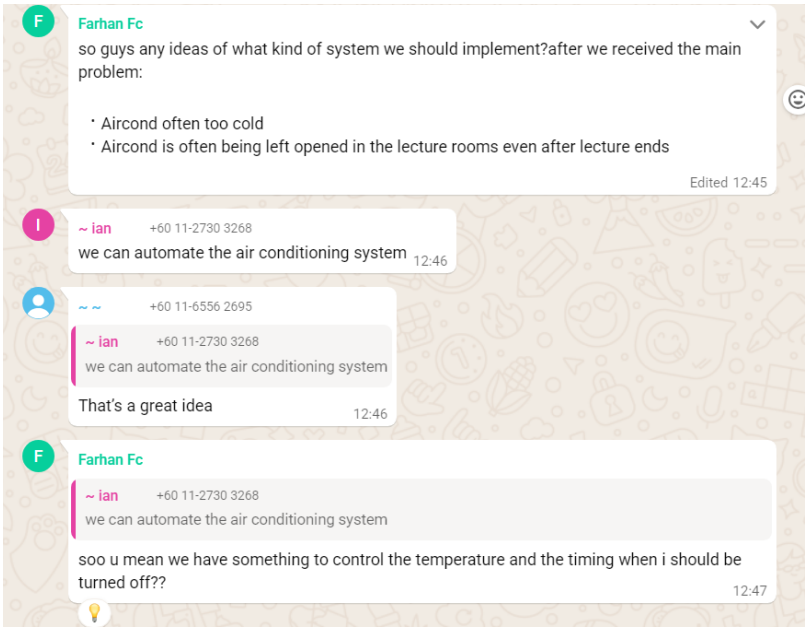


Diagram 6 : Brainstorming

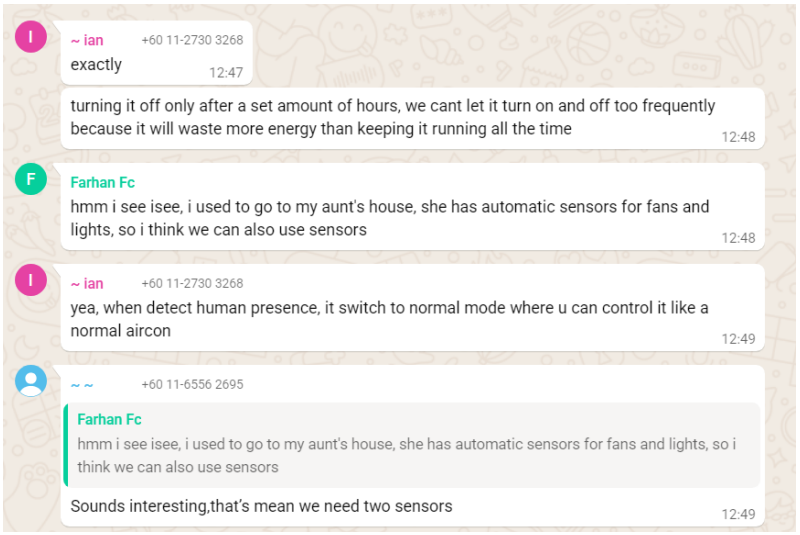


Diagram 6.1 : Brainstorming

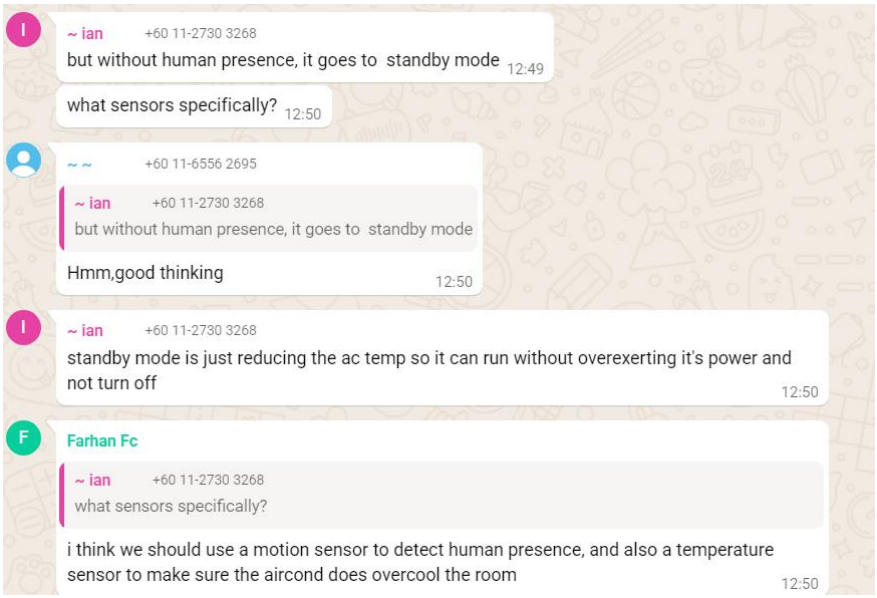


Diagram 6.2 : Brainstorming

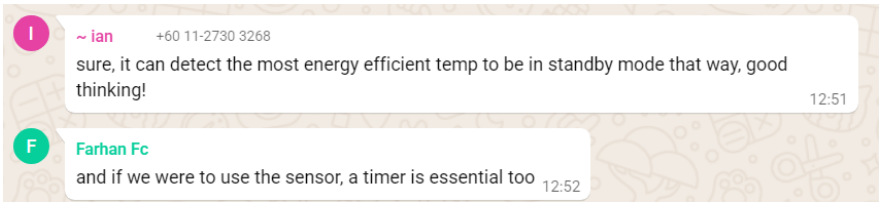
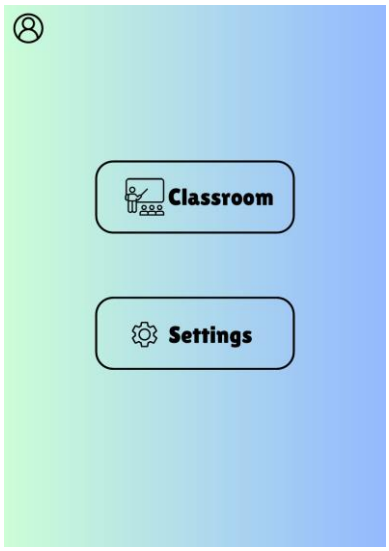


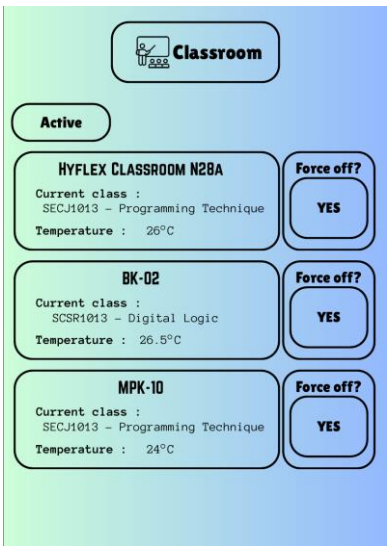
Diagram 6.3 : Brainstorming

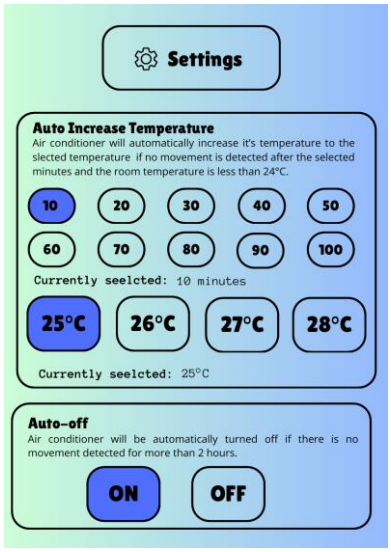
Diagram 6.4 : Brainstorming using Google Meet

Iv)Prototype

In this phase, we implement our solution into a prototype that will demonstrate roughly how our system would work.







V)Test Prototype

In this phase,we want to ensure our software functions successfully

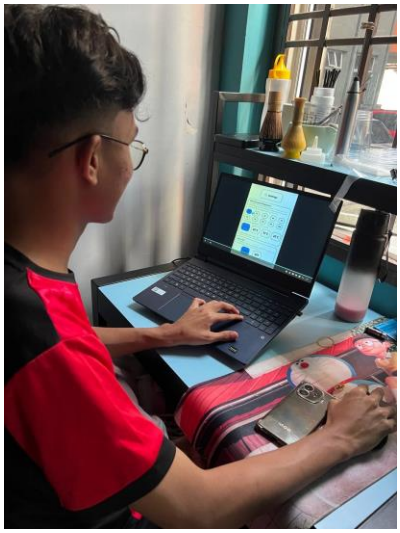


Diagram 7

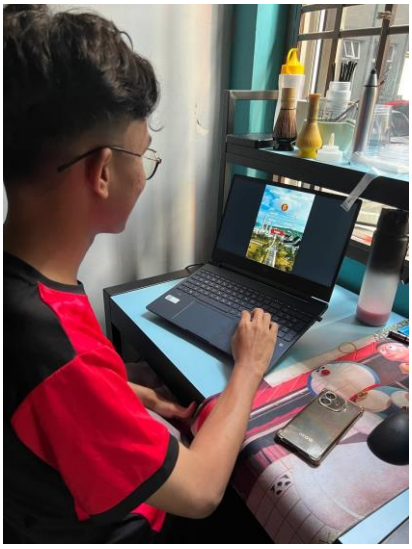


Diagram 7.1

REFLECTIONS

NASAAIE BIN NORISKAMAR (A25CS0118)

My dream as a data engineering students is to be a Data Engineer who could build a data infrastructure that sustainable and efficient to solve real world problems. After completed this project, I had expert in collecting, processing, and convert large, unstructured data sets into a format that can be used for meaningful analysis.Overall,the key I have learnt from this project is ensuring data integrity and accessibility.I have to ensure the data collected from the system is accurate,secure, and easily accessible to decision makers to improve organizational efficiency

FARHAN ASHRAF BIN FAKHRUL ANWAR (A25CS0059)

My goal in this course is to become a Data Engineer or Data Analyst, as I am interested in how data is processed and transformed into useful information. Through this course, I aim to gain the knowledge and skills needed to meet current industry demands. Design thinking has helped me improve important soft skills such as communication, teamwork, and problem-solving, which are essential in industry-focused programs. To further prepare myself for the industry, I plan to develop both my technical and soft skills by joining industry-related projects, hackathons, and Datathons to enhance my coding abilities, critical thinking, and real-world experience.

IAN VICTOR ANAK NEHEMIAH BELANDA KUMBANG (A25CS0233)

Design thinking helped me in understanding the cycle of improvement for a product or software program whereby a developer would continuously fix issues after gathering multiple feedback. This tremendously help me to practically gather feedback by opening a survey and interviewing people. All in all what I have gained from this project is to have a proper and realistic timeline for every step in developing a software is crucial to help me in managing my time under a strict timeline to simulate working condition.

NORSUFIYAH ALIYAH BINTI MD JOHAIMI (A24SC0215)

I have always been interested in solving problems using data. By taking this course, I hope to learn how to use data more efficiently and understand how systems manage data to improve daily life in communities. Through this, I aim to strengthen my skills and contribute to society in the future. Over the four years in this course, I plan to master programming languages such as Python and JavaScript, improve my communication skills, and participate in coding workshops to stay updated with industry trends and prepare for a career in technology.

CONCLUSION

This project has prove that Design Thinking not just a creative process but a critical methodology to build a problem solving related to the data field. Through these five phase which are empathize, define, ideate, prototype and test, we have learnt that a successful Data Engineer begin with understand the users, not just collecting data solely. Besides, this project strengthen the communication skills and cooperation with our team which is the most crucial elements in the industry of information technology. All in all, this experience us a solid fundamental as a future Data Engineer to build a system that has a positive impact on the community

TASK DISTRIBUTION

Ian Victor Anak Nehemiah Belanda Kumbang	- Video Editor - Report writing (Details Description) - Data collector
Nasaaie Bin Noriskamar	- Interviewer - Report Writing (Design Thinking Evidence - Empathy) - Creating Google Form - Report writing (Conclusion)
Farhan Ashraf Bin Fakhrul Anwar	- Interviewer - Report Writing (Details step) - Update backlog in GitHub - Report Writing (Design Thinking- Prototype & Test)
Norsufiyah Aliyah Binti Md Johaimi	- Data collector - Report Writing (Design Thinking Evidence- Ideate) - Report Writing (Assessment point)

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