SECP1513-02 TECHNOLOGY AND INFORMATION SYSTEM

Design Thinking Project Report

Product Name : GoShuttle

Group Name : Cyber Beats

Prepared for: Dr. Aryati binti Bakri

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INTRODUCTION

Design Thinking is a dynamic, human-centered approach for creatively solving problems and bringing innovations to life. It really focuses on solutions rather than dwelling on problems, and there is deep emphasis on empathy towards the end user. This approach is a very powerful tool towards solving complex challenges and developing creative solutions. Design Thinking generally consists of several iterative stages, each specifically adapted to the given problem. The most used procedures structured in the Design Thinking process include:

EMPHATIZE	We try to understand the problems, needs and experiences of users before coming up with a solution. This stage of procedure can be done by doing research, interviews, blasting surveys as well as observations.
DEFINE	Analyze and synthesize the information gathered from the Emphatize phase to get a clear picture of the problems. To make it more accurate, create focused problem statements that guide the design process.
IDEATE	This phase is where we generate a wide range of creative ideas for potential solutions. In this phase, we usually sketch out the solutions after brainstorming to get a full overview of all possible solutions.
PROTOTYPE	In this phase, we transform ideas into low-fidelity prototypes such as sketches and paper models that help quickly and inexpensively bring concepts to life.
TEST	In this phase, we evaluate prototypes with real users to gather feedback and make necessary adjustments to ensure the solutions are effective and fulfill the users' needs.

DETAILED STEPS

In October 2024, our class was given a task to start a Design Thinking project in a group of 4 based on our assigned topic which is Big Data and Artificial Intelligence (AI). After discussing our topic, we have decided to improve the Shuttle Bus system in UTMSmart.

2.1 Emphatize

The first step we took was creating and giving out survey forms and holding interviews with 3 UTM students so that we could gather different problems and points of views to increase our range of possible solutions.

2.2 Define

After analyzing all the problems and issues faced, we managed to come up with a few problem statements with the current system. The bus schedule was not specific, the system was hard to navigate, the crowded bus and the time estimation in the app is not accurate.

2.3 Ideate

Next, after creating clear problem statements, we started to generate and explore potential solutions to solve these problems. We put our heads together and brainstorm ideas which lead us to all kinds of possible ideas. Then, we spent some time sorting the ideas to make a summary of ideas to be prototyped and tested. We discussed the functions and looks of the improvements on the features to create a clearer image of the specification, benefits and risks of the ideas.

2.4 Prototype

During this step, we turn our ideas into a visualized form. At the same time, we made some improvements to our ideas to make the ideas more effective. At the end of this part, we manage to sketch a rough paper prototype of digital interface.

2.5 Test

In this stage, we asked users for their feedback on the prototype concepts and ideas to know whether the new features are useful to the target and up to their needs.

DETAILED DESCRIPTION

3.1 Problem

At University Technology Malaysia (UTM), students have various transportation options and due to the large campus area of 1,222 hectares, vehicles are essential for efficient movement, especially for first-year students who are not allowed to bring their own vehicles. Consequently, most students rely on the bus facilities.

To enhance the convenience of students' movements, the UTM Fleet Unit manages shuttle bus services within the campus. Students can access the shuttle bus schedule through the UTMSmart application. However, the schedule is often inconsistent due to unexpected delays, causing uncertainty regarding bus arrival times. A survey revealed that 40% of students frequently use the shuttle bus system, and 75% find the schedule inaccurate.

The UTMSmart application has notable weaknesses, including the lack of real-time bus location updates and information on bus capacity. Students also desire a chatbot feature for inquiries about locations and shuttle buses.

3.2 Solution

An effective UTMSmart application can enhance students' satisfaction and increase bus usage therefore during the discussion process, we concluded some feasibility improvement on the app. The improvement involves Big Data and AI technology.

One key improvement is the implementation of a bus tracking system. This involves installing GPS trackers on buses to detect their real-time location. AI will calculate estimated arrival times based on the bus's speed and distance to the stop, providing updated arrival times. AI will also send notifications for delays or service interruptions, helping UTM students plan their schedules and reduce waiting times.

Another innovation is the installation of IoT people counter devices on buses. These devices track the number of passengers boarding and exiting the bus in real-time. By comparing the number of passengers to the total seats, the system shows the number of empty seats. This helps students avoid waiting for full buses. Additionally, AI-powered features like facial recognition and demographic analysis can provide data on peak hours and crowded stations, aiding in schedule improvements.

Additionally, the shuttle bus system can be enhanced by integrating 'ShuttleAI' into the app. 'ShuttleAI' is an AI feature that provides decision support for students' campus travel. It suggests bus routes, displays suitable schedules, and uses Big Data techniques to compute travel times and student demands efficiently. In essence, it leverages Big Data analytics and AI to help users choose the shortest route and plan their journeys by listing all public transport mode combinations.

In conclusion, to enhance the shuttle bus features in the UTMSmart application, several updates are needed. These include installing a bus tracker system, adding a people counter device, and implementing a 'ShuttleAI' feature. With the help of AI and Big Data, these updates will provide more precise and reliable information, making the app more user-friendly and dependable for students.

3.3 TEAM WORKING

The first step on diving into this project, we first distribute the task accordingly to each member. We ended up choosing a project that applied both Artificial Intelligence (AI) and Big Data in which we decided to enhance the UTMSmart app.

We broke the project into smaller chunks to accomplish it within a short time frame. The first step was distributing a survey form and conducting interviews with three students: Iman, Alia, and Kavivarthan.

Using this information, we were able to dive deeper into the problems. We shared our opinions and discussions through the WhatsApp group and physical meetings. Finally, we began working on the prototype, which consisted of sketches and drawings.

Throughout our collaborative progress, everything went well as all members gave out their best cooperation and efforts in finishing this project.

DESIGN THINKING ASSESSMENT POINTS

Coming up with the new Shuttle Bus system in UTM Smart was a carefully thought-out process where we use the design thinking procedures to innovate and improve the system. We implemented Artificial Intelligence in the system to produce more accurate planning for the user thanks to its outstanding accuracy in recognizing patterns.

Our first step was the empathize stage, where our team discussed the weaknesses of the shuttle bus system in the UTMSmart app and identified core functions to improve user satisfaction. We conducted interviews with three students and a survey using Google Forms to gather insights on their experiences and challenges with the app, as well as their suggestions for improvement.

Next, in the define stage, we analyzed the results from the interviews and surveys. This helped us clearly identify the problems students were facing with the shuttle bus system.

Following this was the ideate phase, we brainstormed various solutions to tackle the identified problems. We then mapped all the solutions on a mind map to visualize and decide on the best ones.

Furthermore, the prototype phase in which we created the first prototype by sketching the solutions we concluded. This allowed us to share and understand each other's ideas, including layouts and features of the shuttle bus system. We agreed on the features to be included; VR, AR, bus tracker system, people counter, and ShuttleAI to aid users around campus. We then created the sketches prototype and let users review it and share their feedback on the new features.

DESIGN THINKING EVIDENCE

Empathy Phase

Our team conducted an interview session with 3 students from UTM to get insights about the experience of using shuttle bus in Universiti Teknologi Malaysia and further explanation on the project. We also conducted a survey of Google Form to get data and information from the students of Universiti Teknologi Malaysia. The Google Form includes the challenges that the students faced and the improvements that we could do to the shuttle bus system in UTMSmart. The purpose of the interview and survey is to gather data in order to improve the existing system of shuttle bus in UTMSmart.

Below are shown the questions included in the interview and survey :

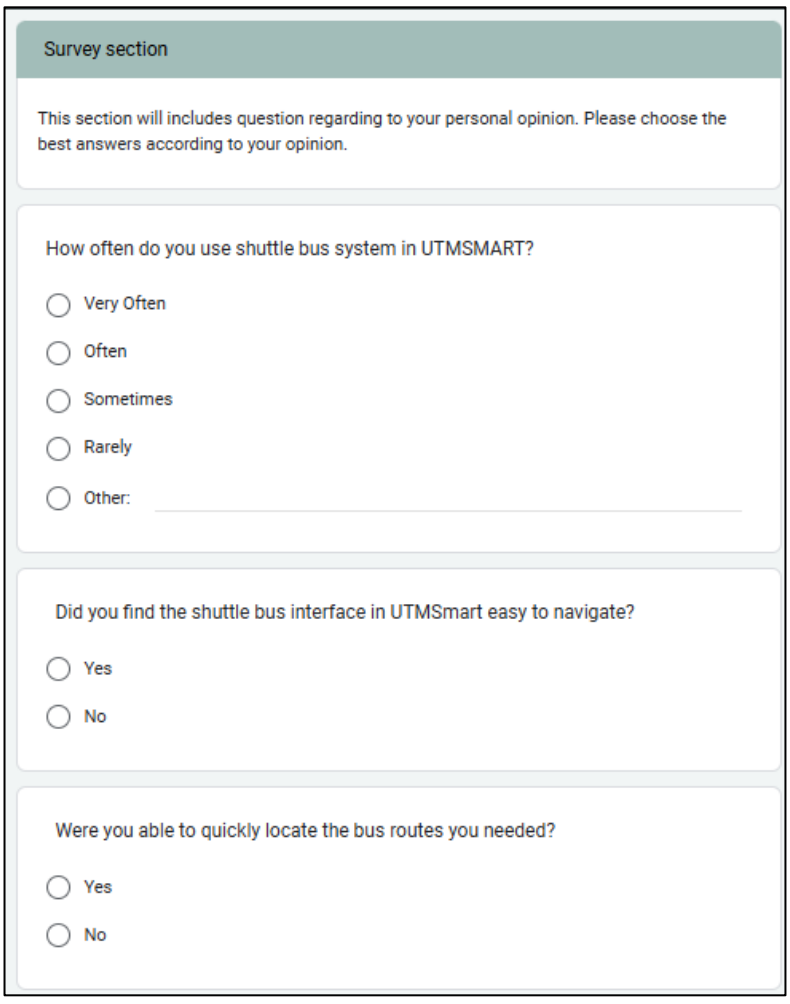
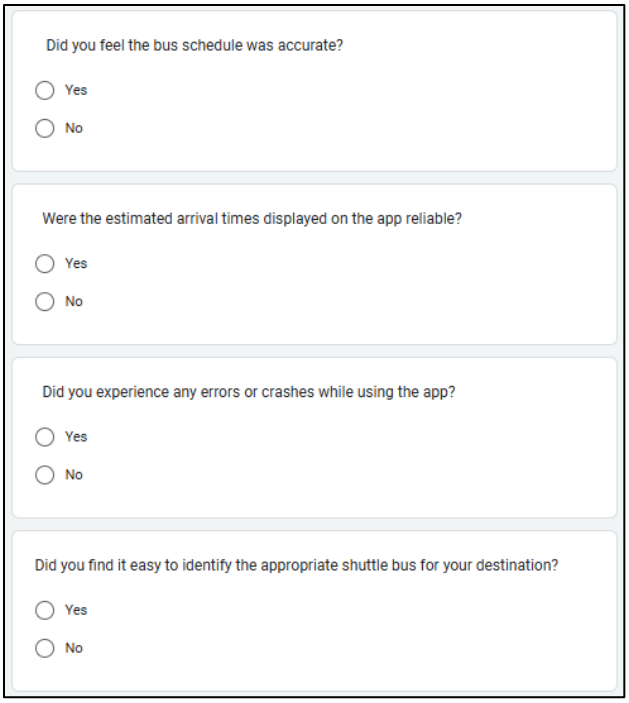


Diagram 1.1 (Survey Questions)



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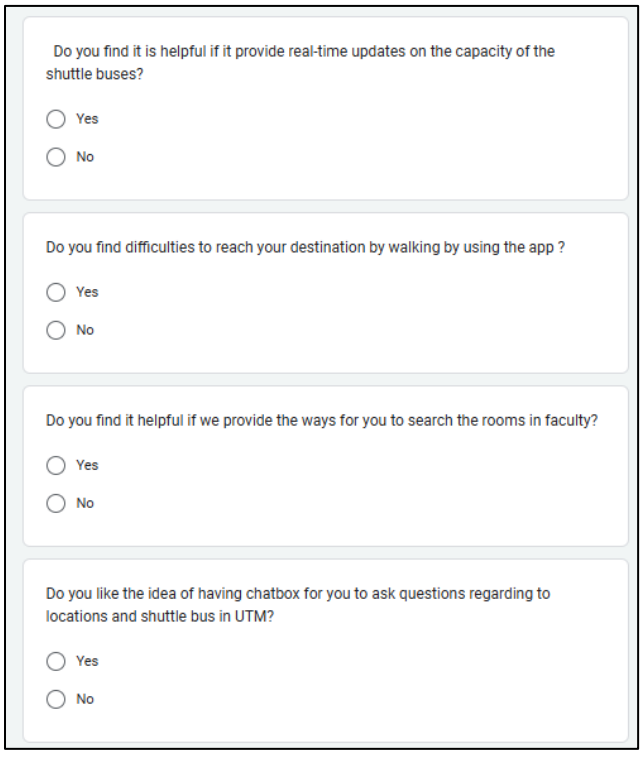

Diagram 1.3 (Survey questions)

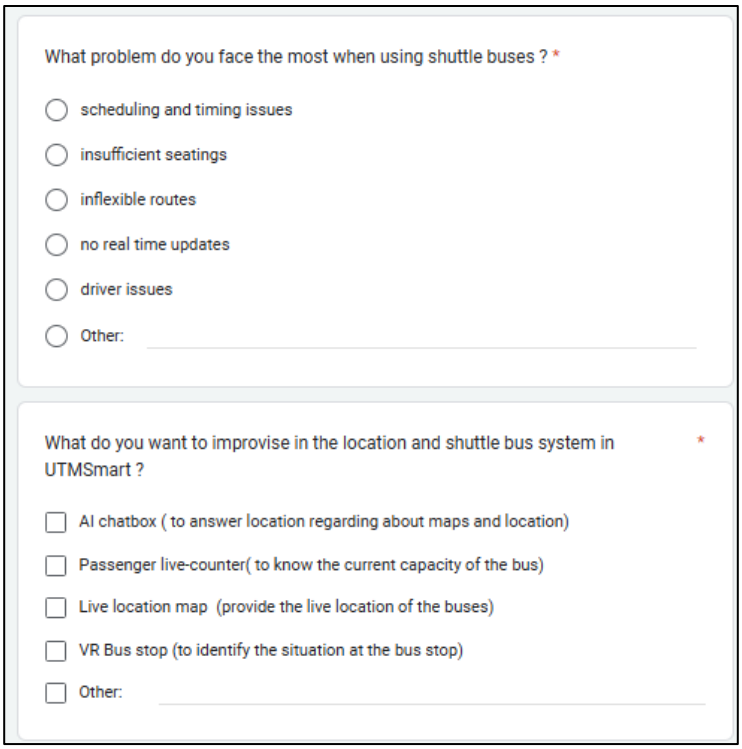

Diagram 1.4 (Survey Questions)

Diagram 1.5 (Interview session)

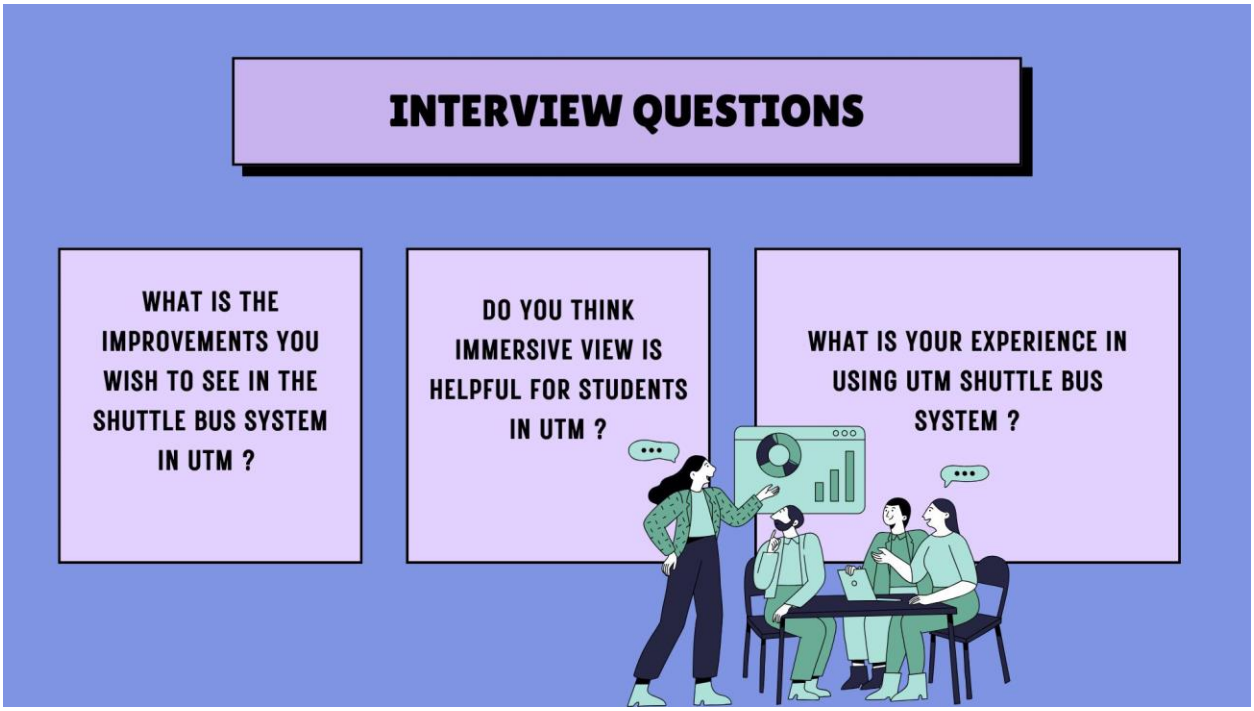

Diagram 1.6 (Interview Questions)

Define Phase

During this phase, we gathered information based on the interview session and the Google Form survey. From this phase, we're able to understand better the problems faced and analyze the most suitable improvements based on customers' needs. We also be able to tailor our project solutions based on the needs of the customers more effectively. The results of the Google Form survey are attached below:

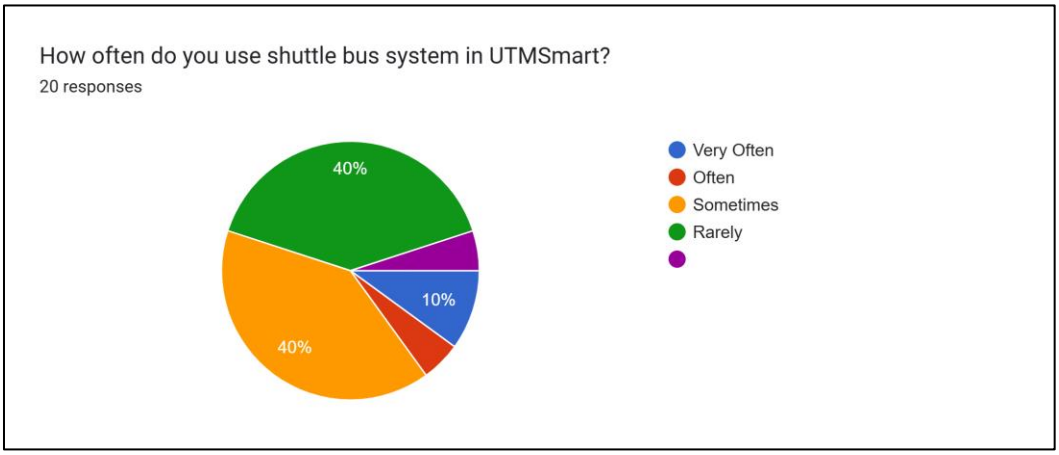

Diagram 2.1 (Question 1)

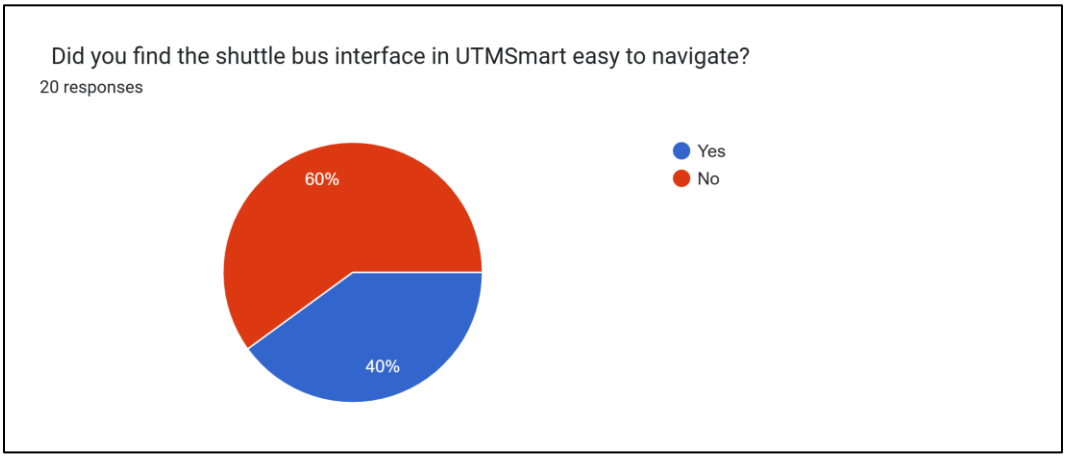

Diagram 2.2 (Question 2)

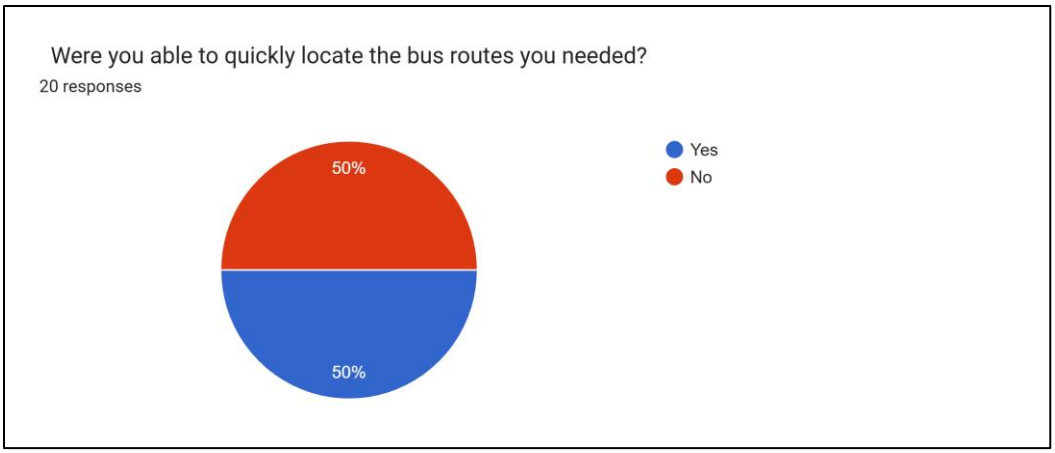

Diagram 2.3 (Question 3)

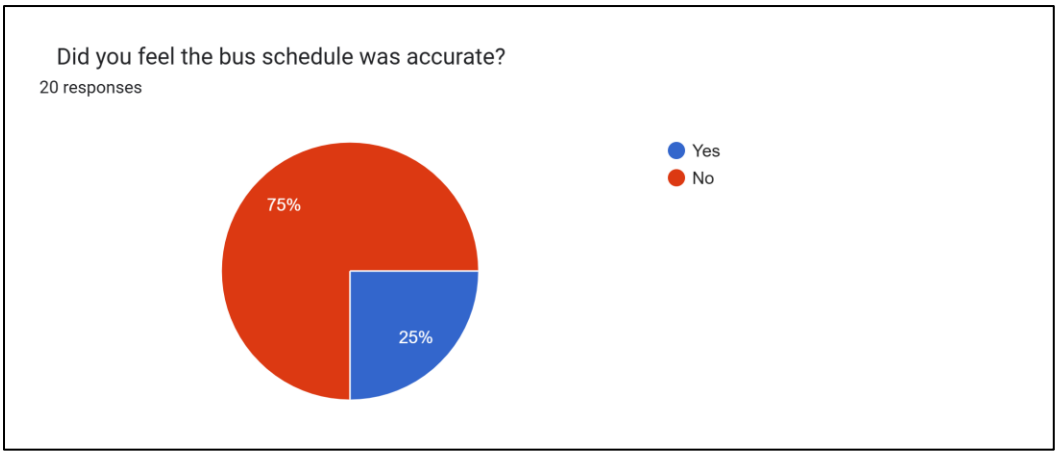

Diagram 2.4 (Question 4)

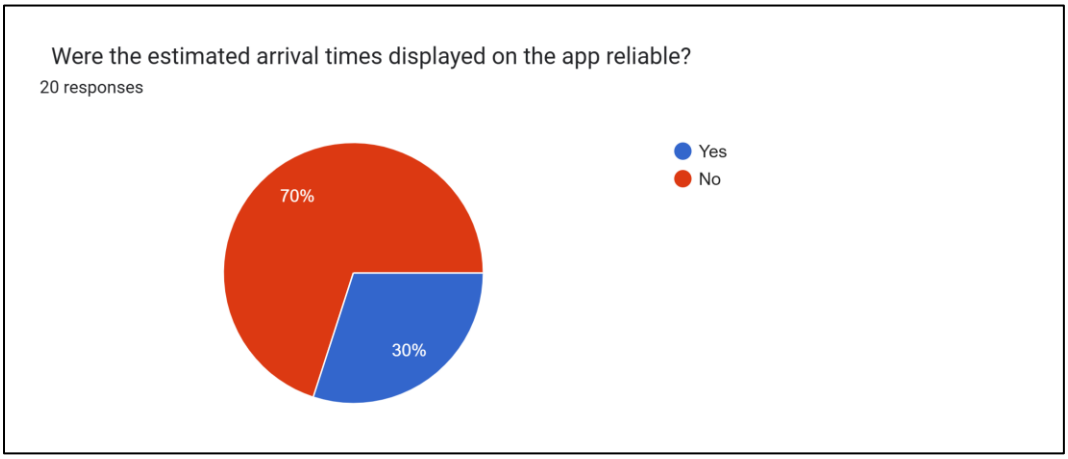

Diagram 2.5 (Question 5)

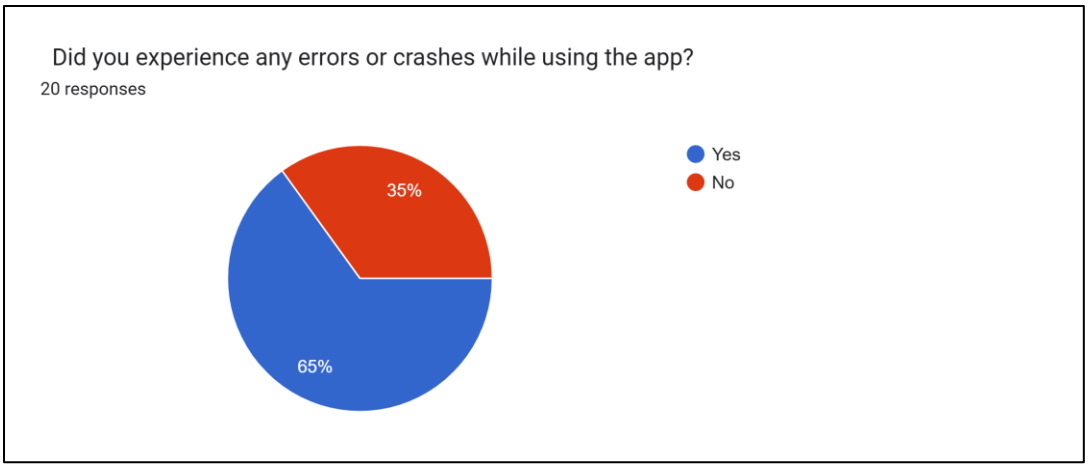

Diagram 2.6 (Question 6)

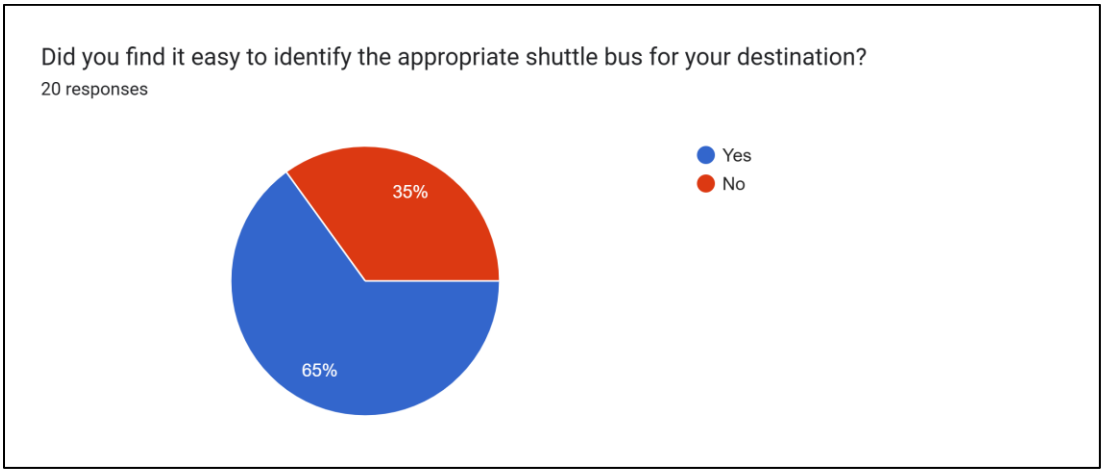

Diagram 2.7 (Question 7)

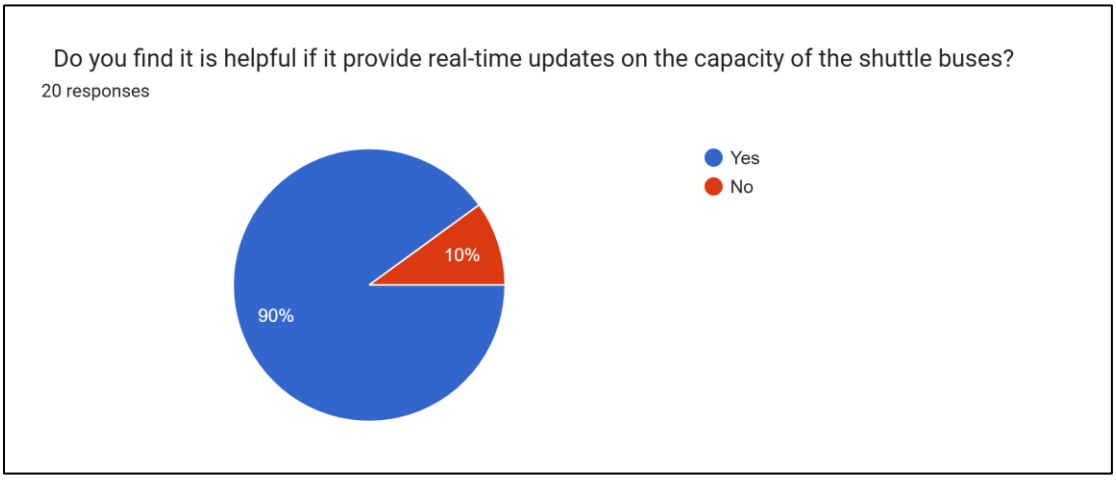

Diagram 2.8 (Question 8)

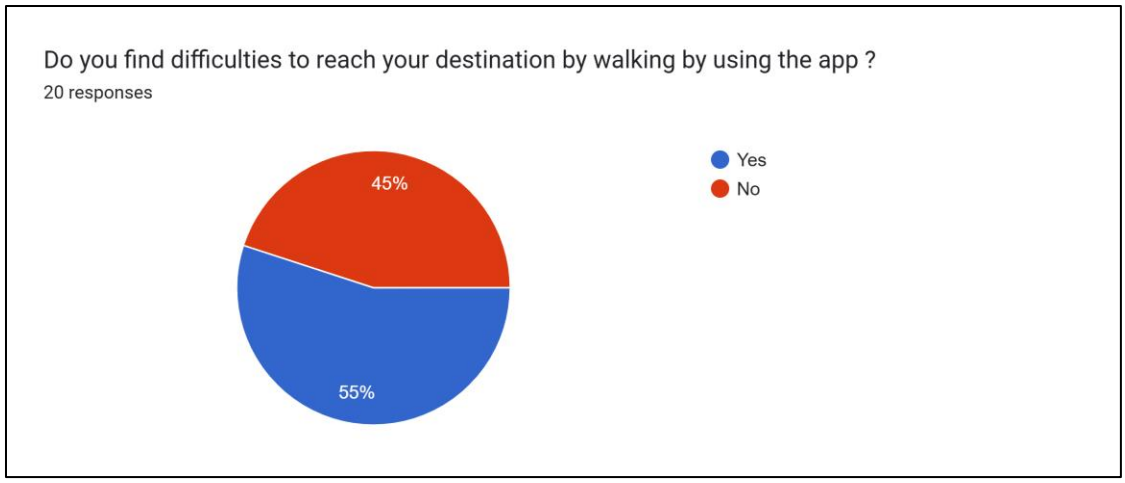

Diagram 2.9 (Question 9)

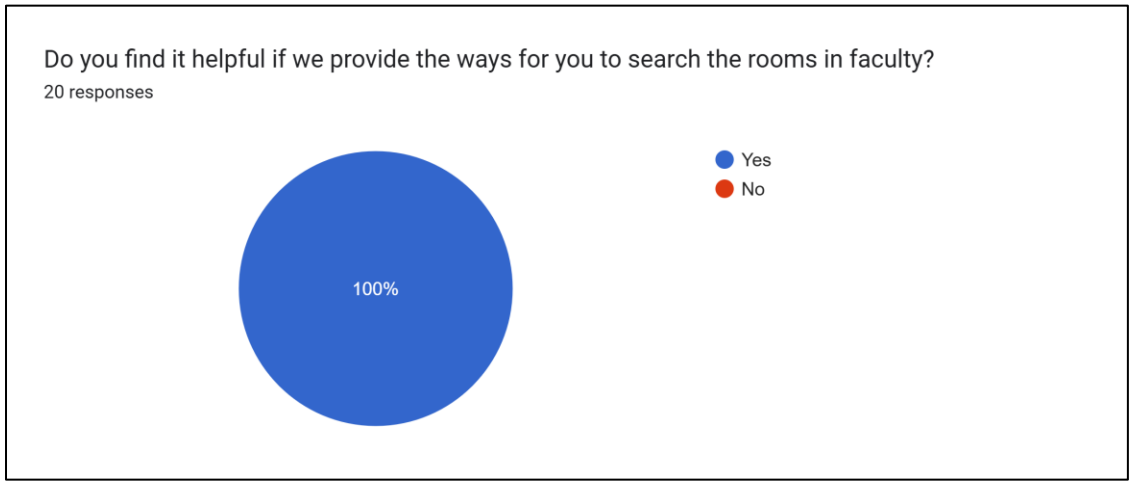

Diagram 2.10 (Question 10)

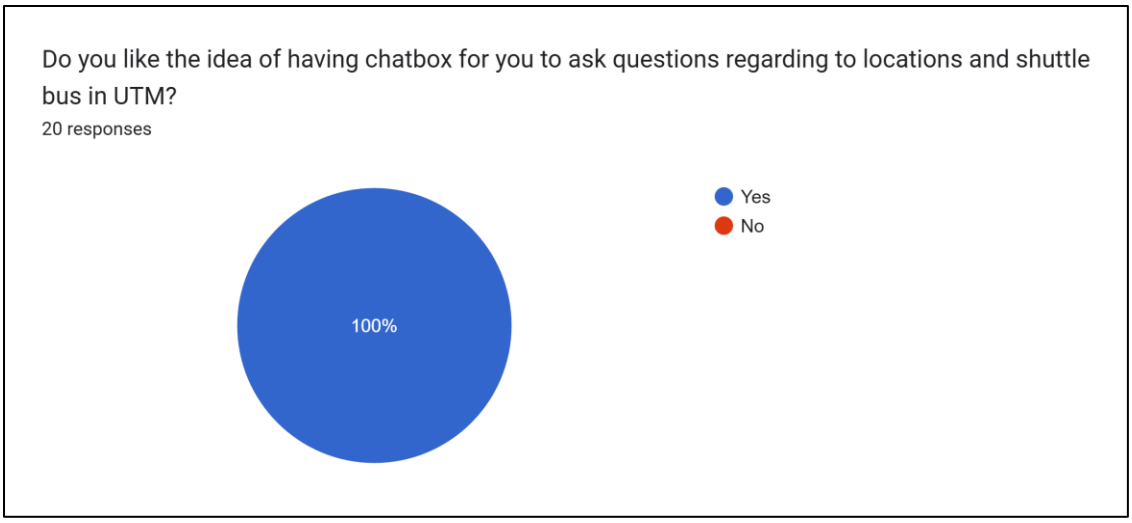

Diagram 2.11 (Question 11)

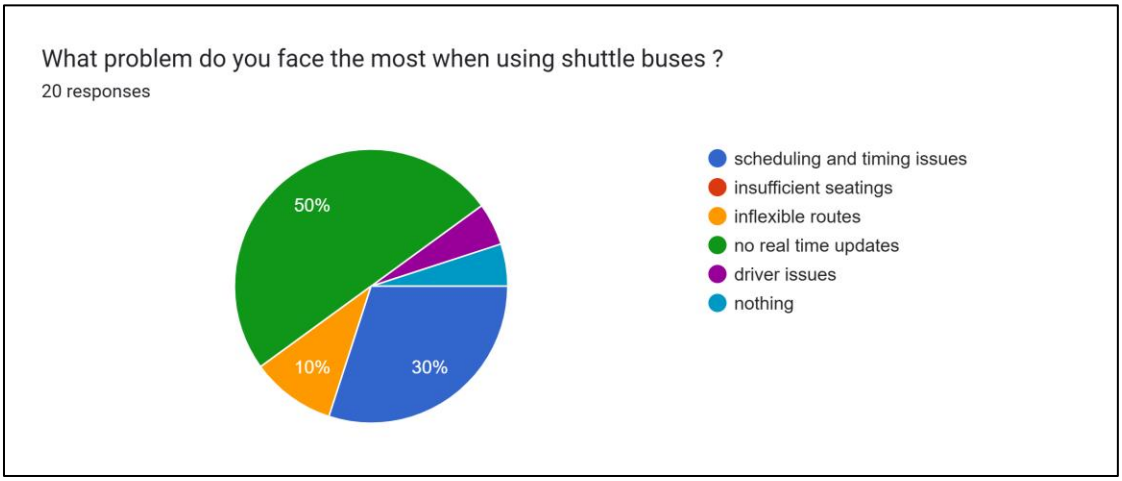

Diagram 2.12 (Question 12)

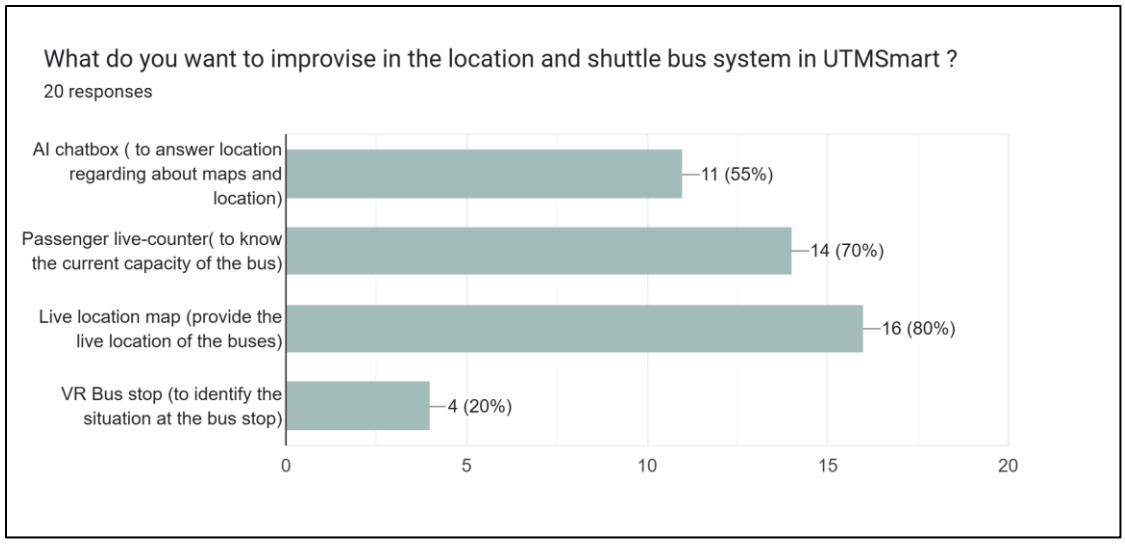

Diagram 2.13 (Question 13)

The results showed that most students faced problems in working and operating the UTMSmart app. They also agreed on the improvements that we planned to make to the shuttle bus system in UTM. The problems chosen included difficulty navigating locations, no live map of the buses and no real-time updates.

Ideate Phase

We discussed all the possible ideas to be included in our project to find the best ways to overcome the problems faced by the customers. We brainstormed the best possible solutions, and we came up with the interface and features to be added to the shuttle bus system in UTMSmart. Our chosen ideas included real-time location, route optimization, IoT passenger based on counting, bus alert and notifications and lastly, immersive view of buildings.

Diagram 3.1 (Group Discussion)

Diagram 3.2 (Group Discussion)

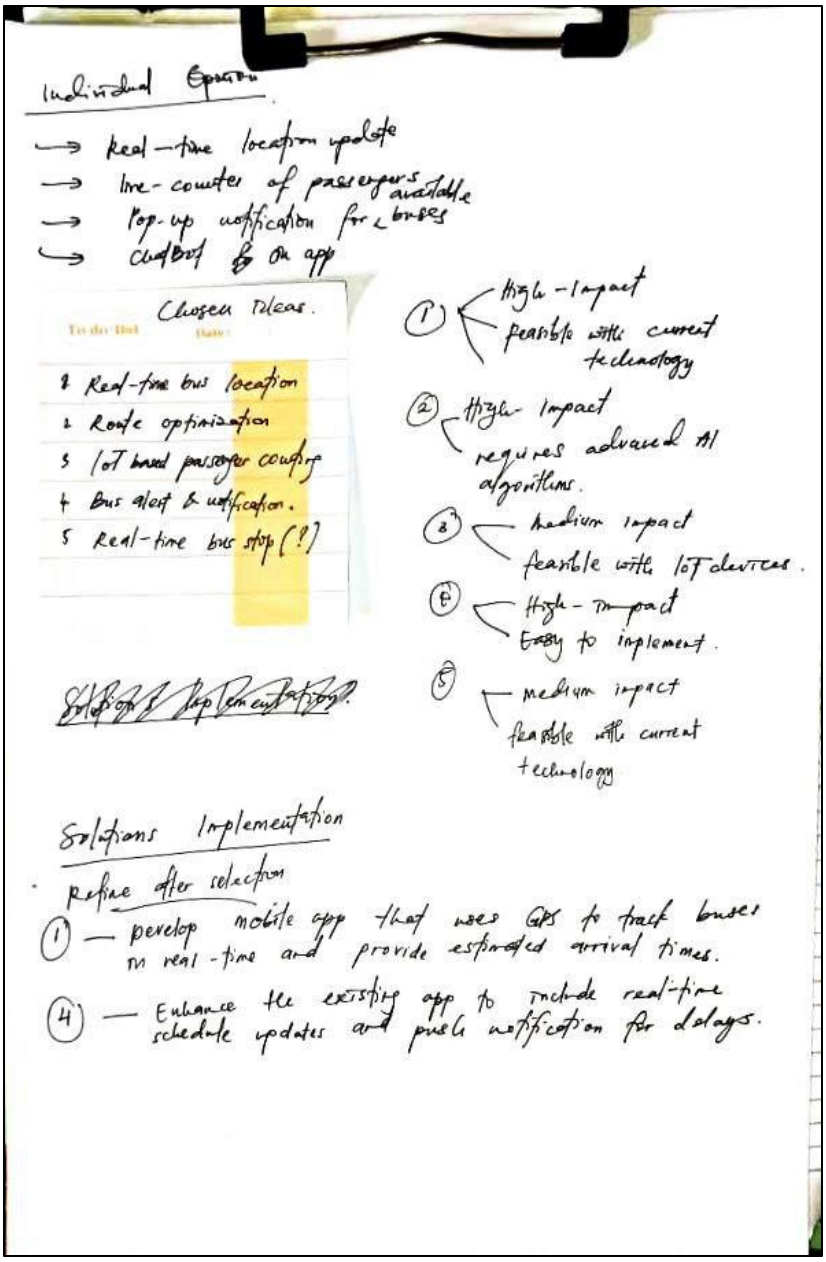

Diagram 3.3 (Brainstorming ideas)

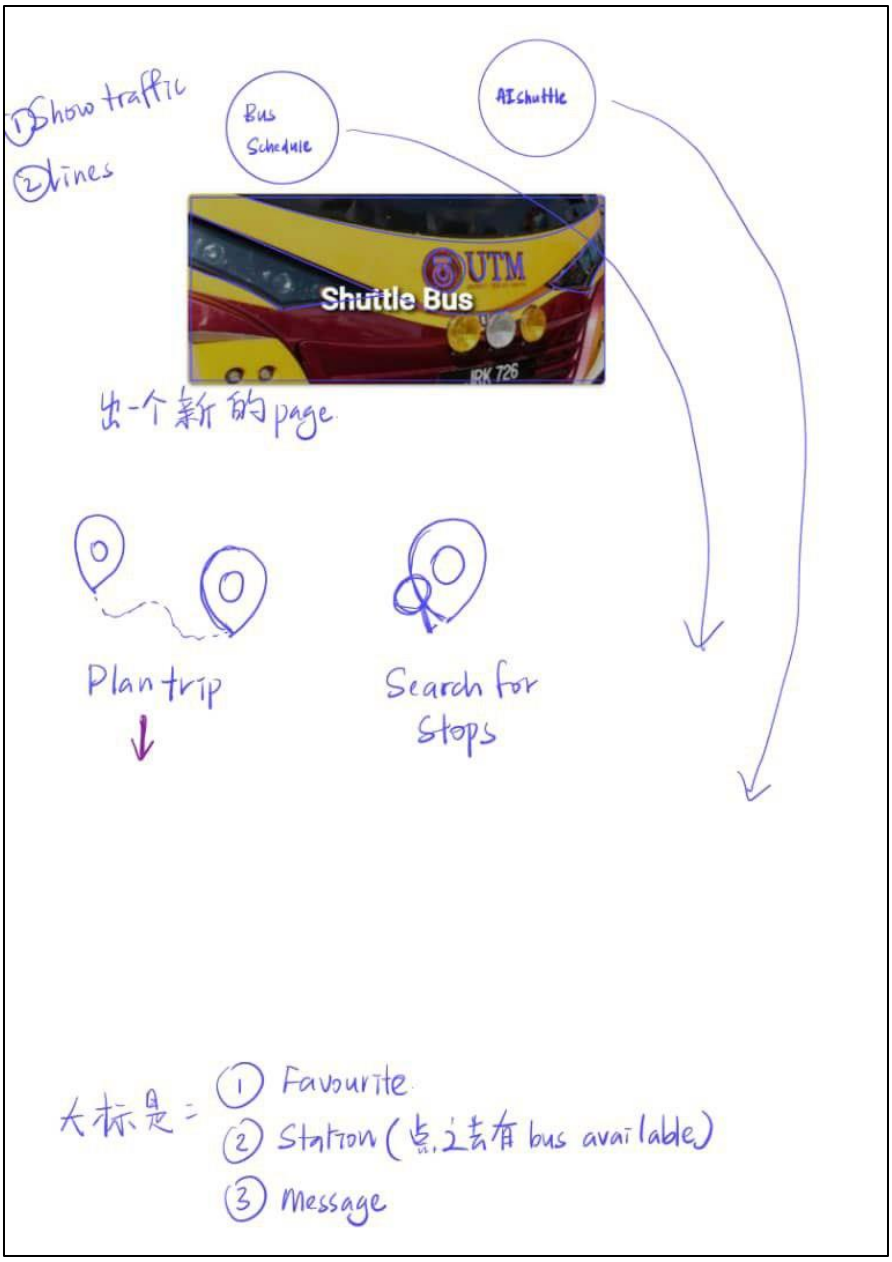

Diagram 3.4 (Brainstorming ideas)

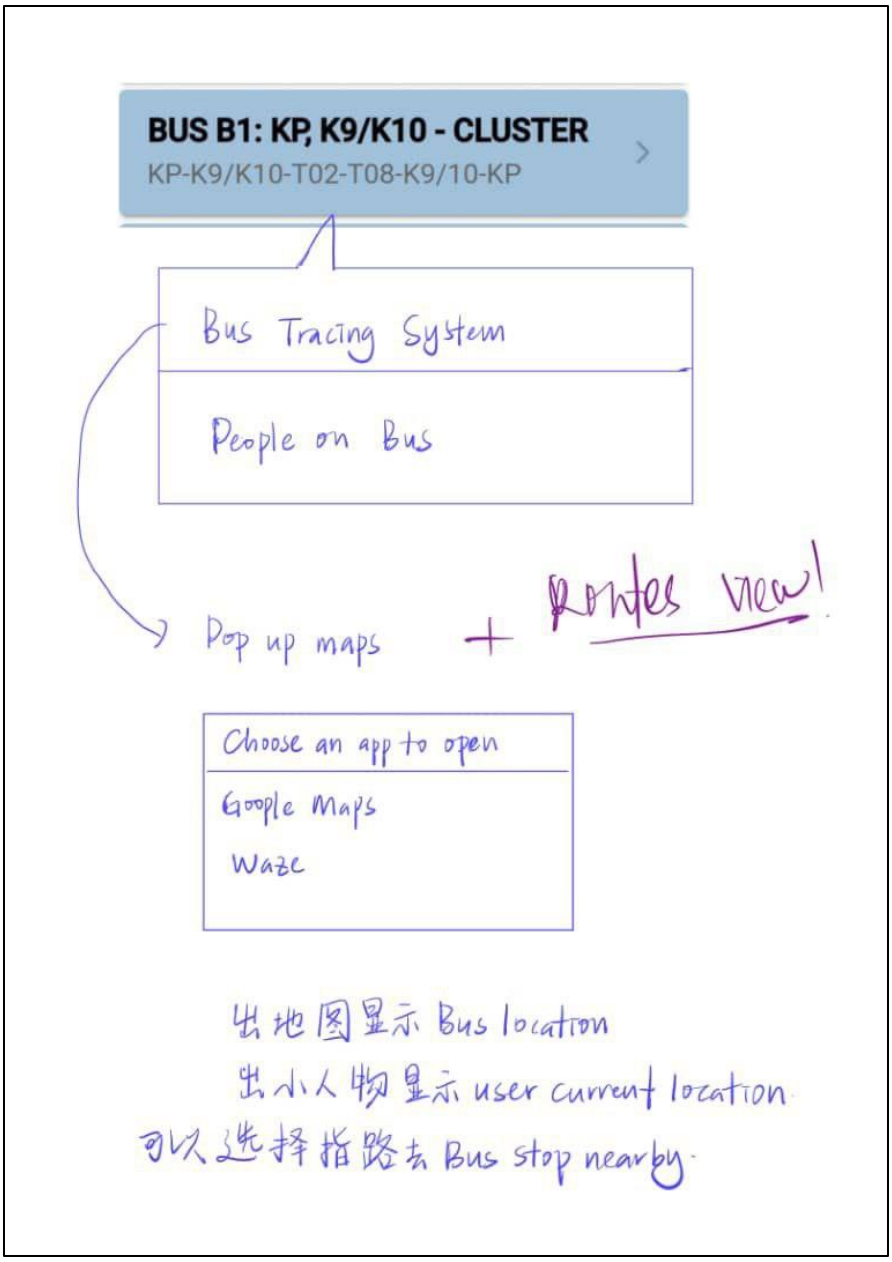

Diagram 3.5 (Brainstorming ideas)

Prototype Phase

In this phase, we designed and developed a model based on data from interviews, surveys, group ideas, and current shuttle bus system trends. We implemented our shuttle bus system in UTMSmart to help students locate buses within UTM. We created a low-fidelity prototype based key features with paper sketches, providing a clear image of our prototype and app interface.

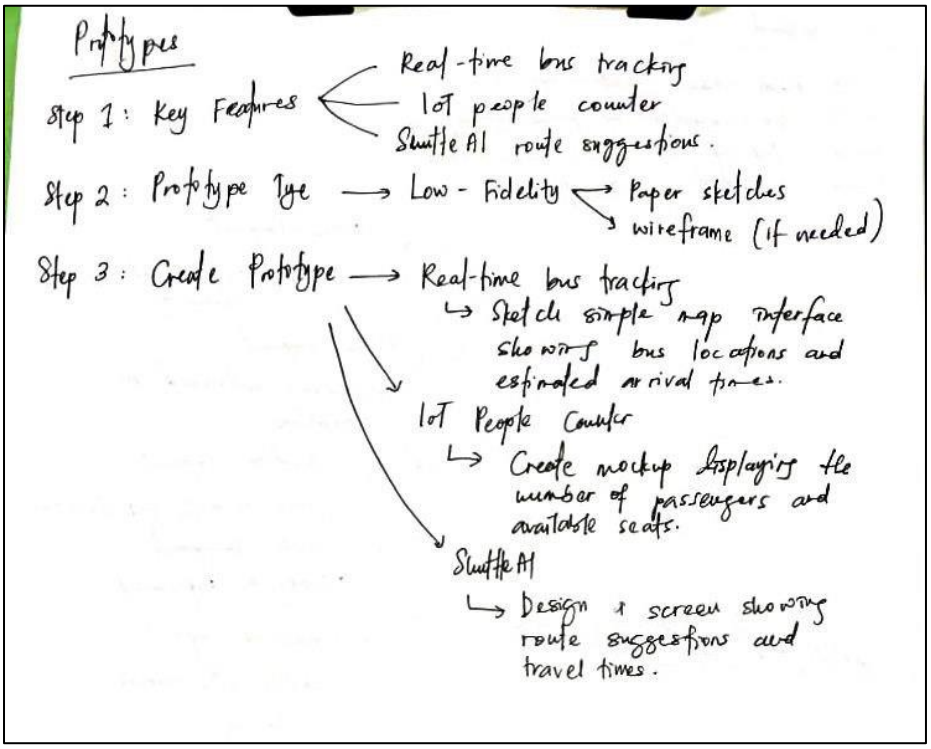

Diagram 4.1 (Steps in developing prototype)

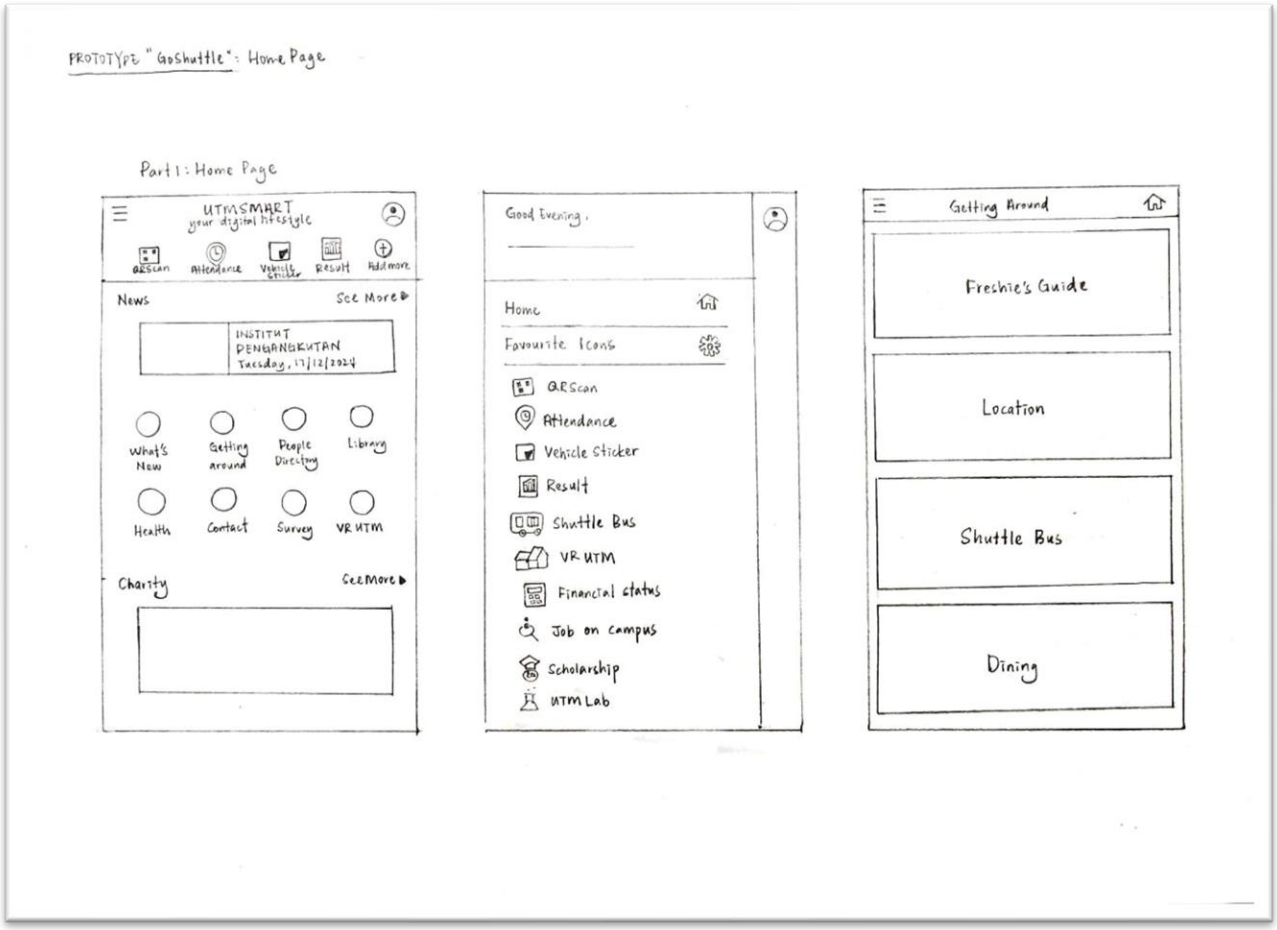

Diagram 4.2 (First page of interface)

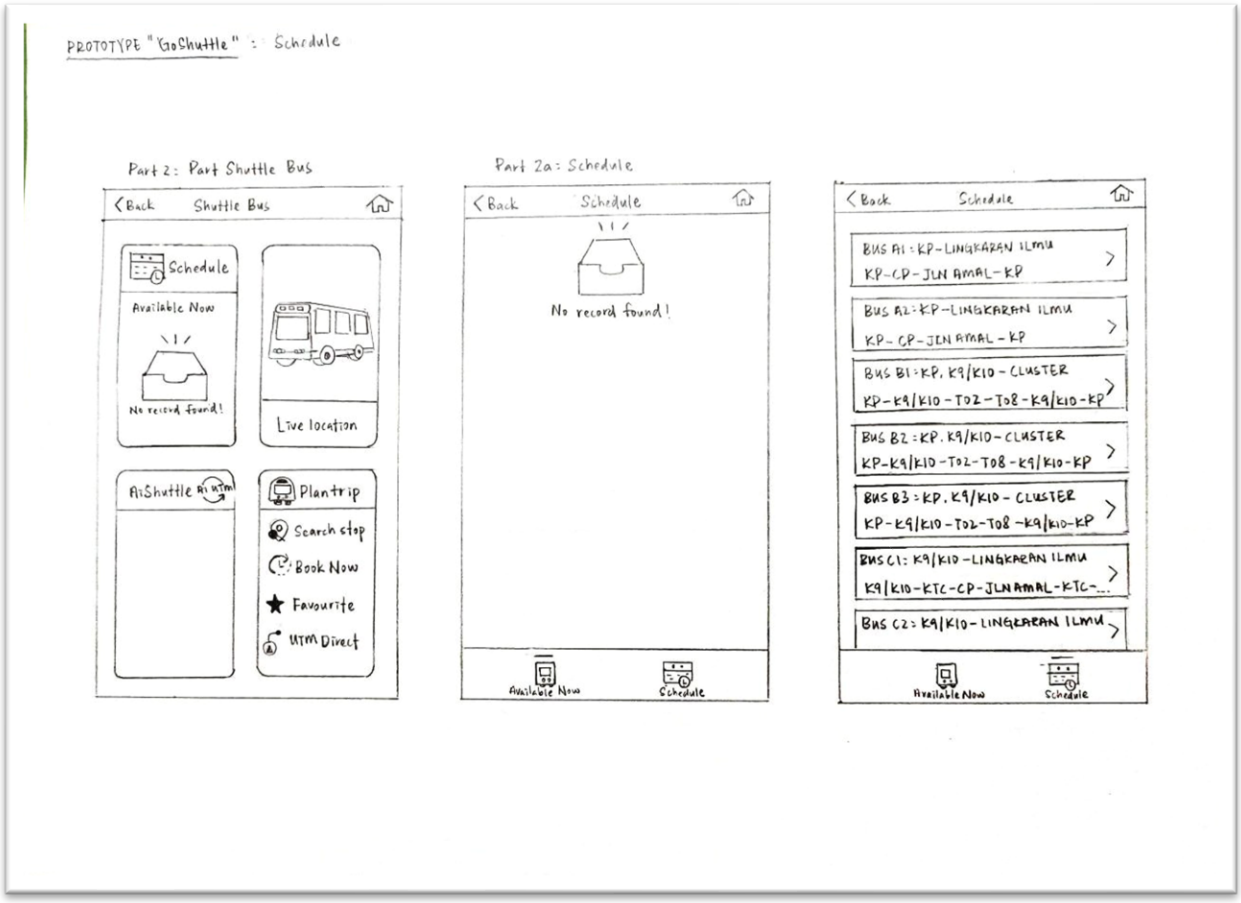

Diagram 4.3 (Second page of interface)

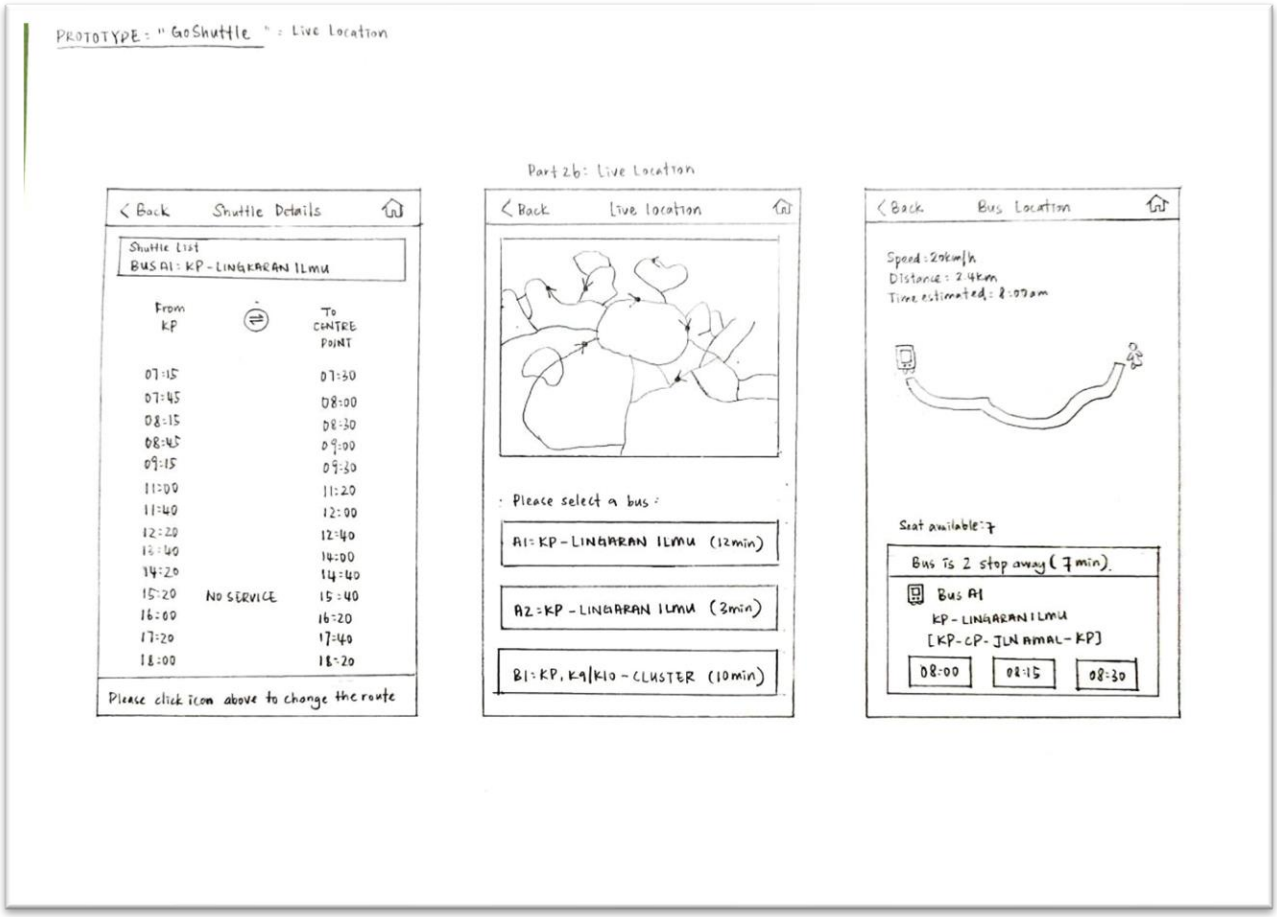

Diagram 4.4 (Third page of interface)

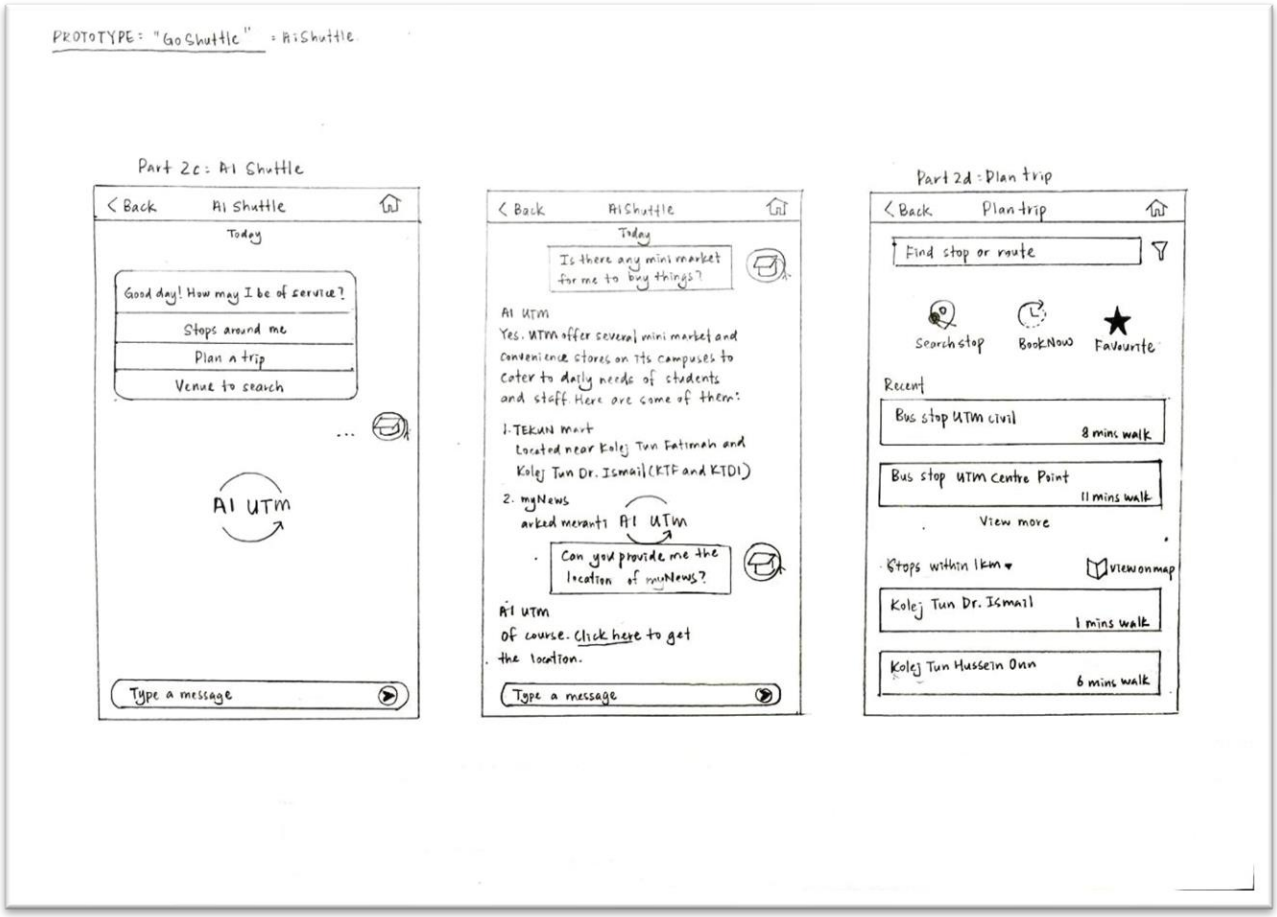

Diagram 4.5 (Fourth page of interface)

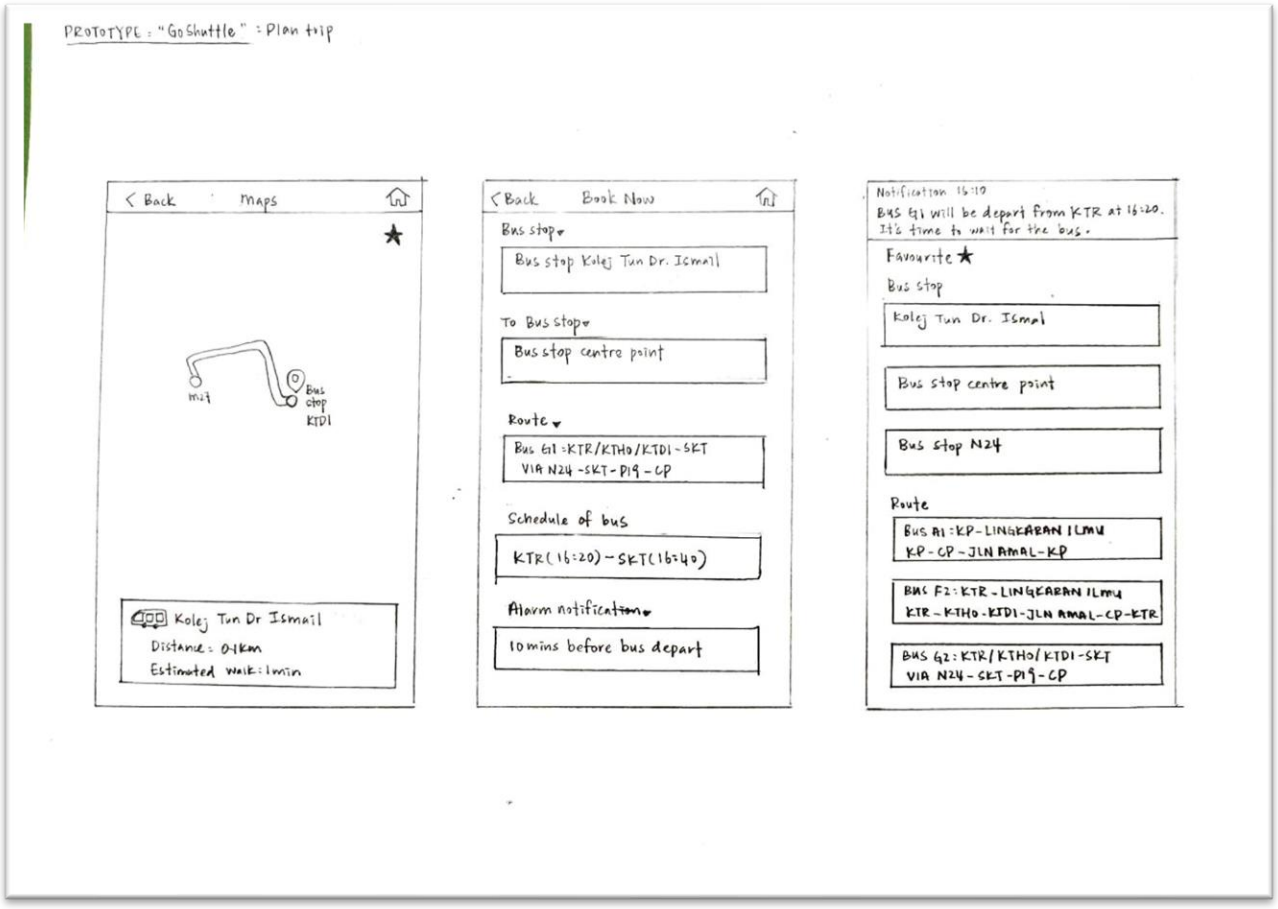

Diagram 4.6 (Fifth page of interface)

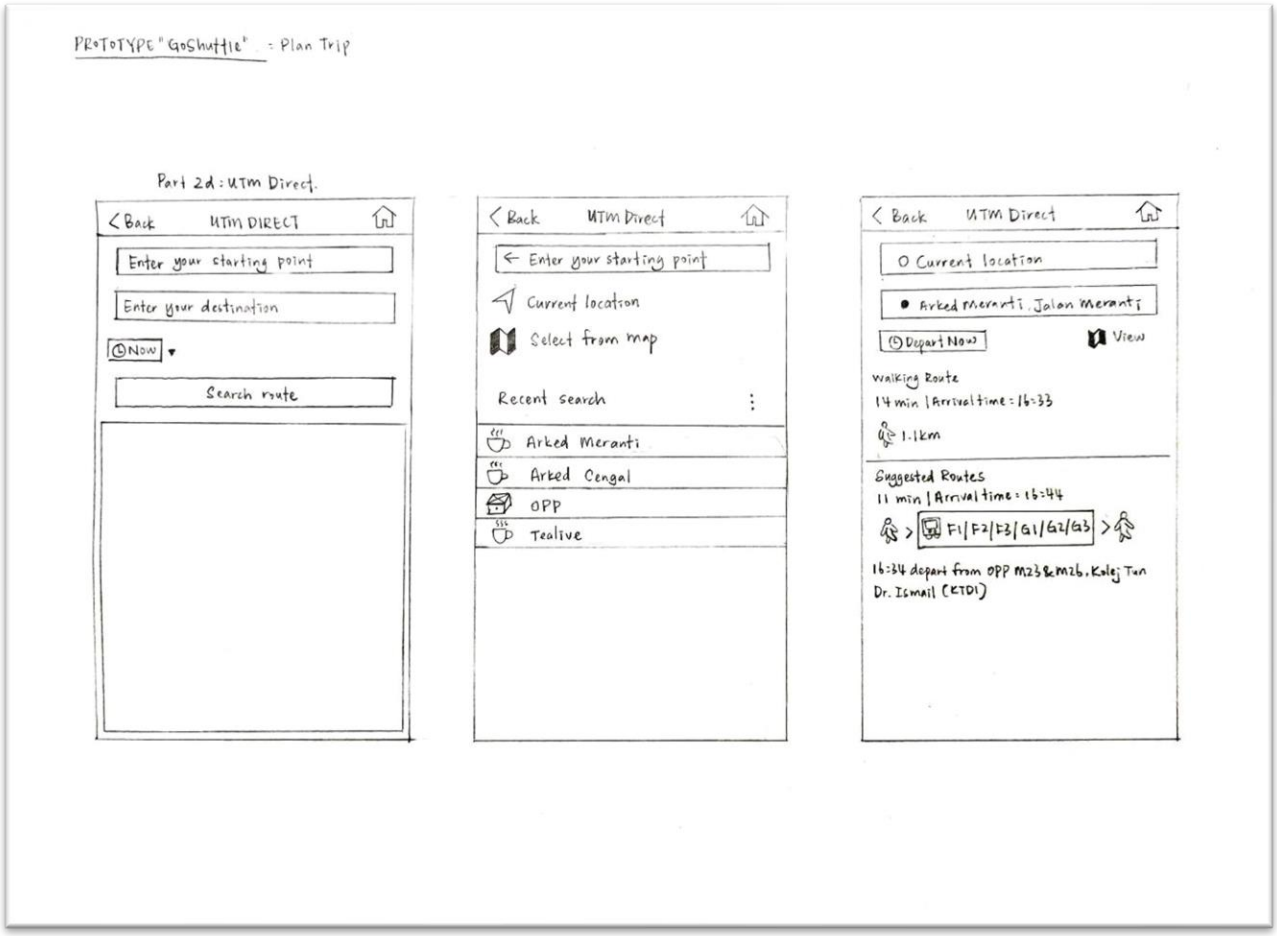

Diagram 4.7 (Sixth page of interface)

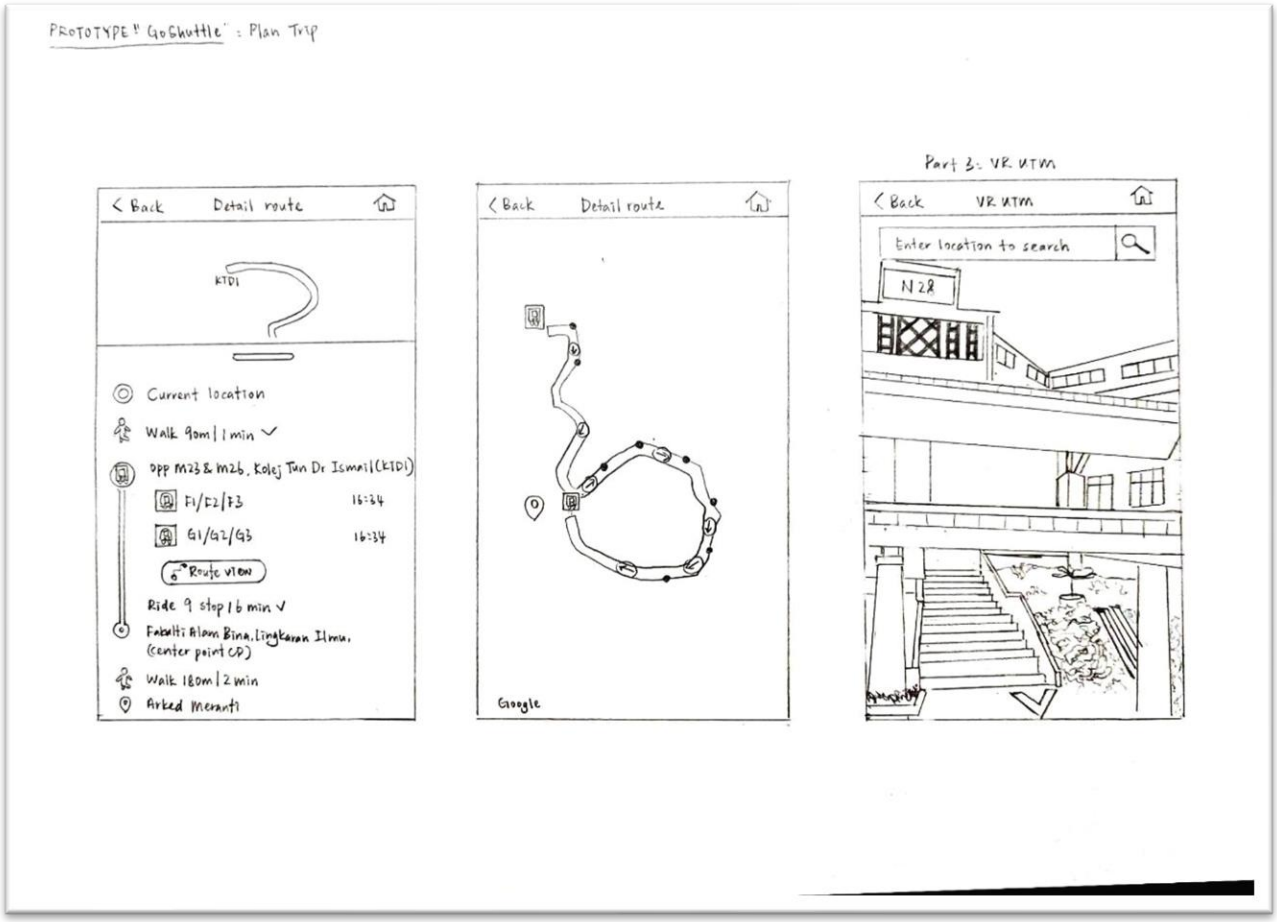

Diagram 4.8 (Seventh page of interface)

Testing Phase

During this phase, we asked several students to review and test our finished prototype and provide feedback on the improvements made to the UTMSmart app. Most students gave positive feedback, finding the app more useful for locating buses and navigating around UTM.

Diagram 5.1 (User testing)

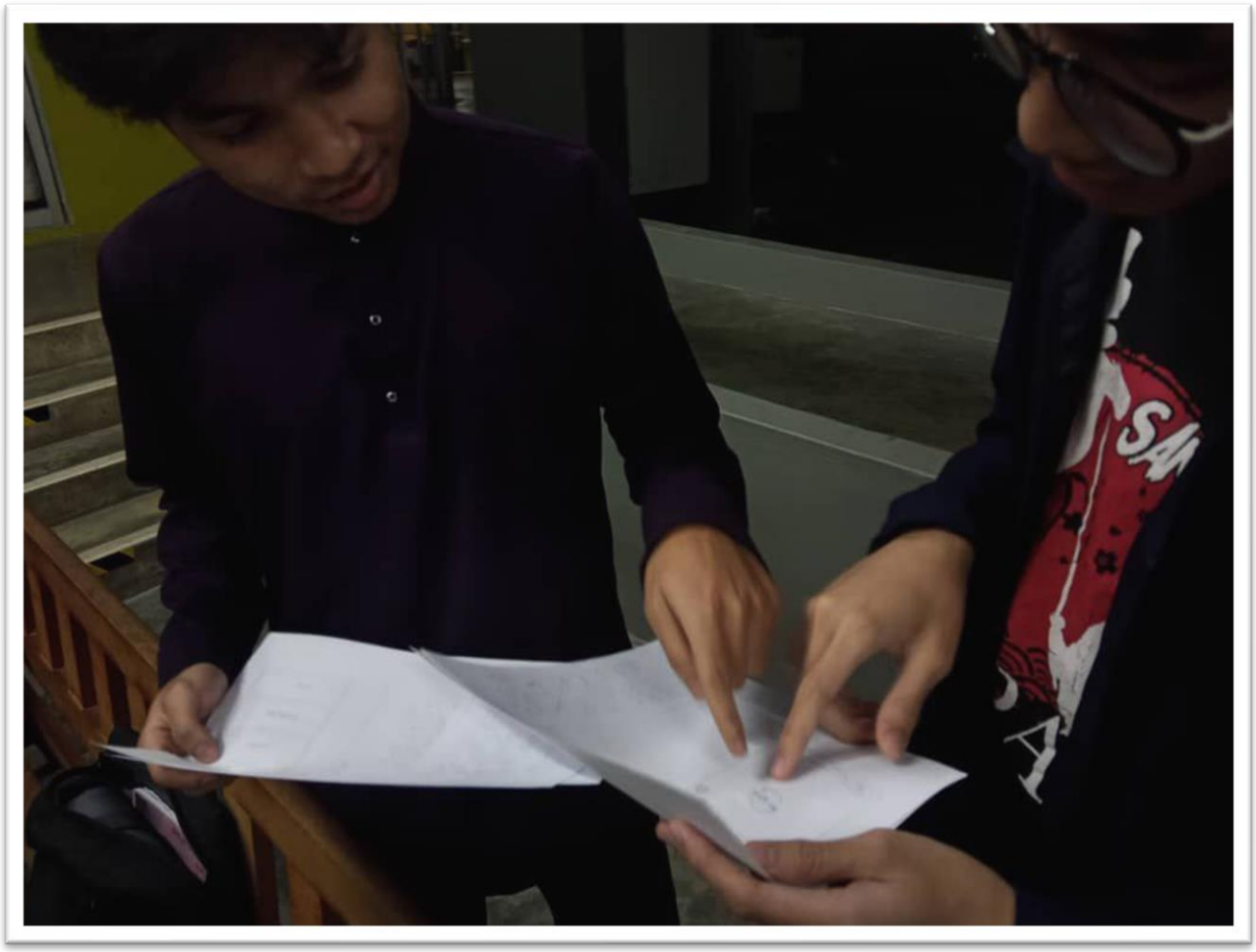

Diagram 5.2 (User testing)

Feedbacks gathered from students:

1. Students requested to add the estimated duration for the entire journey.
2. Students suggested including the estimated time of bus arrival.
3. Students asked for the ability to set an alert for their future destination.
4. Students recommended adding a reminder for bus arrival when it's almost time to board.

REFLECTTION

1. **Nur Faatihah binti Mohamad Fuad (A24CS0161)**

What is your goal/dream with regard to your course/program?

My goal in the data engineering course is to master the subjects, especially programming techniques, which I believe are crucial in computer science. I also aim to develop strong analytical and critical thinking skills, which are essential in industry and project-making.

How does this design thinking impact on your goal/dream with regard to your program?

This project helped me improve my teamwork and collaboration skills, which are essential for any individual. I also gained a lot of knowledge about Big Data and AI. Additionally, this project enhanced my problem-solving skills and understanding of the design thinking processes and phases.

What is the action/improvement/plan necessary for you to improve your potential in the industry?

To improve based on industrial needs, I plan to focus on enhancing communication and decision-making skills, which are essential for both industry and lifelong learning. In my opinion, expertise in this field requires a balance of technical skills, such as programming, and soft skills, such as communication. This combination ensures career relevance and longevity in the industry.

2. **Ahmad Irfan bin Azahan (A24CS0036)**

What is your goal/dream with regard to your course/program?

My goal as a data engineer is to acquire a strong foundation in programming, database management, and data analysis. This will enable me to excel in data-driven projects and contribute effectively to the industry in the future.

How does this design thinking impact on your goal/dream with regard to your program?

Design thinking has been incredibly helpful in understanding project management. For instance, it enabled my group to better plan our strategy to solve a problem by following detailed procedures, which greatly organized our plan structure.

What is the action/improvement/plan necessary for you to improve your potential in the industry?

To further improve my potential in the industry, I plan to attend data-related events and programs. This exposure will help me gain a better understanding of the industry and receive valuable tips from experts on how to excel and thrive in the future.

3. Ida Yatullailiyeh Binti Amrun (A24CS0084)

What is your goal/dream with regard to your course/program?

My goal in the data engineering course is to become an expert in programming and managing large-scale databases. I aspire to work on cutting-edge projects involving big data, machine learning, AI, and VR, and contribute to innovative solutions that address real-world challenges.

How does this design thinking impact on your goal/dream with regard to your program?

This project has enhanced my critical-thinking ability by requiring a deeper understanding of users' problems and generating diverse ideas for innovative solutions. Additionally, it has significantly improved my leadership skills by teaching me to delegate tasks, motivate team members, and make strategic decisions.

What is the action/improvement/plan necessary for you to improve your potential in the industry?

To prepare for the industry, I plan to master the most used programming languages, build an e-portfolio showcasing my projects, skills, and achievements, as well as joining professional organizations to expand my network. Additionally, I aim to improve my communication skills.

4. Cheong Yi Shien (A24CS0058)

What is your goal/dream with regard to your course/program?

I aim to master programming skills, as they are fundamental to the role of a data engineer. Additionally, I plan to develop strong analytical and problem-solving skills to create effective solutions for complex problems.

How does this design thinking impact on your goal/dream with regard to your program?

Design thinking enhances my understanding of innovation and problem-solving by helping me identify user needs, define problems, ideate solutions, prototype, and test. These concepts are crucial for innovation and program development, allowing me to focus on problem definition, generate creative solutions, and strengthen my problem-solving abilities.

What is the action/improvement/plan necessary for you to improve your potential in the industry?

Consistent practice is one of the most effective ways to improve my potential in the industry. Long-term practice can help me become fluent in programming languages. Additionally, starting a project related to my course can enhance my skills and provide practical experience.

TASK DISTRIBUTION

NO	MEMBER	TASK
1.	Nur Faatihah binti Mohamad Fuad A24CS0161	• Report writing (Design Thinking Evidence) • Presentation slides preparation
2.	Ida Yatullailiyeh binti Amrun A24CS0084	• Report writing (Introduction, Detailed Steps) • Presentation slides preparation • Report Video Production
3.	Cheong Yi Shien A24CS0058	• Report writing (Detailed Description, Detailed Steps) • Prototype Design and Sketch
4.	Ahmad Irfan bin Azahan A24CS0036	• Report writing (Design Thinking Assessment Points) • Report Video Production

REFERENCE

Alex Neilson. (2019, September). "*Systematic Review of the Literature on Big Data in the Transportation Domain: Concepts and Applications*". Science Direct.

https://www.sciencedirect.com/science/article/abs/pii/S2214579617303866

Dhanhyaa. (2024). "*3 East Asian Examples Of Big Data In Public Transport*".iunera.

https://www.iunera.com/kraken/public-transport/3-east-asian-examples-of-big-data-in-public- transport/#1-1st-example-of-big-data-in-public-transport-hitachis-people-flow-tech-for-jr-east

James Loran. (2024, 31 October). *"Concept Testing".*Lyssna.

https://www.lyssna.com/blog/concept-testing/

Sagar Yeruva. (2024, 04 November). "*EduBusGuru: Enhancing College Bus Tracking and Management with Real-Time Mobile App*". IEEE.
https://ieeexplore.ieee.org/abstract/document/10724760

Shafri A. Sharif. (2018, 08 November). "*Real-Time Campus University Bus Tracking Mobile Application*". IEEE.
https://ieeexplore.ieee.org/abstract/document/8523915

Su Mon Chit. (2017,10 August). "A pilot study: Shuttle bus tracker app for campus users". IEEE.
https://ieeexplore.ieee.org/abstract/document/8002460