UTM UNIVERSITI TEKNOLOGI MALAYSIA
SCHOOL OF COMPUTING
Faculty of Engineering

SECP1513
TECHNOLOGY AND INFORMATION SYSTEM

PROJECT : LOW FIDELITY PROTOTYPE
REPORT OF PROJECT : PART 2
SHUTTLE+ : INTEGRATED BUS SYSTEM

SECTION : 05 -1 SECRH

LECTURER'S NAME : Ts. Dr. SARINA BINTI SULAIMAN

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TABLE OF CONTENT

1.0 Introduction

In today's fast-growing product sector, user experience (UX) design is crucial. Prototyping is an important aspect of designing a good UX, but it can be complicated for many product teams. Prototypes can range from a set of paper sketches illustrating multiple screens or stages of an app to a fully-functional, perfectly pixeled app. A prototype is a simple statement of design intent. Prototyping helps designers demonstrate and test their ideas. A digital prototype simulates the ultimate user-interface interaction. A prototype can replicate a full app or simply one interaction, depending on the product team's goals. A prototype is a working model of a finished product. It lets product teams test their designs' usability and practicality. Prototyping is used to test designs and product ideas before constructing actual items. In prototyping, "fidelity" refers to how close a representation is to the final result. It also refers to the prototype's details and usefulness. The two basic types of fidelity are low-fidelity (lo-fi) and high-fidelity (hi-fi). This project uses low-fidelity prototypes. Low-fidelity prototyping is a quick and easy technique to turn an idea into a more physical version of the final product. A low-fidelity prototype is used to sketch out the flow and test the proposed functionality's utility and usability. They can be done digitally or on paper. The obvious benefit of low-fidelity prototyping is its low cost. Prototyping also encourages group work. Lo-fi prototyping doesn't require special expertise, so more people can participate. Non-designers can contribute to the idea generation process. For our project, we are using the click through prototype using PowerPoint software.

SHUTTLE+ : INTEGRATED BUS SYSTEM

In this report, we will be documenting our journey to making a functional system that will provide an easement to everyone in UTM. Manual routines, systems, and activities have proven to be ineffective and time-consuming as information technology has advanced. In Malaysia, the manual system is still used to complete daily tasks. The primary reason for the existence of the manual system and its failure to be changed was a lack of knowledge and learning. On the UTM campus, public transportation is critical, especially for first-year students who are not permitted to bring their own transportation. Those who choose public transportation, on the other hand, face difficulties because they must wait for the bus for more than 30 minutes.They will miss the bus if they are late, but waiting for it to arrive sooner is a waste of time, even if it is only 5-10 minutes. Remember that time is gold. As a result, our group agreed to create and test a prototype of an integrated shuttle bus service system project to help UTM students and staff move around. The goal of this integrated shuttle bus service system is to convert the manual routine of shuttle bus booking into a computerised system to ease the routine process. The proposed system will serve as a communication platform between drivers and students. The system will allow users to book an express bus ticket to return to their hometown and pick a drop-off destination beforehand. The system will also allow the bus driver to see the list of bus stops they need to pick up and drop off users in the UTM area. The ride information will be recorded for internal usage. This system allows public bus users in UTM to know the real-time location of the bus, the time the bus will start moving and the time for the bus to reach its destination. This will make it easier for users to prepare and organise their journey and time productively and systematically. It will be one of the on-demand services in UTM.

2.0 Log Journal

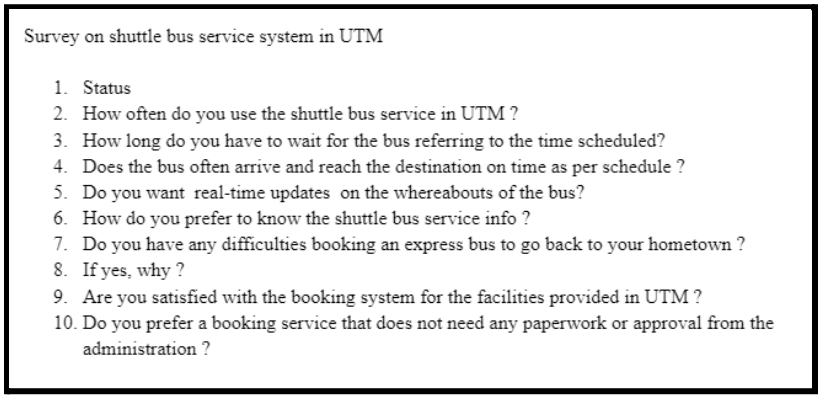
DATE	DESCRIPTION (Activity Records)
13th December 2021	● Group committee formation. ● Create a telegram group consisting of our team members. ● Quick review on the project instruction.
15th December 2021	● Start to discuss and provide planning for the low fidelity prototype project. ● Task assignment for each team members ● Set the timeline to complete the task. ● Setting project expectations and goals. ● Set the next meeting's date and time until the end of the project.
17th December 2021	● Brainstorming process ● Identify which 4th IR technologies to be chosen ● Suggest potential client which can provide input and problem scenarios ● Suggest Cloud Computing architecture that suitable for the project
19th December 2021	● Start making the project report part 1
23rd December 2021	● Discussion on limitations, problem and solutions ● Listed all the problem from the discussion
28th December 2021	● Complete and finalized the project report part 1
31st December 2021	● Report of project Part 1 is submitted
1st January 2022	● Discussion on steps to complete the project ● Created Google form to conduct a survey about shuttle bus in UTM ● Shared the Google form to Whatsapp and Telegram and gained feedbacks ● List all the related problems and solutions ● Sorted out and selected the main problem
4th January 2022	● Discussion about the response from the survey (Google Form) ● Brainstorm all the solution for the problems faced by respondents ● Agreed to the most applicable solutions ● Discussion on what platform or tools needed to create the low fidelity mockups
8th January 2022	● Started making the prototype ● Discussion on the system architecture design and project business process
12th January 2022	● Updated and complete the progress of the low fidelity prototype
15th January 2022	● Test the prototype by using Google form to get review from target users ● Shared the Google form to Whatsapp and Telegram
17th January 2022	● Started making the report and video
19th January 2022	● Updated the progress of the report and video
20th January 2022	● Complete and finalized report and video
22th January 2022	● Report of project Part 2 and video ready to be submitted.

3.0 Details Steps and Description

To make sure this Shuttle+ project becomes a success, we need to schedule the plans and steps and also strictly stick to what we have agreed. With this strict, scheduled plan, we will be able to complete the project on time and with all the components needed for it. First and foremost, we have to think of the problems faced by people nowadays, and we chose UTM students and staff, to be specific, because we want to focus on the society that is closer to us. We conducted a survey to get a better idea of what problems these groups of people encounter, such as the seniors' and the lecturers' opinions. After figuring out the problem that has been raised, we decided what project we would proceed with, and we brainstormed on what industrial revolution technologies we were going to use and how to apply the AWS architecture to our system. We continued the process by planning and designing the architecture based on our knowledge of AWS cloud computing.

3.1 Empathise

By conducting a survey among UTM students and staff, we sought to clarify with our target users the nature of their problem with the shuttle bus service system provided in UTM. We asked a few questions to find out their problem with shuttle bus service .We have identified the problems faced by students and staff when using the shuttle bus service in UTM. Therefore, we set our main target users as the students and staff of UTM, and thus our survey was conducted among students and staff at UTM. Because of the current pandemic, we are not conducting direct interview sessions. Then, we list out some problems that they will usually face when using the shuttle bus service and when they want to book a bus for a special occasion . We created a Google form and sent it through social media platforms such as Whatsapp and Telegram for the student to fill out the survey. Through the survey, we managed to learn about extra problems and suggestions to modify our prototype.


Survey on shuttle bus service system in UTM

1. Status
2. How often do you use the shuttle bus service in UTM ?
3. How long do you have to wait for the bus referring to the time scheduled?
4. Does the bus often arrive and reach the destination on time as per schedule ?
5. Do you want real-time updates on the whereabouts of the bus?
6. How do you prefer to know the shuttle bus service info ?
7. Do you have any difficulties booking an express bus to go back to your hometown ?
8. If yes, why ?
9. Are you satisfied with the booking system for the facilities provided in UTM ?
10. Do you prefer a booking service that does not need any paperwork or approval from the administration ?

Diagram 1: List of questions for respondents

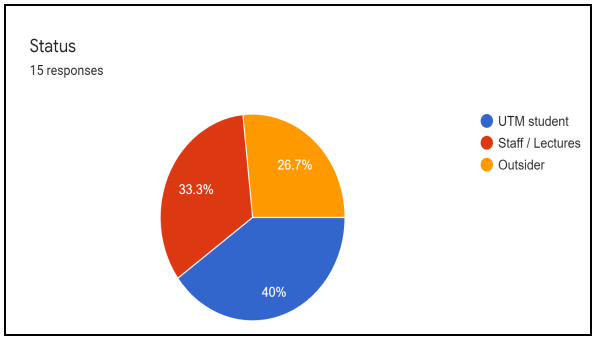


Diagram 2

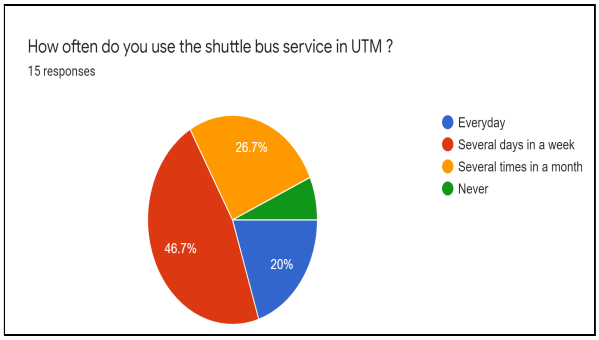


Diagram 3

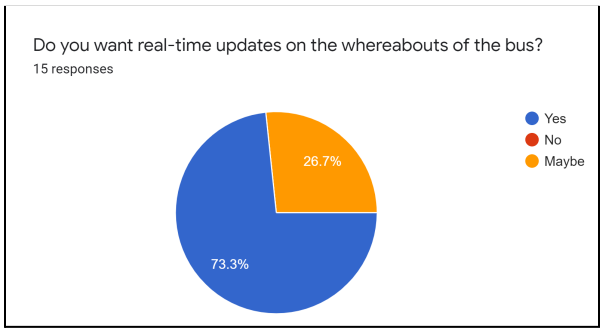


Diagram 4

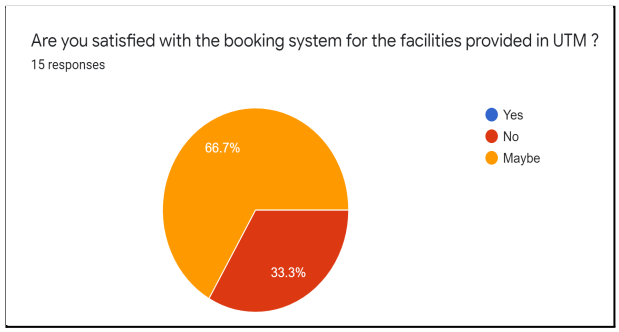


Diagram 5

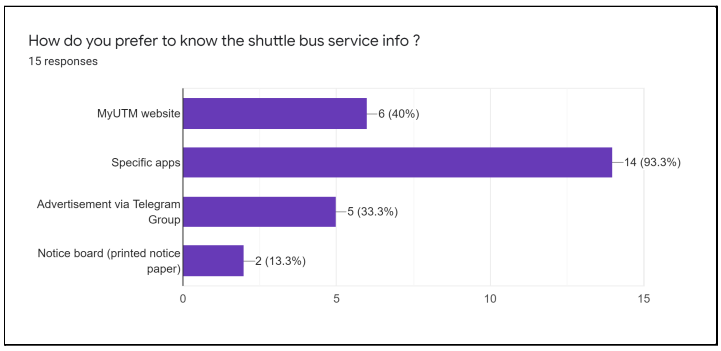


Diagram 6

Google Form link : https://forms.gle/TJj2ZMjJHyoFDnhi6

3.2 Define

Based on the survey that our group has conducted, respondents have clarified several problems that they have faced. Diagrams 7,8,9,10,11 are the visualization of the survey.

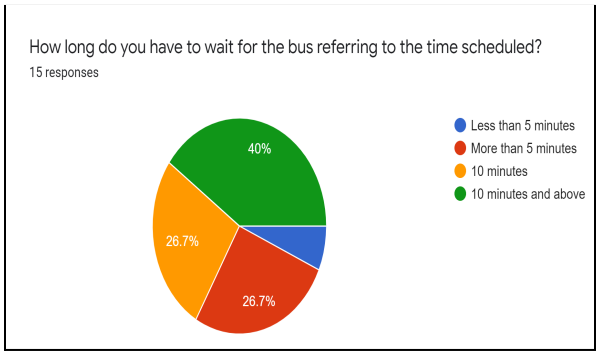


Diagram 7

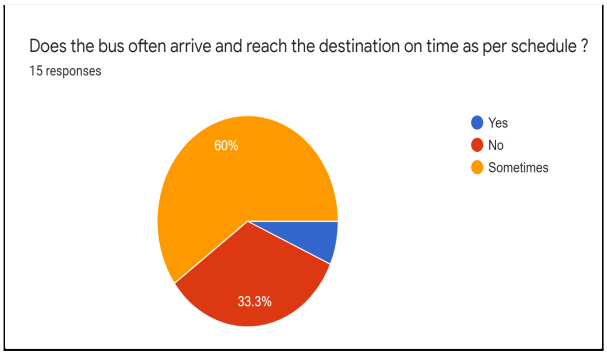


Diagram 8

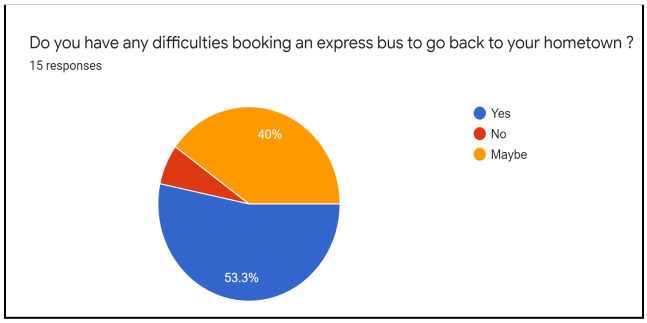


Diagram 9

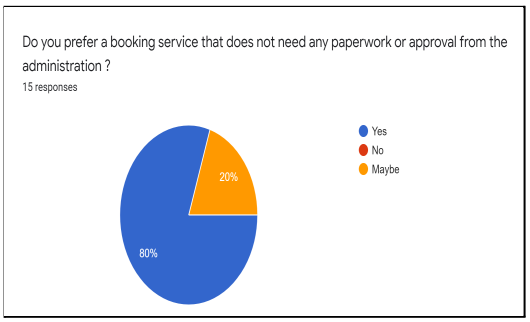


Diagram 10

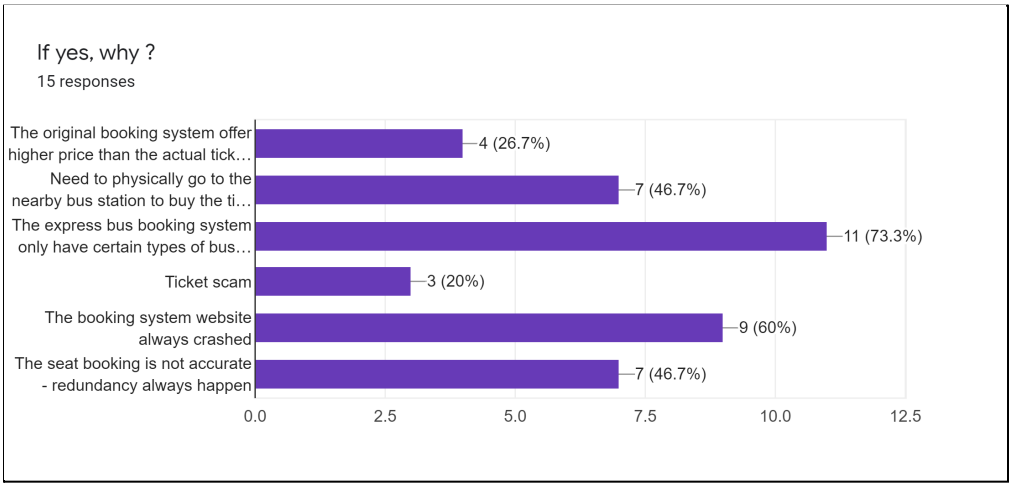


Diagram 11

Analysis of survey results :

Among the respondents that took the survey, 40% of the respondents were UTM students, while 33.3% of the respondents were staff or lecturers. Most of the respondents stated that they use the shuttle bus service several days a week and several times a month. However, 20% of the respondents also stated that they use the shuttle bus service every day. 40% of the respondents proved that they have to wait for the bus for more than 10 minutes, which results in a waste of time. Not only that, more than half of the respondents agreed that the bus also does not often arrive and reach the destination on time as per schedule. Next, 73.3% of the respondents want real-time updates on the whereabouts of the bus to facilitate their movement in UTM. Other than the myUTM system, they prefer to have a specific app or a system that displays real-time updates on the whereabouts of the bus. Not only that, most of the respondents also stated that they had faced difficulties booking an express bus to go back to their hometown. The main reasons they stated are that the express bus booking system only has certain types of buses and is not frequently updated, and that the booking system website always crashes. To summarize, the issues and problems are the inefficient shuttle bus service system and the complicated booking system for express and special-occasion buses in UTM that cause the students to spend their precious time, energy, and money on something unnecessary. It becomes unnecessary when they can just use the Shuttle+ apps to do the bookings without going through a tiring process.

3.3 Ideate

At this stage, we had a virtual conversation in our Telegram group and a discussion on Google Meet on the functionality of the system. Furthermore, we also discussed the chosen IR4.0 technology, which is the system integration technology feature, as it was our main concern in this project. We emphasised the feedback from the survey and came up with various ideas to design our prototype. Our group members also discussed suitable improvements and features that could be implemented on our prototype. One of the ideas of a member was to add real-time location detection using geo-blocking features. In a geo-blocking scheme, the user's location is determined using Internet geolocation techniques. Moreover, one of the members suggested a futuristic idea to include the details of the in-charge bus driver so that if anything happens, we can reach him quickly. Subsequently, Amos, who was on the committee of prototypes, sketched and designed the interface of the application. After the discussion, we drew basic sketches of the prototype on paper. The sketches included some of the suitable features that could aid the user. Once Amos was done sketching, the main sketch of the prototype was shared with the other group members to get our opinions and input on the prototype. Once everyone on the team agreed with the sketch, Amos began making the low-fidelity prototype using PowerPoint software.

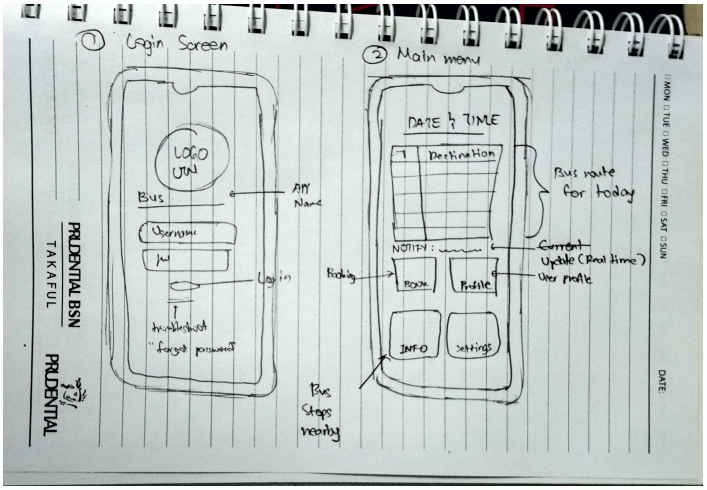


Diagram 12 : Login ,main menu sketches and shuttle bus schedule sketches

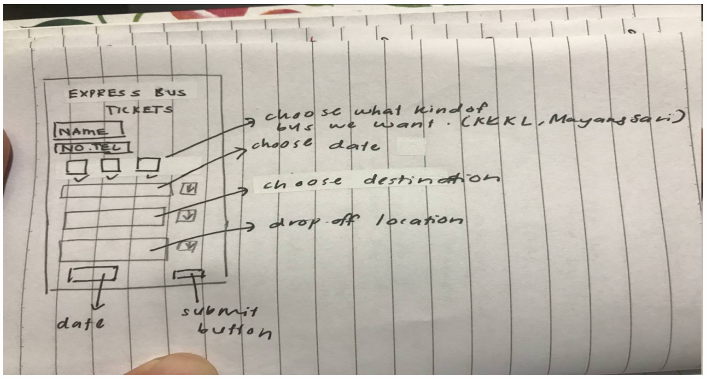


Diagram 13 : Bus ticket booking sketches

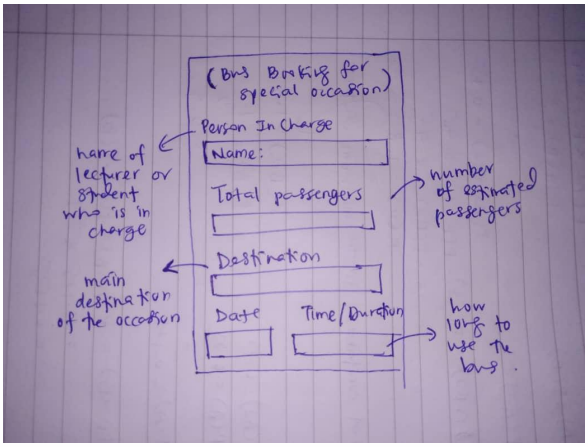


Diagram 14 : Bus booking for special occasions

3.4 Prototype

Based on our idea about the solution to the problem, a prototype application was developed by Amos, which was created using Microsoft Powerpoint. The prototype of Shuttle+ was created with PowerPoint using a drawing feature, and the demonstration was done using a phone to make the demonstration of the prototype easier to perceive. The sketch of the application includes six major parts of the interface, which are the Login, *Main Menu*, *Bus Ticket Booking, Shuttle Bus Schedule, Special Occasions Bus and Info Page.* Our team took three days to complete the prototype. Once Amos was done, he shared the design of the prototype with the rest of the group members. Our group discussed the designs given and agreed to create a prototype with some extra features. A few changes were made to the low-fidelity prototype to tailor it to the theme. Once the changes were made, a prototype made by Amos managed to gain every member's approval.

3.5 Test

After finishing the prototype, we made a short video demonstration of the app prototype system. We explain every part of the application and the function of the apps to our users. After that, we display our prototype in the Google form so that they have an introduction to the operation of our prototype. In order to get some review and feedback from students on our prototype, we made a Google Form and shared it in WhatsApp and Telegram groups to conduct a virtual survey. We also attached the video of the prototype testing so you can get a better view of the prototype. The respondents gave mostly positive reviews of Shuttle+ and the demonstration. Most of them gave some minor suggestions to improve the quality of the app. We keep on innovating our prototype until it perfectly fulfils the expectations of the users. Most of the respondents think this app will benefit the students of UTM. The positive feedback was indeed overwhelming. The diagrams below the details of the survey on testing.

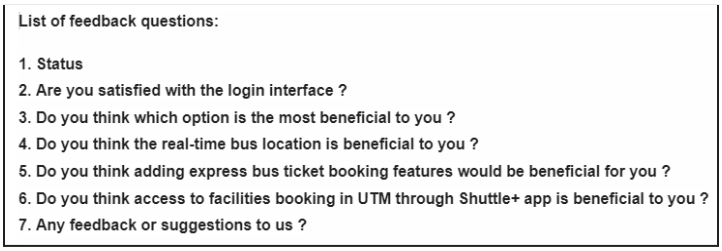


Diagram 15 : List of feedback questions for the respondent

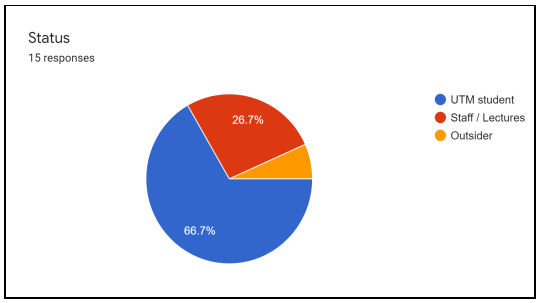


Diagram 16 : Status

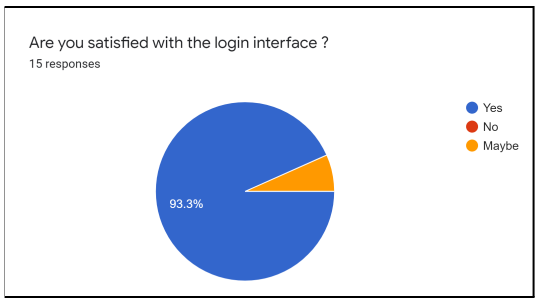


Diagram 17

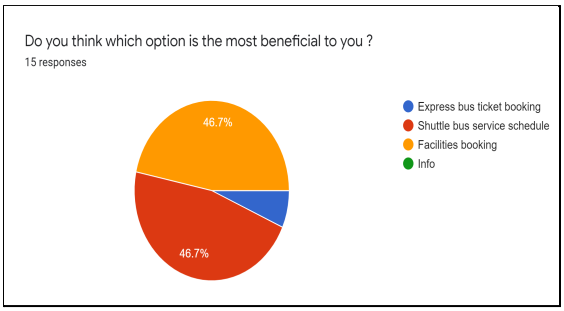


Diagram 18

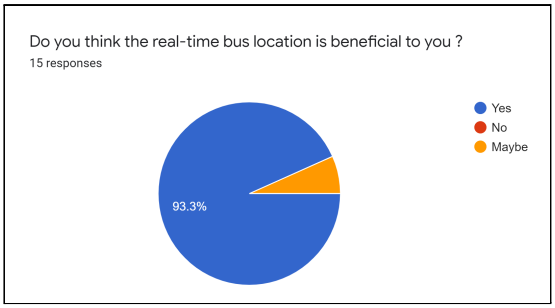


Diagram 19

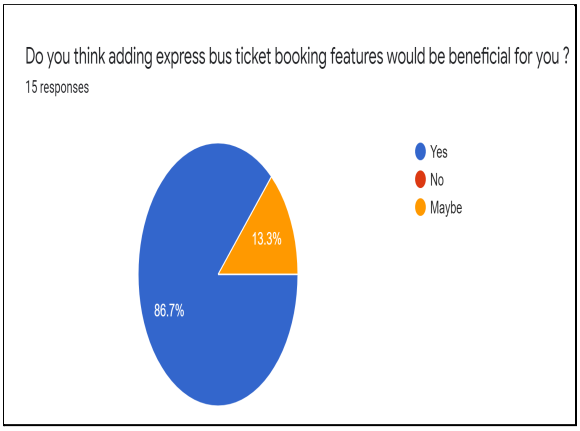


Diagram 20

Any feedback or suggestion to us ?
i cant wait to use this apps 😆
i hope this apps is free because it is good !
add a finger print detection
use finger print identification . moree faster log in
create a face identification to access the app
face identification
use finger print to log in
limit the transaction amount per day
make sure there is some kind of authorization of the apps
i suggest to use the fingerprint to approve the transaction
excited to use this Shuttle+

Diagram 21 Feedbacks from the respondents

Link of feedback Google form : https://forms.gle/B1xrrouftjRdd9L89

4.0 Detailed Description

4.1 Problem

The problem that we are going to solve by implementing this integrated bus system is the lateness faced by the students when attending their classes on time. They usually spend more than five minutes waiting for the shuttle bus. Because of the lateness, the lecturers will not be very pleased with the students as it will prolong the period of the lectures and the possibility of the students not catching up with the lesson is higher. Next, it will definitely cause the environment in the UTM compound to become unpleasant because a lot of students and staff prefer using their own transportation. They are not interested in using shuttle buses provided by the university because of the buses' inefficiency mentioned above. Students also have problems booking the express bus to go back to their hometown because of the bus booking websites' constant breakdowns, and it would be much safer if the booking was conducted via a trusted application. Previously, students had to go to the bus station or some bus stop that had been stated by the booking website, which caused the students to go to that place by themselves. This process requires energy, money, and time. On the other hand , it is time consuming to book a bus for special occasions such as volunteering and study-touring . Students have to do some paperworks and wait for approval from HEP administration only then they can book the bus .

4.2 Solution

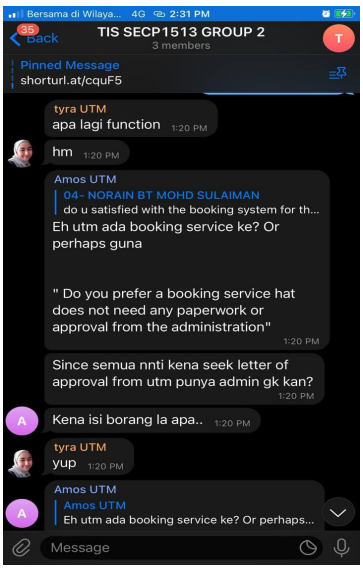
The solution to the problem raised above is to provide an application that informs UTM public bus users of the bus's real-time location, the time the bus will begin moving, and the time the bus will arrive at its destination. This makes it easier for users to plan and arrange their time in a productive and systematic manner and avoid missing classes. Next, the environment in the UTM compound will be much more pleasant because everyone will be using the upgraded public bus instead of using their own transportation. It will not only cut off the students' budgets for their vehicles' petrol and vehicle services because the shuttle bus in UTM is free, it will also decrease the number of vehicles on the road and lead to better air quality. Shuttle+ also allows users to book express bus tickets to return to their hometown using Shuttle+. Students don't have to go to some bus stop or the bus station outside the UTM compound. Even though there are multiple express bus companies that offer online booking, it is much more convenient, easier, and safer in terms of information security to do the booking at a private one-stop center, which is on our application, Shuttle+. Lastly, this prototype proposes a solution for the students and HEP administration to manage the process of booking buses for special events, making it simpler and still professionally done. It would be much simpler for the HEP administration and the students if there were just a few touches on our screen that allowed all the business to be done in a few minutes.

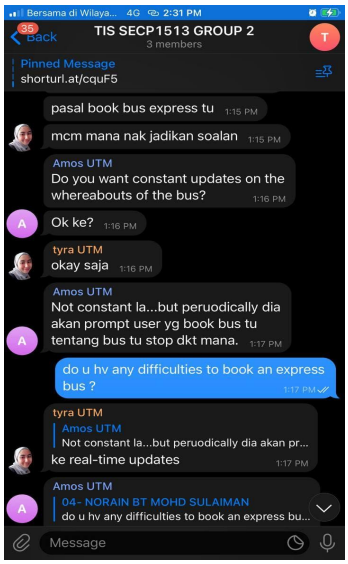
5.0 Team Progress & Team Working

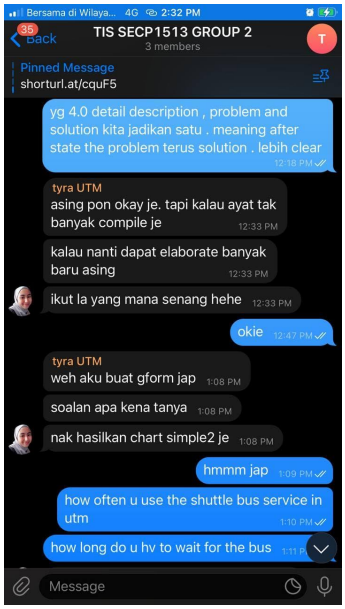
Despite our goals, we will encounter challenges, difficulties, and problems in making this integrated bus system useful in UTM. Time constraints limited our prototype and project completion processes. We have other assignments coming at the end of our first semester. Our issues include a lack of information regarding web application development. No one in our group had previously built a system application, so it was a steep learning curve. We couldn't do usability testing because most of our potential clients and UTM students were busy and hadn't returned to UTM. We also have a limited time frame to execute this assignment. Besides that, we wanted to look at free and easy-to-use mockup software. Due to our busy schedule, we chose to dedicate daily time to this project. To solve the problem of a lack of knowledge, we must spend more time researching and debating with our peers and lecturers. This project (building the low-fidelity prototype) took some time because we learned and tested several different system app frameworks and libraries.

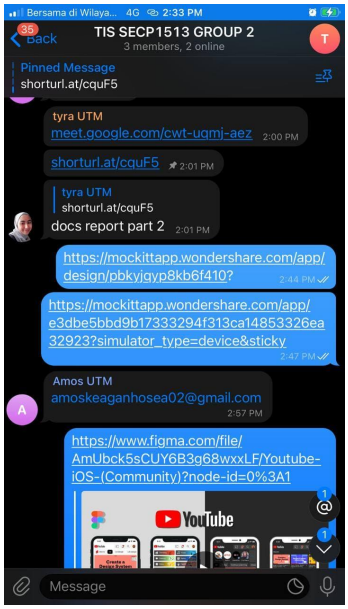
After completing this project, we can proudly say that our teamwork is a success because each of us gives our 100% to do our tasks. Even though there are only three of us, we can complete the project smoothly despite having a packed schedule since it is already the end of the semester. Amos Keagan Hosea, our leader, is responsible for task assignments for each group member and for designing the cloud computing architecture and designing the prototype. He is also the representative of our group to consult with our lecturer when there are any questions regarding our project. Nur Athira Nabila, who is responsible for contemplating on the suitable potential client for our projects, creating the Google form to get opinions from the students and analysing the data according to the responses, managing the workflow and brainstorming with Norain . Norain is also actively involved in this project by thinking of the suitable 4th Industrial Revolution technologies for our project, exploring the free and user-friendly software to build a low-fidelity prototype, and lastly, developing the idea for the project video. We discuss all problems and solutions in the Telegram group, and all members gladly contribute ideas and opinions.

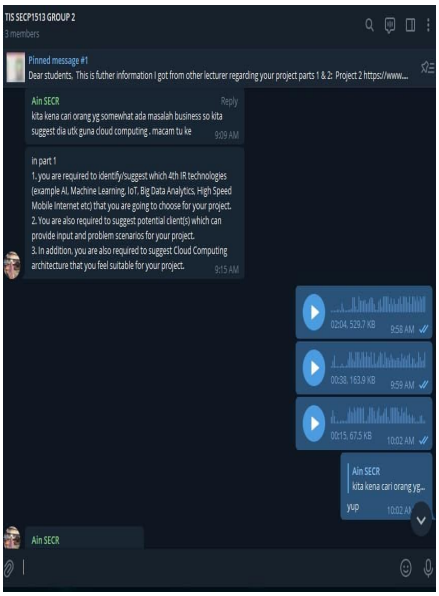
Below are some evidence that shows the screen captures of our discussion.



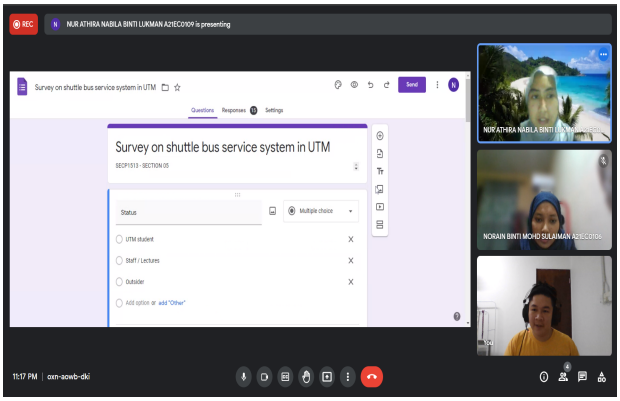


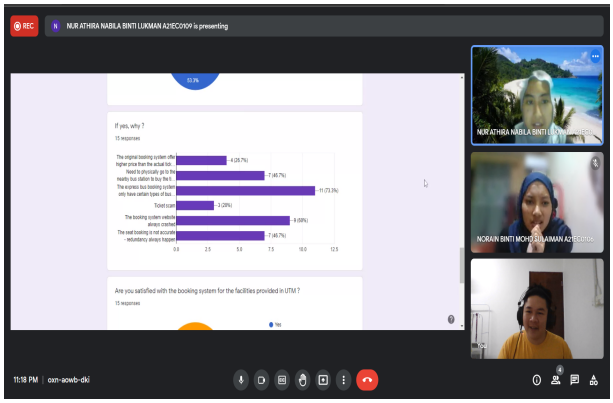


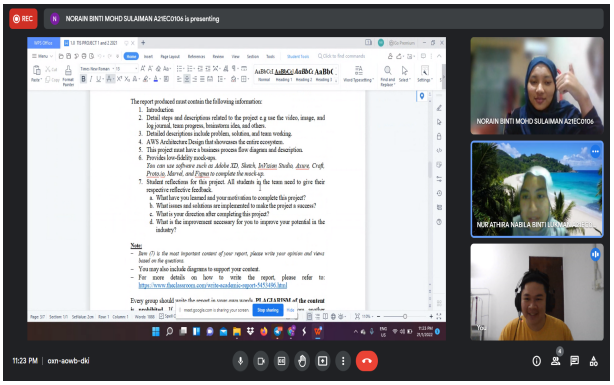


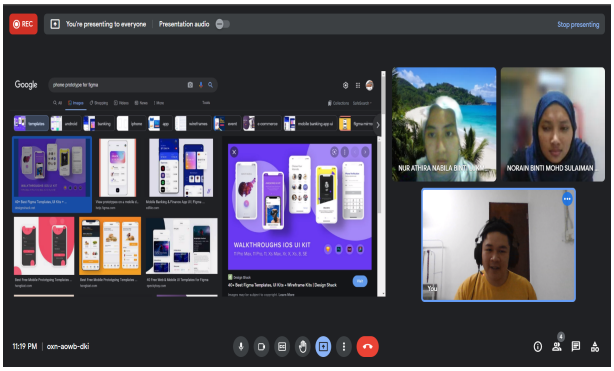


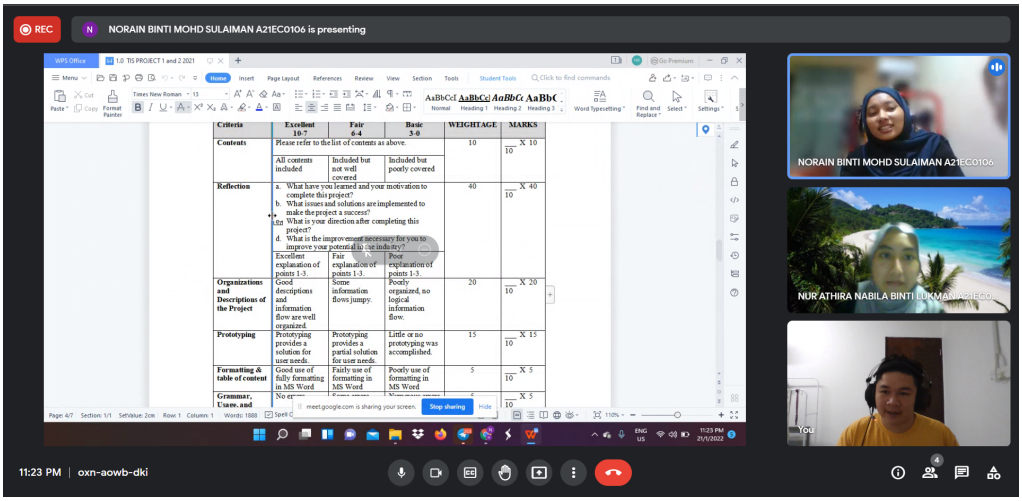
Below are some evidence that shows the screen captures of our meeting and discussion on Google Meet.



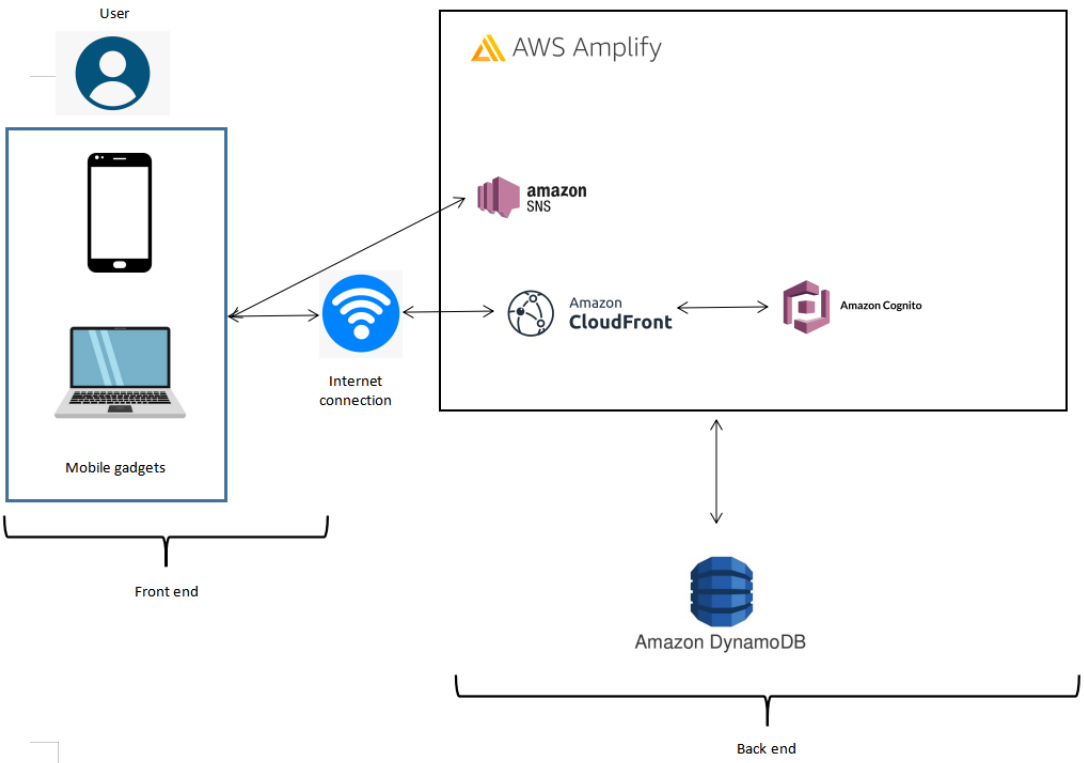








6.0 AWS Architecture Design



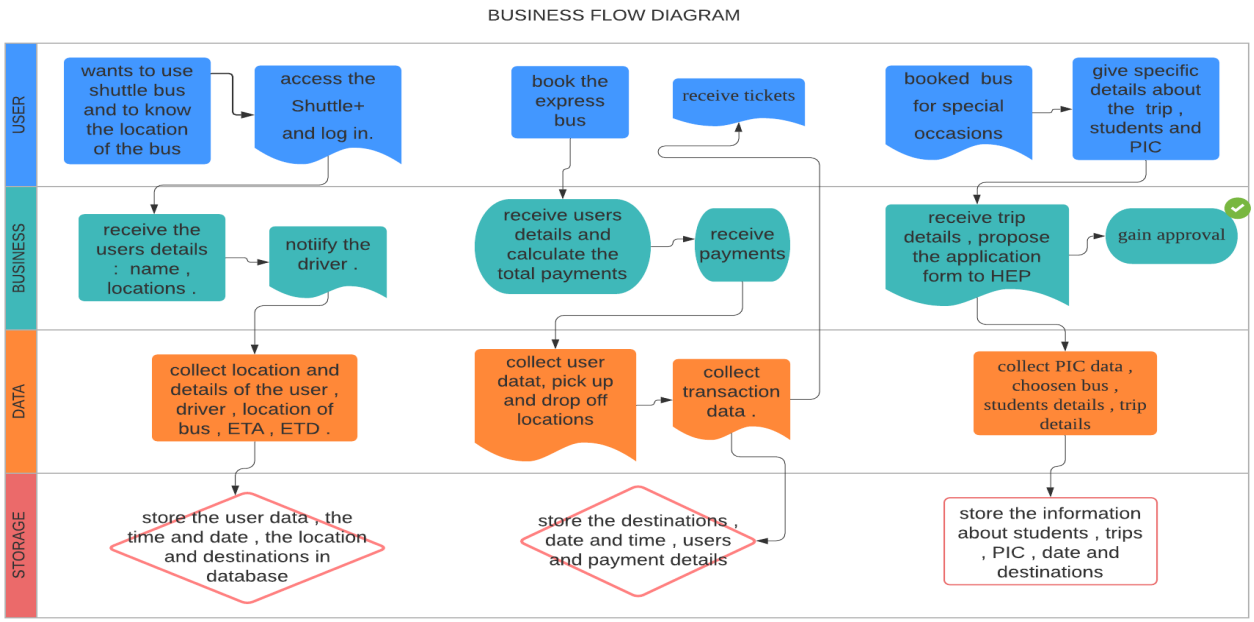
Cloud computing technology, as we all know, is used by both small and large enterprises to store information in the cloud and access it from anywhere at any time via an internet connection. A business that uses cloud computing can benefit from inexpensive maintenance expenses, extremely secure data, infinite storage capacity, and a slew of other advantages. Shuttle+ will be used as an application, and the interfaces will be used as the front end. We give a user-friendly application that makes it easy for the user to get information. The back end is used by the service provider. It is responsible for managing all of the resources needed to provide cloud computing services. First and foremost, to build the Shuttle+, we used AWS Amplify, a set of purpose-built tools and features that lets frontend web and mobile developers quickly and easily build full-stack applications on AWS. It also visually builds a web frontend UI and eases the management of app content outside the AWS console. This eases the effort needed to create our application optimised for both web and mobile users. Next, users will sign in using their official email address to access this application via their mobile phones, laptops, or desktop computers. We use AWS Cognito, which administers a control access dashboard for on-boarding users through sign-up and sign-in features to their web and mobile apps. This helps in securing the user accounts using their usernames and their dedicated passwords so that their information will not be easily exploited and leaked to the public.

Users should have a stable internet connection in order to allow the system to communicate with the users' gadgets successfully in order to do their business on Shuttle+. The user data that has been collected by the data sources will be sent to AWS CloudFront. Cloudfront is a content delivery network platform that executes at rapid rates with the secure distribution of data, videos, apps, and APIs on a global scale with low delay times. By using this AWS, our application will be more responsive and will not require a long time for the application to load the information needed, such as the timetable of the bus. Last but not least, we use Amazon DB, a document database with key-value structuring that delivers single-digit millisecond performance at scale. Dynamo has built-in security with a fully managed, multimaster, multiregion, durable database, backup and restore, and in-memory archiving for web-scale applications. It is used to store all kinds of information, from the ETD (estimated time of departure) and ETA (estimated time of arrival) for the bus, user information, and information on how many stops the bus is going to have on that particular day.

We are determined to implement the system integration technologies in our project because integration system implies the integration of multiple systems that are usually not connected such as the shuttle bus management system , the databases of the students , the fixed routing and stops system , real-time communication between the bus drivers and the users , messaging system , transaction system and also the HEP management system . Integration of the previously stated systems ensures that multiple systems collaborate and work in harmony to increase productivity and data accuracy. Furthermore, it aims to resolve the complexity associated with increased system communication, as they provide a reduction in the impacts of changes that these systems may have. For instance , the integration of the HEP management system , the databases of students and the bus booking system will cooperate well to provide truthful information between them so the process for the students to go volunteering or study touring will be much simpler and faster which does not need any paperworks and waiting list .

7.0 Project Business Process

7.1 Flow diagram



7.2 Description

The Shuttle + apps function is divided into several main interfaces. The flow diagram above showcases the steps to access the information and the process to book the services provided by Shuttle+. The leftmost flowchart is about the shuttle bus's real-time location process. The interface will show the shuttle bus's estimated time of arrival (ETA), estimated time of departure (ETD), and real-time location. If a user wants to know the real-time location of the bus that they want to take, they will login and go to the main menu. The user has to look and click the bus schedule icon, and the database will collect the real-time location of the user. Then, the system will display all the related information. For example, if you want to know the real-time location of the buses, Shuttle+ will display the map of UTM and you will see the buses moving along with the plate number of the bus and also the driver's name. The ETA and ETD of the buses will also appear if we point our cursor at that particular bus.

The next flowchart shows the business flow diagram for the user who wants to buy an express bus ticket to return to their hometowns or anywhere in Peninsular Malaysia. Firstly, users have to sign in using their official email address to make sure that they are part of the family of UTM and to safely store their data. Next, users need to go to the main menu and click the icon for express bus ticket booking. After the user chooses the company of the bus that they want to ride on, such as KKKL, Mayang Sari, or Causeway Link, the user will then fill in the details about the ticket booking. Different buses offer different conveniences, such as wifi access, USB charging ports, and some buses are double-decker. The database will receive and store the booking details, and then it will calculate and display the total payment to the user. The system will receive and send the booking details to the chosen bus company's management system. The database will collect information such as date, time, boarding location, and drop-off station. After that, the chosen bus company's management system will send the booking ticket confirmation within a few minutes back to the Shuttle+ database. The transaction details will be kept in both the Shuttle+ database and the chosen bus company's management system. The user can then download and print the confirmation ticket.

The third flow diagram shows the process of the UTM bus booking process. The bus can be booked by UTM students or staff for any special occasion or event. Once the user has already logged into the Shuttle+ apps, the user will remain logged in until they manually press "logout." To book the bus for any occasion or trip, users need to go to the main menu page and click on the bus booking option. The page will bring the user to another page to fill in a few simple details to confirm the bus booking. The necessary information includes the name of the person in charge, contact number, destinations, date, and duration of the booking. The database system will receive the details and send the application for the booking form to HEP. The user needs to wait for HEP confirmation, which will be notified via the apps within a few working days. The database will store the person in charge of the data and details.

8.0 Low Fidelity Mockups

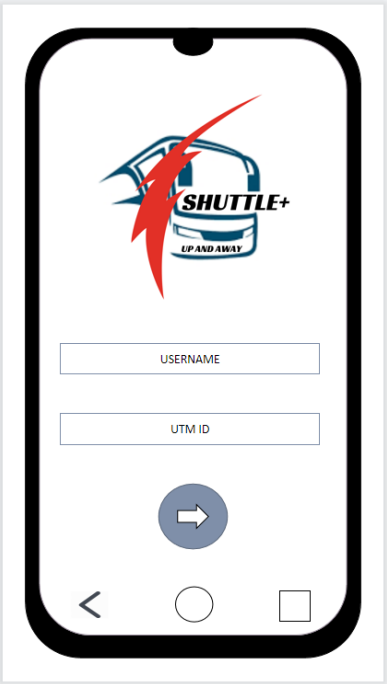


Diagram 23 : Login

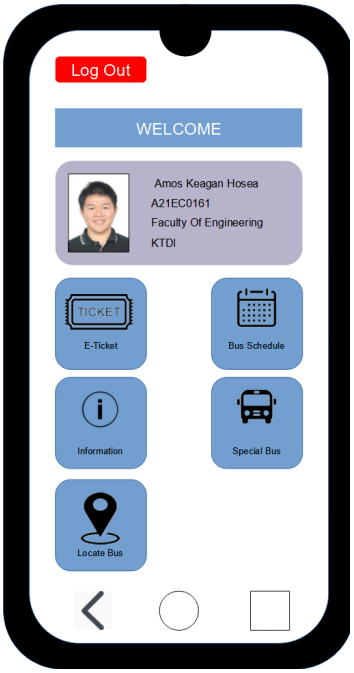


Diagram 24 : Main menu

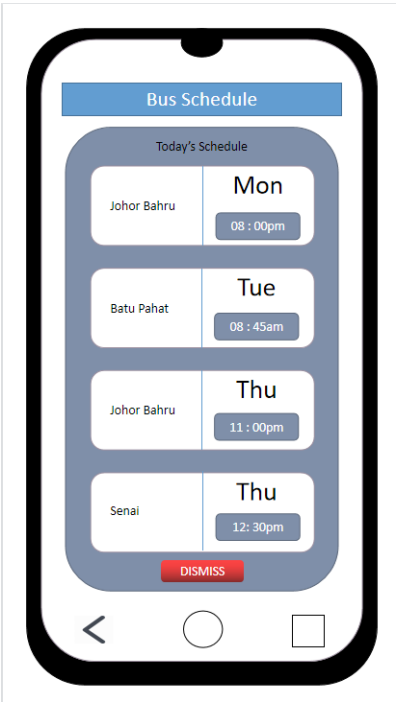


Diagram 25 : Shuttle bus schedule

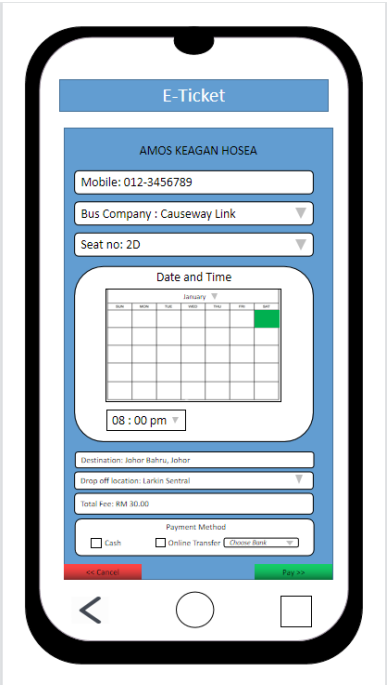


Diagram 26 : Bus ticket booking

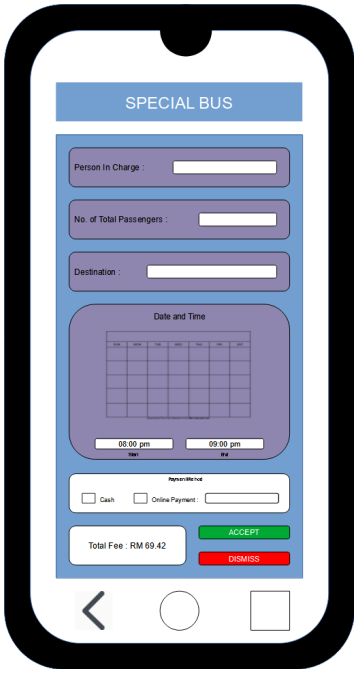


Diagram 27 : Special Bus

Diagram 28 : Info page

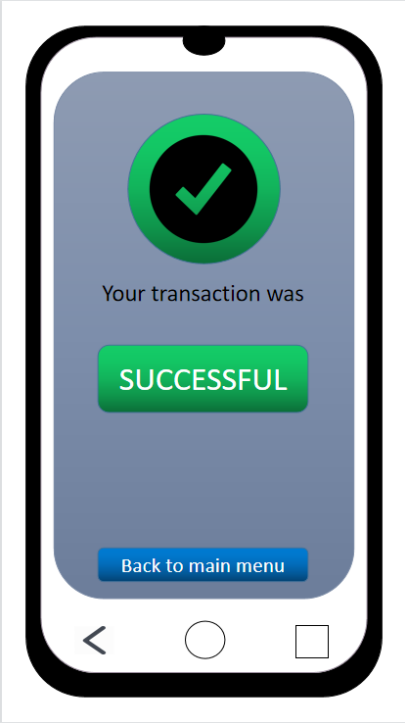


Diagram 29: Payment processing page

Diagram 30 : Locate Bus

9.0 Reflections

AMOS KEAGAN HOSEA

This project is indeed an eye-opening experience for me because I have the chance to explore the basics of technology and information systems students should master. I learned a lot about fourth industrial revolution technologies, especially about integrated systems and cloud computing. It is because this low-fidelity prototype project is focusing on those fields and also some inventions from other technologies such as the Internet of Things. Because I am in charge of designing the AWS cloud architecture with my group members, I am confident that I understand how to use the AWS services better, and I hope that one day I will be able to start a business using AWS services.Furthermore, I learned to be a good leader for my group by distributing work fairly and squarely, assisting others who are having difficulty with their tasks, and being more open-minded because everyone has different points of view.Thus, misunderstandings do happen, but we can handle them professionally by discussing the best solutions and accepting others' opinions. The things that motivate me to complete this project are the commitment of my team members to complete their tasks, which is near perfect. Everyone is struggling to catch up with the lectures, the assignments, and other subject projects, but they can still succeed in completing their parts before the deadline that we have agreed upon. Now that this project is perfectly done, I am beyond happy and overwhelmed because of how my teammates motivate me to continue giving my best when the situation is not in good condition.

We can not get perfection in everything we do because we are just humans who are always making mistakes and we learn from what we have experienced . The issues that should be addressed even though it has been mentioned hundreds of times , is the time constraint . The due date of the projects and assignments from other subjects are making us struggle for the past few weeks . But , with the high responsibility traits that each one of us have , we managed to do our parts successfully . we can't make it earlier but fortunately we have not exceeded the deadline . We agreed to spend our time everyday doing our work slowly but surely . This is to make sure that we are continuing to give commitment to this project . Other than that , the problem that arises is we have limited resources to refer to since we are a first year student. We have never been to UTM, our classes are held virtually which causes us to have no opportunity to create a network or make more friends . our coursemates are always there but the bonding is not really strong . Therefore , we have no idea on how things work in UTM . The number of seniors that we know are also limited, so we can't really know what is the problem for the students who live in UTM . The solution for this problem , we have to gain as much as seniors and ask them to spread the google form link in order for us to identify the problems that exist .

Following the completion of this project, my ambition is to follow my passion for inventing technologies that can provide convenience, rather than concentrating on technologies that serve only a small group of people, but rather technologies that help the entire society. While developing a prototype piqued my curiosity, I am not entirely confident in my knowledge of the topic because this project is just concerned with low-fidelity prototypes. Also my ultimate goal is to take this project to the next level once it has been completed. Our team agreed to develop and evaluate this prototype, known as Shuttle+, in order to allow UTM students, faculty, and guests to move around more easily. My goal is to persuade the management to take these excellent suggestions into consideration, as they would benefit a large number of students and staff members who are navigating their way through UTM.

If I want to enhance my potential in the industry, I need to learn everything I can about that. This includes learning about the latest developments in IR4.0, such as cloud computing, data analytics, and artificial intelligence. As we work on the project, we get more creative and imaginative information. It's possible to reach my ambitions. That I had to work hard to obtain my aim. I've always believed that success would inspire me. There are various things I can do to boost my industry potential. I also need to improve my communication abilities. To acquire a career in computer science, you need to communicate well. At the very least, I have some understanding of how things operate in that profession, and once I am formally a part of the business, I want to work hard to establish myself as one of the specialists.

NUR ATHIRA NABILA BINTI LUKMAN

Throughout the journey to completing this project with my teammates, Ain and Amos, I have learned a lot of new things and developed a lot of new skills. First and foremost, I have learnt to apply the knowledge of 4th IR technologies that I have learnt throughout this semester in this course. We chose to use integrated system technologies as the main frame of our low-fidelity prototype for our project.Other than that, I have also developed new interpersonal skills, which are critical thinking and communication skills. When we were given a task to find potential users or target users for our project, my team faced a lot of restrictions.In order to make the project a success, the main issue was that we are first-year students and yet we have never been to UTM. Also, with this current pandemic situation, it is really hard to gain a lot of information, such as the experience of our target users when they use the shuttle bus service in UTM. Therefore, we still continue our project, which is about the shuttle bus service system in UTM, even though we never know the experience, the real situation, or problems with the system. Hence, we managed to get the solution by doing a survey and asking a lot of questions to seniors and lecturers because they had been to UTM and experienced using the shuttle bus service.

Regardless of our aims, we faced barriers in implementing this integrated bus system in UTM. Time restrictions limited our project completion. Our concerns include a lack of web application development knowledge. We also have a time constraint for this task. Due to our busy schedule, we chose to work on this project daily. All these obstacles have developed a new skill for me, which is critical thinking. Through this journey, I am motivated by meeting set targets within the deadlines and goals of our team, as it gives me a sense of accomplishment and it's something that I can look back on and say "I achieved that." What motivates me more with this project is that we are working well as a team. In the end, we managed to spot the flaws and errors so as to ensure the end result of this project is as good as possible. I find it interesting that we have been working together from the beginning to find a way to solve a problem, overcome a challenge, and also come up with creative ideas to improve our prototype.

After completing this project, my goal is to take it to the next level. Our team agreed to create and assess this prototype, called Shuttle+, to let UTM students, staff, and visitors move around. In keeping with our goal, this system will allow bus drivers and UTM students to communicate. UTM students and staff could use the Shuttle+ system to book express bus tickets home and choose a pick-up point near UTM. This system informs UTM bus users of the bus's current location, departure time, and arrival time. We also decided to make this app more adaptable by allowing students to book activities or facilities available at UTM via our app, such as kayaking, cycling, and rock climbing. My goal is to get the administration to consider these good ideas that would help many students and staff navigate around UTM.

During the project, we obtain creative and inventive knowledge to generate new ideas or solutions. My goals can be achieved with perseverance and hard work. I realised I had to work hard to achieve my big goal. I've always thought that a strong desire to succeed would motivate me. There are several things I can do to improve my industry potential. I need to improve my soft and hard skills. I also need to work on my communication skills, which are vital nowadays. Communication skills are crucial for a computer science student to get a job. I also need to be aware of and quick to adopt the latest technology. To improve, I plan to join UTM societies like AIROST and CyberX, where I may compete and learn more. I will also keep taking part in extracurricular activities that can enhance my skills and potential in the industry. This will help me better explore different situations and improve my potential in the industry.

NORAIN BINTI MOHD SULAIMAN

From completing this project , I learned to be more responsible especially when it comes to team working . I felt responsible to complete my part as soon as possible and with full focus . This is to make sure that the flow to complete the project becomes smooth and does not delay my groupmates progress . I also learned about designing a basic cloud computing architecture, especially using services from AWS which gives us more flexibility in managing our business , applications and data . I also need to have a better understanding of each pillar in the fourth industrial revolution to make sure what pillars are suitable to use in our project . My motivation to complete this project is the desire to provide a better service for UTM citizens and motivate them to be a punctual and responsible person towards the environment .On top of that , my motivation is also my input and knowledge about the basic step of creating an application starting with creating a low fidelity prototype . I feel motivated to finish this project because I feel like I am exploring my passion and interest in this field and I hope I can discover what my actual passion is . My team is also one of my motivations to push myself harder because they have contributed a lot and I don't want to take things for granted .

The issues that have been raised are about the clarity of the instructions . Some of the instructions regarding the project are not very clear and needed more explanation from our lecturer . so , we asked our lecturer about things that we are not clear about and asked for their opinion about our project . Next , none of our group members have experience or knowledge on developing an application and also designing a prototype . Thus , we have to do some research , explore the steps on building a prototype , some tutorials from youtube and choose what software provides the best mock-ups . On top of that , we have not come back to campus meaning we do not have a perfect view on how things work in UTM . Therefore , we asked our seniors and friends who already experienced staying in the campus and asked for their insight and opinion . We also checked out the system for booking the facilities in UTM to see what we can learn and improve from those resources .

After completing this project , my direction is to pursue my passion on developing technologies that can provide convenience not focusing on small groups of people only but the technologies that give benefits to the society worldwide . I found my interest in designing a prototype but I am not really certain about the field as this project only focuses on low fidelity prototypes . Each pillar in the fourth industrial revolution is different and there is more interesting knowledge we will gain from those pillars . In order for me to be certain about my direction after this , I need to experience other projects that focus on other types of technology .

For me to improve my potential in the industry , I have to gain as much knowledge as I can, especially knowledge about the emerging trends on IR4.0 such as cloud computing , data analytics and artificial intelligence . I should not force myself to master the things I learn , but the intermediate level would be enough . At least I have the knowledge on how things work for that field and when I am officially a part of the industry , I will make sure I become one of the experts . I will also enhance my hard skills together with my soft skills for me to have places in the industry . It is not just about the intelligence you need but the skills on how to deal with people , workloads , pressure and stress are significant in this modern world . I believe from improving my attractively intelligent personality , it will bring me further in the industry .

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