UTM
UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF COMPUTING
UTM Johor Bahru

SECP1513

TECHNOLOGY AND INFORMATION SYSTEM

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SECTION 04

PROJECT REPORT

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ACKNOWDLEDGEMENT

First and foremost, we would like to express our sincere gratitude to our lecturer Dr Muhammad Iqbal Tariq Bin Idris for the continuous support of this project, for his patience, motivation, enthusiasm and dedication. This project cannot be accomplished without his guidance and assistance.

We are grateful for each and every one of our groupmates throughout this project. All of our groupmates are very responsible, supportive and helpful and everyone puts lots of time and effort into this project. Many hands make work lighter. We appreciate each other's strengths and learn from each other.

We would also like to express our gratitude to family and friends for their encouragement and support throughout this journey. Their encouragement has been a driving force, helping us navigate challenges and celebrate successes. Finally, we would like to express our heartfelt gratitude to everyone who contributed to the success of the project, whether directly or indirectly. Your collective efforts have made this journey memorable and rewarding.

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1. INTRODUCTION

In our efforts to address common challenges faced by students, we've discovered a recurring issue – missed buses and unpredictable delays. Often, buses are too full or significantly deviate from their schedules. To tackle this, we propose the implementation of a user-friendly bus tracking system. This system will offer real-time updates on bus locations, passenger count, and estimated arrival times, empowering students to plan their commute better. By providing this essential information, we aim to minimize instances of missed buses and help students navigate unexpected issues like heavy traffic and adverse weather conditions. This report explores the benefits of adopting such a system, highlighting its potential to create a more reliable and stress-free transportation experience for our student community.

2. PHASES

No.	Activity Description	Date
1	Group meeting at Library to discuss and brainstorm ideas on Design Thinking focusing on IoT. Also decided on roles of each member in the team and came up with the proposal of UTM Bus Tracking System.	07/11/23
2	Decided on possible questions for students as well as questions for the drivers. Distributed the work for each member like creating a google form and agreed on the date and time to interview a bus driver.	01/12/23
3	Google meet to discuss on the findings from the interviews and surveys and discussed on possible solutions.	12/12/23
4	Each member of the team was assigned with several tasks like drawing the user interface and making the hardware prototype.	31/12/23
5	Google meet a day before demonstration and presentation to rehearse and to ensure a smooth flow of the activity.	10/01/24

Table 1: Log Journal

2.1. PROPOSAL

The UTM Bus Tracking System (UTM BTS) is proposed as a solution to address the dissatisfaction among UTM students with the current bus tracking system, specifically Moovit. Unlike Moovit, UTM BTS offers real-time tracking, a student verification system, demand-based supply alerts, and a rating feature. The goal is to provide an efficient and user-friendly tool for tracking UTM buses, minimizing disruptions to students' schedules.

2.2. DATA COLLECTION

Collected data reflects varying opinions on the UTM Fleet bus system. While some express satisfaction with coverage and convenience, others raise concerns about specific destinations not being served, punctuality issues, and a desire for improvements such as a tracking app.

2.3. PROTOTYPE

The prototype prioritizes a user-friendly experience with an attractive, responsive design compatible with smartphones and tablets. Integrating real-time tracking, student verification, alerts, and a rating system, the prototype aims to address concerns raised in the data collection, ensuring improved satisfaction among UTM students with the bus transportation service.

2.4. PRESENTATION AND DEMONSTRATI0N

The demonstration and presentation comprises three parts: the student interface of the app, the driver interface, and the scanner. It begins by defining the Internet of Things (IoT) and presenting common student issues with proposed solutions. The demonstration showcases how the app functions, details the scanner's technical aspects and uses, and explains the features of the driver's interface, providing a comprehensive overview of the UTM BTS solution.

3. PROBLEM, SOLUTION AND TEAMWORK

Our team is a dynamic, well-coordinated unit proficient in problem-solving and devising creative solutions. Comprising individuals with diverse skills and expertise, we approach challenges associated with GPS tracking systems with a solid and collaborative strategy.

Here are some problems we have identified and their solutions.

Issue	Problems	Solutions
Power Consumption	Continuous GPS usage quickly depletes device batteries.	Optimize tracking to use power-efficient modes, implement periodic updates, and employ intelligent power management strategies.
Data Connectivity Issues	Users face disruptions in tracking due to poor network connectivity.	Introduce offline functionality for data synchronization and storage when internet connectivity is restored.
Satellite Signal Blockage	Obstacles like buildings or foliage obstruct satellite signals.	Use a mix of satellite systems, incorporate assisted GPS (A-GPS) for improved accuracy dependent on network and satellite support.
Lack of Real-Time Updates	Users may not receive real-time bus updates, leading to missed connections.	Ensure real-time communication between the app server and buses; utilize push notifications for prompt updates on delays, route changes, or critical information.
Maintenance Issues	Lack of routine maintenance may lead to hardware or software failures.	Implement a proactive maintenance program, conduct frequent device checks, use remote diagnostics for early problem identification, and address issues promptly.

Data Privacy and Security	Security and privacy concerns arise when handling real-time location data.	Establish robust data encryption protocols, comply with privacy laws, inform users of implemented security measures, and regularly update security features.

Table 2: Problems and Solution

4. DESIGN THINKING ASSESSMENT POINTS

4.1. PROPOSAL PHASE

UTM students primarily use the university's bus service, but the lack of a reliable bus tracking system causes disruptions. The proposed UTM Bus Tracking System (UTM BTS) aims to enable real-time bus tracking using GPS. Only students with verified matric numbers can access the app, which includes a QR code verification system for bus access. UTM BTS features a rating system and gathers data to optimize bus supply based on demand.

4.2. DATA COLLECTION PHASE

A survey conducted through Google Forms revealed that while most students find the UTM Fleet covers campus adequately, issues such as missed buses and late arrivals were common. A significant percentage reported dangerous driving by bus drivers. The survey also indicated peak congestion times. Respondents unanimously agreed that a real-time tracking app would improve their commuting experience. Suggestions included improving punctuality, adding more buses during peak hours, and live location tracking. Competitor Analysis: Moovit, a popular transit tracking app in Malaysia, offers route recommendations but lacks a real-time bus monitoring feature. This gap in service leads to frustrations among users who miss buses due to the inability to track them in real-time.

4.3. PROTOTYPING PHASE

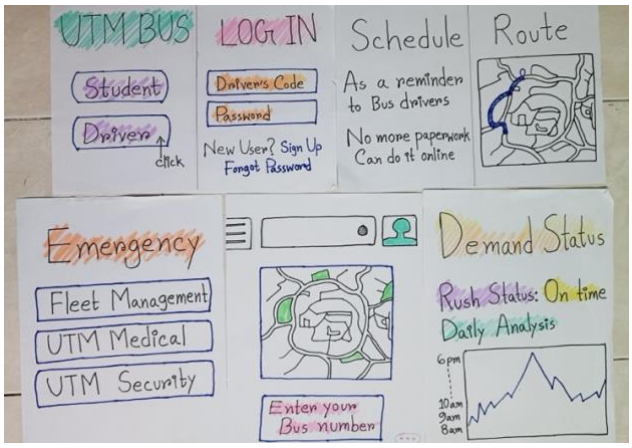

Figure 1: Handwritten Prototype

The app, designed with a user-centered approach, caters to both UTM students and bus drivers, supporting four languages for accessibility. Unique features include crowd status, break notifications for buses, and communication tools for emergencies. Handwritten prototypes were developed to visualize the app's functionality. The prototype presentation received positive feedback, highlighting the need for features like real-time location, bus break notifications, and crowd status. The app's exclusive availability to UTM students and drivers, along with its comprehensive free services, sets it apart from existing solutions.

5. DESIGN THINKING EVIDENCE

5.1. EMPATHIZE

Google Form During the first phase of the project, we came up with various topics and problems we experienced during our study in UTM, and through the heated discussion, we were able to agree on a bus tracking system that is focused for UTM students to fulfil students' needs for a better facilitation of UTMFleet transportation system. During this phase, we were also able to identify the main problems students and drivers experienced through survey and interviews

5.2. DEFINE

Based on the problems students and drivers encounter during facilitation of UTM bus, we were able to provide solutions to overcome the questions and problems. We focus on easy interface navigation for users while providing complete services. We came up with features that allow students and drivers to communicate indirectly, where students can keep track of UTM buses and drivers can keep track of the demand status of buses.

5.3. IDEATE

Through surveys and interviews conducted during the first phase, we designed a system where students can keep track of UTM buses' location using a real-time tracking system, which facilitates the use of Global Positioning System (GPS). Drivers can reduce crowds during rush hours using the demand status feature, which analyses students' bus usage through a students' matric card scanner. The scanner will count the number of scans throughout the hour and analyse rush hours to provide accurate crowd status of each bus.

5.4. PROTOTYPE

In accordance with our topic IoT, we need to come up with both software and hardware design for our project. The application can only be accessed through verified matric number or verified driver's code, which allows for exclusive use of UTM buses. Both interfaces allow students and drivers to find the bus routes, schedules, and demand status. In an emergency, drivers can seek assistance through the software. We designed a card scanner for every bus, which can only scan students' matric cards. This hardware is used to exclusively allow UTM students to use the bus and analyse the demand status of buses in UTM. In Figure 1, we included the hardware prototype we used for our project.

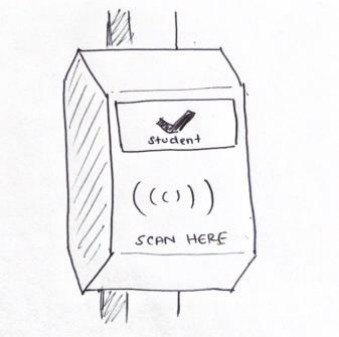

Figure 2: Hardware Prototype

5.5. TEST

After our prototype progress presentation, we found that we needed to add some features in order to satisfy some questions and problems our lecturer came up with, such as how to overcome the need for a bus when students are not aware whether the bus is crowded or not. Thus, we came up with an interface where students are given a couple choices of buses for their desired location. Through this interface, students can determine which bus is most suitable for them; whether they should enter the first or wait for a less crowded bus.

6. REFLECTIONS

1. Farah Nabila binti Wan Ismail A23CS0077

Through this project, we seek to maintain accessibility and efficiency of UTM Bus Tracking system, providing a platform for easy navigation for students, and improving the facilitation of transportation within UTM. We believe that having a smart system for UTM buses is crucial to improve the traffic problems in UTM and allow students to always have the option of transportation at no cost.

2. Abdur Rahman A23CS0005

One revolutionary step toward improving the ease of transportation in educational settings is to give students access to a platform for straightforward navigation. This technology not only makes it easier for students to navigate their campus or learning environment, but it also makes commuting more productive and stress-free

3. **Anjum Siddiqua Tanveer Siddiqui A23CS0289**

One less hassle, One stop app for navigation through UTM. UTM Fleet App is designed to make university life easier for students. Our future plans are to make this prototype into a real app that will tackle the issues mentioned and we also plan to coordinate the app with its parent app UTMSMART to provide a seamless and hassle-free navigation, Ensuring the smooth flow of the app.

4. **Anisa Chowdhury A23CS0288**

Our design thinking project UTM fleet app can be a real-life problem solution for all the UTM students. In the data collection phase, we aimed to identify the challenges experienced by the UTM students and with existing technology. Based on the information gathered, we created user-centred prototypes for our app. Following the demo prototype presentation, we were overjoyed to receive good feedback from our peers, indicating that our project was successful in identifying and fixing the existing problems.

5. **Anwar Hidayath Bn Ali Yusuf A23EC9005**

Design thinking has significantly influenced our goal by guiding us through ideas, problem-solving, and processes. It ensures that our project is user-centric, addressing the real needs of students and drivers. This method enhances our ability to practical and user-friendly solutions on the course.

6. **Asser Ahmed Ibrahim A23CS0010**

My goal for studying software engineering is to become a game developer. This project has made me realize how important creating and discussing a plan on how to tackle the problem is extremely important before any coding begins.I have to further develop my problem solving and critical thinking skills as this is what employers are looking for in programmers in the industry

7. TASK DISTRIBUTION

Content	Description	Person In Charge
Introduction	A short summary of our project.	Asser Ahmed Ibrahim
Phases	Description of each phase in the project.	Anwar Hidayath Bn Ali Yusuf
Problem, Solution and Teamwork	Identifying problems and brainstorming the best solutions and empathizing on teamwork	Abdur Rahman
Design Thinking Assessment points	General and technical assessment of the project.	Anisa Chowdhury
Design Thinking Evidence	The journey taken in making this prototype come to life.	Farah Nabila binti Wan Ismail
Work Distribution Table	Showing the description for each content and the person in charge of it.	Anjum Siddiqua Tanveer
Compile the project report.	Compiling and ensuring the report is in correct format and follows the guidelines mentioned.	Anjum Siddiqua Tanveer
Survey and Interview	Creating a google form to survey students and interviewing a bus driver.	Anwar Hidayath Bn Ali, Farah Nabila binti Wan Ismail, Anisa Chowdhury
Front-End and Back-End Prototype Sketching	Designing the front-end and back-end of the UTM bus app	Farah Nabila binti Wan Ismail, Anisa Chowdhury, Anjum Siddiqua Tanveer
Hardware Prototype	Making of hardware prototype i.e. Card Scanner and Gps Tracker	Anwar Hidayath Bn Ali Yusuf, Abdur Rahman.