UTEM COMMUNITY APP

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UTeM Community App

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This report is submitted in partial fulfillment of the requirements for the Bachelor of Computer Science (Software Development) with Honours.

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2024

DECLARATION

I hereby declare that this project report entitled

UTeM Community App

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT :  Date : 29/8/2024

(MOHAMAD HISHAM BIN SALEHHUDIN)

I hereby declare that I have read this project report and found

this project report is sufficient in term of the scope and quality for the award of

Bachelor of [Computer Science (Software Development)] with Honours.

SUPERVISOR :  Date : 28/8/2024

(TS. DR. LIZAWATI BINTI SALAHUDDIN)

DEDICATION

To my dearest family and friends,

This project is dedicated to all of you, whose unwavering support, encouragement, and love have been my guiding light throughout this journey. Your belief in me has provided the strength and determination needed to overcome every challenge and obstacle.

To my parents, thank you for your endless patience, understanding, and unconditional love. Your encouragement and sacrifices have been the foundation of my success.

To my friends, thank you for being my pillars of support, offering words of wisdom, and providing much-needed moments of laughter and relief. Your companionship has been invaluable and has made this journey an enjoyable and memorable experience.

I am truly grateful to each one of you for being a part of my life and for your continued support. This achievement is as much yours as it is mine.

With heartfelt gratitude,
Hisham

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Finally, I am thankful to the faculty and staff at Universiti Teknikal Malaysia Melaka (UTeM) for providing the resources and environment necessary for the successful completion of this project. Their dedication to fostering a supportive academic community has been vital to my progress and achievements.

Thank you all for your unwavering support and encouragement.

ABSTRACT

In the dynamic environment of university life, fostering meaningful connections and providing a seamless platform for interaction among students is crucial. The UTeM Student Community application aims to revolutionize the student experience by creating a unified digital space that supports robust communication, efficient information exchange, and a sense of belonging. This project builds upon the previous UTeM Community App, addressing significant issues such as limited social contact, fragmented campus information, and inadequate real-time communication. The application enhances academic and social engagement by integrating features like direct messaging, discussion forums, group chats, event reminders, and utilities for managing schedules, budgets, and study materials. Additionally, an admin-only website ensures a well-regulated environment with tools for user management and content moderation. Developed using the Flutter framework with Dart and integrated with Firebase for real-time data management, the project followed the Waterfall methodology, encompassing phases from design to rigorous black-box testing. Key modules like messaging, discussion forums, event reminders, and academic utilities were tested, yielding a 100% pass rate and high user satisfaction. The application successfully improves student interaction, academic support, and overall university experience, making it a significant contribution to the UTeM community. The project focuses on developing a user-friendly interface for students and comprehensive administrative controls for moderators, ensuring a safe and engaging platform. The expected outcome is a versatile application that not only improves communication and collaboration among students but also supports their academic and personal growth. By facilitating easier interactions and promoting active participation in university events, the UTeM Student Community application aspires to significantly enrich the overall university experience.

ABSTRAK

Dalam persekitaran dinamik kehidupan universiti, memupuk hubungan bermakna dan menyediakan platform interaksi yang lancar dalam kalangan pelajar adalah penting. Aplikasi Komuniti Pelajar UTeM bertujuan untuk merevolusikan pengalaman pelajar dengan mencipta ruang digital bersatu yang menyokong komunikasi yang kukuh, pertukaran maklumat yang cekap, dan rasa kekitaan. Projek ini dibina berdasarkan Aplikasi Komuniti UTeM yang terdahulu, menangani isu-isu penting seperti hubungan sosial yang terhad, maklumat kampus yang terpecah, dan komunikasi masa nyata yang tidak mencukupi. Aplikasi ini meningkatkan penglibatan akademik dan sosial dengan mengintegrasikan ciri-ciri seperti pemesejan langsung, forum perbincangan, sembang kumpulan, peringatan acara, serta utiliti untuk mengurus jadual, bajet, dan bahan pengajian. Selain itu, laman web khas untuk pentadbir memastikan persekitaran yang dikawal dengan baik dengan alat pengurusan pengguna dan moderasi kandungan. Dibangunkan menggunakan rangka kerja Flutter dengan Dart dan diintegrasikan dengan Firebase untuk pengurusan data masa nyata, projek ini mengikuti metodologi Waterfall, merangkumi fasa daripada reka bentuk kepada ujian black-box yang ketat. Modul utama seperti pemesejan, forum perbincangan, peringatan acara, dan utiliti akademik telah diuji, menghasilkan kadar lulus 100% dan kepuasan pengguna yang tinggi. Aplikasi ini berjaya memperbaiki interaksi pelajar, sokongan akademik, dan pengalaman universiti secara keseluruhan, menjadikannya sumbangan yang penting kepada komuniti UTeM. Projek ini menumpukan kepada pembangunan antara muka yang mesra pengguna untuk pelajar dan kawalan pentadbiran yang komprehensif untuk moderator, memastikan platform yang selamat dan menarik. Hasil yang diharapkan adalah aplikasi serba boleh yang bukan sahaja memperbaiki komunikasi dan kerjasama dalam kalangan pelajar tetapi juga menyokong pertumbuhan akademik dan peribadi mereka. Dengan memudahkan interaksi dan menggalakkan penyertaan aktif dalam acara universiti, aplikasi Komuniti Pelajar UTeM berhasrat untuk memperkayakan pengalaman universiti secara keseluruhan.

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LIST OF ABBREVIATIONS

FYP	-	**Final Year Project**
UTeM	-	**Universiti Teknikal Malaysia Melaka**
SDK	-	**Software Development Kit**
API	-	**Application Programming Interface**
CRUD	-	**Create, Read, Update, Delete**
ERD	-	**Entity-Relationship Diagram**
SDLC	-	**Software Development Life Cycle**
VS Code	-	**Visual Studio Code**
npm	-	**Node Package Manager**
ID	-	**Identifier**
APK	-	**Android Package**
CSV	-	**Comma Separated Values**
EU	-	**Perceived Ease of Use**
PU	-	**Perceived Usefulness**
CP	-	**Capability**
TW	-	**Trustworthiness**
AYY	-	**Attitude**
IU	-	**Intention to Use**
HLD	-	**High-Level Design**

LIST OF ATTACHMENTS

CHAPTER 1: INTRODUCTION

1.1 Introduction

Students frequently find themselves up against a big obstacle in the busy world of university life when it comes to developing deep connections and creating lasting relationships. Through the creation of a shared digital space, the unification of the diverse student body and the provision of a platform for seamless interaction, the fostering of a sense of belonging, and the facilitation of the exchange of crucial information in a lively and engaging online environment, our upcoming social application has the potential to completely change the student experience.

This project is for the improvement of the project from Workshop II which is UTeM Community App. It is a centralized application for students to engage in an online environment. This app includes capability for communication such as direct chat, discussion forum and group chat room. It also includes utilities for students such as student location, budget expenses, time management schedule, event reminder and more. But there are more features lacking from the app that need to be added and improved.

1.2 Problem Statement

The limited impact of social contact on students is a serious issue, which is made worse by the dispersed knowledge about campus services that makes it difficult for students to get the help they need. Furthermore, efficient cooperation and connection are hampered by a lack of real-time communication between people. These problems are made worse by the fact that there is no administrator to manage the app's usage, and there are no chat or event reminder alerts. Additionally, users are not

engaged by the app's dull and simplistic colour design, which lessens the app's overall attractiveness and efficacy.

1.3 Objective

- To develop centralize Android application for student
- To design a solution to provide students with real-time communication platform
- To develop a website only to be used by the admin for moderation of app environment control.
- To test the functionality and usability of the proposed application.

1.4 Scope

1. Target User
   - Student
   - Admin
2. Student
   - Login/logout of the application
   - Student registration
   - Public/Group student chat room
   - Map for other student’s location
   - Direct messaging
   - Discussion forum
   - Display user profile
   - Note taking.
   - Time management schedule
   - Budget expenses
   - Event reminder
   - To do list
   - Study Material sharing
   - Voice/video call between students

- Push notification
- Report any unwanted messages or forum discussion

3. Admin
   - Website use for admin only.
   - Register/Login
   - View all chat messages and forum discussion.
   - Receive report from user.
   - Delete chat messages
   - View user profiles.
   - Suspend/ban user

1.5 Project Significance

The project's idea and drive came from a desire to enhance university student's overall experiences and wellbeing. Students may make more friends and converse more easily without using their personal phone numbers by utilizing this program. Additionally, we hope that students will fully utilize this tool to advance their education and develop into more engaged individuals who willingly participate in all university-wide events.

1.6 Expected Output

The expected output of this project will be a comprehensive web or mobile application with the following components:

1.6.1 Student Interface:

The application offers a user-friendly interface tailored for students, integrating a secure registration and login system. It features functional chat rooms, direct messaging, and discussion forums, fostering communication and collaboration. An interactive map and user profile display enhance the user experience, while tools for note-taking, time management, budgeting, and event reminders support academic success. Additionally, the platform includes features for sharing study materials, creating to-do lists, and communicating via voice and video calls. A reporting

mechanism for inappropriate content ensures a safe environment, and push notifications keep students informed and engaged.

1.6.2 **Admin Interface:**

The admin website is designed to be secure and easily accessible, providing comprehensive administrative controls for user management. Administrators can view profiles, suspend or ban users, and maintain full visibility, control over forum discussions and manage public event. Additionally, the platform enables administrators to receive and act on user reports efficiently, ensuring a well-regulated and safe environment.

1.7 Conclusion

The goal and scope of the UTeM Student Community application are introduced in Chapter 1, with an emphasis on how it can improve the university experience for students by encouraging meaningful connections and fluid interaction. By addressing a number of issues, including limited social interaction, decentralized campus information, lack of real-time communication, absence of administrative control, and minimalistic design, the application seeks to improve upon the previous UTeM Community App. Key challenges are identified in the problem statement, such as a lack of real-time communication, decentralized information, and inadequate social interaction. The project's goals are to use Android Flutter to develop the application, improve student relationships, guarantee prompt information access, offer a platform for real-time communication, and make an admin-only website for moderation. The scope lists the functionalities for each group, including event reminders, messaging, login/logout, and administrative controls, as well as the target users (students and administrators). The project's motivation to facilitate easier communication, enhance educational engagement, and promote participation in university events is what makes it significant. These are ways that the project aims to improve students' university experiences. A complete application with intuitive user interfaces for both administrators and students is anticipated, complete with secure registration, messaging, event reminders, study material sharing, and administrative controls for content moderation and user management.

CHAPTER 2: LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

This chapter discusses the literature review and the methodology being used by this project.

2.2 Facts and Findings

A sample of 300 students from different Pakistani institutions participated in the study, which used questionnaires to collect data. Results show that using social media, especially Facebook and Twitter, for academic activities like study material sharing and group discussions can have a positive impact on academic performance. Academic achievement and Facebook use showed a weakly positive correlation, while Twitter usage and Facebook usage showed a moderately positive correlation. This study challenges the notion that social media has a harmful effect on academia by arguing that responsible use of the platform can improve engagement and academic results. A small sample size that is region-specific and an emphasis on self-reported data are among the limitations. According to this study, social media has emerging positive effect on the students and causes for their high results grade. (Amin, 2016)

Social media can serve as a motivational tool, encouraging students to stay focused on their studies. Being part of academic communities on social media can provide support, encouragement, and a sense of accountability, which can drive students to perform better academically. The study found that students who used social media for academic purposes had higher GPAs compared to those who did not. This suggests that the use of social media as a tool for academic collaboration and

information sharing can positively influence academic performance (Amin, 2016). Students reported that social media helps them efficiently complete assignments and projects. By collaborating with peers and accessing helpful resources, students can manage their academic workload more effectively.

The study "Social Media and Education" looks at how Facebook and Twitter affect learning outcomes, academic performance, and student engagement (Selwyn, 2011). The study uses a mixed-methods approach that includes surveys, interviews, and content analysis. It is carried out by looking at various educational contexts. Important results show that social media can be a distraction as well as a tool for informal learning and increased student engagement. When social media is used wisely, it enhances learning outcomes in the classroom. The study emphasizes social media's dual roles as helpful and potentially distracting, pointing to the necessity of a balanced integration of social media into educational practices. One of the main contributions has been understanding how social media affects students' social integration and identity formation. Generalizability issues and possible biases in self-reported data are among the limitations. Future studies ought to concentrate on the role of new social media platforms in education, successful integration techniques, and longitudinal effects. (Selwyn, 2011)

2.2.1 Domain

This project's domain is a comprehensive platform for student management and collaboration designed to improve students' educational experiences while offering administrative oversight. Administrators and students are the main users of this platform. A variety of features that support academic and social interactions are available to students on the platform, such as the ability to log in and out, register as a student, use public and group chat rooms, find other students on a map, engage in direct messaging, participate in discussion forums, view user profiles, take notes, manage time, schedule tasks, keep track of expenses, share study materials, make voice and video calls between students, receive push notifications, and report any offensive messages or forum discussions.

2.2.2 Existing System

There are a few existing systems that had same the functionality as UTeM Community App but this existing have a few disadvantages that need to be improved. One of the existing system is Microsoft Teams. While Microsoft Teams offers a broad set of collaboration tools suitable for various organizations, it lacks the tailored features and customizations that specifically cater to the needs of UTeM students. The UTeM Community App, on the other hand, is designed with the unique requirements of UTeM students and administrators in mind, offering specialized features such as integrated time management, budget tracking, and dedicated study material sharing. This makes the UTeM Community App a more focused and effective solution for enhancing the student experience at UTeM.

2.2.2.1 Complex Interface

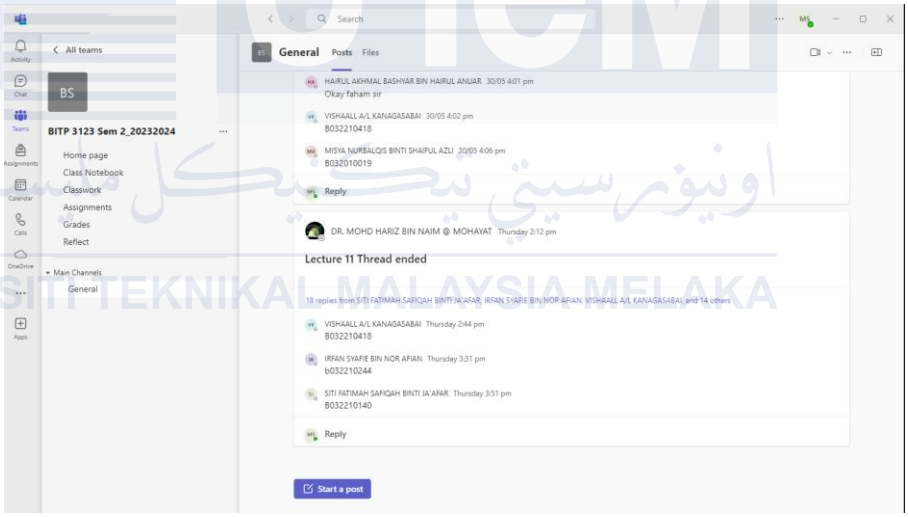

Figure 2.1 : Microsoft Team meeting page

Figure 2.1 shows the interface of Microsoft Team meeting page. The left sidebar contains various sections (Home page, Class Notebook, Classwork, Assignments, Grades, Reflect). For new users, it might take a while to understand the purpose and content of each section. Clear labels help, but without prior guidance, users might not know where to start or what to look for first. The nested reply structure

is logical but can become confusing if there are many replies and sub-replies. Users might have difficulty tracking the flow of conversation, especially in active threads.

2.2.2.2 Integration with Other Tools

Figure 2.2 : Other apps by Microsoft

Figure 2.2 shows all the app that Microsoft use and interacts with each other. One of the significant issues with Microsoft Teams is the separation of applications within the platform and the lack of seamless integration between them. This separation often leads to a fragmented user experience where navigating between different apps feels disjointed and inefficient. For instance, Teams incorporates various functionalities such as chat, meetings, file storage, and task management, but these features do not always interact smoothly with each other or with external tools. The siloed nature of apps within Teams means that users frequently have to switch contexts, which can interrupt their workflow. For example, moving from a chat conversation to a task list or calendar event might require multiple clicks and navigation through different sections of the interface. This not only slows down productivity but can also lead to confusion, especially for new users who are not yet familiar with the platform's structure.

2.2.2.3 Poor Video Call Quality

Issues such as poor audio/video quality or connectivity problems can significantly disrupt virtual meetings and collaboration in Microsoft Teams. When audio quality is poor, participants may struggle to hear and understand each other, leading to miscommunication and the need for repeated explanations, which wastes time and reduces meeting efficiency. Similarly, video quality issues, such as lagging, pixelation, or frozen screens, can hinder participants' ability to see each other's facial

expressions and body language, which are crucial for effective communication and engagement.

2.2.2.4 Time Management Schedule

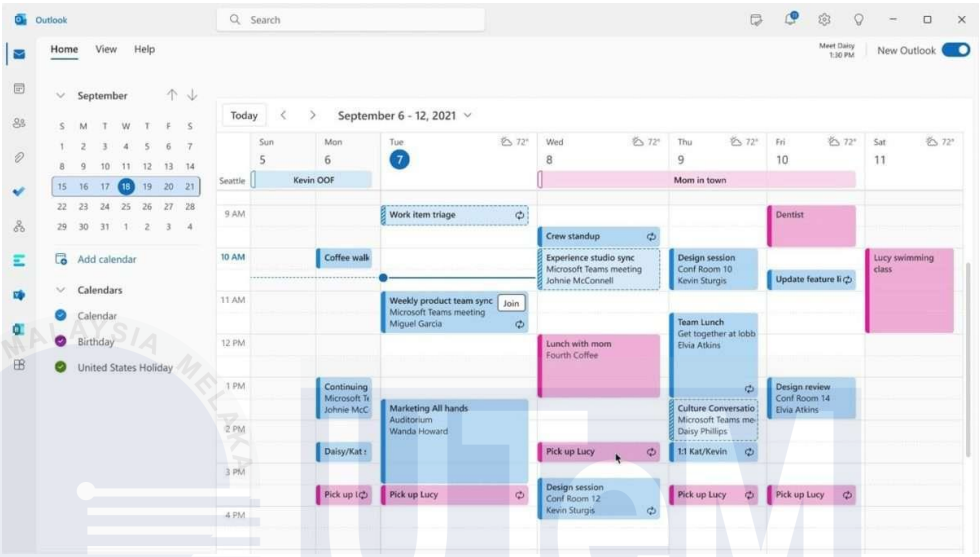

Figure 2.3 : Microsoft Outlook calendar page

Figure 2.3 shows the interface of Outlook Calendar, an app that is separate from Microsoft Teams offers some similar functionalities through its integration with Outlook Calendar and Microsoft To Do, but does not provide a time management tool specifically tailored for students. Teams integrates calendar events and tasks within its broader suite of productivity tools, which are designed for general use across various professional and educational settings. While students can use these features to manage their schedules, they are not as specifically focused on the unique needs of students. For instance, the integration might not include features like class timetable management or academic-specific reminders that are inherently designed into the UTeM Community App time management schedule. Therefore, while Teams offers robust scheduling and task management through its ecosystem, it lacks the specialized focus and streamlined integration that the UTeM Community App's provides for student time management.

2.2.2.5 Comparison Table between Existing and Propose System

Table 2.1 : Comparison Table between UTeM Community App and Microsoft Teams

Functionality	UTeM Community App	Microsoft Teams
Note Taking	Yes	Yes (via OneNote)
Map for Other Student's Location	Yes	No
Time Management Schedule	Yes (Student-specific)	Yes (General via Outlook Calendar)
Budget Expense	Yes	No
Event Reminder	Yes	Yes (via Calendar reminders)
To-Do List	Yes	Yes (via Microsoft To Do)
Admin View All Chat Messages	Yes	Yes (through compliance tools)

2.3 Project Methodology

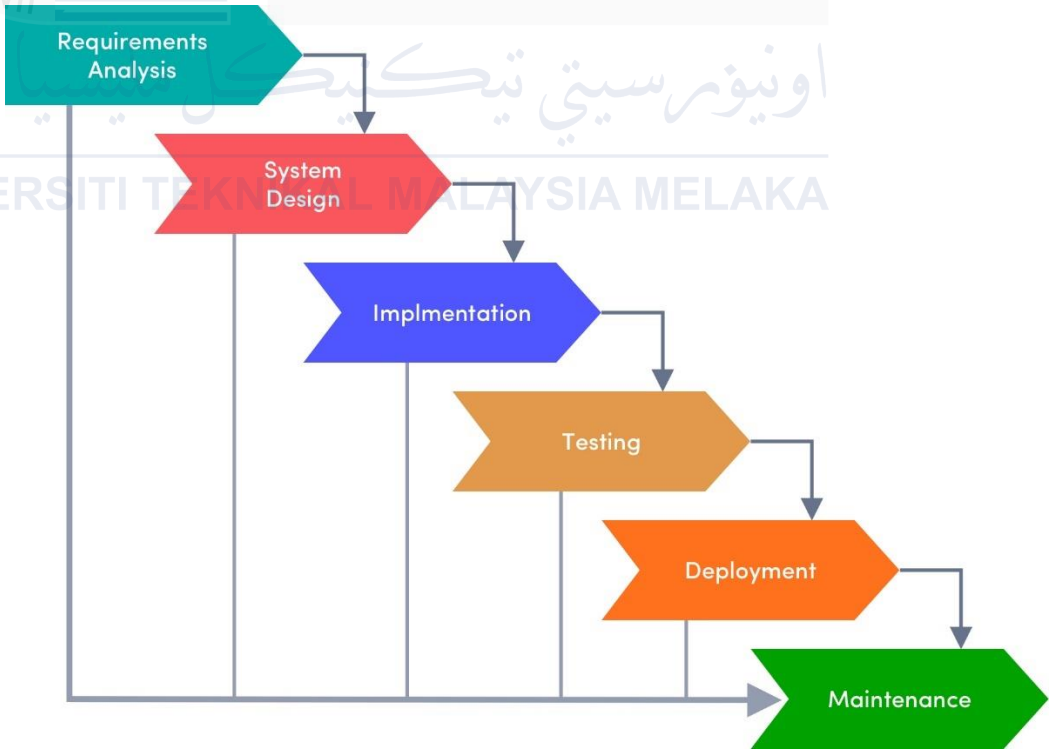

Figure 2.4 : Waterfall Model (SDLC)

Figure 2.4 shows the Waterfall Model (Ahmad, 2020). Waterfall Model is a linear and sequential approach to the software development model (SLDC) that is

popular in software engineering and product development (Ben Lutkevich, 2022). The Waterfall model is highly suitable for the development and improvement of the UTeM Community App. It ensures that all necessary requirements are gathered, a detailed design is created, implementation is carried out systematically, and thorough testing is conducted before deployment.

2.3.1 Requirements Analysis

In the Requirements Analysis phase, the team gathers and documents detailed requirements for the UTeM Community App based on feedback from users and stakeholders. This involves understanding the shortcomings of the current app and identifying new features such as enhanced communication tools (direct chat, discussion forums, group chat rooms) and student utilities (location tracking, budget management, time management schedules, event reminders). This phase is crucial as it sets the foundation for what the updated app should achieve. Clear and comprehensive requirement documentation helps ensure that all necessary functionalities are accounted for and provides a reference point for the subsequent phases of the project.

2.3.2 System Design

During the System Design phase, the team translates the gathered requirements into a detailed blueprint for the app's architecture. This includes designing how new features will be integrated and how existing functionalities will be improved. Develops design documents that describe the app's new architecture, data flow, user interface, and system interactions. This phase ensures that every aspect of the app's enhancements is planned out in detail, providing a clear guide for developers during the implementation phase. A well-thought-out design helps in anticipating integration challenges and lays down a structured approach to building the new functionalities.

2.3.3 Implementation

The Implementation phase involves the actual development of the app's new features and improvements according to the design specifications. Developers write the code necessary to build functionalities like the group chat, enhanced discussion

forums, and various student utilities. Since the project builds on an existing app, the implementation focuses on integrating new features seamlessly while enhancing current components. This phase is where the theoretical design is transformed into a working application. Developers follow the design documents closely to ensure that the new features align with the specified requirements and that the existing system is augmented effectively.

2.3.4 Integration and Testing

In the Integration and Testing phase, the newly developed features are integrated into the existing app, and the system is tested as a whole to ensure all components work together harmoniously. This phase includes both integration testing, to verify that new features are compatible with existing functionalities, and user acceptance testing, to ensure that the app meets the documented requirements and performs as expected. Testing helps identify and resolve any issues or bugs that may have been introduced during implementation, ensuring that the app's enhancements are robust and reliable before deployment.

2.3.5 Deployment

The Deployment phase involves releasing the updated UTeM Community App to its users. This phase includes installing the app in the production environment, making it available for download or access, and ensuring that it is functioning correctly in the real-world setting. The deployment also involves communicating the changes to users and providing any necessary support or documentation. This phase marks the transition of the app from development to active use, and it is crucial to ensure a smooth rollout to avoid disruptions for the users.

2.3.6 Maintenance

The Maintenance phase is an ongoing process where the team provides support for the app after deployment. This includes monitoring the app for any issues, fixing bugs, and making updates as needed based on user feedback and evolving requirements. Regular maintenance ensures that the app remains functional, secure, and relevant to its users. It also provides an opportunity to continuously improve the

app based on real-world usage and to address any unforeseen challenges that arise post-deployment.

2.4 Project Requirement

2.4.1 Software Requirements

In developing this system, one of the crucial requirements to be prepared at the beginning of the project to guarantee a trouble-free development process is the software requirement for this system. In this instance, the necessary requirements are listed below:

a) Android Studio IDE & Flutter SDK

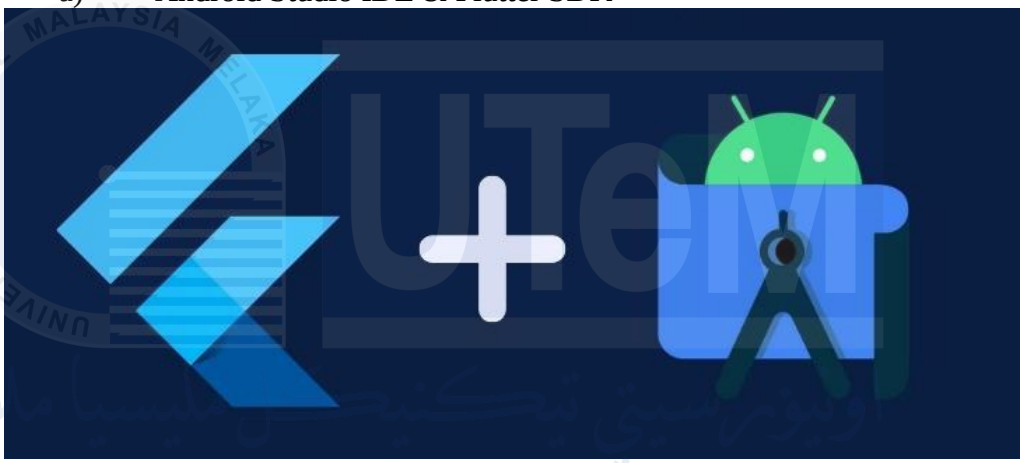

Figure 2.5 : Flutter SDK and Android Studio IDE logo

Figure 2.5 shows the Flutter logo and Android Studio logo. UTeM Community App was developed using Flutter in Android Studio by following a comprehensive process. First, the development environment was set up by installing Flutter and Dart SDKs, along with Android Studio, and configuring the necessary plugins and SDKs. A new Flutter project was created in Android Studio, with the project structure understood and modified to fit the app's requirements. The main.dart file was edited to design the user interface and implement the app's logic. An emulator or physical device was set up for testing, and the app was run, debugged, and tested using Android Studio's tools and Flutter DevTools. Dependencies were managed in the pubspec.yaml file, and the app was built for release, with necessary configurations for app signing. Finally, the app was published on the respective app stores, completing the development process of UTeM Community App using Flutter in Android Studio.

b) Firebase

Figure 2.6 : Firebase logo

For the UTeM Community App, Firebase was primarily used for its Firestore and Authentication services. Firebase Authentication was implemented to handle user sign-up, login, and logout processes, ensuring secure and efficient user management. This facilitated various authentication methods, providing a seamless login experience for both students and admins. Firestore was utilized to manage and store structured data within the app. This included user profiles, notes, schedules, forum discussions, and other relevant information. Firestore's real-time synchronization capabilities ensured that data was always up-to-date and accessible to users, even when offline. These Firebase services provided a robust and scalable backend solution, enhancing the app's functionality and user experience.

c) Visual Studio Code

Figure 2.7 : Visual Studio Code logo

Visual Studio Code (VS Code) is a powerful, open-source code editor ideal for developing web applications using HTML and JavaScript. To develop the Admin site for the UTeM Community App using VS Code, we start by installing VS Code and Node.js, which includes npm for managing dependencies. Open VS Code and use its integrated terminal to navigate to the project directory, initializing the project with npm init -y to create a package.json file. Install necessary packages such as Firebase by running npm install firebase. Create a structured project directory with folders for HTML, CSS, and JavaScript files. Develop the HTML file (index.html) to define the basic structure of the admin site, including linking to CSS and JavaScript files for styling and functionality. Write JavaScript code in app.js to handle the site's interactive features and integrate Firebase for user authentication and data management. VS Code's features like syntax highlighting, IntelliSense, and integrated debugging tools streamline the development process, making it efficient to build, test, and deploy the admin site. This setup ensures a robust development workflow, enabling the creation of a functional and secure admin site for the UTeM Community App.

2.4.2 Hardware Requirements

Each hardware component serves a specific function in facilitating the research. Table 2.2 provides an overview of the hardware components along with their corresponding descriptions.

Table 2.2 : List of Hardware Requirements

Hardware	Description	Specification
Android phone	Android phone will be used to run the application	Android device with version 21 or better.
Laptop	Laptop serves multiple purposes, including running the necessary software for program development and facilitating documentation tasks for the project.	• Operating system: 64-bit Microsoft Windows 8/10/11 • CPU: x86_64 CPU architecture, 2nd generation Intel Core or newer, or AMD CPU with support for a Windows Hypervisor • RAM: 8 GB or more • Disk space: 8 GB of available disk space minimum (IDE + Android SDK + Android Emulator)
USB Cable	USB Cable is used to connect android phone and laptop before the application can be deploy.	USB 3.0 or better for fast transfer speed.
External Hard Disk	External Hard Disk is used to back up the project.	External Hard Disk with atleast 50GB for backup

2.5 Project Schedules and Milestones

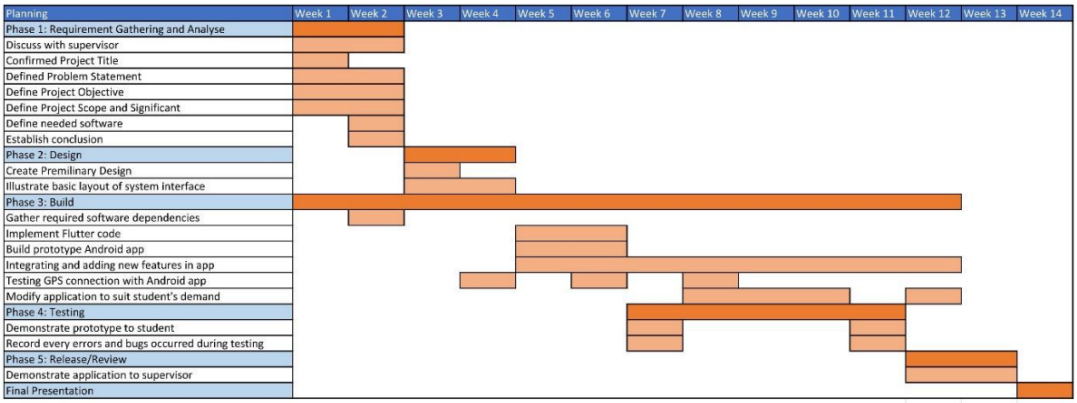

Figure 2.8 : Project Gantt Chart

This Gantt chart outlines the timeline and phases of a project over a 14-week period, detailing specific tasks within each phase and their respective durations. The project begins with the Planning Phase, where initial discussions with the supervisor take place in Weeks 1 and 2 to clarify project goals. During these weeks, the project title is confirmed, the problem statement is defined, project objectives are set, and the project scope and significance are outlined. In Weeks 3 and 4, the necessary software is identified, and the planning phase concludes with a clear project direction. Phase 1 focuses on Requirement Gathering and Analysis, spanning Weeks 3 to 6. Requirements are gathered from Weeks 3 to 5, followed by an analysis of these requirements from Weeks 4 to 6 to understand the project needs fully. In Phase 2, Design, a preliminary design is created between Weeks 4 and 5. This is followed by illustrating the basic layout of the system interface, which takes place from Weeks 5 to 7. Phase 3, Build, begins with gathering required software dependencies in Weeks 6 and 7. Implementation of the Flutter code starts in Week 6 and continues through Week 10. During Weeks 8 to 10, a prototype of the Android application is built. The integration and addition of new features to the app occur from Weeks 8 to 11, followed by testing the GPS connection with the Android app and modifying the application to suit user demands from Weeks 9 to 12. Phase 4, Testing, involves demonstrating the prototype to students in Weeks 10 and 11, recording every error and bug during testing from Weeks 10 to 12, and fixing these issues. Phase 5, Release/Review, takes place in

Weeks 13 and 14, where the application is demonstrated to the supervisor. The project concludes with the final presentation in Week 14. This Gantt chart effectively outlines the tasks and their durations, providing a clear project timeline.

2.6 Conclusion

In this chapter, a comprehensive overview of the literature and methodology used in this project was provided. The literature review highlighted key studies on the impact of social media on students' academic performance, showing both positive and negative effects depending on usage. Notably, social media can enhance academic performance when used responsibly for academic purposes. The domain and functionalities of the proposed UTeM Community App were outlined, emphasizing its tailored features for UTeM students and administrators. This platform aims to improve educational experiences and administrative oversight through various integrated tools such as time management, budget tracking, and academic collaboration features. The existing systems, particularly Microsoft Teams, were analyzed, highlighting their limitations in meeting the specific needs of UTeM students. The UTeM Community App's targeted functionalities offer a more effective solution for enhancing the student experience. The methodology for developing the app was detailed, including the Waterfall Model methodology, software and hardware requirements, and the use of tools like Flutter, Firebase, and Visual Studio Code. These elements collectively ensure the app's robustness, scalability, and user-friendliness. This chapter serves as a foundation for understanding the project's objectives, the need for a tailored student management platform, and the systematic approach adopted for its development.

CHAPTER 3: ANALYSIS

3.1 Introduction

This chapter discusses the problem analysis and the requirement analysis of the system to be developed.

3.2 Problem Analysis

3.2.1 Overview of Current System

The existing system for student interaction and campus resource management often lacks centralized functionality, leading to fragmented and inefficient communication. Current platforms generally provide basic features such as direct messaging and event reminders but fail to integrate a comprehensive suite of tools that cater to the diverse needs of students. Existing systems typically do not offer robust social interaction features. Communication is often limited to basic chat functions without the capability for group chats or discussion forums, which hinders the formation of a vibrant student community.

There is usually a lack of administrative oversight within these platforms. Without proper moderation, issues like inappropriate content and user misconduct can go unchecked, leading to an unsafe and unregulated environment. The design and user interface of existing systems often do not engage students effectively. Minimalistic and uninteresting color schemes, coupled with a lack of interactive features, can result in low user engagement and satisfaction.

3.2.2 Overview of Proposed System

3.2.2.1 System Flowchart

The main flowchart of UTeM Community App can be referred in Appendix 3. It provides a detailed overview of the UTeM Community App mobile application, outlining the user journey from initial interaction to the various features available within the app. The process begins at the start point, where users are prompted to determine if they are new to the app. New users are directed to the registration process, while returning users can proceed to the login page. There is also an option for users who have forgotten their passwords to recover their accounts through the "Forgot Password" process.

Upon successful login, users are redirected to the home page, which serves as the central hub for navigating the app's various functionalities. From the home page, users can access their profile page to update personal information such as gender, password, bio, birthday, username, and profile picture. The contact page allows users to view other user profiles and initiate direct chats. The chat page provides access to recent personal chats, group chat lists, and the option to create new group chats.

The forum page enables users to create posts, display existing posts, comment on posts, and report inappropriate content. The utilities page includes tools for note-taking, tracking monthly expenses, scheduling daily routines, and adding public or personal events. The to-do list page allows users to manage their tasks by adding items to their to-do lists.

Additionally, the library page offers features for uploading and downloading library content, while the nearby users page displays the location of other UTeM Community App users nearby. Users can also add posts and view posts from others. Finally, the app provides an option for users to log out, ensuring secure access to the application. This comprehensive flowchart highlights the app's robust functionality, designed to enhance student engagement and interaction within the university community.

3.2.2.2 User Authentication

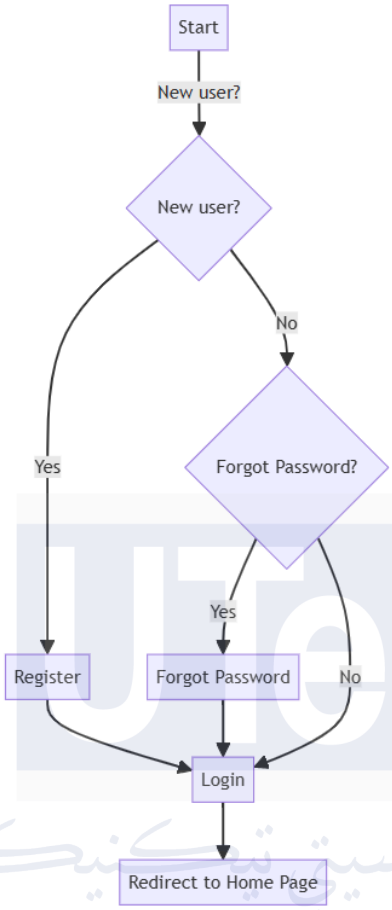

Figure 3.1 : User authentication flowchart

The flowchart in Figure 3.2 illustrates the user authentication process for an application. It begins with the user being prompted to determine if they are a new user. If the user is new, they are directed to the registration page to create a new account. If the user is not new, they proceed to the next step, which checks if they have forgotten their password. If the user has forgotten their password, they are guided to the password reset page to recover their account. If the user remembers their password, they are directed to the login page to enter their credentials. Upon successful login, the user is redirected to the home page of the application. This process ensures that users are appropriately guided through registration, password recovery, or login based on their current status and needs.

3.2.2.3 Profile Management

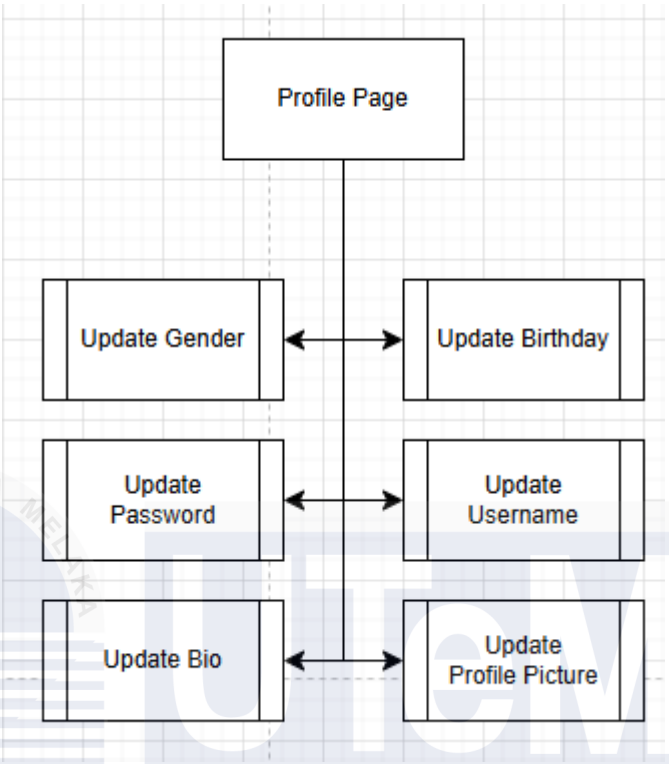

Figure 3.2 : Profile management flowchart

Flowchart in Figure 3.3 illustrates the various components and options available on a user's profile page within an application. The main page, labeled as the "Profile Page," serves as the central hub where users can view and manage their profile information. From this page, users have direct access to several update options. They can update their gender and birthday information, ensuring their personal details are current. Additionally, users can update their password to maintain account security and change their username if necessary, such as for rebranding or correcting an error. The profile page also allows users to update their bio, providing a space to reflect their current status, interests, or any other information they wish to share. Furthermore, users can update their profile picture, adding a personal touch and making their profile easily recognizable. Each of these update options is conveniently accessible from the profile page, allowing users to manage their profile details efficiently in one centralized location.

3.2.2.4 Contact and Chat

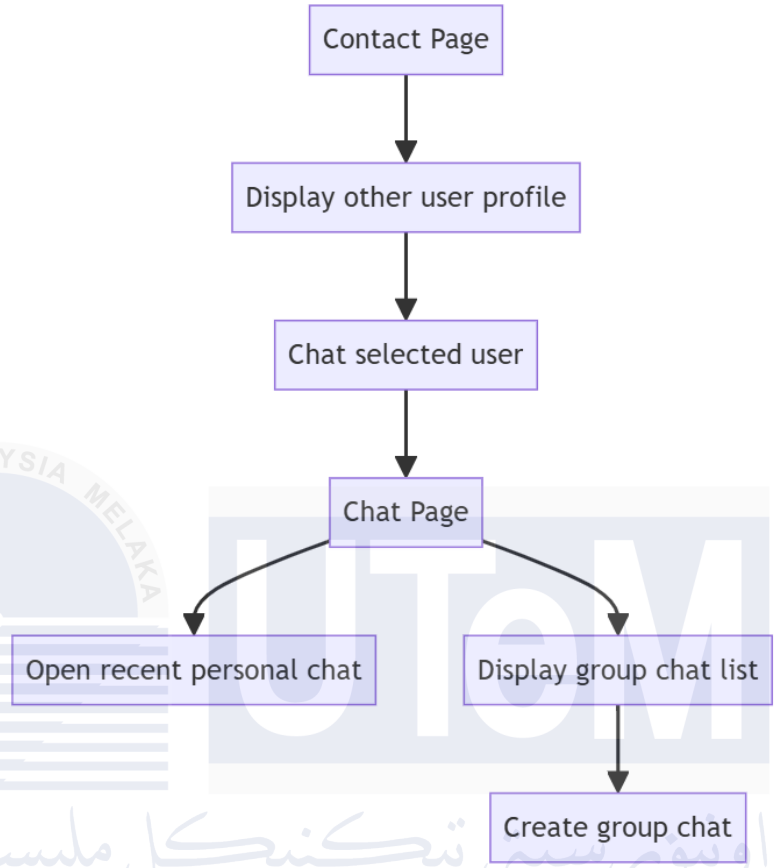

Figure 3.3 : Contact and chat flowchart

Figure 3.4 outlines the process of initiating and managing chats within an application. The process begins at the "Contact Page," where users can view their contacts. From here, users can select and display the profile of another user. Once a user selects a profile, they have the option to initiate a chat with the selected user, leading them to the "Chat Page." On the Chat Page, users can choose between two main actions: opening a recent personal chat or managing group chats. If they choose to open a recent personal chat, they can continue their previous conversation with an individual. Alternatively, users can display the group chat list, where they can view all existing group chats. From this list, users have the option to create a new group chat, facilitating communication with multiple users simultaneously. This flowchart effectively illustrates the steps for navigating from the contact page to various chat functionalities, providing a clear and structured process for user interaction within the application.

3.2.2.5 Forum Interaction

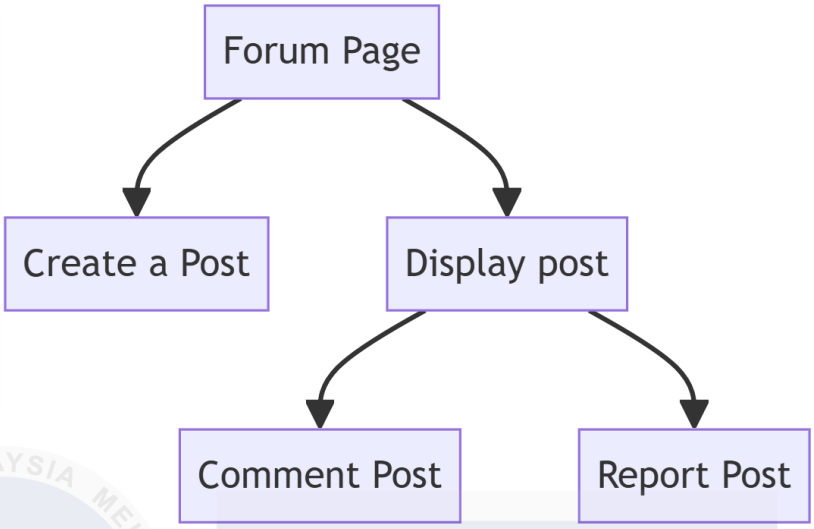

Figure 3.4 : Forum interaction flowchart

Flowchart in Figure 3.5 represents the functionality available on the Forum Page of an application. The process begins at the Forum Page, where users have two primary options: they can either create a new post or display an existing post. If the user opts to create a post, they are directed to a page where they can input and publish their content. If the user chooses to display an existing post, they are presented with further options for interaction. From here, they can either comment on the post, contributing to the discussion, or report the post if they find it inappropriate or against the forum's guidelines. This flowchart effectively maps out the user actions from the Forum Page, providing clear pathways for creating content, engaging with existing posts, and ensuring community standards are upheld through reporting mechanisms.

3.2.2.6 Utilities

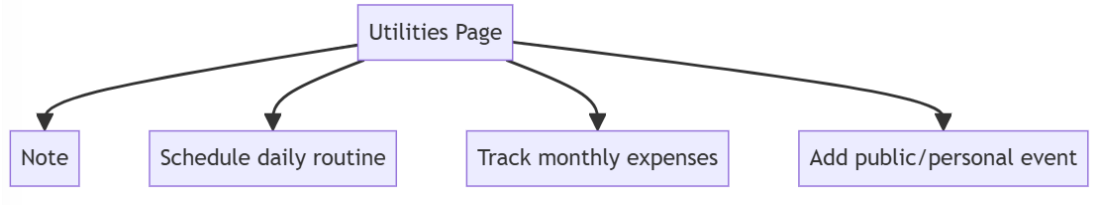

Figure 3.5 : Flowchart of utilities

Figure 3.6 outlines the functionalities available on the Utilities Page of an application. Starting at the Utilities Page, users are provided with four primary options to manage their daily activities and information. First, users can create and manage Notes, allowing them to jot down important information or reminders. Second, they can Schedule their daily routine, helping them organize their day and ensure they stay on track with their tasks and commitments. Third, users have the option to Track their monthly expenses, aiding them in managing their budget and monitoring their spending habits. Lastly, users can Add public or personal events, which helps in planning and keeping track of important dates, whether they are personal milestones or public gatherings.

3.3 Requirement Analysis

3.3.1 Data Requirements

Data Dictionary of UTeM Community App. This data dictionary format is based on Firebase Firestore rules.

Table 3.1 : Data Dictionary of UTeM Community App

Users		
Field Name	**Data Type**	**Description**
SearchKey	string	A search key for the user.
admin	string	Indicates if the user is an admin (e.g., "yes").

bio	string	A short biography of the user.
birthday	string	The user's birthday in the format "DD-MM-YYYY".
email	string	The user's email address.
gender	string	The user's gender.
isAdmin	boolean	Boolean flag indicating if the user is an admin.
isSuspended	boolean	Boolean flag indicating if the user is suspended.
profilepicture	string	URL to the user's profile picture.
status	string	The current status of the user (e.g., "Offline").
toDoItems	srray	A list of to-do items for the user.
username	string	The user's username.
Posts		
Field Name	**Data Type**	**Description**
PostMessage	string	The content of the post.
TimeStamp	timestamp	The date and time when the post was created in the format "DD MMMM YYYY at HH:MM UTC±X".
UserEmail	string	The email address of the user who created the post.
likedBy	array	A list of user IDs who liked the post
likes	integer	The number of likes the post has received.
chatroom		
Field Name	**Data Type**	**Description**
Users	array	A list of users in the chatroom.
lastMessage	string	The last message sent in the chatroom.

lastMessageSendBy	string	The name of the user who sent the last message.
lastMessageSendTs	string	The time the last message was sent, in "HH" format.
time	timestamp	The date and time when the last message was sent in the format "DD MMMM YYYY at HH:MM UTC±X".
Chats (subcollection for Chatroom)		
Field Name	**Data Type**	**Description**
message	string	The content of the chat message.
sendby	string	The username of the person who sent the message.
time	timestamp	The date and time when the message was sent in the format "DD MMMM YYYY at HH:MM UTC±X".
ts	string	The time the message was sent, in "HH" format.
type	string	The type of message (e.g., "text", “img”).
Groups		
Field Name	**Data Type**	**Description**
id	string	The unique identifier for the group.
members	array	A list of members in the group. Each member contains email, isAdmin, and name.
Members (sub-document)		
Field Name	**Data Type**	**Description**

email	string	The email address of the group member.
isAdmin	boolean	Boolean flag indicating if the member is an admin.
name	string	The name of the group member.
Forums		
Field Name	**Data Type**	**Description**
imageUrl	string	URL to the image associated with the forum post.
PostMessage	string	The content of the forum post.
PostTitle	string	The title of the forum post.
TimeStamp	timestamp	The date and time when the post was created in the format "DD MMMM YYYY at HH:MM UTC±X".
UserEmail	string	The email address of the user who created the post.
Reports		
Field Name	**Data Type**	**Description**
image	string	URL to an image associated with the report (if any).
postContent	string	The content of the reported post.
postFrom	string	The email address of the user who created the reported post.
postId	string	The ID of the reported post.
postTitle	string	The title of the reported post.
reason	string	The reason for reporting the post.
reportedAt	timestamp	The date and time when the report was created in the format "DD MMMM YYYY at HH:MM UTC±X".

status	string	The status of the report (e.g., "Completed").
Notes		
Field Name	**Data Type**	**Description**
NoteContent	string	The content of the note.
NoteTitle	string	The title of the note.
TimeStamp	timestamp	The date and time when the note was created in the format "DD MMMM YYYY at HH:MM UTC±X".
UserEmail	string	The email address of the user who created the note.
Schedules		
Field Name	**Data Type**	**Description**
Activity	string	The description of the scheduled activity.
Day	string	The day of the week when the activity is scheduled.
Time	string	The time when the activity is scheduled.
TimeStamp	timestamp	The date and time when the schedule was created in the format "DD MMMM YYYY at HH:MM UTC±X".
UserEmail	string	The email address of the user who created the schedule.
Expenses (subcollection for 'Users')		
Field Name	**Data Type**	**Description**
date	string	The date of the expense in the format "YYYY-MM-DDTHH:MM

		.sssZ".
day	number	The day of the month when the expense was recorded.
description	string	A brief description of the expense.
price	number	The amount spent.
time	timestamp	The date and time when the expense was recorded in the format "DD MMMM YYYY at HH:MM UTC±X".
Events		
Field Name	**Data Type**	**Description**
addedBy	string	The user who added the event.
date	timestamp	The date and time of the event in UTC+8 timezone.
description	string	A brief description of the event.
status	string	The current status of the event (e.g., Pending, Confirmed).
title	string	The title or name of the event.
type	string	The type or category of the event (e.g., public, private).

Table 3.1 shows the data dictionary of UTeM Community App. The database consists of 12 tables.

3.3.2 Functional Requirements

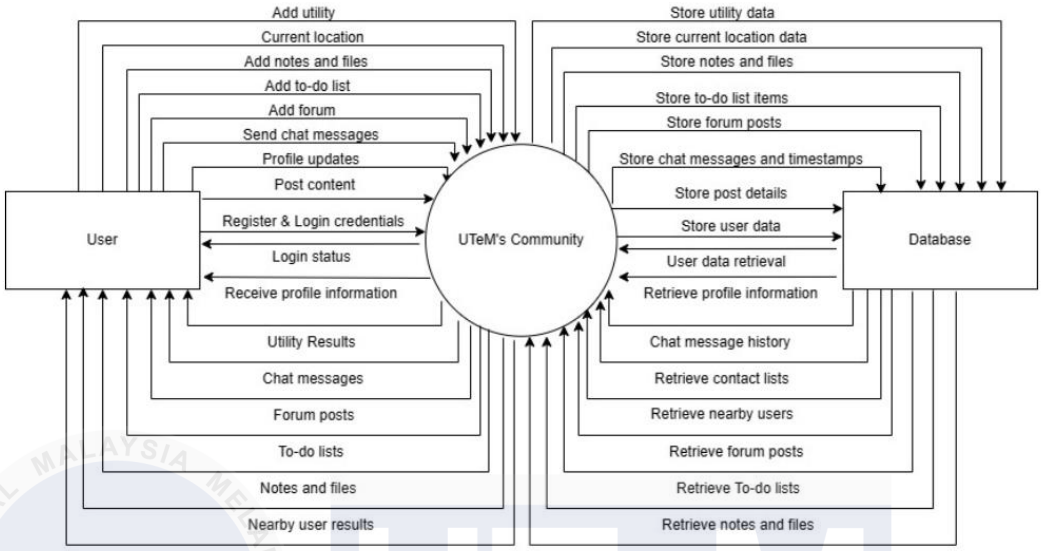

Figure 3.6 : Data Flow Diagram (Level 0)

The Data Flow Diagram (DFD) for the UTeM Community App shown in Figure 3.2 illustrates the interactions between users, the application system (UTeM's Community), and the database in a detailed manner. Users engage with the app by performing various actions such as registering and logging in, adding utilities like current location, notes, files, or to-do list items, sending chat messages, posting content to forums, and updating their profiles. These actions are processed by the UTeM's Community, the central hub of the application, which manages these inputs and facilitates communication, utility management, and profile updates. When users send requests to the app—such as adding new content or communicating with others—the UTeM's Community processes these inputs and interacts with the database accordingly. For example, when a user updates their profile or posts a message, this data is stored in the database. Similarly, when users need to view their chat messages, forum posts, or to-do lists, the system retrieves this data from the database. The UTeM's Community ensures that the data from the database is correctly processed and presented back to the user, maintaining a seamless flow of information. The database plays a crucial role in storing all user-generated content and utility data, including chat messages, forum posts, and various utility information like location data and notes. It

also handles the retrieval of stored information when requested by the UTeM's Community, enabling the system to display up-to-date and accurate information to the users. This setup ensures that users can interact with the app efficiently, with all their inputs leading to immediate and relevant outputs, supported by a robust backend database. In summary, the DFD depicts a well-structured data flow where user interactions are effectively processed by the UTeM's Community, which then communicates with the database to store and retrieve necessary data. This process enables a dynamic and interactive environment for users, providing functionalities that support communication, utility management, and personal content handling in a centralized manner.

3.3.3 Conclusion

This chapter provided a comprehensive analysis of the current and proposed systems for the UTeM Community App. The problem analysis highlighted the limitations of existing platforms in terms of fragmented communication, lack of administrative oversight, and unengaging user interfaces. The proposed system addresses these issues with detailed flowcharts illustrating improved user authentication, profile management, contact and chat functionalities, forum interactions, and utility features. The requirement analysis, including the data dictionary and functional requirements, ensures that the new system is well-equipped to enhance student engagement and interaction within the university community. By implementing these improvements, the UTeM Community App aims to create a more centralized, efficient, and user-friendly platform for students. Chapter 3 provided a comprehensive analysis of the current and proposed systems for the UTeM Community App. The problem analysis highlighted the limitations of existing platforms in terms of fragmented communication, lack of administrative oversight, and unengaging user interfaces. The proposed system addresses these issues with detailed flowcharts illustrating improved user authentication, profile management, contact and chat functionalities, forum interactions, and utility features. The requirement analysis, including the data dictionary and functional requirements, ensures that the new system is well-equipped to enhance student engagement and interaction within the university community. By implementing these improvements, the UTeM Community App aims to create a more centralized, efficient, and user-friendly platform for students.

CHAPTER 4: DESIGN

4.1 Introduction

The design of the project refers to the process of creating a plan or blueprint for building a software system. It involves making decisions about the overall structure, architecture, and components of the software application before the actual implementation begins. Designing a software system aims to ensure that it meets the desired functional requirements, is maintainable, scalable, and performs efficiently.

4.2 High-Level Design

High-Level Design (HLD) is a phase in the system design process where the overall architecture of a system is outlined. It provides a broad view of the system and describes how various components and modules will interact with each other. HLD is crucial as it bridges the gap between requirements analysis and detailed design, ensuring that the system architecture aligns with the specified requirements and provides a blueprint for further development.

4.2.1 System Architecture

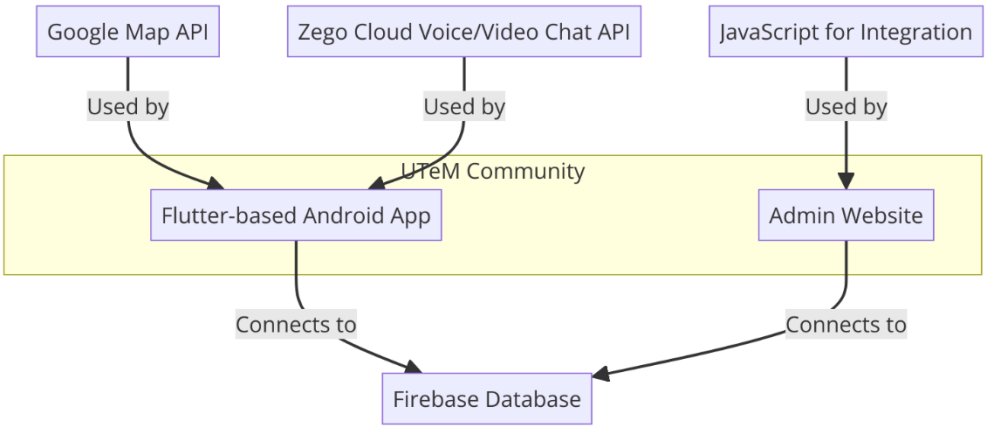

Figure 4.1 : UTeM Community System Architecture

The system architecture for the UTEM community application is designed to provide a seamless and integrated experience for both users and administrators. The core of the system is a Flutter-based Android app that serves as the primary interface

for the UTEM community. This app leverages the Google Map API to offer location-based services, such as displaying maps and geographical data, and the Zego Cloud Voice/Video Chat API to facilitate real-time voice and video communication among users. To ensure robust data management and synchronization, the app connects to a Firebase Database, which handles the storage and retrieval of user data, chat logs, and other critical information. Complementing the mobile app is an Admin Website, built using JavaScript, which provides administrators with the tools to manage and monitor the application's data and user activities. This website also connects to the Firebase Database, enabling administrators to perform CRUD (Create, Read, Update, Delete) operations efficiently. The integration of these components ensures that while users engage with the mobile app for various activities, such as viewing maps and participating in real-time chats, administrators can oversee and manage the system through the web interface. This architecture, utilizing cloud services (Firebase), real-time communication (Zego Cloud API), and location services (Google Map API), creates a comprehensive and cohesive solution that supports both user engagement and administrative control.

4.2.2 Mobile App User Interface Design

4.2.2.1 Login Page

Figure 4.2 : Login page of the application

Figure 4.2 shows the login page of the application. User needs to enter their email and password in both fields and press the login button to login into the application. If one of the fields or both fields are empty or invalid credential, the system will display an error message.

4.2.2.2 Register Page

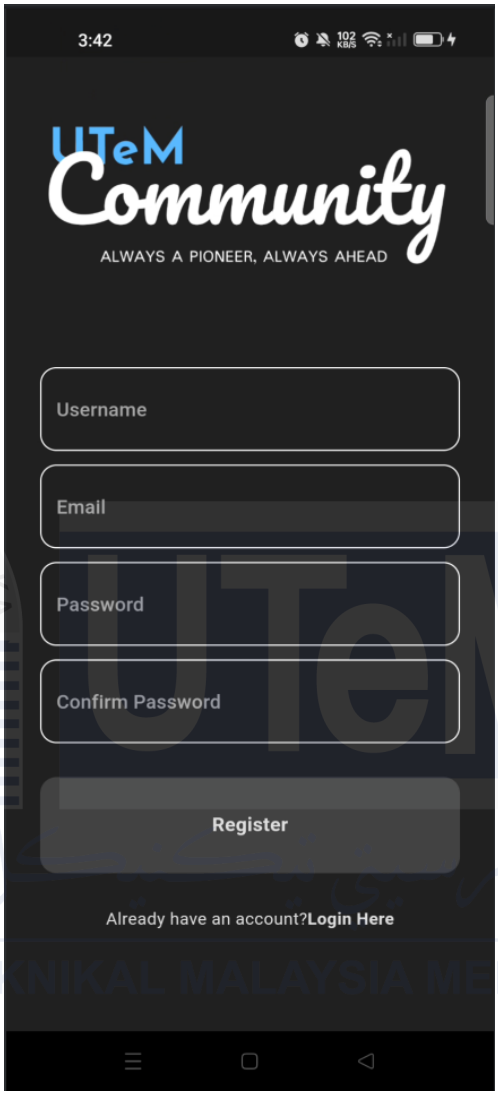

Figure 4.3: Register page of the application

Figure 4.3 shows the registration page of the system. The user is required to enter username, email, password, password confirmation. All the field is mandatory. The user also needs to fulfill the requirement for the password format and email format. After every field is filled, the user will need to press the register button to register their account. The system will verify every field and if all fields are verified and all input is valid. If one or multiple fields are empty, the system will display an error message.

4.2.2.3 Home page

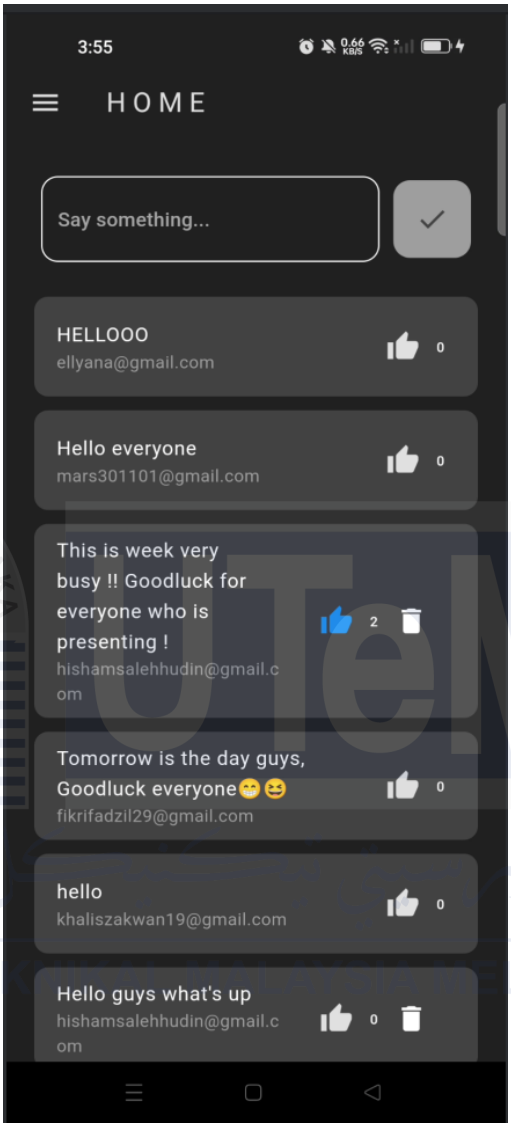

Figure 4.4 Home page of the application

Figure 4.4 shows the home page of the application. This page display short text post from other user. User can post their own text post in the “Say something…” field at the top. They can also like other people’s text post and delete their own text post.

4.2.2.4 Application drawer/sidebar

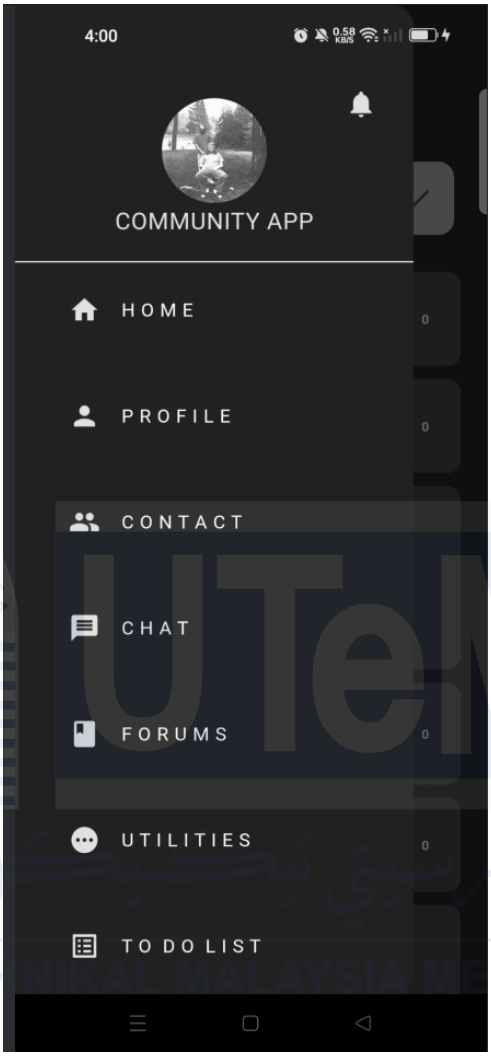

Figure 4.5 : Application drawer/sidebar

Figure 4.5 displays the drawer of the application. User most of the time will interact with this drawer to be able to navigate to other page. The header shows the profile picture that they have set on their profile. This drawer contain all the button to navigate to their desired page including, home page, profile page, contact page, chat page, forums page, utilities page, library page, nearby users page, and logout.

4.2.2.5 Profile Page

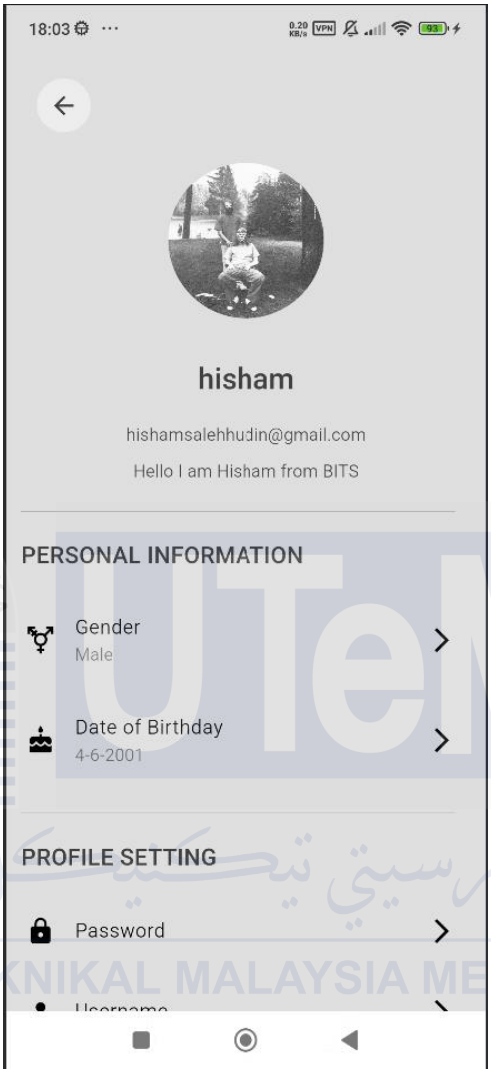

Figure 4.6 : Profile page of the application

Figure 4.6 shows the profile page of the application. In this page, user can update their personal information such as gender and their date of birthday. Additionally user can update their password, username, bio and profile picture.

4.2.2.6 Contact Page

Figure 4.7 : Contact page of the application

Figure 4.7 shows the contact page of the application. In this page, it displays all the user that currently registered in the application. User select any user they want to view their profile.

4.2.2.7 Other User Profile Page

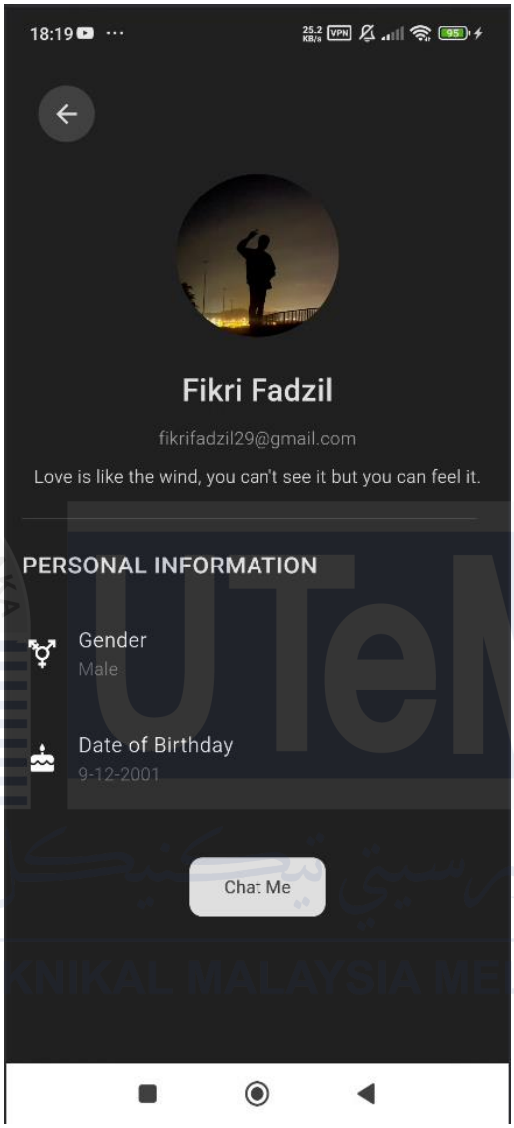

Figure 4.8 : Other user profile page

Figure 4.8 shows the profile page of other user. This is the page that user can view when they select a user from the contact page. User can view their bio, gender, date of birth and profile picture. User also have the option to chat directly with them when they pressed the “Chat Me” button.

4.2.2.8 Personal Chat Page

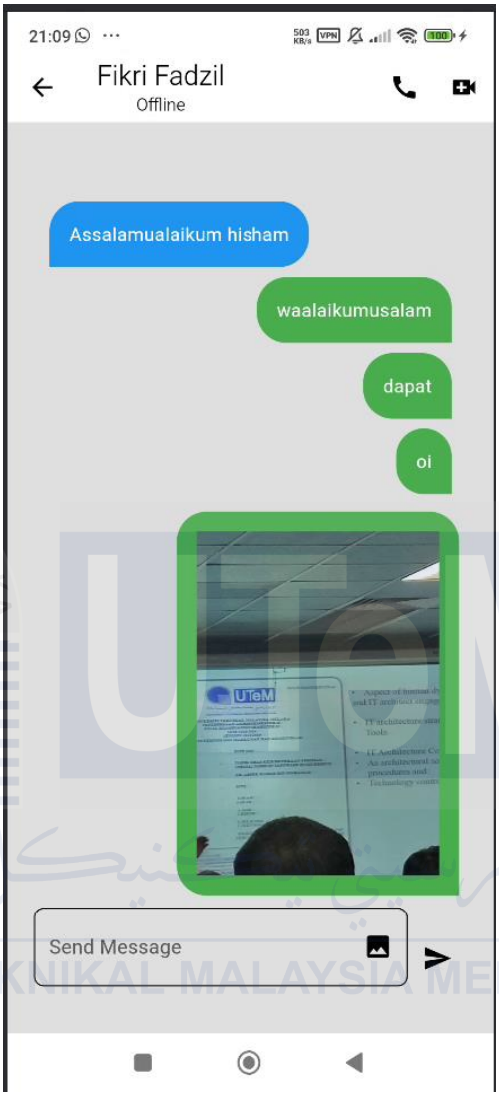

Figure 4.9 : Personal chat page of the application

As shown in figure 4.9, this page is for user to do a personal chat with another user. Beside text messages, user can also send images with each other.

4.2.2.9 Voice Call Page

Figure 4.10 : Voice call page

Figure 4.10 is the voice call page. User can navigate to this page when they pressed the call icon at the top of the chat page. In this voice call, user can mute their microphone, turn on loudspeakers and end call.

4.2.2.10 Video Call Page

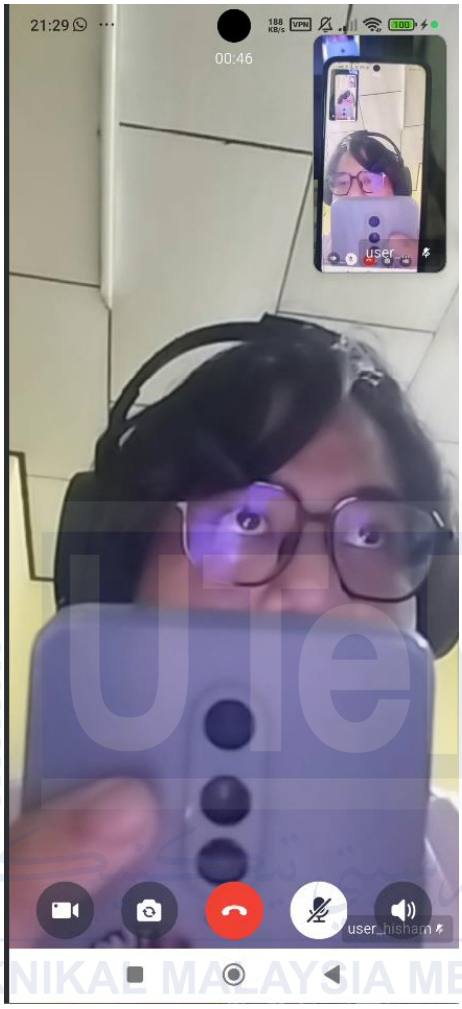

Figure 4.11 : Video Call Page

Figure 4.11 displays the video call page. User can navigate to this page when they pressed the call video call icon at the top of the chat page. In this video call, user can turn off their camera, change camera, mute voice and turn off speaker.

4.2.2.11 Group Chat Page

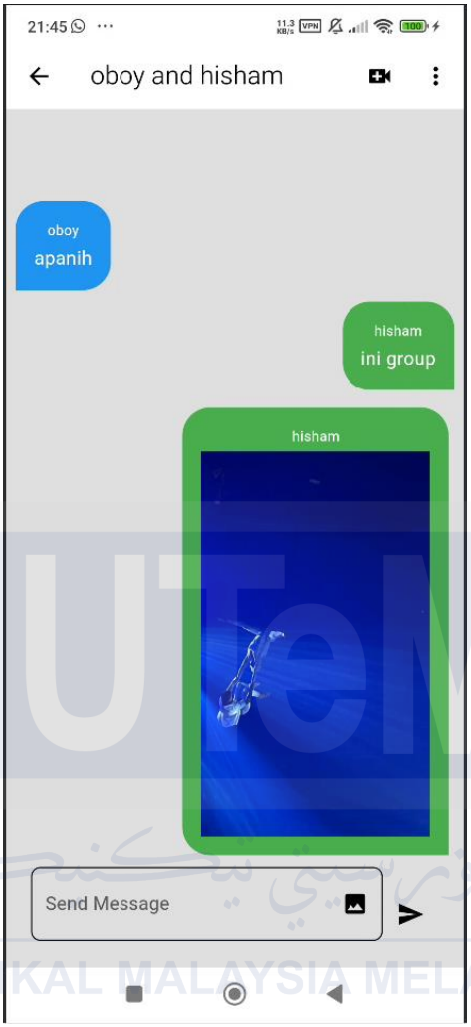

Figure 4.12 : Group Chat Page

Figure 4.12 shows the group chat page. This page had the same functionality as personal chat such as sending text messages and images.

4.2.2.12 Group Video Conference

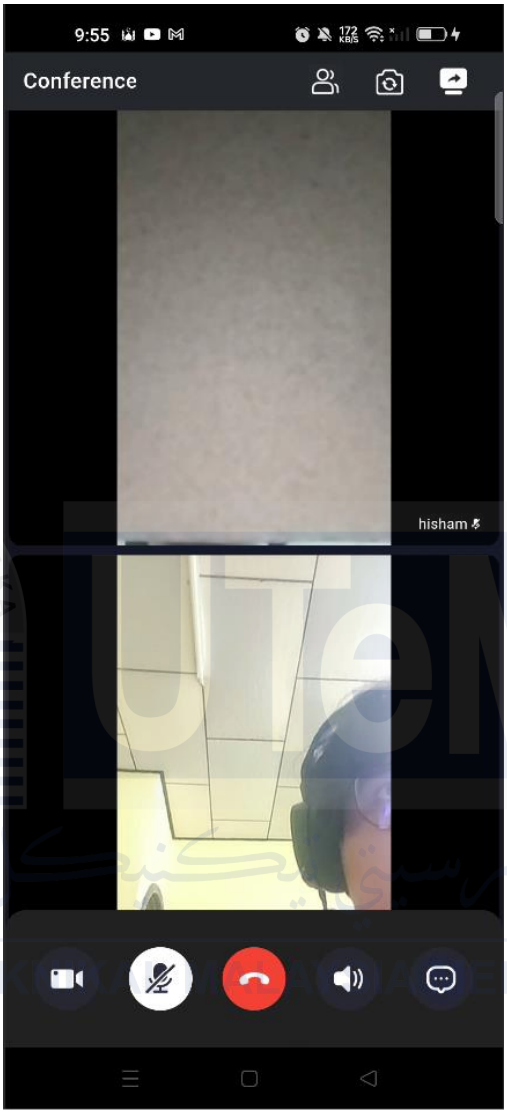

Figure 4.13 : Group video conference page

Figure 4.13 shows the group video conference page. To navigate to this page, user need to press the video call icon on the top left of the group chat page. There are a many features user can access in this conference page. User can toggle their video, mute their microphone, toggle loudspeaker, send text messages in the mini-chat section, view members in the conference room, change camera and share their screen.

4.2.2.13 Utilities Page

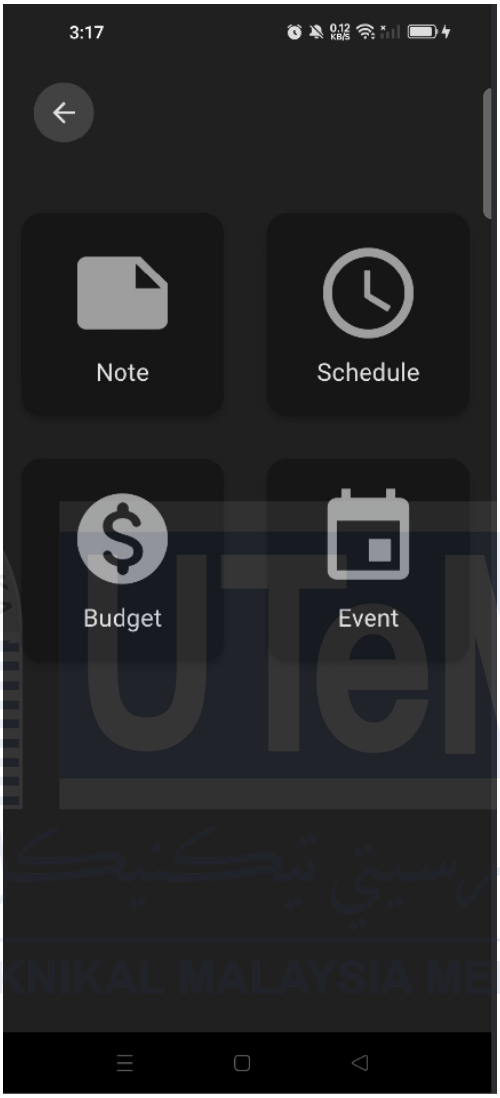

Figure 4.14 : Utilities Page

In this utilities page as shown in Figure 4.14, user can select four options such note, schedule, budget and event.

4.2.2.14 Event Calendar Page

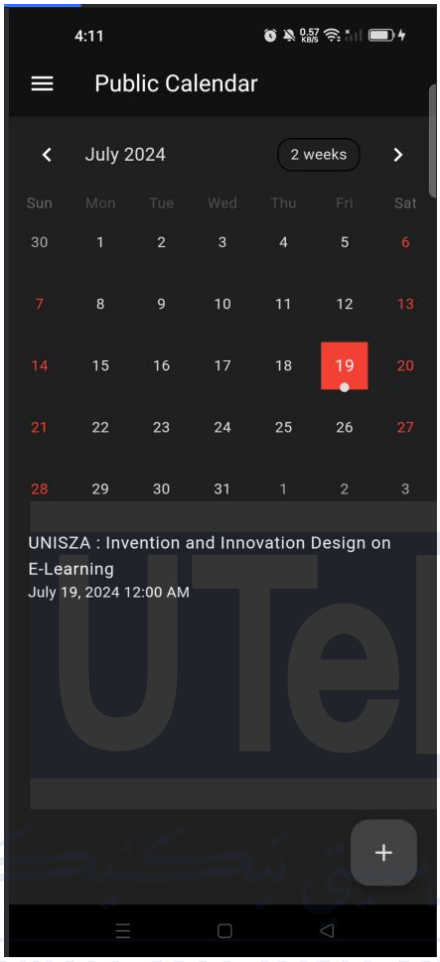

Figure 4.15 : Event calendar page

Figure 4.15 shows the event calendar page. There are two types of event calendar. First one is the public calendar which shows all the public event that available for all user to see. Another one is the personal calendar, this calendar is for user to add their own event and only user can see the event that they added in their personal calendar.

4.2.3 Website User Interface Design

4.2.3.1 Login Page

Figure 4.16 : Login page of the website

Figure 4.16 shows the login page of the admin website. User need to enter their email and password in order to login into the website. If either of the is empty or invalid, website will display error.

4.2.3.2 Dashboard Page

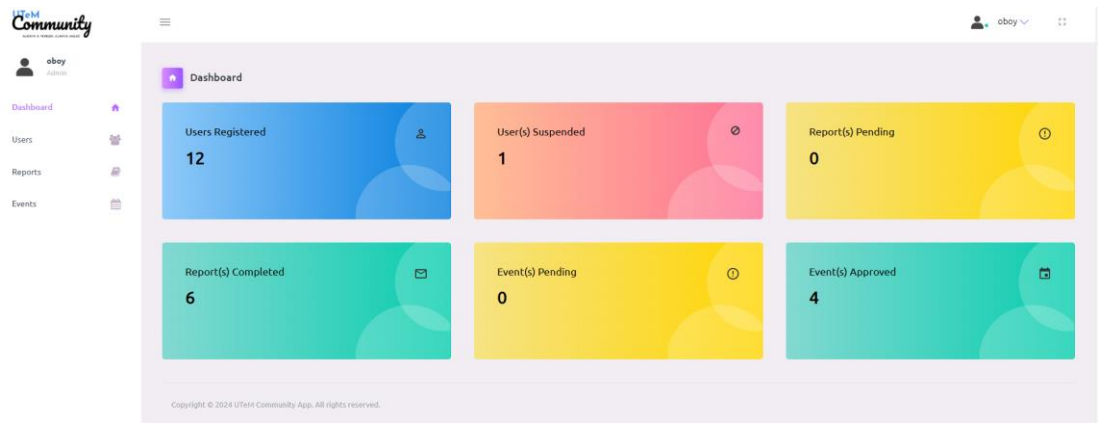

Figure 4.17 : Dashboard page of the website

Figure 4.17 shows the dashboard page of the website. This dashboard displays numerical data such as number of user registered, user suspended, report pending, report completed, event pending and event approved.

4.2.3.3 Users Page

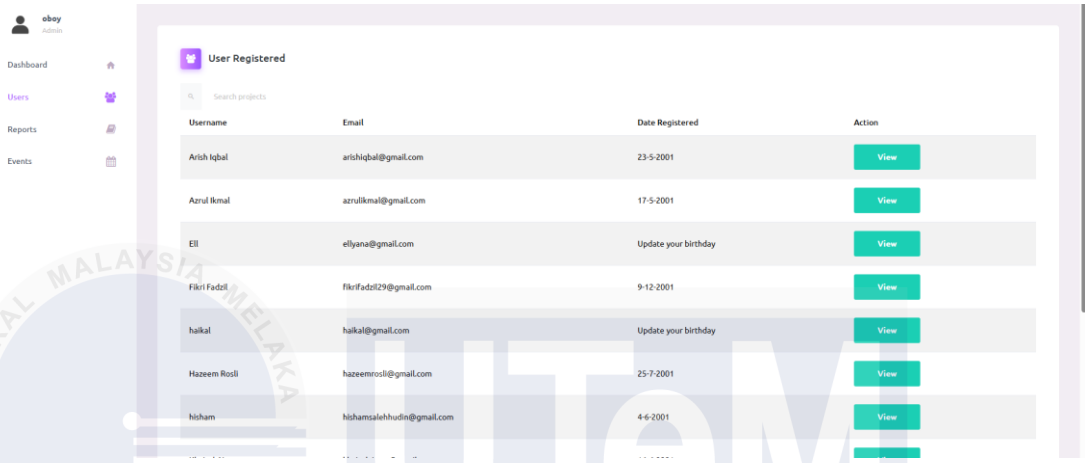

Figure 4.18 : User registered page

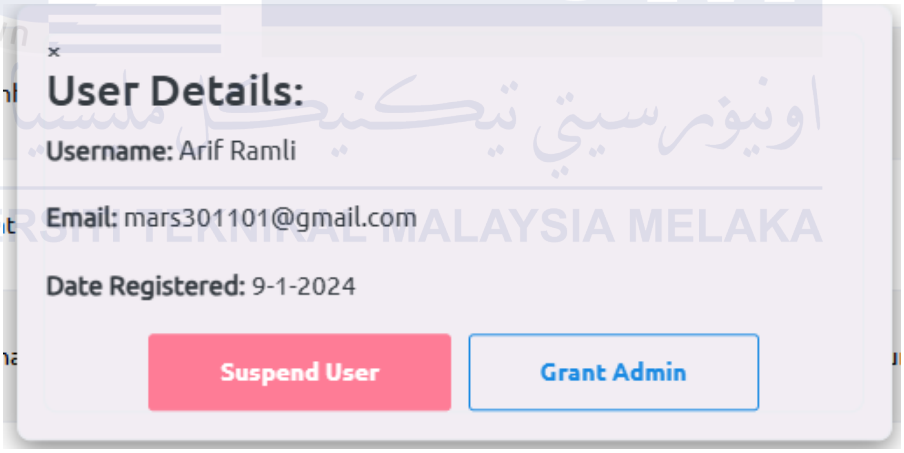

Figure 4.19 : User details dialog box

Figure 4.18 shows the user registered page. This page shows a table that contains all the data of the user registered. As shown in Figure 4.19, the view button will show up a dialog box that shows the details of the user and two option such as suspend user or grant admin access for the user.

4.2.3.4 Report Page

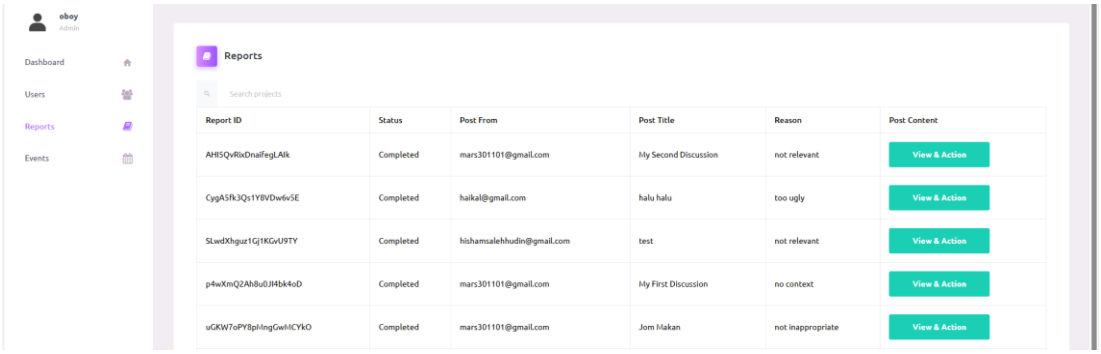

Figure 4.20 : Report Page

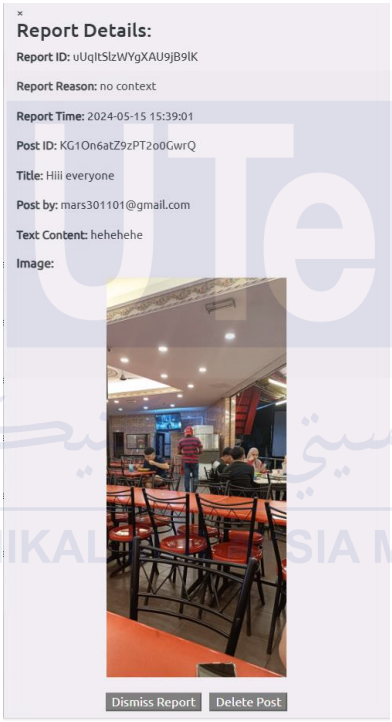

Figure 4.21 : Report details dialog box

Figure 4.20 shows the report page. This page shows a table containing all the reports that have been sent by user. This report contain the complains from user towards other user's forum discussion. The dialog box in Figure 4.21 will show up when admin press the "View & Action" button. The dialog displays the details of the report and two option such as dismiss report and delete post.

4.2.3.5 Events Page

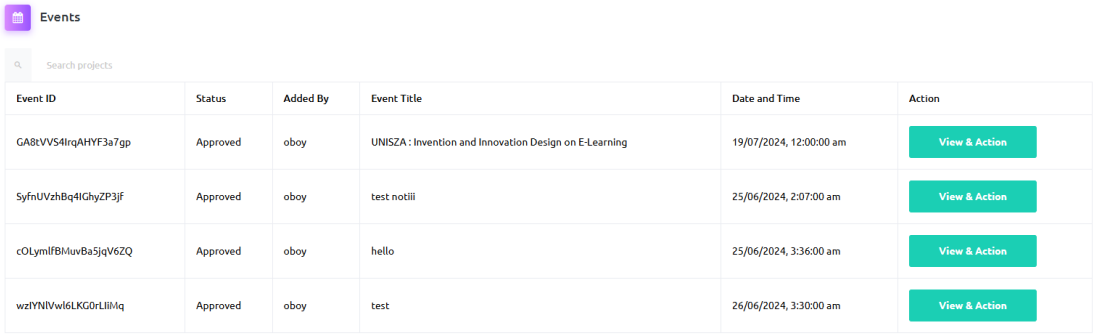

Figure 4.22 : Events page

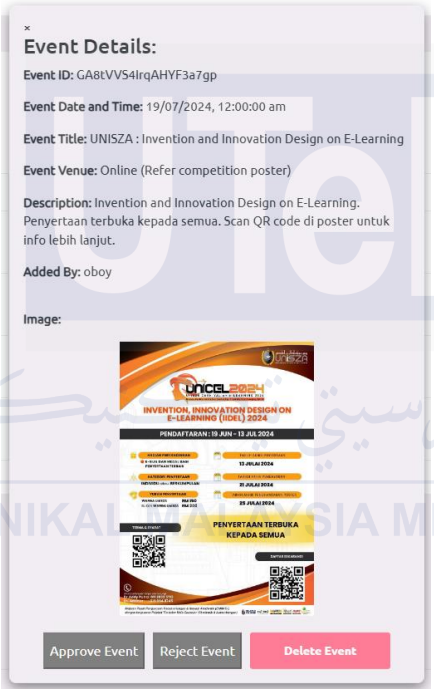

Figure 4.23 : Event details dialog box

Figure 4.22 shows the event page. This page shows a table that contains all the event that is added by user in the public calendar awaiting for approval from admin. Figure 4.23 shows the dialog box that contains the event details. There are 3 option for admin which is approve event, reject event and decline event.

4.2.4 Physical Design

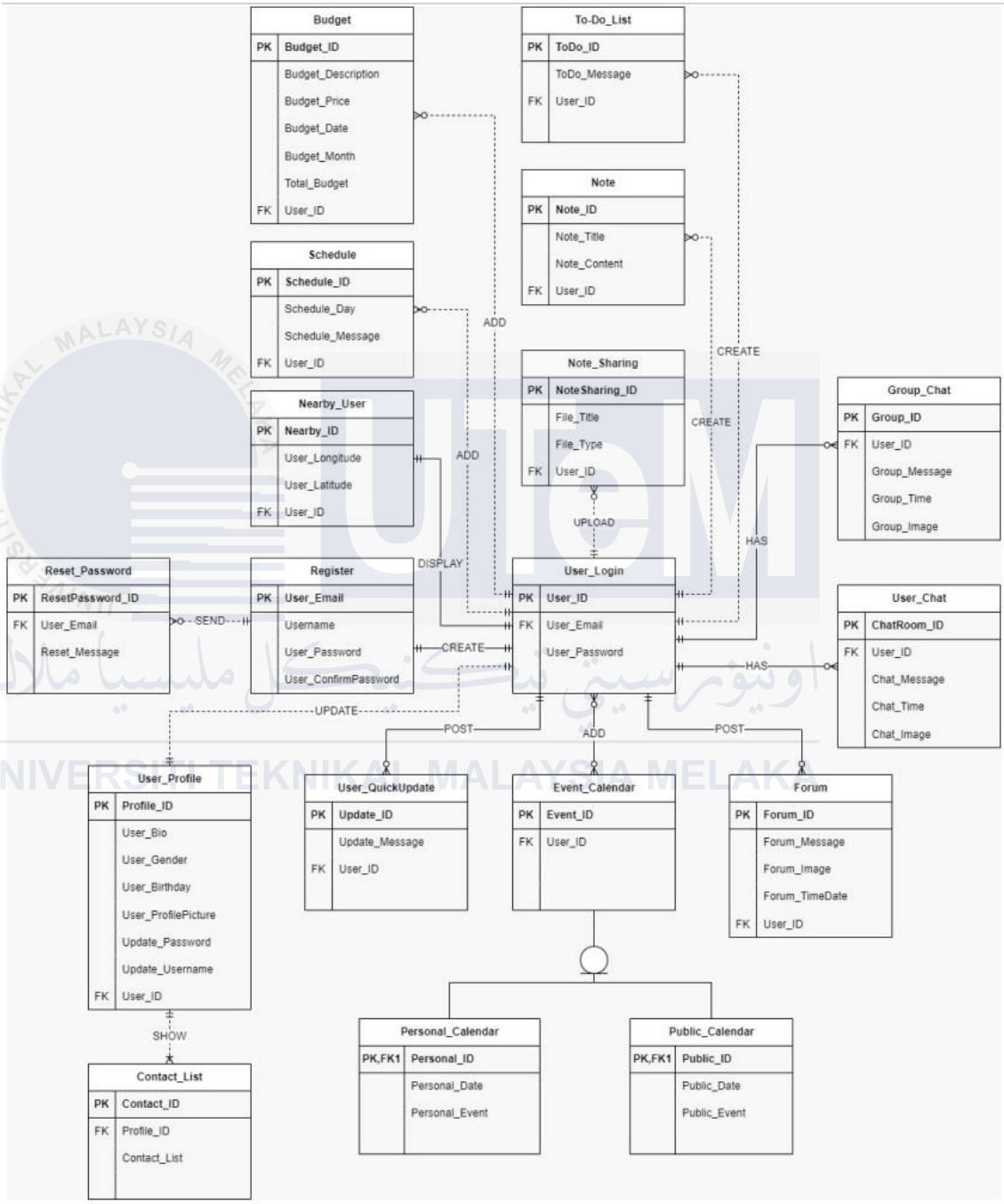

Figure 4.24 : Entity Relationship Diagram

This Entity-Relationship Diagram (ERD) illustrates the database schema for an application, highlighting the relationships between various entities involved in managing user activities, profiles, and interactions. At the core of the database is the User_Login entity, which stores user credentials, including User_ID, User_Email, and

User_Password. This entity is linked to multiple other entities, establishing a comprehensive user management system. The Register entity captures user registration details, including Username, User_Password, User_Email, and User_ConfirmPassword. The Reset_Password entity manages password reset requests, storing the User_Email and Reset_Message. The User_Profile entity stores detailed user profile information such as User_Bio, User_Gender, User_Birthday, User_ProfilePicture, Update_Password, and Update_Username, linked to User_ID. This entity is related to the Contact_List entity, which manages user contacts. The User_QuickUpdate entity allows users to post quick updates, with fields like Update_Message and User_ID. The Event_Calendar entity tracks user events, containing Event_ID and User_ID, and is linked to both Personal_Calendar and Public_Calendar entities, which manage personal and public events, respectively. The Note entity, containing Note_Title and Note_Content, is associated with the Note_Sharing entity, which handles shared notes with fields like File_Title, File_Type, and User_ID. Communication features are represented by the User_Chat and Group_Chat entities. User_Chat manages individual chat messages with fields like ChatRoom_ID, Chat_Message, Chat_Time, and Chat_Image, while Group_Chat handles group messages, storing Group_Message, Group_Time, and Group_Image. The Forum entity allows users to post messages and images, storing Forum_Message, Forum_Image, Forum_TimeDate, and User_ID. Utility management entities include Budget, To-Do_List, and Schedule. The Budget entity tracks user expenses with fields like Budget_Description, Budget_Price, Budget_Date, Budget_Month, and Total_Budget, linked to User_ID. The To-Do_List entity manages user tasks, and the Schedule entity helps organize daily activities. Finally, the Nearby_User entity enables location-based user interactions, storing User_Longitude and User_Latitude. This ERD provides a detailed overview of the database structure, showing how different entities are interconnected to support various functionalities within the application, ensuring a comprehensive and user-friendly experience.

4.3 Conclusion

This chapter provided an in-depth exploration of the design phase for the UTeM Community App, outlining the essential components and architecture required to create a comprehensive and user-friendly application. The High-Level Design

section introduced the system architecture, highlighting the integration of various APIs and databases to ensure seamless user experiences and robust data management. Detailed descriptions of the mobile app's user interface design were provided, covering crucial pages such as login, registration, home, profile, chat, and utilities, along with their functionalities. The design of the admin website was also discussed, emphasizing the tools available for administrators to manage user activities and ensure a safe environment. The chapter concluded with a presentation of the Entity-Relationship Diagram (ERD), illustrating the database schema and the relationships between entities. This structured approach to design aims to create an efficient, scalable, and maintainable system that meets the needs of both students and administrators, ultimately enhancing the overall university experience.

CHAPTER 5: IMPLEMENTATION

5.1 Introduction

This chapter explain the process of developing and implementing UTeM Community App. The main purpose of this implementation phase is to finish the development process and the modules of UTeM Community App such as voice/video call module, public and personal calendar module, admin dashboard module and others.

5.2 Software Development Environment Setup

Figure 5.1 : Logo of Flutter SDK and Android Studio

The app will be developed on Android Studio with Flutter SDK. Flutter is an open-source UI toolkit by Google that allows developers to build natively compiled applications for mobile, web, and desktop from a single codebase. When using Flutter in Android Studio, developers can write Dart code to create cross-platform apps. Android Studio, which is traditionally used for Android development, integrates Flutter by providing tools like the Flutter plugin. This plugin supports the creation of new Flutter projects, running and debugging apps, and accessing Flutter's rich set of

widgets. Developers can use Android Studio's powerful features, such as code completion, refactoring, and Git integration, while leveraging Flutter to build high-performance, visually appealing apps that run on both Android and iOS.

Figure 5.2 : Firebase Logo

Firebase is used for database management of UTeM Community App. When developing a Flutter app in Android Studio, Firebase can be integrated to provide backend services, enhancing the app's functionality. Android Studio, equipped with the Flutter and Dart plugins, allows developers to build cross-platform apps using Flutter's UI toolkit. Firebase complements this by offering backend services like real-time databases, authentication, and cloud storage, all of which can be seamlessly integrated into the Flutter app using the FlutterFire plugins. In this setup, developers can write their Flutter code in Android Studio and use Firebase to manage backend operations. This includes tasks such as user authentication, data storage, and sending push notifications. Firebase's services can be accessed and configured directly within Android Studio, making it easy to implement complex backend features without leaving the development environment. This integration streamlines the process of building fully-featured, scalable apps with a unified development experience.

Figure 5.3 : Microsoft Visual Studio Code

For admin website development, Microsoft Visual Studio code is used for the development of the admin website. Visual Studio Code (VS Code) is a versatile code editor that is widely used for web development, including creating HTML websites. When developing an HTML website in VS Code, developers can use its features like syntax highlighting, IntelliSense, and extensions to write and manage HTML, CSS, and JavaScript code efficiently. To integrate Firebase into the website, developers can install Firebase tools using npm (Node Package Manager) and configure Firebase within their project. By using Firebase's SDKs, developers can add backend functionalities to their HTML website, such as hosting, real-time databases, authentication, and cloud functions. The Firebase CLI (Command Line Interface) can be used within VS Code to deploy the website to Firebase Hosting, manage Firebase services, and monitor the application's performance. This integration allows developers to build and deploy feature-rich, serverless web applications directly from VS Code.

5.3 Software Configuration Management

Software configuration management explain more on environment configuration setup and the version control procedure when implementing the UTeM Community App.

5.3.1 Configuration Environment Setup

To set up Android Studio for creating a Flutter app with Firebase integration, start by installing the latest version of Android Studio, ensuring that the Android SDK and related tools are included. Next, open Android Studio and install the Flutter and Dart plugins by navigating to the Plugins section in the settings. These plugins enable Flutter development within Android Studio. After setting up Flutter, create a new Flutter project. To integrate Firebase, use the Firebase Console to create a new project and add Android app to it. Download the google-services.json file provided by Firebase and place it in the Flutter project under the android/app directory. Finally, add the necessary Firebase dependencies to the pubspec.yaml file and configure the Firebase SDK in Android-specific files to complete the integration.

To set up Visual Studio Code (VS Code) for creating an HTML website with Firebase integration, start by installing VS Code and Node.js, which includes npm for managing packages. In VS Code, open the terminal and install the Firebase CLI globally using the command npm install -g firebase-tools. This allows developer to interact with Firebase services from their project. Next, create or open HTML website project in VS Code. Initialize Firebase in project by running firebase init in the terminal, selecting the services needed, such as Hosting and Firestore. Follow the prompts to configure Firebase, including linking project to a Firebase account. Once set up, write the HTML, CSS, and JavaScript code in VS Code and use Firebase for backend services like hosting, databases, and authentication, all managed directly from the VS Code environment.

5.3.2 Version Control Procedure

To manage version control for a Flutter Android app integrated with Firebase in Android Studio, start by initializing a Git repository within the project. This can be done directly in Android Studio through the **VCS** menu by selecting "Enable Version Control Integration" and choosing Git. Once initialized, regularly commit changes to the repository, including the Flutter code, Firebase configuration files (like google-services.json), and any related assets. For effective collaboration and backup, connect the local repository to a remote Git service like GitHub or GitLab. Ensure that sensitive files, such as API keys, are excluded using a .gitignore file. By integrating Git with

Android Studio, developer can easily track changes, collaborate with others, and manage the development of Flutter app alongside Firebase services, all within a consistent version control workflow.

5.4 Implementation Status

This section explains the progress of development status for each module developed for this project.

Table 5.1 : List of implementation duration

No.	Module	Description	Duration to complete
1	Login/Logout	Allows users to securely log in and log out of the application.	2 days
2	Student Registration	Manages the creation of new student accounts and user authentication.	2 days
3	Public/Group Student Chat Room	Enables group communication among students in a shared chat environment.	1 week
4	Map for Student Locations	Displays the real-time location of other students on a map.	2 weeks
5	Direct Messaging	Allows students to send private messages to each other.	4 days

6	Discussion Forum	Provides a platform for students to post topics and discuss in threads.	2 days
7	Display User Profile	Shows detailed information about each student, such as name and interests.	2 days
8	Note Taking	Offers a feature for students to take and save notes within the app.	2 days
9	Time Management Schedule	Provides tools for students to plan and manage their time effectively.	2 days
10	Budget Expenses	Allows students to track and manage their financial expenses.	2 days
11	Event Reminder	Sends notifications to remind students about upcoming events or deadlines.	4 days
12	To-Do List	Helps students create and manage a list of tasks they need to complete.	2 days
13	Study Material Sharing	Enables students to upload and share study materials with peers.	2 days
14	Voice/Video Call	Allows students to communicate through voice or video calls.	1 week

15	Push Notification	Sends alerts and updates directly to students' devices.	1 week
16	Website Use for Admin Only	Restricts access to the website so that only administrators can use it.	1 week
17	Register/Login	Allows administrators to register and log in to the website securely.	1 days
18	View All Chat Messages and Forum Discussions	Enables admins to view all chat messages and discussions on the forum.	2 days
19	Receive Report from Users	Allows users to send reports to admins about inappropriate content or behavior.	2 days
20	View User Profiles	Enables admins to view detailed profiles of users on the platform.	2 days
21	Suspend/Ban User	Allows admins to suspend or ban users who violate terms of service.	2 days

CHAPTER 6: TESTING

6.1 Introduction

This chapter describe the activity that involved in the testing phase which are test plan, test strategy, test design, test results and analysis.

6.2 Test Plan

6.2.1 Test Organization

Two tester involved in the testing of the system, 30 people are involved in an online questionnaire survey in order to test the user satisfaction on the system. Tester are friend of mine which is UTeM students. The survey respondents is random people comes from various age and gender.

6.2.2 Test Environment

Black-box testing was conducted remotely. The android APK installer is distributed through social media such as WhatsApp and Telegram. The app can be used everywhere since the database is connected to Firebase. The training for these testers is to test the functionality of the system and ensure the system performed as what it should perform. Training is conducted to make sure testers know what they suppose to do and how are they going to perform the testing process. In the other hand, a questionnaire survey will be distributed alongside the Android APK installer to multiple people. In the questionnaire survey, the survey is hosted on Google Form and Google Form can help generate statistics automatically based on the response from user.

6.2.3 Test Schedule

Table 6.1 : Test Schedule

Test	Schedule
Testing with developer	05/08/2024
Testing with questionnaire survey	7/08/2024-25/08/2021

For tester who is developing the app. I will test the app for 1 day based on the test case designed. Only one cycle will be carried out in this testing phase

For the user acceptance test, the respondents will test the system remotely through their phone. They were given 1 week to complete the questionnaire survey.

6.3 Test Strategy

For the test strategy, black box testing is chosen because access to the code is not required. Black box testing is also well-suited and efficient for large code segments. It also clearly separated the user's perspective from the developer's perspective through visibly defined roles. Many testers can test the system because they do not need the knowledge of implementation, programming languages, or the operating system being used by the system.

6.4 Test Design

6.4.1 Test Description

Test case ID is recognized during the process, the explanation is provided to clarify what the test all about and the module of the system. The list of test cases is registered with the real and anticipated results as shown in Appendix 1 and Appendix 2. Appendix 1 explained the mobile functionality that is added during PSM1. Appendix 2 explained the testing that covers the admin website module. Both Appendix 1 and Appendix 2 also covers the authentication in both side of the system.

6.4.1.1 Test case to test functionality of the system

Table 6.2 : Test case template for testing functionality

Test Case ID	Test Scenario	Test Data	Expected Results	Actual Results	Pass/Fail

The test case template in Table 6.2 is used in software testing to document and organize test cases. It consists of several columns, each serving a specific purpose. The **Test Case ID** column is used to assign a unique identifier to each test case, making it easy to reference and track. The **Test Scenario** column describes the specific situation or condition being tested, outlining the context in which the test will be executed. The **Test Data** column lists the inputs required for the test, such as variables, parameters, or conditions needed to carry out the test scenario. The **Expected Results** column specifies the anticipated outcome if the system under test is functioning correctly. After the test is executed, the **Actual Results** column is used to record what actually happened, providing a basis for comparison with the expected results. Finally, the **Pass/Fail** column indicates whether the test passed or failed based on whether the actual results matched the expected results. This template is crucial for ensuring that test cases are systematically documented, facilitating easier tracking, analysis, and reporting of test outcomes. The full test case table can be seen in Appendix 1 till Appendix 2. There are total 38 test cases prepared for the testers to perform testing process.

6.4.2 Test Result and Analysis

The fact that all test cases shows in Appendix 1 and Appendix 2 achieved a 100% pass rate is a strong indicator that the application is functioning as intended under the tested conditions. This means that for every test scenario, the actual results matched the expected results without any discrepancies. A 100% pass rate suggests that the application is stable and reliable, at least in the areas covered by these test cases. It also implies that the development and testing processes were thorough, as no issues were encountered during testing. However, it's important to note that while a 100% pass rate is encouraging, it doesn't guarantee that the application is entirely bug-

free; it only confirms that the tested scenarios worked as expected. There may still be untested edge cases or other scenarios that could reveal issues.

6.5 User Acceptance Testing

User acceptance testing is conducted to study the acceptance of UTeM Community App by measuring 6 components of perceived ease of use, perceived usefulness, capability, trustworthiness, attitude and intention to use. These five components are guided by the supervisor to conduct user acceptance testing more effectively. The questionnaire is created by using an online platform which are Google Forms for the user acceptance testing.

To study the acceptance level of the users by using UTeM Community App, 30 respondents voluntarily participated which are UTeM students ranging from various faculties in this testing which being conducted from 8 August 2024 until 26 August 2024. All the participants were asked to use the proposed application and then require to answers the questionnaire in Google Forms.

Table 6.3 : All questions in the Google Forms questionnaire

Components	Questions
Perceived ease of use	- The UTeM Community App is flexible to interact with. - I find it easy to get the UTeM Community App to do what I want to do. - It is easy to become skilled at using the UTeM Community App. - I find the UTeM Community app easy to use. - Interaction with the UTeM Community App is clear and understandable.
Perceived usefulness	- Using the UTeM Community App enables me to communicate with other students. - I find the UTeM Community App useful for my daily communication.

	- Using the UTeM Community App enhances my effectiveness in organizing my schedules. - The UTeM Community App makes it easier to add events in public calendar and personal calendar.
Capability	- UTeM Community App provides clear instructions for searching other students and chat with them. - Adding and viewing event in calendar is straightforward in UTeM Community App - The utilities features of the UTeM Community App meet my daily routine needs.
Trustworthiness	- I trust the UTeM Community App to keep my personal information secure. - I feel safe sharing my personal information using the UTeM Community App. - I trust the UTeM Community App to keep my login credential secure.
Attitude	- I enjoy using the UTeM Community App. - It is convenient for me to use the UTeM Community App. - I find it desirable to learn more about using the UTeM Community App.
Intention to Use	- I intend to use UTeM Community App for communicating with other UTeM students. - I intend to use UTeM Community App to get acquainted with the UTeM students community - I will continue to use UTeM Community App for social networking

6.5.1 Test Result and Analysis

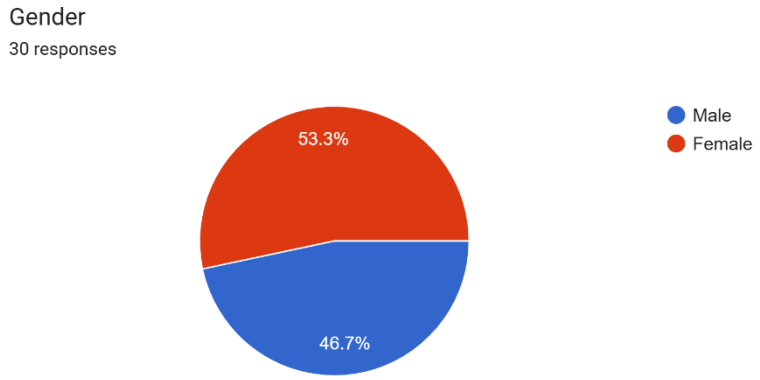

Figure 6.1 : Pie Chart of Gender Question

Figure 6.1 shows that the gender distribution of respondents who participated in the UTeM Community app User Acceptance Test. Out of 30 participants, 53.3% identified as female, while 46.7% identified as male. This suggests a relatively balanced gender representation among the respondents, with a slight majority being female. This distribution provides insight into the demographic composition of the user base, which could influence the interpretation of the test results and the app's reception among different gender groups.

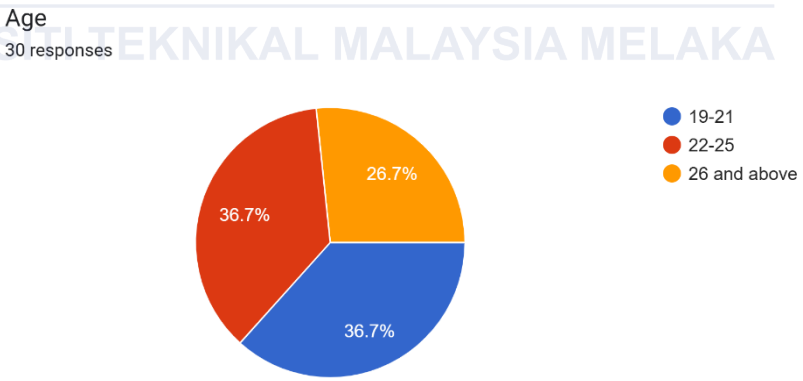

Figure 6.2 : Pie Chart of Age Question

The pie chart in Figure 6.2 represents the age distribution of 30 respondents who participated in a user acceptance survey for the UTeM Community App. The chart is divided into three segments, each representing a different age group. Both the age groups 19-21 and 22-25 are equally represented, each making up 36.7% of the total responses. Meanwhile, the age group of 26 and above accounts for 26.7% of the

respondents. This distribution indicates that the majority of users are young adults, with a slightly smaller proportion of older individuals engaging with the app.

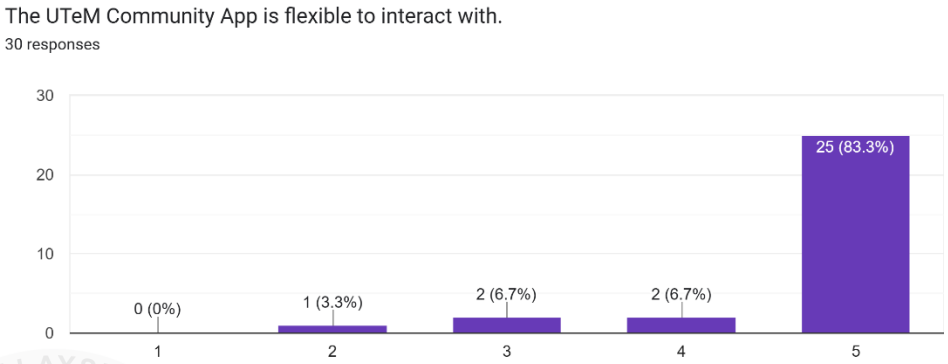

Figure 6.3 : Bar Chart of Question 1 in Perceived Ease of Use (EU)

The bar chart in Figure 6.3 illustrates the responses to the statement, "The UTeM Community App is flexible to interact with," based on a survey of 30 participants. The responses are on a scale from 1 (strongly disagree) to 5 (strongly agree). A significant majority, 25 respondents (83.3%), rated their agreement at the highest level of 5, indicating strong satisfaction with the app's flexibility. A small number of participants gave lower ratings: 2 respondents (6.7%) chose 4, another 2 respondents (6.7%) chose 3, and only 1 respondent (3.3%) chose 2. Notably, no respondents rated the app with a 1, suggesting a generally positive perception of the app’s flexibility among the users.

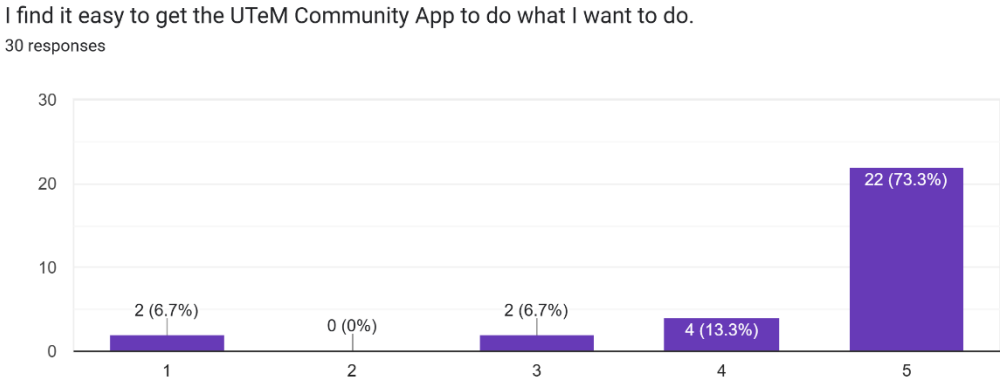

Figure 6.4 : Bar Chart of Question 2 in Perceived Ease of Use (EU)

The bar chart in Figure 6.4 shows the responses to the statement, "I find it easy to get the UTeM Community App to do what I want to do," based on feedback from 30 respondents. A significant majority, 22 respondents (73.3%), gave the highest rating of 5, indicating a strong agreement that the app is easy to use for achieving their goals. Additionally, 4 respondents (13.3%) rated it a 4, suggesting a positive, though slightly less enthusiastic, experience with the app's ease of use. A smaller number of respondents, 2 each (6.7%), rated their experience as a 1 or 3, indicating either disagreement or neutrality about the app's ease of use. Notably, no one chose a 2, highlighting a general trend towards positive usability perceptions among most users.

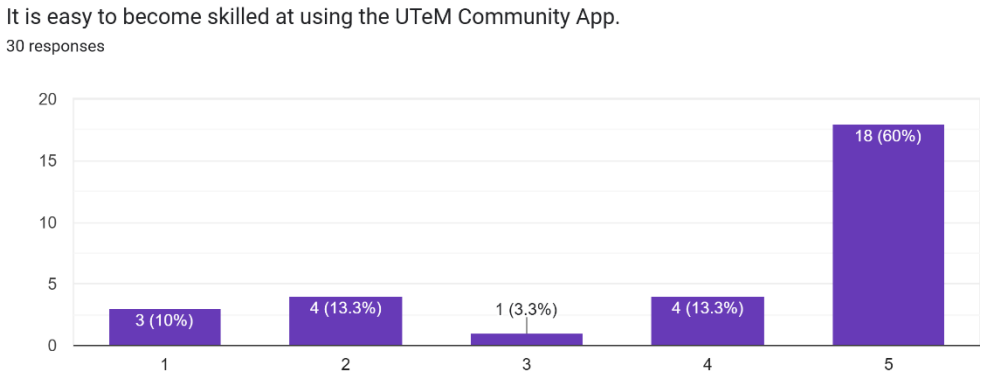

Figure 6.5 : Bar Chart of Question 3 in Perceived Ease of Use (EU)

The bar chart in Figure 6.5 presents responses to the statement, "It is easy to become skilled at using the UTeM Community App," from 30 survey participants. Most respondents, 18 (60%), rated the statement with a 5, indicating a strong belief that the app is easy to master. Additionally, 4 respondents each (13.3%) gave ratings of 2 and 4, showing mixed feedback where some found it less easy to become skilled, while others still had a positive view. A smaller number, 3 respondents (10%), rated the statement with a 1, expressing strong disagreement about the ease of acquiring skills for using the app. Only 1 respondent (3.3%) chose a rating of 3, suggesting a neutral stance. Overall, while the majority find the app easy to use, a notable minority have challenges becoming skilled with it.

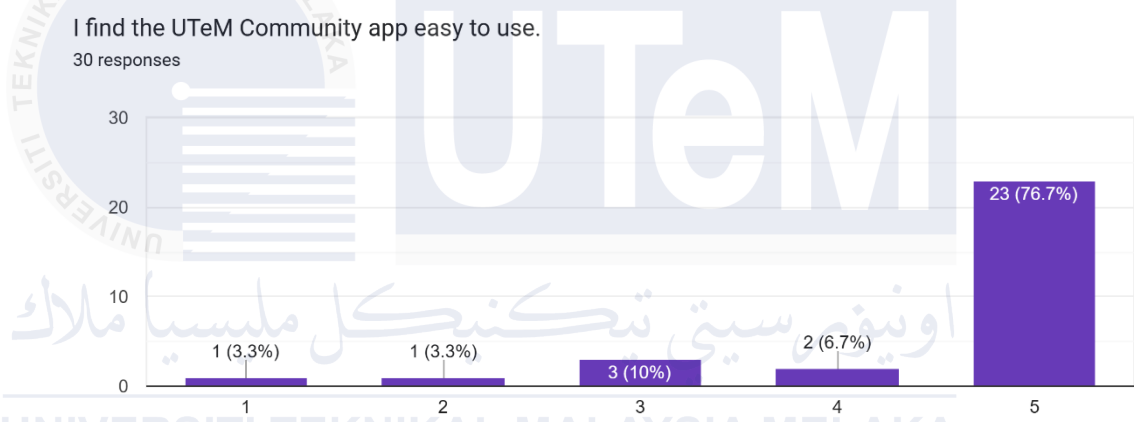

Figure 6.6 : Bar Chart of Question 4 in Perceived Ease of Use (EU)

The bar chart in Figure 6.6 shows the responses to the statement, "I find the UTeM Community app easy to use," from 30 survey participants. A large majority of respondents, 23 (76.7%), rated the app with a 5, strongly agreeing that the app is easy to use, which suggests high satisfaction with its usability. Additionally, 2 respondents (6.7%) rated it a 4, indicating they also find the app easy to use, though slightly less strongly. On the other hand, a few respondents rated the app lower: 3 respondents (10%) gave it a 3, indicating a neutral stance, while 1 respondent each (3.3%) gave it a 1 or 2, reflecting some disagreement about the app's ease of use. Overall, the majority feedback is positive, indicating that most users find the UTeM Community app user-friendly.

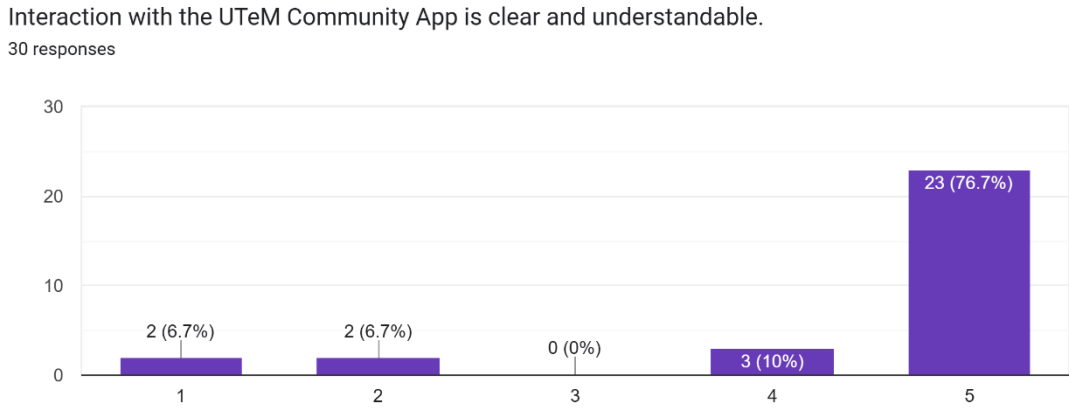

Figure 6.7 : Bar Chart of Question 5 in Perceived Ease of Use (EU)

The bar chart in Figure 6.7 represents the responses to the statement, "Interaction with the UTeM Community App is clear and understandable," from a survey of 30 participants. A substantial majority, 23 respondents (76.7%), rated the statement with a 5, indicating strong agreement that interacting with the app is clear and understandable. This suggests that most users find the app's interface and functions easy to comprehend. Additionally, 3 respondents (10%) gave it a rating of 4, further supporting the app's clarity and understandability. However, 2 respondents each (6.7%) rated the statement with a 1 or 2, reflecting a minority who found the app less clear and understandable. Notably, no respondents chose a rating of 3, implying users have definitive views about the app’s clarity, either finding it highly understandable or not. Overall, the feedback is predominantly positive, highlighting effective user interaction design.

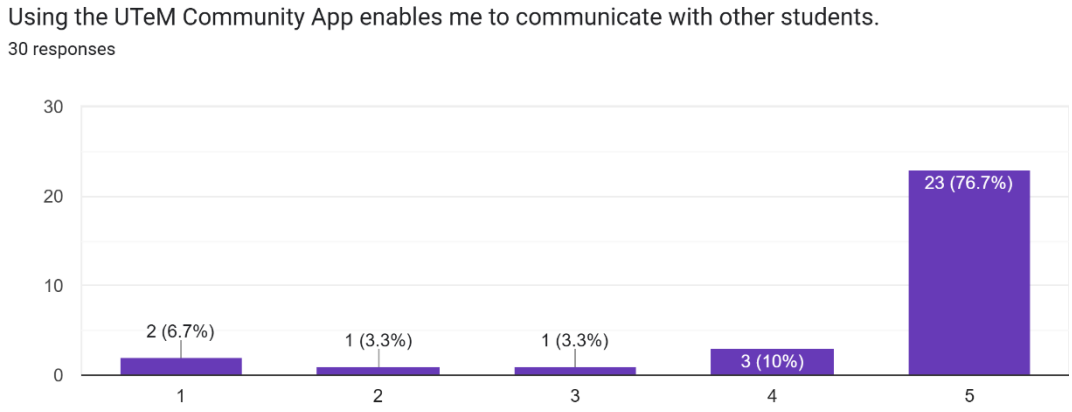

Figure 6.8 : Bar Chart of Question 1 in Perceived Usefulness (PU)

The bar chart in Figure 6.8 depicts responses to the statement, "Using the UTeM Community App enables me to communicate with other students," from a survey of 30 participants. A significant majority of respondents, 23 (76.7%), rated the statement with a 5, indicating strong agreement that the app effectively facilitates communication among students. Additionally, 3 respondents (10%) rated it a 4, showing they also find the app helpful for communication, albeit slightly less strongly. A small minority of respondents had lower ratings: 2 respondents (6.7%) gave it a 1, and 1 respondent each (3.3%) rated it a 2 or 3, reflecting some disagreement or neutrality about the app's effectiveness in enabling student communication. Overall, the feedback is predominantly positive, suggesting that most users feel the UTeM Community App is a valuable tool for student interaction and communication.

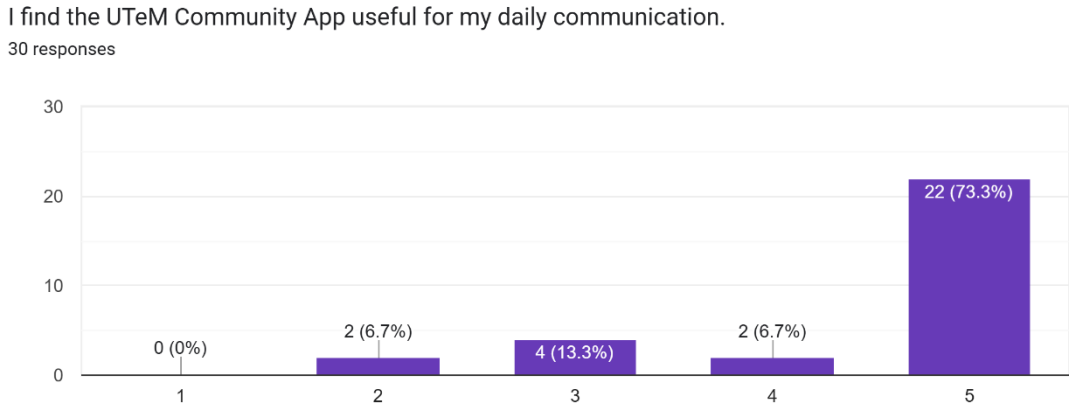

Figure 6.9 : Bar Chart of Question 2 in Perceived Usefulness (PU)

The bar chart in Figure 6.9 displays the responses to the statement, "I find the UTeM Community App useful for my daily communication," based on a survey of 30 participants. A large majority, 22 respondents (73.3%), rated the app with a 5, strongly agreeing that the app is useful for their daily communication needs. This indicates a high level of satisfaction with the app's functionality in facilitating everyday communication. Additionally, 2 respondents each (6.7%) rated it with a 2 or 4, reflecting a range of experiences from slight dissatisfaction to moderate satisfaction. Meanwhile, 4 respondents (13.3%) rated it with a 3, suggesting a neutral stance on the app's usefulness. Notably, no respondents gave a rating of 1, indicating no strong disagreement with the app's utility for daily communication. Overall, the feedback is highly positive, suggesting that the UTeM Community App meets the daily communication needs of most users effectively.

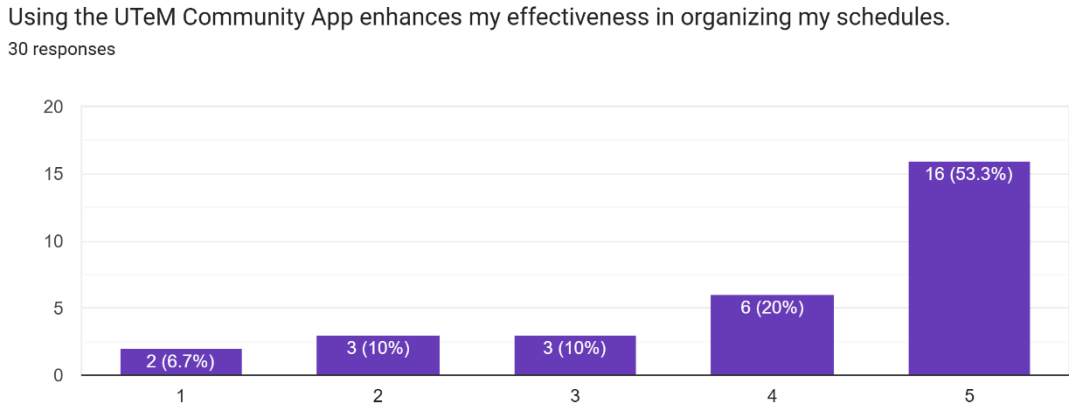

Figure 6.10 : Bar Chart of Question 3 in Perceived Usefulness (PU)

The bar chart in Figure 6.10 illustrates the responses to the statement, "Using the UTeM Community App enhances my effectiveness in organizing my schedules," based on feedback from 30 survey participants. Many respondents, 16 (53.3%), rated the app with a 5, indicating strong agreement that the app significantly improves their ability to organize schedules. Additionally, 6 respondents (20%) rated it a 4, also reflecting a positive experience, though slightly less strong. On the other hand, 3 respondents each (10%) rated the app with a 2 or 3, indicating some users have a neutral or slightly negative view of the app's effectiveness in schedule organization. A smaller group, 2 respondents (6.7%), gave a rating of 1, showing disagreement with the statement. Overall, the majority of feedback is positive, suggesting that the UTeM Community App is generally seen as a helpful tool for enhancing scheduling effectiveness, although some users feel it could be improved in this regard.

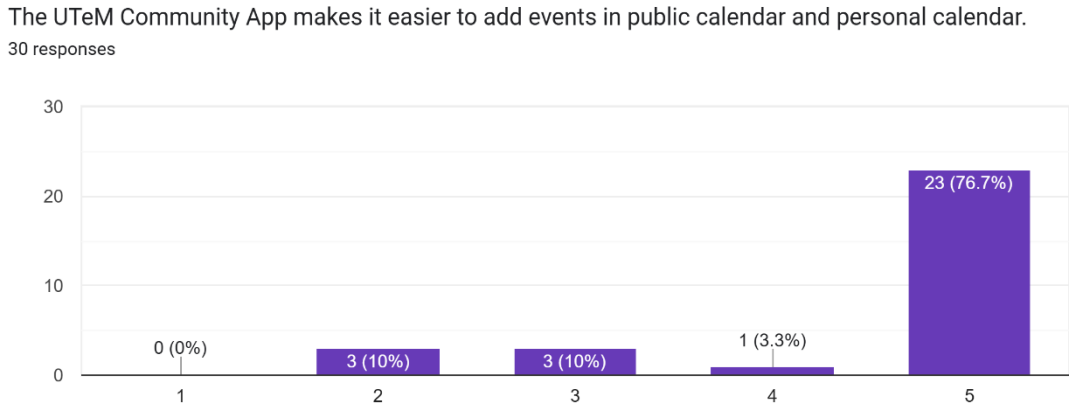

Figure 6.11 : Bar Chart of Question 4 in Perceived Usefulness (PU)

The bar chart in Figure 6.11 shows the responses to the statement, "The UTeM Community App makes it easier to add events in the public calendar and personal calendar," from 30 survey participants. Most respondents, 23 (76.7%), rated the statement with a 5, indicating a strong belief that the app simplifies the process of adding events to both public and personal calendars. This suggests that most users find the app highly effective in managing event scheduling. Additionally, 1 respondent (3.3%) rated it a 4, which also indicates a positive experience with this feature of the app, though slightly less strongly. On the other hand, 3 respondents each (10%) rated the statement with a 2 or 3, reflecting either a neutral or mildly negative perception of the app's functionality in this area. Notably, no respondents gave a rating of 1, suggesting that there is no strong disagreement with the app's ease of use for calendar management. Overall, the feedback is overwhelmingly positive, highlighting the app's effectiveness in helping users manage their schedules.

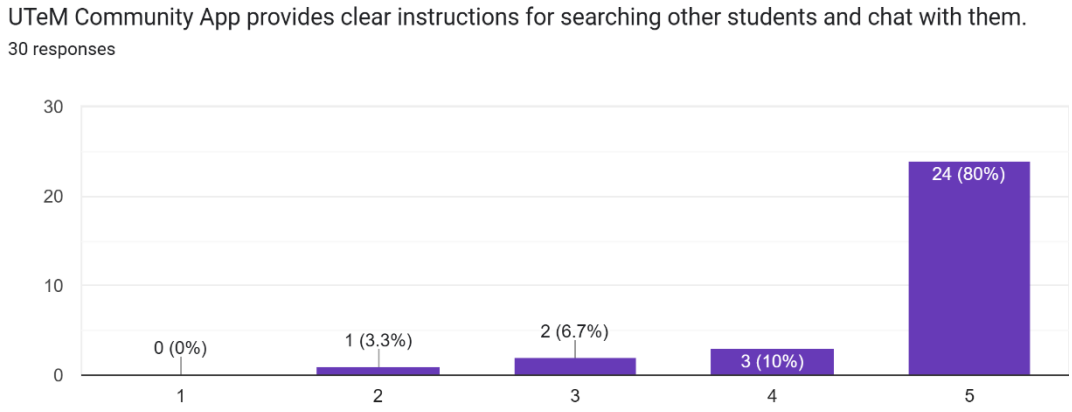

Figure 6.12 : Bar Chart of Question 1 in Capability (CP)

The bar chart in Figure 6.12 depicts the responses to the statement, "UTeM Community App provides clear instructions for searching other students and chat with them," based on feedback from 30 survey participants. A substantial majority, 24 respondents (80%), rated the statement with a 5, indicating strong agreement that the app provides clear instructions for finding and communicating with other students. This suggests that most users find the app's user interface and instructions for social interaction easy to follow. Additionally, 3 respondents (10%) gave a rating of 4, showing that they also perceive the instructions as clear, though with slightly less conviction. A smaller number of respondents rated the app lower: 2 respondents (6.7%) gave a rating of 3, indicating a neutral perception, and 1 respondent (3.3%) gave a rating of 2, reflecting some dissatisfaction. Notably, no respondents gave a rating of 1, indicating no strong disagreement about the clarity of the app’s instructions. Overall, the majority of users find the instructions for searching and chatting with other students to be clear and effective.

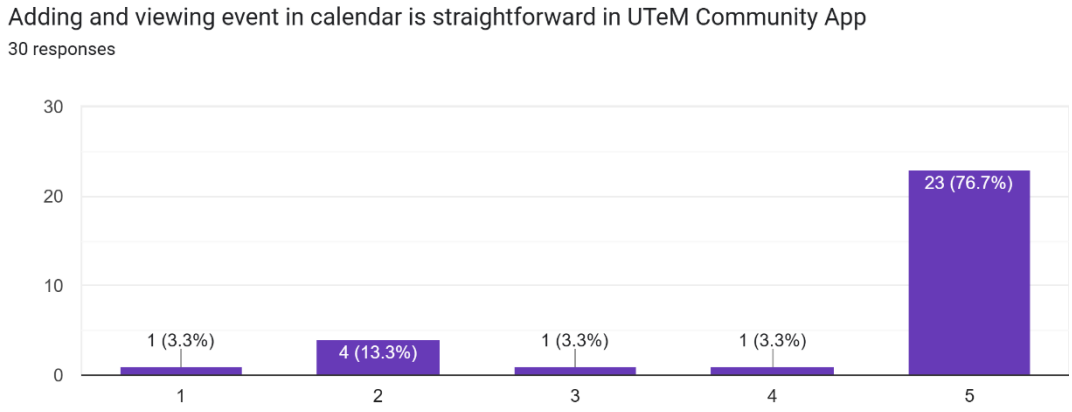

Figure 6.13 : Bar Chart of Question 2 in Capability (CP)

The bar chart in Figure 6.13 illustrates the responses to the statement, "Adding and viewing events in the calendar is straightforward in UTeM Community App," based on a survey of 30 participants. A large majority of respondents, 23 (76.7%), rated the statement with a 5, indicating strong agreement that the process of adding and viewing events in the app's calendar is easy and straightforward. This reflects high satisfaction with this feature of the app. Additionally, 1 respondent each (3.3%) rated the statement with a 3 or 4, suggesting that a small minority found the process to be somewhat straightforward. On the other hand, 4 respondents (13.3%) rated the statement with a 2, indicating that they found the process less straightforward. Only 1 respondent (3.3%) rated it with a 1, showing strong disagreement. Overall, the feedback indicates that most users find the calendar functionality of the UTeM Community App to be user-friendly and easy to navigate, although a small group of users experienced some difficulties.

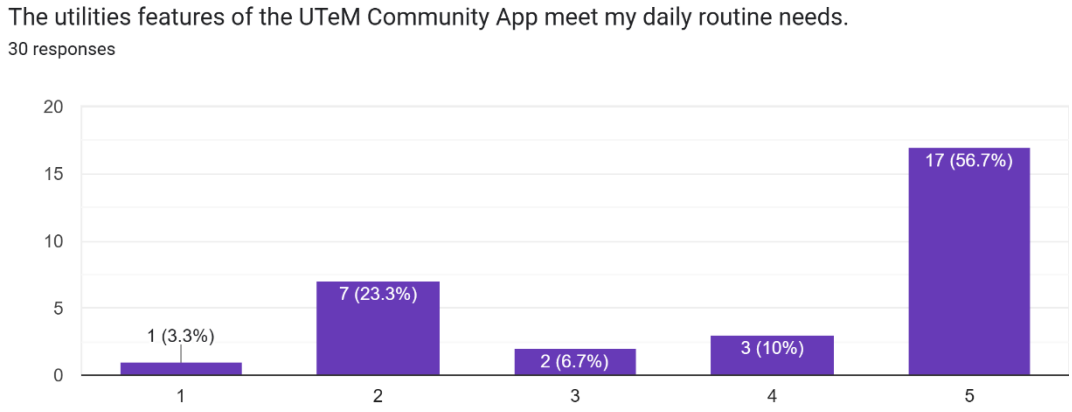

Figure 6.14 : Bar Chart of Question 3 in Capability (CP)

The bar chart in Figure 6.14 indicates that the majority of users, 17 out of 30 (56.7%), strongly agree that the utility features of the UTeM Community App meet their daily routine needs, with another 3 users (10%) agreeing somewhat. However, a notable portion of the respondents, 7 users (23.3%), rated their agreement with a 2, and 2 users (6.7%) were neutral, suggesting some dissatisfaction or unmet expectations. Only 1 respondent (3.3%) strongly disagreed, highlighting that while most users find the app's utility features beneficial, there is still room for improvement to better meet all users' needs.

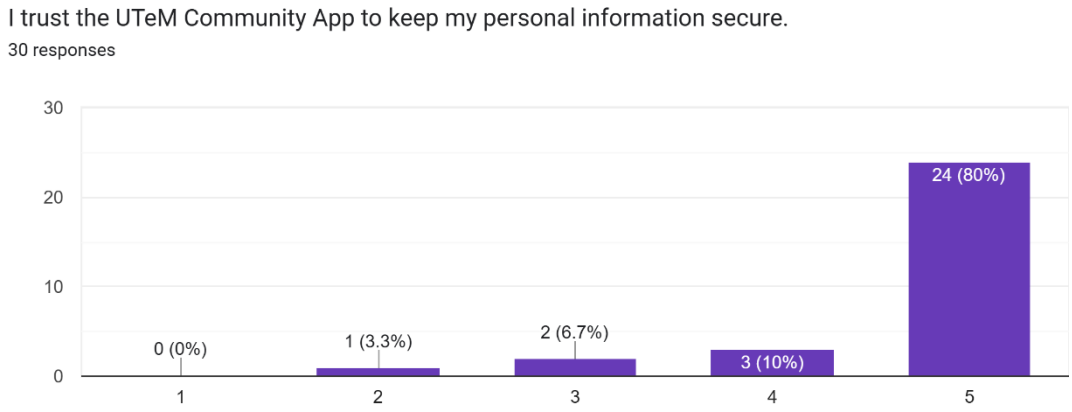

Figure 6.15 : Bar Chart of Question 1 in Trustworthiness (TW)

The bar chart Figure 6.15 shows that a strong majority of respondents, 24 out of 30 (80%), rated their trust in the UTeM Community App to keep their personal information secure with a 5, indicating high confidence in the app's security. Additionally, 3 respondents (10%) rated it a 4, also expressing trust in the app's ability to protect personal data. A smaller number of respondents, 2 (6.7%), rated it a 3, suggesting a neutral stance, while only 1 respondent (3.3%) gave a rating of 2, showing a slight lack of confidence. No respondents strongly disagreed, reflecting overall positive perceptions of the app's data security measures.

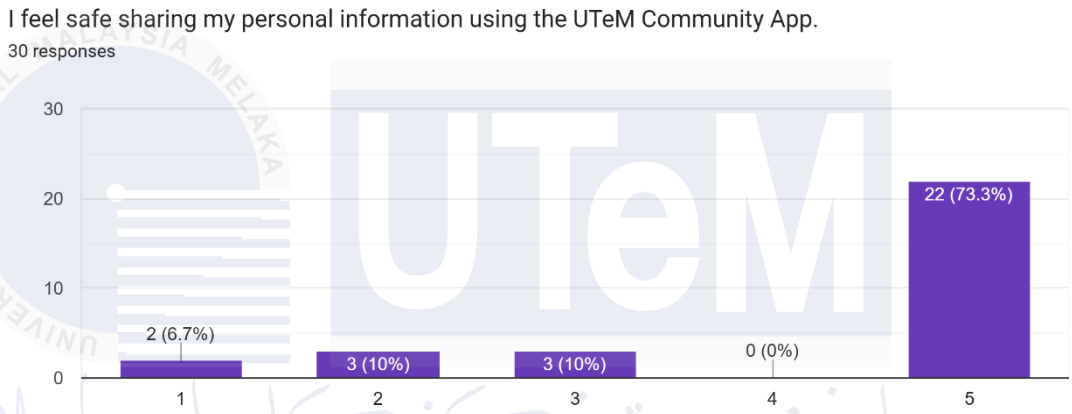

Figure 6.16 : Bar Chart of Question 2 in Trustworthiness (TW)

The bar chart in Figure 6.16 indicates that a majority of respondents, 22 out of 30 (73.3%), feel very safe sharing their personal information using the UTeM Community App, as they rated their safety perception with a 5. Additionally, 3 respondents (10%) rated it with a 3, suggesting a neutral feeling of safety, while another 3 respondents (10%) gave it a 2, indicating some concerns. A small portion, 2 respondents (6.7%), rated it with a 1, reflecting a lack of safety. Notably, no respondents chose a 4, highlighting a strong polarization in user perceptions, with most feeling either very safe or expressing some level of discomfort.

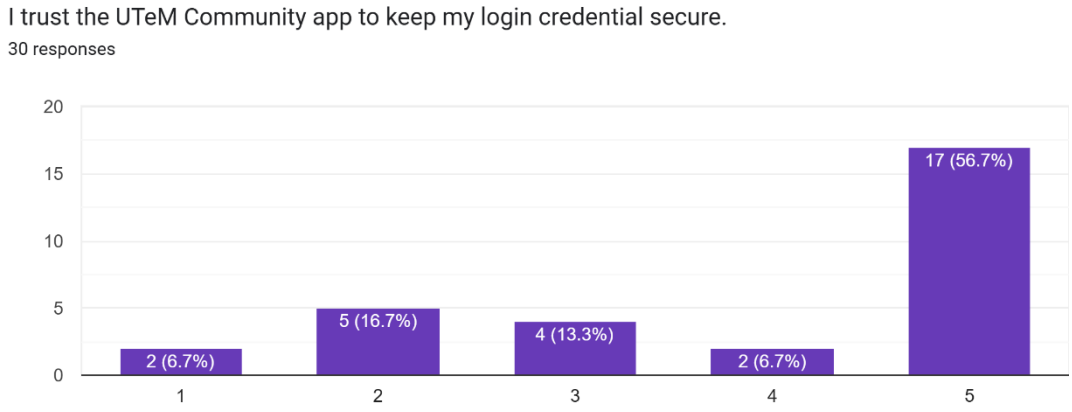

Figure 6.17 : Bar Chart of Question 3 in Trustworthiness (TW)

The bar chart in Figure 6.17 shows that most respondents, 17 out of 30 (56.7%), strongly trust the UTeM Community app to keep their login credentials secure, giving it a rating of 5. Additionally, 2 respondents (6.7%) rated it a 4, indicating moderate trust. Meanwhile, 4 respondents (13.3%) chose a neutral rating of 3, and 5 respondents (16.7%) rated it a 2, suggesting some concerns about security. A smaller number, 2 respondents (6.7%), rated it a 1, indicating a lack of trust in the app's ability to secure their login credentials. Overall, while most users have high trust in the app's security, there are notable concerns among a minority of users.

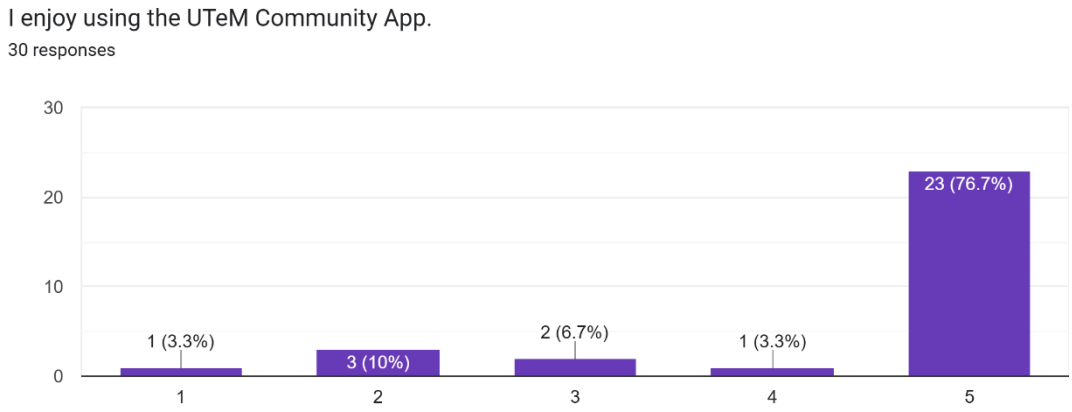

Figure 6.18 : Bar Chart of Question 1 in Attitude (ATT)

The bar chart in Figure 6.18 reveals that a significant majority of respondents, 23 out of 30 (76.7%), rated their enjoyment of using the UTeM Community App with a 5, indicating they highly enjoy using the app. A smaller number of respondents, 2 (6.7%), rated their enjoyment with a 3, showing a neutral stance, while 1 respondent each (3.3%) gave a rating of 1 and 4, indicating varying levels of enjoyment. Additionally, 3 respondents (10%) rated it a 2, suggesting some users do not find the app enjoyable. Overall, the chart shows that most users have a positive experience with the UTeM Community App, although a small group finds less enjoyment in using it.

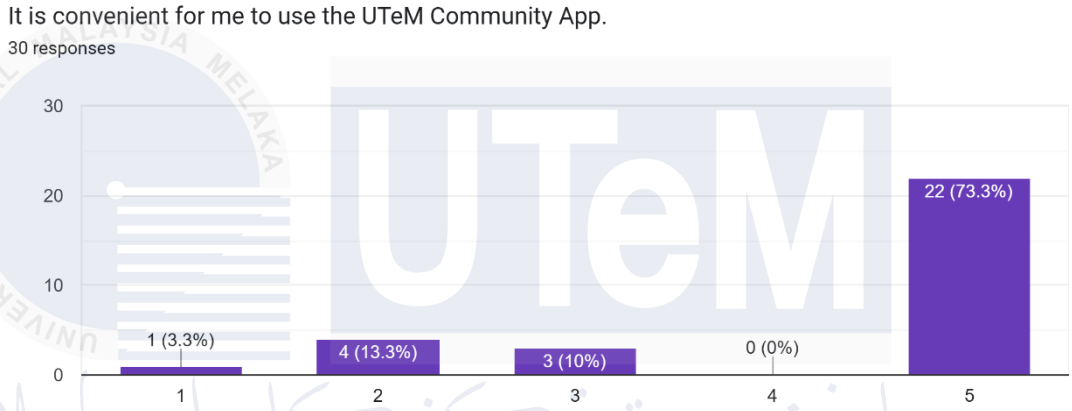

Figure 6.19 : Bar Chart of Question 2 in Attitude (ATT)

The bar chart in Figure 6.19 shows that a majority of respondents, 22 out of 30 (73.3%), find the UTeM Community App very convenient to use, as indicated by a rating of 5. Additionally, 3 respondents (10%) gave a neutral rating of 3, and 4 respondents (13.3%) rated it a 2, suggesting some find it less convenient. Only 1 respondent (3.3%) rated the app with a 1, indicating strong inconvenience. Notably, no respondents chose a 4, emphasizing the polarization in views about the app's convenience. Overall, most users perceive the app as highly convenient, though a small minority have reservations.

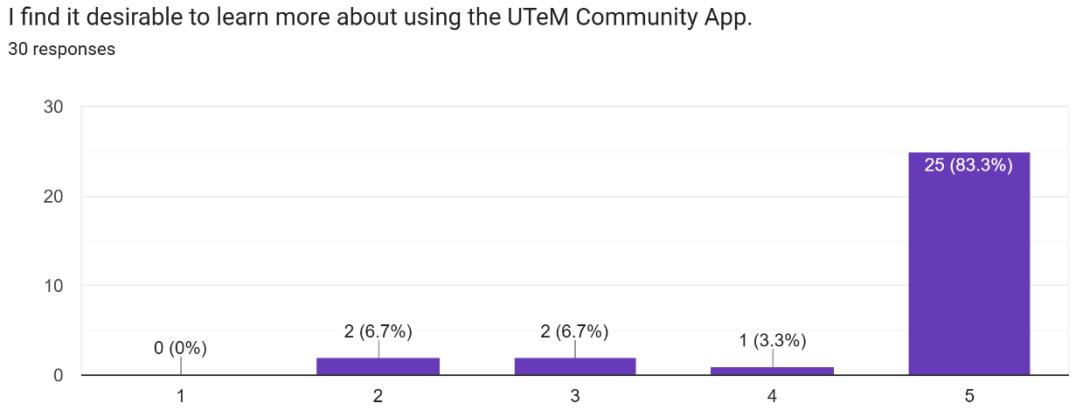

Figure 6.20 : Bar Chart of Question 3 in Attitude (ATT)

The bar chart indicates that a vast majority of respondents, 25 out of 30 (83.3%), find it highly desirable to learn more about using the UTeM Community App, as shown by a rating of 5. A small number of respondents, 2 each (6.7%), gave ratings of 2 or 3, reflecting some neutrality or slight disinterest in further learning about the app. Only 1 respondent (3.3%) rated it a 4, indicating moderate desirability. Notably, no respondents rated it with a 1, indicating no strong disinterest. Overall, the chart highlights a strong interest among users in gaining more knowledge about the app's features and capabilities.

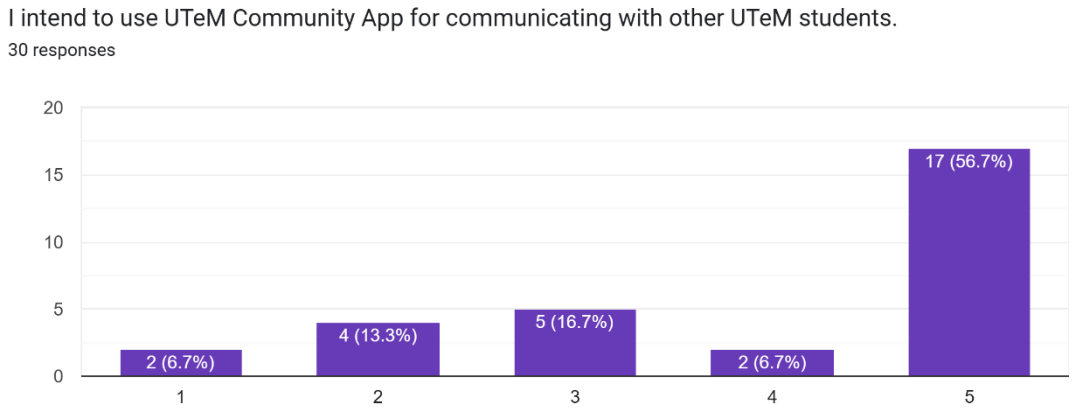

Figure 6.21 : Bar Chart of Question 1 in Intention to Use (IU)

The bar chart in Figure 6.21 shows that the majority of respondents (56.7%) strongly intend to use the UTeM Community App for communication with other students, indicating a positive reception. A smaller proportion of participants are neutral (16.7%) or slightly negative (13.3%) about using the app, while a minimal number (6.7%) are either disinclined or moderately inclined to use it. Overall, the chart reflects a generally favorable attitude towards adopting the app among the surveyed group.

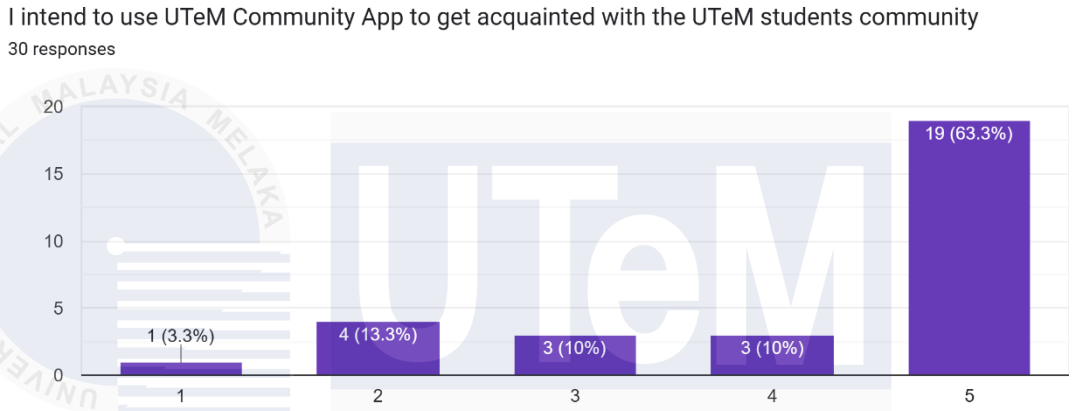

Figure 6.22 : Bar Chart of Question 2 in Intention to Use (IU)

The bar chart in Figure 6.22 displays the responses from 30 participants regarding their intention to use the UTeM Community App to get acquainted with the UTeM student community. Most respondents (63.3%) strongly agree with the intention to use the app, selecting the highest rating of 5. A smaller portion of respondents (10%) rated their intention as neutral with a score of 3, and another 10% rated it just below positive at 4. Additionally, 13.3% of participants showed slight reluctance with a score of 2, while only 3.3% selected the lowest rating of 1, indicating a strong disinterest. Overall, the chart indicates a generally positive attitude towards using the app for connecting with the student community, with the majority of users expressing a strong intention to engage with the app for this purpose.

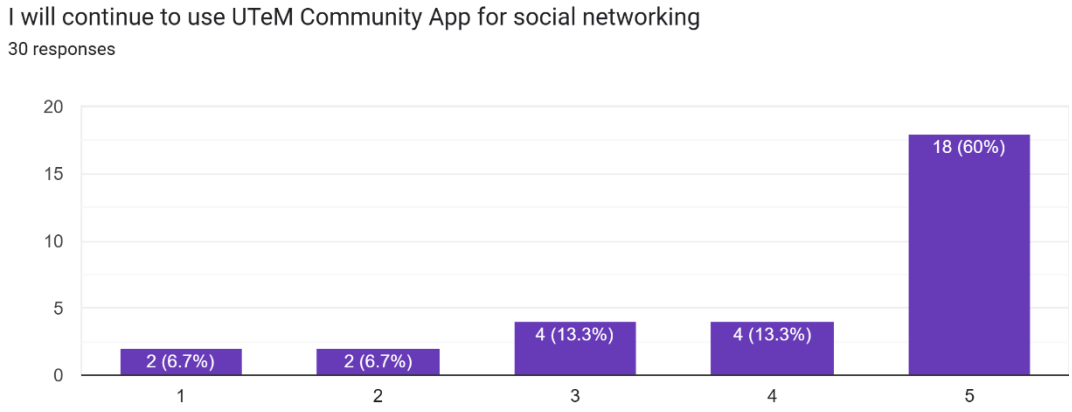

Figure 6.23 : Bar Chart of Question 3 in Intention to Use (IU)

The bar chart in Figure 6.23 illustrates the responses of 30 participants regarding their intention to continue using the UTeM Community App for social networking. The majority of respondents (60%) strongly agree with continuing to use the app, selecting the highest rating of 5. A smaller portion of participants (13.3%) rated their intention as moderate, selecting either 3 or 4. Meanwhile, 13.4% of respondents expressed low intention to continue using the app, with 6.7% each selecting ratings of 1 and 2. Overall, the chart indicates a predominantly positive outlook towards the continued use of the UTeM Community App for social networking, with a significant majority of users intending to remain engaged with the app.

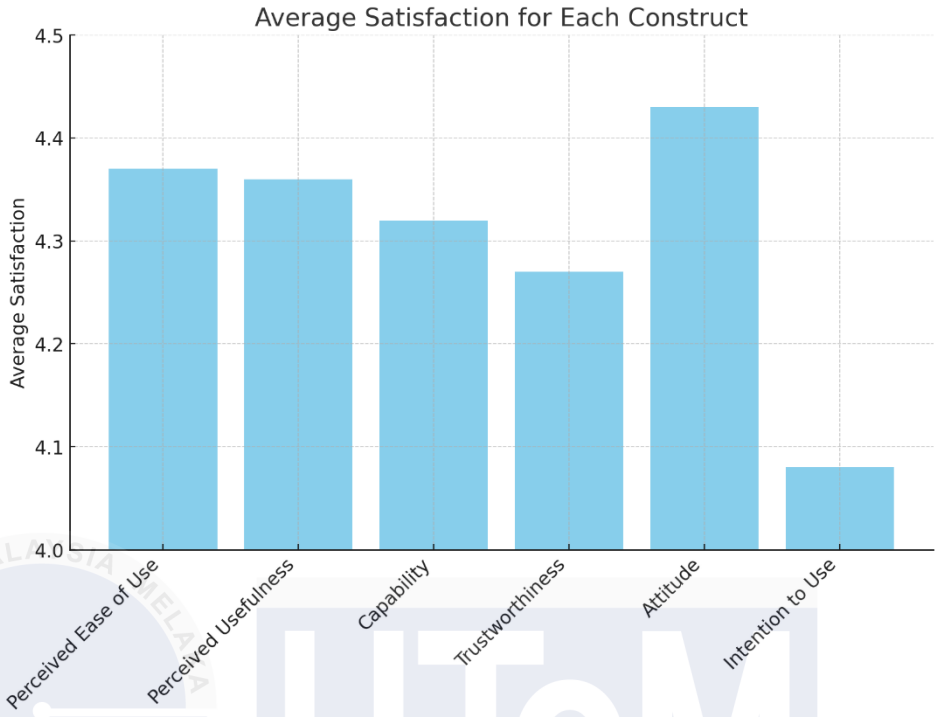

Figure 6.24 : End user satisfaction bar chart

The bar chart in Figure 6.24 displays the average satisfaction scores for six different constructs related to the UTeM Community App. "Attitude" has the highest average satisfaction score at around 4.43, indicating that users generally have a positive attitude toward the app. "Perceived Ease of Use" and "Perceived Usefulness" follow closely with scores of 4.37 and 4.36, respectively, suggesting that users find the app both easy to use and useful. "Capability" and "Trustworthiness" have slightly lower average satisfaction scores, but still relatively high at 4.32 and 4.27. The lowest score is for "Intention to Use," with an average satisfaction of 4.08, indicating that while overall satisfaction is positive, there is slightly less enthusiasm in terms of the users' intent to continue using the app. Overall, the chart reflects a generally favourable user experience across all constructs.

6.6 Conclusion

The testing phase for the UTeM Community App, as outlined in this chapter, was comprehensive and methodical, covering various aspects such as functionality, user satisfaction, and overall system reliability. The use of black-box testing and a structured test environment, combined with user acceptance testing involving 30

diverse participants, ensured thorough evaluation from both technical and user perspectives. The 100% pass rate across all test cases indicates a high level of system stability and functionality under the tested scenarios. User feedback, reflected in the high mean satisfaction scores across multiple constructs, suggests that the app is well-received, particularly in terms of ease of use, usefulness, and overall attitude towards the app. However, while user responses were generally positive, the slightly lower score in "Intention to Use" indicates an area for potential improvement in encouraging long-term engagement with the app.

CHAPTER 7: PROJECT CONCLUSION

7.1 System Strength

The UTeM Community App, designed exclusively for Android, showcases technical strengths in its optimized use of the Android platform. Leveraging Flutter, the app achieves a high level of performance and a visually appealing interface, which ensures a smooth and responsive user experience. The integration of Firebase for backend services provides real-time data synchronization and robust authentication, which are critical for the app's communication features, such as chat rooms and event management. Additionally, the app's modular architecture facilitates maintainability and future enhancements, making it a scalable solution tailored to the specific needs of UTeM students. This focused Android development allows the app to fully utilize the platform's capabilities, ensuring a reliable and engaging user experience.

7.2 System Weakness

The UTeM Community App, while robust in many areas, exhibits several weaknesses that warrant attention. Technically, the app is currently limited to the Android platform, which restricts its accessibility for users on other operating systems, potentially alienating a significant portion of the student body. Functionally, although the app integrates various utilities, some features, like time management and budgeting tools, may not be fully optimized to meet the specific academic and personal needs of students, leading to lower engagement over time. The interface, while generally user-friendly, can be perceived as simplistic, which might not appeal to users accustomed to more visually dynamic and interactive apps. These aspects collectively suggest areas where the app could be enhanced to better serve its users..

7.3 Proposition for Improvement

To address these weaknesses and enhance the app's long-term viability, several improvements are proposed. First, the app could benefit from the introduction of features that increase user engagement over time, such as gamification elements, regular updates with new content or features, and more personalized user experiences. Enhancing the utility features to better align with students' daily needs—perhaps by integrating more academic-specific tools or improving existing ones—could increase the app's relevance. To tackle security concerns, it would be prudent to strengthen the app's security measures, possibly by implementing additional layers of protection, like two-factor authentication, and by clearly communicating these measures to users to build trust. Additionally, user feedback mechanisms could be implemented more robustly, allowing the app to evolve based on continuous user input.

7.4 Project Contribution

The UTeM Community App project has made significant contributions to improving the university experience for students by providing a centralized platform for communication, collaboration, and resource management. By integrating various tools that cater specifically to students' academic and social needs, the app has successfully created a digital space that fosters community and enhances student engagement. The project also contributes to administrative efficiency by offering a robust backend for user management, which is crucial for maintaining a safe and well-regulated online environment. The inclusion of real-time communication features, such as voice and video calls, alongside academic utilities, represents a significant advancement over existing platforms, offering a tailored solution that meets the unique demands of university students and administrators.

7.5 Conclusion

In conclusion, the UTeM Community App represents a significant step forward in enhancing the student experience at UTeM. The project has successfully addressed many of the challenges identified in the initial problem statement, offering a comprehensive solution that integrates communication, collaboration, and academic utilities within a single platform. The high levels of user satisfaction and the successful

testing outcomes indicate that the app is both functional and well-received by its intended audience. However, the project has also highlighted areas for improvement, particularly in terms of long-term user engagement and security. Moving forward, addressing these areas will be crucial for ensuring the app's sustained success and relevance. Overall, the project has laid a strong foundation for further development, contributing valuable insights and tools that will benefit the UTeM student community.

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APPENDICES

Appendix 1

Test Case ID	Test Scenario	Test Data	Expected Results	Actual Results	Pass/Fail
UCA1001	Enter a valid username and password	username = "hishamsalehhudin@gmail.com" password = "test123"	Redirected to the homepage of the app	Redirected to the homepage of the app	Pass
UCA1002	Enter a valid username and invalid password	username = "hishamsalehhudin@gmail.com" password = "abc123"	An alert box will pop up and display "invalid-credential"	An alert box will pop up and display "invalid-credential"	Pass
UCA1003	Enter an invalid username and valid password	username = "hishamsalehhudin" password = "abc123"	An alert box will pop up and display "invalid-credential"	An alert box will pop up and display "invalid-credential"	Pass
UCA1004	Tap on forgot password		Popup dialog box for user to enter their valid email address	Popup dialog box for user to enter their valid email address	Pass
UCA1005	Enter valid email in the forgot password email form	email = "hishamsalehhudin@gmail.com"	User receive email for password reset	User receive email for password reset	Pass
UCA2001	Start a voice call via personal chat		Redirected to the voice call screen	Redirected to the call screen	Pass
UCA2002	Join the voice call on the other account via personal		Redirected to the voice call screen and connect to the voice call host	Redirected to the call screen and connect to the voice call host	Pass

	chat				
UCA2003	Start a video call via personal chat		Redirected to the video call screen	Redirected to the video call screen	Pass
UCA2003	Join the video call on the other account via personal chat		Redirected to the video call screen and connect to the voice call host	Redirected to the video call screen and connect to the voice call host	Pass
UCA2004	Start a video conference via group chat		Redirected to the video conference screen	Redirected to the video conference screen	Pass
UCA2005	Join a video conference via group chat		Redirected to the video conference screen and connect to the host of the video conference	Redirected to the video conference screen and connect to the host of the video conference	Pass
UCA3001	Tap on the flag icon on a forum discussion		Dialog box for report post pop-up	Dialog box for report post pop-up	Pass
UCA3002	Enter reason for reporting and post report.	Report reason = “Inappropriate post”	Admin received the report	Admin received the report	Pass

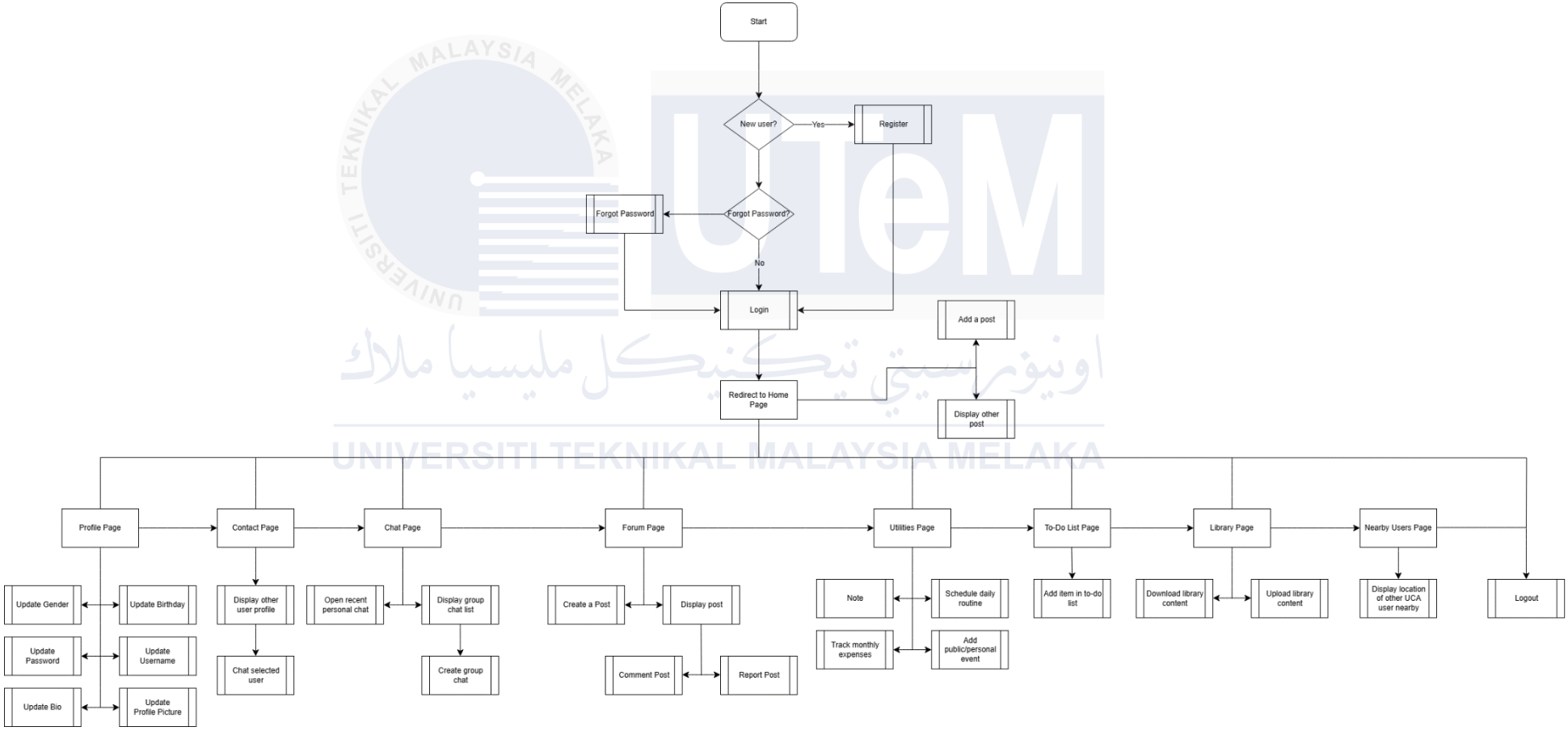
Appendix 2

Test Case ID	Test Scenario	Test Data	Expected Results	Actual Results	Pass/Fail
UCA4001	Enter a valid username and password in the admin site login	username = "hishamsalehhudin@gmail.com" password = "test123"	Redirect to admin dashboard	Redirect to admin dashboard	Pass
UCA4002	Enter a valid username and password but not an admin user.	username = "ben10boy23@gmail.com" password = "test123"	Display "Only administrators can log in"	Display "Only administrators can log in"	Pass
UCA4003	Click on Users navigation link		Redirect to the User Registered page	Redirect to the User Registered page	Pass
UCA4004	Click on Reports navigation link		Redirect to the Reports page	Redirect to the Reports page	Pass
UCA4005	Click on Events navigation link		Redirect to the Events page	Redirect to the Events page	Pass
UCA4006	Click on view button on User Registered table		Pop-up the User Details dialog box	Pop-up the User Details dialog box	Pass
UCA4007	Click on Suspend User button on the User Details dialog box and click OK on the confirmation box		Pop up an alert box said "User Suspended" and the button is changed to "Lift Suspension"	Pop up an alert box said "User Suspended" and the button is changed to "Lift Suspension"	Pass
UCA4008	Login into the app as the	username =	Alert box popup: "Your account Is	Alert box popup: "Your account Is	Pass

	suspended user	"ben10boy23@gmail.com" password = "test123"	suspended. Please contact support"	suspended. Please contact support"	
UCA4009	Click on Lift Suspension button on the User Details dialog box and click OK on the confirmation box		Pop up an alert box said "User suspension lifted" and the button is changed to "Suspend User"	Pop up an alert box said "User suspension lifted" and the button is changed to "Suspend User"	Pass
UCA4010	Login into the app as the lifted suspension user	username = "ben10boy23@gmail.com" password = "test123"	Redirect to the app homepage	Redirect to the app homepage	Pass
UCA4011	Click on Grant Admin button on the User Details dialog box and click OK on the confirmation box		Pop up an alert box said "Admin permission granted" and the button is changed to "Remove Admin"	Pop up an alert box said "Admin permission granted" and the button is changed to "Remove Admin"	Pass
UCA4012	Login in the admin website as the granted as admin user.	username = "ben10boy23@gmail.com" password = "test123"	Redirect to the admin dashboard page	Redirect to the admin dashboard page	Pass
UCA4013	Click on Grant Admin button on the User Details dialog box and click OK on the confirmation box		Pop up an alert box said "Admin permission removed" and the button is changed to "Grant Admin"	Pop up an alert box said "Admin permission removed" and the button is changed to "Grant Admin"	Pass
UCA4014	Login in the admin website as the remove admin permission user.	username = "ben10boy23@gmail.com" password = "test123"	Display "Only administrators can log in"	Display "Only administrators can log in"	Pass
UCA4015	Click on "View & Action "button on Reports table		Pop-up the Report Details dialog box	Pop-up the Report Details dialog box	Pass
UCA4016	Click on Dismiss Report button on the Report Details dialog box.		Pop up an alert box said "Report dismissed" and the report status is changed from "Pending" to "Completed".	Pop up an alert box said "Report dismissed" and the report status is changed from "Pending" to "Completed".	Pass
UCA4017	Click on Delete Report button on the Report Details dialog box.		Pop up an alert box said "Post deleted and report status updated successfully" and the report status is changed from "Pending" to "Completed".	Pop up an alert box said "Post deleted and report status updated successfully" and the report status is changed from "Pending" to "Completed".	Pass
UCA4018	Click on "View & Action "button on Events table		Pop-up the Events Details dialog box	Pop-up the Events Details dialog box	Pass
UCA4019	Click on Approve Event button on the Event Details and click OK on the		Pop up an alert box said "Event Approved" and the event status is changed from "Pending" to	Pop up an alert box said "Event Approved" and the event status is changed from "Pending" to	Pass

	confirmation dialog box.		"Approved".	"Approved".	
UCA4020	Check event approval notification on phone.		Event approval notification on phone received	Event approval on phone received	Pass
UCA4021	Check approved event on Public Calendar page in the app.		Approved event is displayed on the Public Calendar.	Approved event is displayed on the Public Calendar.	Pass
UCA4022	Click on Reject Event button on the Event Details and click OK on the confirmation dialog box.		Pop up an alert box said "Event Rejected" and the event status is changed from "Pending" to "Rejected".	Pop up an alert box said "Event Rejected" and the event status is changed from "Pending" to "Rejected".	Pass
UCA4023	Check event rejection notification on phone.		Event rejection notification on phone received	Event rejection notification on phone received	Pass
UCA4024	Check rejected event on Public Calendar page in the app.		Rejected event is not displayed on the Public Calendar.	Rejected event is not displayed on the Public Calendar.	Pass
UCA4025	Click on Delete Event button on the Event Details and click OK on the confirmation dialog box.		Pop up an alert box said "Event Deleted" and the event is removed from the Events table.	Pop up an alert box said "Event Deleted" and the event is removed from the Events table.	Pass
UCA4026	Check the approved event that has been deleted in the Public Calendar.		Deleted event is removed from the Public Calendar.	Deleted event is removed from the Public Calendar.	Pass

Appendix 3


Start
New user?
Yes
Register
Forgot Password
Forgot Password?
No
Login
Add a post
Redirect to Home Page
Display other post
Profile Page
Contact Page
Chat Page
Forum Page
Utilities Page
To-Do List Page
Library Page
Nearby Users Page
Logout
Update Gender
Update Birthday
Update Password
Update Username
Update Bio
Update Profile Picture
Display other user profile
Chat selected user
Open recent personal chat
Display group chat list
Create group chat
Create a Post
Display post
Comment Post
Report Post
Note
Schedule daily routine
Track monthly expenses
Add public/personal event
Add item in to-do list
Download library content
Upload library content
Display location of other UCA user nearby