

WEB BASED VIDEO CONFERENCING APPLICATION

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**A project report submitted in partial fulfilment of the
requirements for the award of Bachelor of Science
(Honours) Software Engineering**

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Jan 2021

DECLARATION

I hereby declare that this project report is based on my original work except for citations and quotations which have been duly acknowledged. I also declare that it has not been previously and concurrently submitted for any other degree or award at UTAR or other institutions.

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APPROVAL FOR SUBMISSION

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ABSTRACT

As the corona virus moves from a regional epidemic to a global pandemic, businesses and academic institutions have been forced to switch from physical to virtual. Many companies and universities are considering video conferencing as the ideal option for engaging while homes were transformed into classrooms and offices. However, the existing video conferencing system does not allow direct interaction between the participants, the productivity of virtual meeting is comparatively low and there is a lack of a built-in speed test. Therefore, a new web-based video conferencing system is designed and developed to improve team collaboration by providing enhanced engagement. Gamification is used to increase work productivity. It includes a built-in speed test to detect the network connectivity as well as an agenda planner to keep the meeting focused on the topic at hand. Evolutionary Prototyping is adopted to speed up the delivery of the system. Besides, to design a more reliable system, existing similar systems are analysed to define potential features and to integrate into the new system. By using the suggested methodologies and tools, the objectives of this project are accomplished favourably. Moreover, various testing had been performed such as unit, integration, usability testing and user acceptance testing. The web application provides a time-saving agenda planner, a faster and easier built-in speed test, a better collaboration tools and a gamification reward system to boost the engagement. For future work, more important features will be added into this web application such as video recording and virtual background.

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LIST OF SYMBOLS / ABBREVIATIONS

API	Application Programming Interface
CSS	Cascading Style Sheets
ERD	Entity Relationship Diagram
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transfer Protocol
RTC	Real Time Communication
SDK	Software Development Kit
SDLC	Software Development Life Cycle
SQL	Structured Query Language
SUS	System Usability Scale
UAT	User Ability Testing
UI	User Interface
UX	User Experience
URL	Uniform Resource Locator
WBS	Work Breakdown Structure

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CHAPTER 1

INTRODUCTION

1.1 Introduction

The COVID-19 pandemic infection has significantly changed how people interact with each other, causing individuals to consider different forms of communicating, learning, hosting special events, and interacting with friends and family. This also contributed to tremendous increases in the number of users of video conferencing. Video conferencing application is utilized in a wide range of areas, from personal user software to more specialized systems, such as apps relevant to the industry, education, and healthcare. Several specific video conferencing devices are accessible today. Zoom, Microsoft Team and Cisco Webex are examples of famous video conferencing platform. This project aims to develop a new video conferencing system to incorporate useful features from various existing systems and promote user engagement. This chapter will provide details about the general overview of the project, problem statement, objectives, proposed solution, project approach as well as the scope.

1.2 Importance of the Study

The idea of communicating over long distances, both audibly and visually begin from audio wires in the 1870s and video phone in 1927 at Bell Lab (Wolfe,2019). In 1964, AT&T introduced the first video conferencing at the World Fair in New York (Business Matters, 2015). It was a basic device where a listener on the other side of the line could see the image and hear the voice of the caller (Janice,2017). Video conferencing turn out to be free through Internet services during the 2000s (Janice,2017). Skype was one of the first to popularize video conferencing in 2003. (Wilson,2014). The technology has transformed from hardware and application-based to cloud-based systems in the evolution of video conferencing. Now, there are companies such as Zoom, Join. Me and BlueJeans that provide cloud-based video conferencing systems that make it easier for companies and individuals across the globe to communicate with others (Business Matters, 2015).

Zoom's founder and CEO Eric Yuan recently announced in a webinar that Zoom has seen an increase in usage after the Covid-19 pandemic has forced many enterprises and universities towards remote work and online study. Data published from Zoom's blog (2020) reveals the number of Zoom users in March 2020 grew to 200 million from around 10 million three months ago. According to UC Today, Webex, a video conferencing platform, hosted over 20 billion meeting minutes in April 2020, more nearly twice the previous month's total (Beufor,2020). Google Meet added three million new users, and since the beginning of the year, the total individuals in video calls have risen by five. (Peters, 2020).

When technology evolves, the way we learn, interact and work also change. Many organizations, as well as individuals, utilize video conferencing to communicate with others, boost work productivity, facilitate telecommuting, and more. However, organisations and individuals have still encountered some issues when using the existing online video conferencing system to set up a virtual meeting.

1.3 Problem Statement

The current problems in a video conferencing system can be divided into two main areas. For the problem statements identified below, the first and second statements address the problems in the existing video conferencing system. The last problem statement, on the other hand, addresses the shortcoming of using the video conferencing system.

1.3.1 Lack of Personal Interaction and Engagement

Most meetings involve personal interaction. Unlike traditional face-to-face conferences, online video conferencing does not allow direct interaction between the participants. 90% of people daydreaming in meetings, according to Dr Donald Wetmore (2018), founder of the Productivity Institute. Nevertheless, virtual meetings are often more difficult because of people more likely to get bored, multitasking, and many other disruptions. According to The Muse (2020), Majority of employees surveyed reported multitasking at meetings, while two-third of the employees reviewed their email during

meetings. Hence, making a virtual meeting interesting with lively engagement is necessary to keep everyone's attention in the meeting.

1.3.2 Lack of Built-In Speed Test to Detect Network Connectivity

A good quality video conferencing requires fast network connections. Inadequate bandwidth and network connectivity issues affect user experience. The common problems faced by users are delay, a freezing computer, bad audio quality or disconnected, screen sharing failure and extended, unexplained delays (Bell, 2020). A research in 2014 German (Schoenberg et al., 2014) found that delays in a virtual meeting had a negative influence on the participants: people would perceive the presenter as being less respectful or less focused if there is a delay of just 1.2 seconds. Although silence is a common part of the discussion in real life, it can appear uncomfortable in video conferencing, or trigger us to worry that others cannot hear our voice. Hence it is essential to provide a speed test to detect the participants' network connectivity. However, the existing video conferencing system does not have a built-in speed test, and the participant can only use a third-party device to verify the speed of the internet connection.

1.3.3 Low Productivity of Video Conferencing

Look Up Research Now (2018) questioned enterprise employees about their conference call experiences. The study showed that an average conference call lasting around 38 minutes with a total of 15 minutes were wasted. The time wasted on a regular conference call mostly because of failing to start the meeting on time, addressing conference infrastructure problems and dealing with disruptions. Data indicates that 85.3% of respondents noticed the negative effect of disruptions on conference calls, including in meeting productivity, becoming able to progress into an agenda, being passionate or being able to stay focused. Besides, the research found that only 53% of respondents found video conferencing to be effective for everyday meetings. More than 63% of participants mentioned that they must wait for more than five minutes to get everyone to set up on online conference devices until the meeting could start properly.

1.4 Project Objectives

Main objective:

To implement a new web-based video conferencing system that delivers enhanced engagement for team collaboration and productivity using Prototyping approach in 24 weeks.

Sub-objectives:

1. To analyze project requirements and existing similar video conferencing system during Project 1 period.
2. To design a model of web-based video conferencing system during Project 1 period.
3. To develop a new web-based video conferencing system with collaboration tools to promote user engagement using Prototyping approach.
4. To evaluate the functionalities of the applications by using functional testing and user acceptance testing results during Project 2 period.

1.5 Proposed Solution

1.5.1 Front-End Development

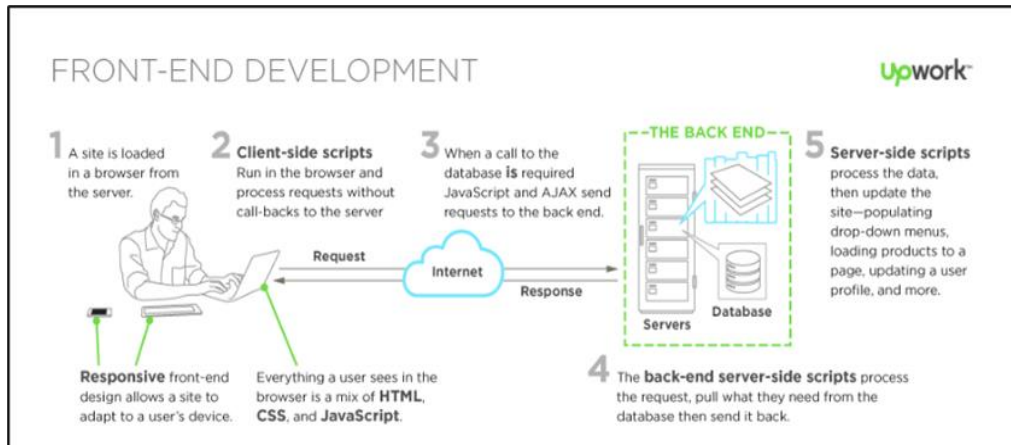


Figure 1.1: Front-End Development (Wodehouse, 2020)

According to Sagara Idea Lab (2019), front-end development is referred to as the "client-side" programming, is all about the UI and UX. UI is the abbreviation of the "user interface" while UX refers to the term "user experience". While design a software application, UI designs come in the first place. Design and interaction are strongly tied to the interfaces. It is important in supporting software functions visually. The UI is about icons and buttons,

links, typography and colour schemes, layout, images, and responsive design (Lamprecht, 2019).

Unlike UI design is about visuals, the UX emphasizes on the overall feel of the experience. It emphasizes on software usability, functionality and features, user satisfaction, and stakeholder value (Joo,2017). The "Eight Golden Rules of Interface Design" from Shneiderman is being used as a guide to enhance user interface design and improve user experience. HTML as the organizer, JavaScript as the multitasker and CSS as the stylist are some of the key technologies used in front-end web development (Sagara Idea Lab, 2019).

1.5.2 Back-End Development

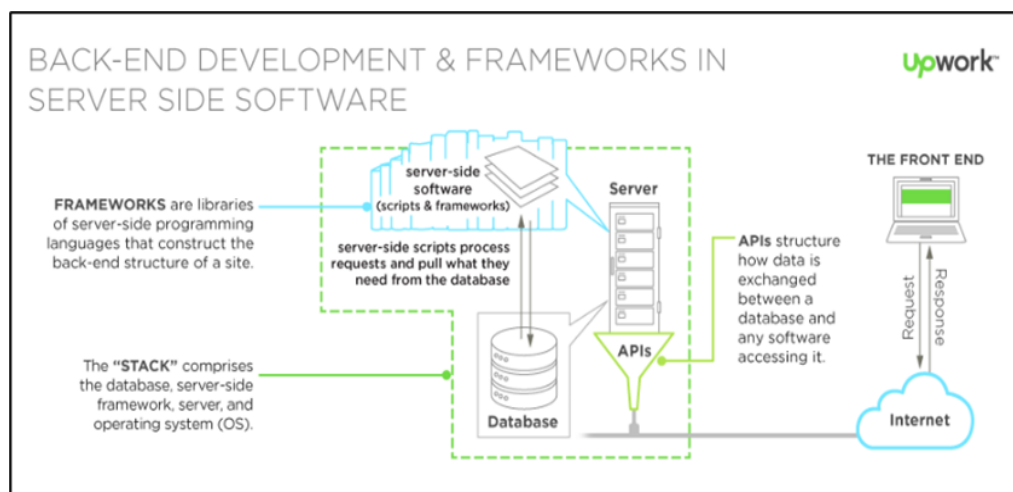


Figure 1.2: Back-End Development (Wodehouse, 2020)

Sagara Idea Lab (2019) clarified that the backend, also known as "server-side" programming, is the mechanism that operates behind the scenes to assist consumers communicating with the applications on the client-side. The major back-end components are a server as a machine, middleware as plumbing, programming languages and framework as nuts and bolts, and a database as a brain (Wodehouse,2020). Back-end development is important to make these components communicate with each other. It involves writing APIs, writing code to connect with a database, designing databases, and system infrastructure, and more. Krystal Tolani (2020) from GoSkills shares the various types of backend languages used by backend developers: Java, Python, Ruby, SQL, Javascript, .Net and PHP.

1.5.1 Video Streaming Protocol Integration

Max Wilbert (2020) described a video streaming protocol as a structured distribution technique for splitting up, distributing, and reconstructing a video into chunks. In other words, a streaming protocol is to deliver data over the internet. Some protocols prioritize minimizing latency, some operate exclusively on certain devices and some emphasis on digital rights management (DRM), Wilbert added. In this project, the WebRTC (Real-Time Communication) protocol is used. It allows the transmission of a live video or audio through the application (Ruther,2019). WebRTC is a secure protocol, and it offers features, such as peering, streaming, audio or video codecs for communication between users (Oleksandr et al., 2020).

1.6 Proposed Approach

There are a lot of methodologies for software development or Software Development Life Cycle (SDLC) models that can be used in a software project. Each of these methodologies has its pros and cons. The methodology is chosen to match the specific requirements and characteristics of a project. In this case, the methodology to be used in this project is the prototyping methodology as show in Figure 1.3.

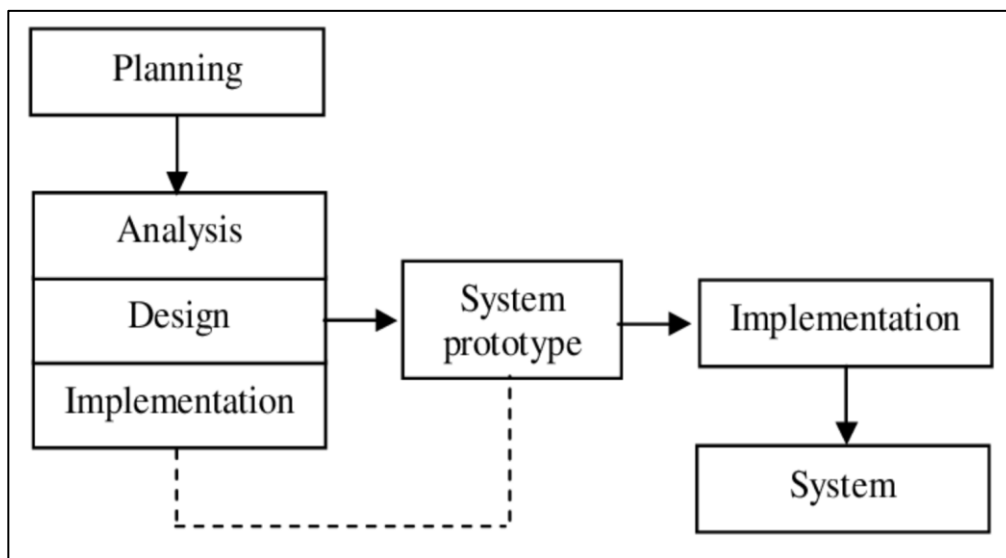


Figure 1.3: Prototyping Methodology (Wahab, 2009)

At the planning stage, develop a system request and conduct a feasibility analysis about a video conferencing system. Establish milestone, purpose, problem statement, objective and target user. A Gantt Chart is used to shows the project tasks to be done with the start and end date. At the analysis

phase, study book, research papers, journals and articles about the video conferencing system, communication technology and related project. Then, write a comprehensive summary of the research.

Besides, analyse existing similar systems to define potential features of these systems to integrate certain features into the proposed system and design a more reliable system. Review the latest trends of the video conferencing system. Gather functional and non-functional requirements.

The design phase involves creating a use case diagram, design plan, planning the layout and user interfaces, determining the features of the system and design the data model. Identify the inputs and the expected output. Determine overall visual feels, identify colours and fonts used in the user interface. At the implementation phase, develop the first prototype and evaluate the prototype by showing the prototype to the users. The users will test the first prototype and provide feedback or comments. The feedbacks and suggestions are recorded and incorporated into the second iteration. The second prototype could then be re-analyzed, re-designed, and re-implemented. The process repeats until the final prototype satisfies the user's requirements and has sufficient functionality. Finally, implement a complete video conferencing system that contains the user interface, back-end development and database management system.

1.7 Scope

1.7.1 Target User

The primary target user is business, companies, enterprise. This system serves customers of all sizes, from sole businesses to organizations. The second target user is universities and colleges, and the system will be used for education purpose. In this project, the video conferencing system will be created on the web platform. The video conferencing mobile app will enable individuals to virtually interact with each other.

1.7.2 Basic Features

- a) Registration and Sign in

The user may join a meeting without registration if he receives an invitation code for a meeting. However, if the user needs to use the conferencing system constantly, then he may sign up for a free account using email and phone number to prevent unregistered attendees from joining a meeting.

b) Profile Management

Users who have registered are able to manage their profiles like upload a profile photo and change the current password.

c) Contact List

The contact list is provided to enable the user to contact another user. Users should be able to find a person by using a search engine in the contact list. The user can add a new contact by entering a phone or email.

d) Audio and Voice Calls

Users should be able to make an audio call, a video call or set up a video conferencing. The meeting can be broadcast over the internet in real-time, and two-way audio and video allow quick communication between the attendees. Users can hold one-on-one meetings or host a meeting with several members.

e) Text messaging

When the users are in a poorly Internet covered area, or busy on a meeting, they cannot make a voice call or video call. Thus, the system must allow the user to send text messages to another person in his contact list.

f) Notification

The app will automatically alert users when received new messages, being added into a room, and more.

g) Schedule Meeting

The user can create a schedule for the meeting to plan the meeting time and attendees.

1.7.3 Advance Features

a) Rewarding Feature

The rewarding feature is implemented into a virtual meeting to help enhance the attendee's engagement and drive meeting productivity. The user can earn points for attendance and claim the reward based on the accumulated points.

b) Agenda Planner

The agenda planner can help the host to plan the agenda wisely and easily. The invited attendees can prepare their topic before the meeting. The agenda planner helps the user to design the meeting session and assigning time to each session.

c) Speed Test

The system can determine user internet speed. The user can check the internet speeds by clicking a button.

1.7.4 Limitations of the System

The focus of this project is to create additional features to enhance user engagement and productivity. Some features are not implemented in this system. Virtual background, video recording and virtual noise cancellation are complicated and require a lot of development time so it will not be integrated into the web application.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to Video Conferencing

2.1.1 Definition

The video conference also refers to video telephony, video call, video chat, or web conferencing. Rosi Maria Heller (2010) defines videoconferencing as a type of telecommunications technology that enables a group of participants to communicate in two-way, integrated audio and video interaction at distinct places. The participants will use devices with built-in cameras to attend virtual meetings or conferences. The major component of video conferencing is the combination of audio and video that can transmit text and graphics. This is supported by M. Kouadio and U. Pooch (2002) who clarify video conferencing as the use of a multimedia software incorporating audio, video, text, graphics to enable real-time connectivity and information sharing within a distributed group of people working together on a shared task.

2.1.2 Types of Video Conferencing System

There are different types of video conferencing systems. It is important to understand different types of video conferencing systems and their real-world usage.

a) Telepresence Video Conferencing System

Telepresence is a form of video conference in which the physical and virtual participants look like in the same space. Telepresence is designed to host a meeting like a traditional face-to-face meeting where the participants are physically together. The set-up is done in a way that uses big screens and places the cameras at eye level. The effect is a video conference set-up that looks as if all the attendees are seated in the same room. Each attendee will see a life-size image of the remote people and the outcome is extremely realistic (Hellen,2020; Brown,2017).

b) Integrated Video Conferencing System

Integrated video conferencing systems are typically built for group video conferencing. It involves the hardware, codec and a centralized location. All the devices like camera, screen and peripheral video are placed in the

multimedia meeting room. These systems are suitable for boardroom and classroom conferences (Brown,2017).

c) Desktop Video Conferencing System

Desktop video conferencing system is common among the office workers. These systems are used by personal computer and provides a full-motion conference (Brown,2017).

d) Service-based Video Conferencing System

A provider (a telecom carrier) is responsible to control the majority of a service-based system. The provider gets paid to manage it, so the user does not need to bother with the technicalities (Brown,2017).

e) Codec

Codec is an abbreviation of the word “coder” and “decoder” or “compressor” and “decompressor”. It is encoded when one sends a transmission and decoded when another person receives the transmission. A codec means a tool does both encoding and decoding. It uses a camera, microphone and outside display which is similar to a room-based video conferencing framework (Neurilink, n.d). If one wants to use a whiteboard and wishes to interact with a physical demonstration or likes to walk around when on a call, then codec is the right choice (Brown,2017).

There are soft codecs and hard codecs. Soft codecs transmit and receive audio-visual conference room which is software-rendered. For instance, Microsoft Team and Zoom. Hardcodes are devices that developed for video conferencing where power and raw audio or video supply by the users. In real-time, the stream is encoded, distributed and decoded. Examples of hard codecs are Polycom, LifeSize, Cisco and StarLeaf (Neurilink, n.d.)

2.1.3 Use of Video Conferencing

Video conferencing is now commonly used in many countries. The following are the applications of video conferencing in distinct fields.

a) Meeting or Collaboration

A video conference is mostly used by an organization's employees to hold online meetings or communicate with stakeholders (Kagan,2019). Besides, it is used for important announcements or collaborative presentations of information that enables all participants to interact and give feedback (Sharma,2017). All the participants can discuss while the presenter shares the slide on the screen.

In July 2017, a Forbes Insights (Insights Team, 2017) survey revealed that 80% of respondents say video conferencing is quickly becoming the trend for project teams and the number increasing to 84% for communication with customers or partners. Similarly, a report from Lifesize (2019) found that 80% of employees are using video calling for one-to-one meetings. The employees who use web conferencing tools for team meetings and large meetings are 78% and 77% respectively. The study also found that 62% of workers are using video conferencing tools for meetings with clients or partners. Video conferencing is now commonly deployed in the workplace for meetings and team collaboration.

b) Education

With the aids of video conferencing, communicating with a huge number of people at the same time from all over the world is easy. Education has become more immersive with the introduction of the Internet, with students and teachers connecting internationally without the need of both lecturer and students in the same location. Lecturers can use video conferencing tools to teach students in rural areas (Gegenfurtner & Ebner, 2019; Paderanga, 2014). Students may upload assignments and access to live and recorded lectures. Also, organizations can utilize video conferencing for educational purposes, online courses and workshops. In the USA, long-distance education programs are incorporated with the Ivy League school and included in their syllabus such as Harvard University (Paderanga, 2014).

One of the examples that the use of video conferencing in education is many universities and colleges had online class due to Covid-19 and Movement Control Order (MCO) imposed by the government in Malaysia (Yee,2020).

c) Video Interviews

Nowadays various companies are using video calls or conferences to meet a group of stakeholders and experts at once, interview the potential workers for the organization, contact client and much more. This is proved by a Gartner Inc. (Baker,2020) found that due to the COVID-19 pandemic, 86% of companies are using video conferencing system to interview candidates. Another qualitative research was done by Kimberly Nehls, Brandy D.Smith and Holly A. Schneider (2015) focused on the advantages and disadvantages of the video interview. This research revealed that both interviewer and interviewees feel more comfortable when they attend the interview online at a location that they familiar with. It showed that organizations use video conferencing system as a tool to interview the potential worker.

d) Working from Home

A lot of employees and company owners work from home. This is proven by a study (Bick, Blandin & Mertens, 2020) showing that 35.2% of the US population worked completely from home in May 2020. Sharma (2017) notes that working from home would save travel time and cost. This could also prevent the workers from being stressed out in traffic congestion. Another survey was done by Airtasker in 2019 (Caramela, 2019) found that working at home not only helps workers by reducing their regular travel times, it also improves efficiency and leads to healthy lifestyles.

e) Healthcare Professionals

Telehealth video conferencing systems allow patients and doctors to meet without the need for travel for treatment. Doctors may remotely inspect a patient and have a diagnosis from a laptop or a mobile device in real-time. The research found that the use of telehealth in the healthcare profession had increased rapidly where 76% of U.S. hospitals utilize video technologies to communicate with patients and remotely

meet practitioners (AHA, n.d.). Governments around the world use telehealth infrastructure because of ageing demographics and high healthcare expenses (Jang-Jaccard et al., 2014). Furthermore, those patients living in remote areas are unlikely to receive medical treatment because the distance is too far.

2.1.4 Comparison of Virtual Meeting with Traditional Face-to-Face Meeting

Previously, the face-to-face meeting was the only choice when people wanted to exchange ideas or discuss with each other. But, with the advances in technology, people could easily host meetings using the video conferencing system. Virtual meetings have become the trend for many organizations, bringing more personal and engaging than ever before, but face-to-face meetings have still not been fully replaced (Amanda,2017; Hutt,2017; Denstadli et al., 2011). A few studies have specifically conducted to evaluate how video conferencing and face-to-face meetings are utilized in business organizations. By performing a comprehensive analysis of these two types of meetings, the studies found that video conferencing and face-to-face meetings vary in advantages and disadvantages, revealing that these two forms of communication tend to work concurrently in collaboration.

A quantitative survey was conducted to evaluate the usage of face-to-face meetings and video conferencing of a group of Norwegian business travellers (Denstadli et al., 2011). The researchers recruited the respondents at Gardermoen airport in Oslo from December 2009 to January 2010, by distributing the travellers a flyer. After that, a survey website was open for 3 weeks for the respondents to log on and complete the survey. Only 10.2 % of the 13,881 passengers who accepted the flyer submitted usable responses. The survey contained questions regarding respondent profiles, access to video conferencing, type of technology platform used, main purpose, participants, scheduling, the time is taken, and their opinions on video conference. The respondents had taken on average 12 minutes to finish the questionnaire.

The key findings indicate that travel restrictions, meeting content and social relationships are critical aspects that determine the potential use of video conferencing. People prefer to choose face-to-face meetings when travel restrictions are limited, a new relationship and handle highly ambiguous tasks.

On the contrary, when there are high travel restrictions, pre-established relationships and low-ambiguity tasks, people tend to select video conference. This study shows that most corporations tend to use both video conferencing and face-to-face meetings. The advantages of video conferencing do not cause face-to-face meetings to be outdated in these companies (Denstadli et al., 2011).

Video Conferencing and face-to-face meetings represent two alternative modes of communication in many organizations. This study provides a better understanding of how video conferencing and face-to-face meeting serve complementary functions over time and of the factors that motivate users' decisions to use one over the other. However, the survey results had some limitations. First, majority of the respondents are from the middle age (30 to 49) and higher age groups (50 and above) and only 9% are from youngest age groups (30 and below). Nonetheless, the sample size was just 10%, it is difficult to know how accurately the findings represent the aeroplane passenger. This research, therefore, does not generally represent the employee of various organizations. There are no statistics for those who are not travel using an aeroplane and those who might use telecommunications to substitute business trips.

From the authors' argument, both video conference and face-to-face meetings can be utilized by the organizations simultaneously. Therefore, there is no competition relationship between video conferencing and face-to-face meetings. Amanda (2017) and Mike Hutt (2017) support this claim. Amanda (2017) points out that both face-to-face and virtual meetings have their pros and cons and combining both is the best way to do. Hutt (2017) also agrees that even though there are obvious benefits of face-to-face meetings, virtual meetings are also useful, and it is necessary to establish a balance between the two. Hutt (2017) proposes that online meetings should be organized when in need of fast answers while a face-to-face meeting should be held when the individual wants to experience a more personal interaction and have sufficient time. Video conferencing technology has significantly saved the travel expenses and time waste associated with in-person meetings and it also keeps the project up-to-date and moving forward.

Kevin McMahon (2018) argues that although video conferencing may not be capable of replacing the relationship-building that takes place during physical activities, it has achieved a degree equivalent to face-to-face meetings. He points out that video conferencing will tackle problems like travel concerns, so can substitute most face-to-face meeting. In response to McMahon's finding (2018), Heller (2017) indicates that regardless of the argument on whether video conferencing is a feasible alternative to a face-to-face meeting, companies need to realize that video conference is scalable and can produce high quality and satisfactory outcomes.

Table 2.1: Advantages and Disadvantages of Video Conferencing (Amanda, 2017; Heller, 2017; Hutt, 2017; Denstadli et al., 2011)

Advantages of Video Conferencing
<ul style="list-style-type: none"> a. Save time and cost to travel b. Enables greater freedom of thought and improves the communication c. More convenient - allows users to communicate at any time and location d. Save the environment and climate by reducing the carbon footprint e. Save cost to rent a venue / facilities / equipment
Disadvantages of Video Conferencing
<ul style="list-style-type: none"> a. Some meetings/ works are not suitable for a video conference b. Technical and logistical problems may waste time c. Not suitable for meetings with people who don't know each other d. High chance of multitasking which will not allow participants to fully concentrate on what is being shared in the meeting e. The absence of non-verbal cues makes communication difficult f. Easier to misinterpret information or make incorrect assumptions

Table 2.2: Advantages and Disadvantages of the Face-to-Face meeting
(Amanda, 2017; Heller, 2017; Denstadli et al., 2011)

Advantages of Face-to-Face Meeting
<ul style="list-style-type: none"> a. Helps to develop trust and easier to convince someone b. People can express themselves by using body language and gestures c. Get instant feedback and response, reduce misunderstandings d. Low chance of multitasking and meetings are more engaging which will help the participant to focus easier e. Create a great positive impression as a client may appreciate the efforts to visit them personally
Disadvantages of Face-to-Face Meeting
<ul style="list-style-type: none"> a. Travel cost is too expensive b. Not suitable for large organizations or a large group of people when they are located in different places or countries.

In conclusion, both videos conferencing and face-to-face meetings have distinct pro and con. Therefore, organizations can combine these two alternatives to conduct meetings. Through this survey, it shows that travel constraint, meeting content and social relationship are factors to influence decisions to select the mode of communication. Thus, organizations must select the mode of communication according to the needs and constraints.

2.1.5 Existing Video Conferencing System

Three video conferencing applications are being studied in this section. The useful features of the studied applications are extracted out and will be incorporated into the proposed system.

2.1.5.1 Zoom

Adopted from <<https://zoom.us/>>

Zoom is a popular video conferencing platform. Zoom was founded in 2011 and launched in 2013. Zoom is a subscription-based service that provides various plan like Zoom Meeting, Zoom for Education and Zoom for Telehealth. Video sessions in Zoom are like sessions conducted in a traditional meeting, where a group of people meet to discuss, brainstorm and collaborate. A user has either a free or paid license can set up a video session to engage in real-time, private, and group discussions using Zoom.

A user can create a free Zoom account by sign-in to his Google account. The user can download the Zoom app on a computer or a mobile phone or open Zoom a web browser. To host a meeting, a user must first log in the Zoom account. The user can join a meeting without signing in as shown in Figure 2.1. Zoom uses the room system, where the user can create one URL that represents a meeting room. The attendees can just click to the URL to join a meeting from anywhere. When joining a meeting, the attendees can choose to mute or unmute and switch on the camera. Zoom allows user to test the speaker, microphone and video before joining a meeting as shown in Figure 2.2. Zoom can support up to 500 participants in a group video conference.

Zoom provides a virtual background feature which enables the user to show a picture or video as the virtual background during a meeting. However, this feature requires the user to have a green colour background and uniform lighting to achieve the best effect. Figure 2.3 shows how the user can upload an image or video as a virtual background.

Zoom provides multiple screen sharing to support presentations during a virtual meeting. While in a meeting, the user has three options to share the screen: Basic, Advanced and Files as shown in Figure 2.4. The basic screen share means the user can share either the full screen, a specific application window, a part of the screen, whiteboard or iPhone/iPad screen. For the advanced screen share, the user can either share a portion of the screen, the

computer's music or sound, or the content of a secondary camera connected to the computer. The files screen share means to share a file from a third-party sharing device.

After the user select to share the screen or whiteboard, Zoom will show the annotation tools as shown in Figure 2.5. Zoom's annotation tools enable the participants in a meeting to annotate on a shared screen or a whiteboard. It helps the brainstorming and works planning in a meeting as easy as possible. The user can insert a drawing, a text, a stamp or highlight an area. The user can also customize the format of the annotation tools, for example, the font style, font type, line width and colour. Zoom also provides a feature where the user can save the shared screen or whiteboard with the annotations in PDF or PNG format.

Zoom allows a user to record meeting audio and video locally to the computer. A licensed user can also record the meeting to the Zoom cloud and access the files on the cloud. By default, Zoom will reduce background noise automatically. However, if the environment is too noisy, the user can remove the background noise by changing the background noise suppression level as shown in Figure 2.6.

By default, Zoom will save the internal users of same Zoom account and organization in All Contacts section. The user can send direct messages to the member on the same channel. The user may add an external user as a contact by specifying their email address. Zoom also allows the user to sync the contact with a third-party service or the user's phone contact. The user can star important contact to quickly access a contact.

Zoom provides chat features that allow user to send messages in a meeting, private individual message or group messages. The user can also edit, share, copy, star and delete a message. The user can also react to a message by adding an emoji below the message as shown in Figure 2.7.

Zoom offers a feature to schedule a meeting. The user can schedule a meeting by entering a topic, description, start date and time, duration, time zone and choose the meeting settings like allow participants to join the meeting before the host, only authenticated users are allowed to join the meeting and so on.

Join a Meeting

Meeting ID or Personal Link Name

Grant MacLaren

Do not connect to audio

Turn off my video

Join Cancel

Figure 2.1: Join a Meeting as a Guest

Testing speaker...

Do you hear a ringtone?

Yes No

Speaker 1: Headset Earphone (Sennheiser SC70 USB f)

Output Level:

Testing microphone...

Speak and pause, do you hear a replay?

Yes No

Microphone 1: Headset Microphone (Sennheiser SC70 US)

Input Level:

Figure 2.2: Speaker and Microphone Testing

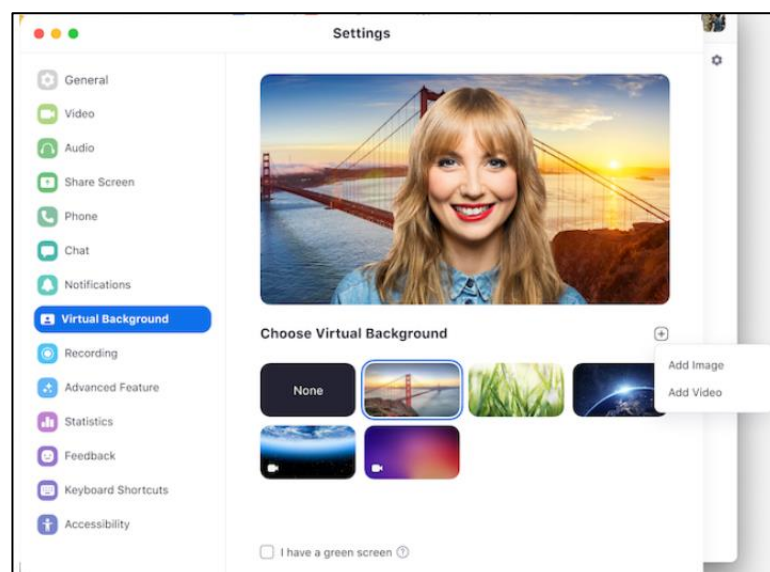


Figure 2.3: Upload Image or Video as Virtual Background

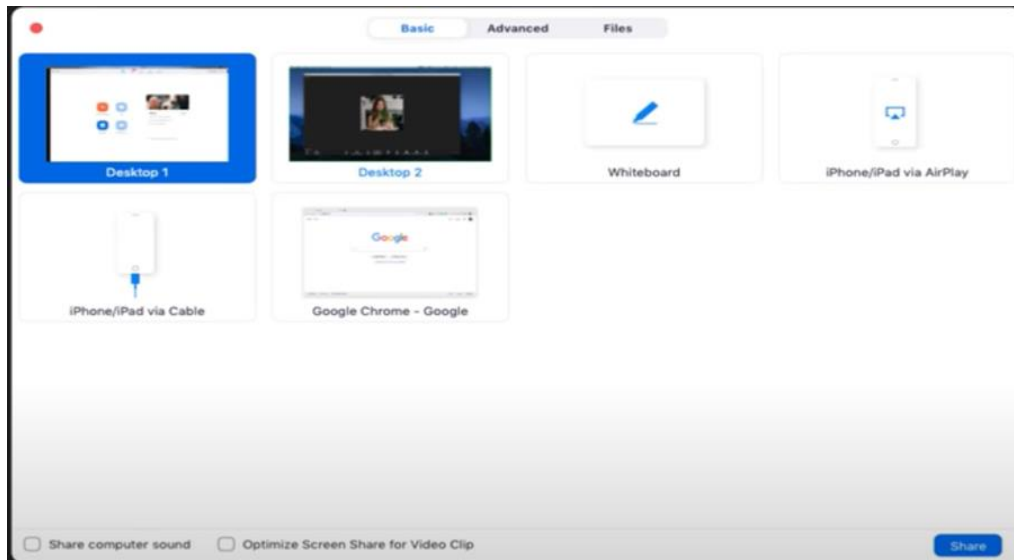


Figure 2.4: Different Screen Sharing Option of Zoom



Figure 2.5: Zoom's Annotation Tools

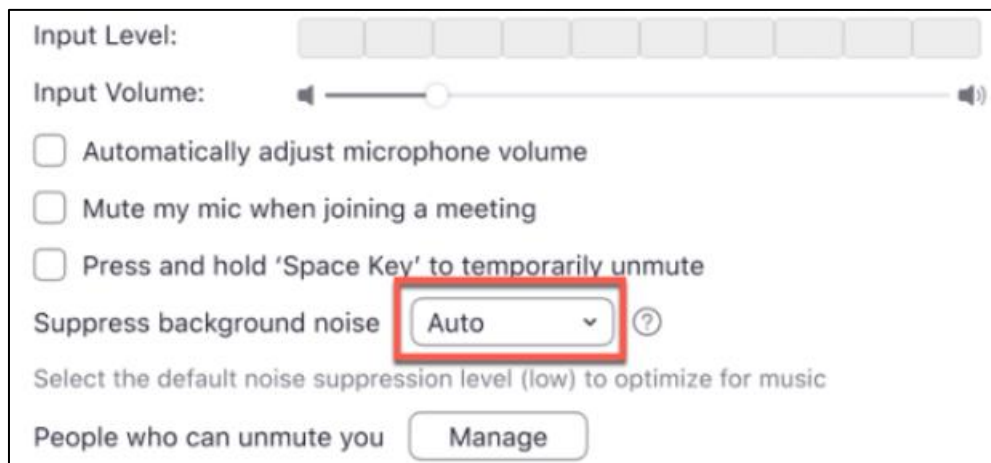


Figure 2.6: Background Noise Suppression

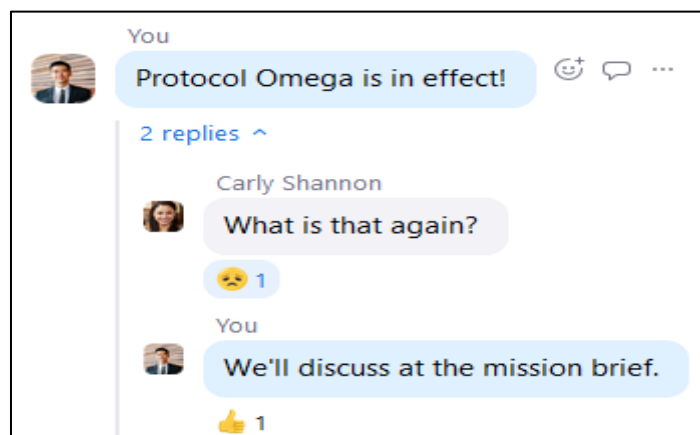


Figure 2.7: React to a Message

2.1.5.2 Cisco Webex

Adopted from <<https://www.webex.com/>>

Cisco Webex Meetings is a flexible audio and video conferencing system. It allows users to set up an effective virtual meeting with multiple productivity tools.

The user can download the Cisco Webex app on a computer or a mobile phone or open by a web browser. The user can register a Cisco Webex account by using an email address. To host a meeting, a user must first log in the Cisco Webex account as shown in Figure 2.8. The host can invite people to the personal room by sending the URL using email or instant message. If the user receives an email invitation that provides the information to join the meeting, then the user can join the meeting even he does not have a WebEx account as shown in Figure 2.9.

Before joining a meeting, the user can choose the audio and video settings. The user can choose the device to connect to audio, turn on or turn off the audio or video. Cisco Webex Meeting limits the background distractions that can disrupt a meeting. If the application detects background noise from the user's microphone, it will show a message to ask the user to mute himself as shown in Figure 2.10.

Cisco Webex provides recording meeting feature to help those who absent to refer what was discussed in a meeting. Figure 2.11 shows two alternatives to record meetings in Cisco Webex, depending on Webex site configuration and the user's account type. The first method is record meeting in the cloud, and the user will receive an email with the recording link after the meeting. The second method is starting a recording and save it to the personal computer after the meeting.

Cisco Webex Meetings also provides a feature to help the attendees to view what the host talking about by sharing the screen content. Figure 2.12 shows the options for sharing content: share the desktop, an application, a file or a whiteboard. During the meeting, a user can annotate a shared screen to highlight, explain, or point out information. The user can perform various activities while sharing a screen or whiteboard, like drawing, insert a text, place an arrow or draw a border to draw the attention of the attendees. The

user may also save the annotation to the computer or mobile. Figure 2.13 shows the annotation tools in Webex.

Besides, the user can also use a poll to create and share questionnaires, which is useful for gathering feedback and voting. The user can create poll questions and answers and set the time to close the poll automatically. Only the presenter can view and share the results of the poll. Figure 2.14 shows the manage panels of a poll.

Cisco Webex Meetings provides schedule meeting feature with options tailored to the meeting. After the user schedule the meeting, the system will automatically send an invitation email to the invited people. If there are any changes to the scheduled meeting, for example, the meeting is postponed, the system will inform those who are invited.

Figure 2.8: Login to Cisco Webex

Figure 2.9: Join a Webex Meeting

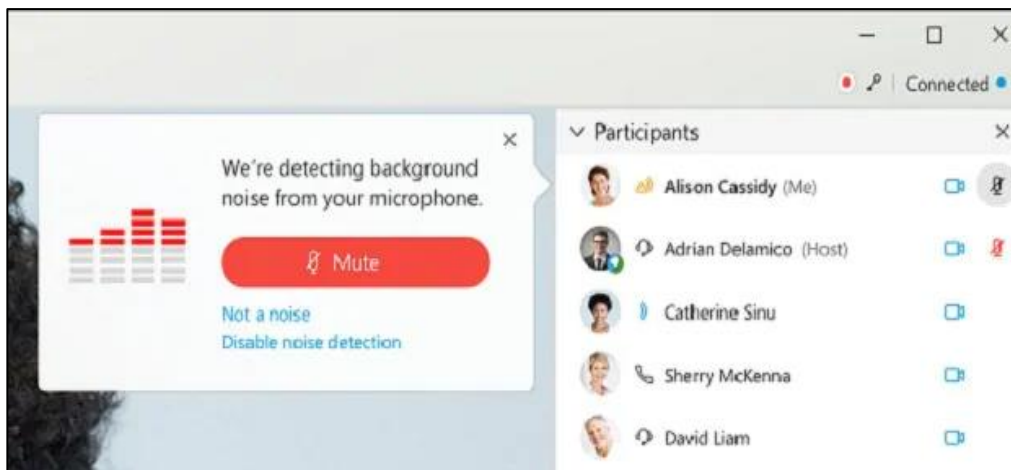


Figure 2.10: Webex Background Noise Detection



Figure 2.11: Recording Alternatives in Webex

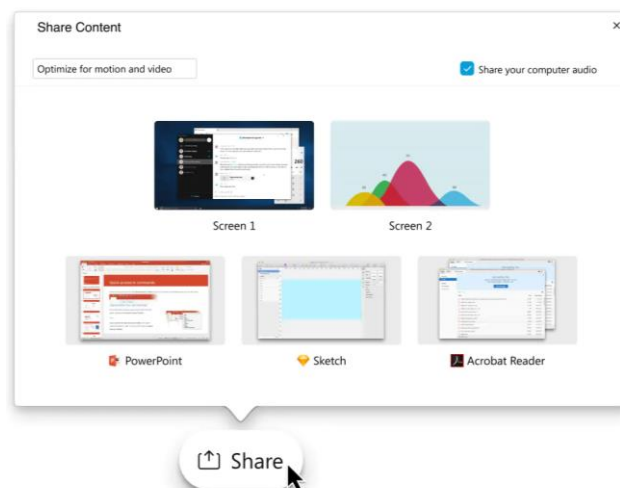


Figure 2.12: Share Content Options



Figure 2.13: Annotation Tools

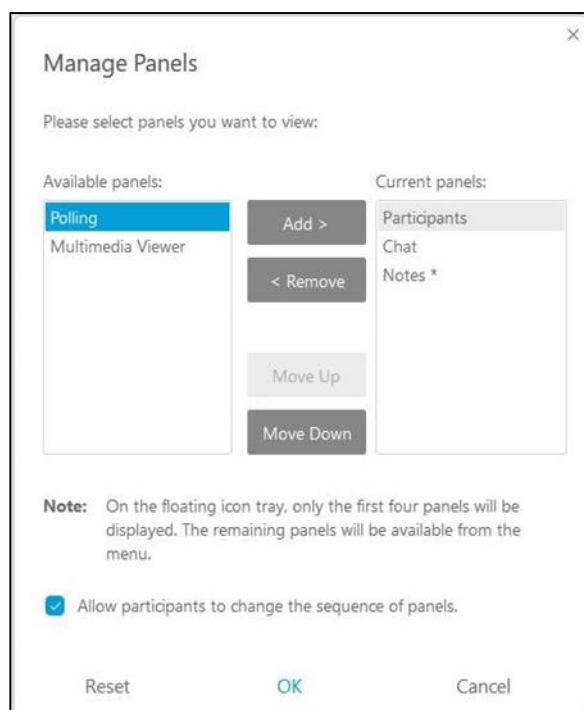


Figure 2.14: Poll Manage Panel

2.1.5.3 Microsoft Team

Adopted from <<https://www.microsoft.com/en-my/microsoft-365/microsoft-teams/group-chat-software>>

Microsoft Teams is a collaborative tool designed to enhance internal communication in a company. Microsoft Teams is famous among those companies that use Office 365 products.

A team can have one or many owners, members and guests. Each member of the Teams has a different role, and each role has different levels of access privileges. For instance, an owner can manage a team setting such as add and remove team members, add guests, change team setup, and manage administrative tasks. The people in a team are members. They can do activities such as send a message, view and upload documents. Guests are external stakeholders like partners or consultants who are invited by the host to join the team. They have limit capabilities to access some features.

The user can join a Teams meeting anytime, from any device, with a Team account. However, if the user does not have an account but receive an invitation to join a team, then the user can join the meeting using a Microsoft account. The user can choose to use the web browser if he does not want to download the app.

Before starting a meeting, the user must set a title, audio and video source. The host can invite people by typing the name or phone number or sharing the meeting link. There are a few ways that a user can join a meeting: join by link, join in a channel, join from a calendar and join from chat. The user can start recording a Teams meeting or call to record the activity. Teams shows a message to all attendees when a meeting recording starts. The recording will be stored to Microsoft Stream and available to all participants. The recording will stop automatically once all the participants leave the meeting.

The user can change the video background before or during a meeting by either blur the background or replace it entirely with any images from the computer. The user can preview the chosen background before applying it. Figure 2.15 shows how a user can blur the background during a meeting.

In Microsoft Team, the user can share the screen during a meeting or when chatting with another user. Figure 2.16 shows the four options for screen sharing. Desktop allows the user to show everything on the screen, Window shows a specific app, PowerPoint shows a presentation while Browse allows user to find the file you to show. A red border will surround the sharing content when the user selects sharing.

The meeting participants can collaborate on a whiteboard and save the product after a meeting. Figure 2.17 shows several pens and tools for the user to annotate on a whiteboard. For example, marker, highlighter, eraser, ruler to draw straight lines, Text, Notes. The user may also insert an image or file from the library, Bing or take a picture using the device camera.

Microsoft Teams allows the user to organize the contacts into a group so that the user can search a contact easily. For example, the user can create a contact group and add people into it, rename or delete the group. Microsoft Teams will automatically set the status of a user. However, the user can also update their status such as available, busy, do not disturb, be right back and appear away as shown in Figure 2.18. Microsoft Teams also includes a chat service that allows users to send chat message without the need of video or audio call. Chats can be one-on-one or in a group.

In Teams, the calendar of a user is connected to the Exchange calendar. It enables the user to schedule a meeting in Outlook and Teams.

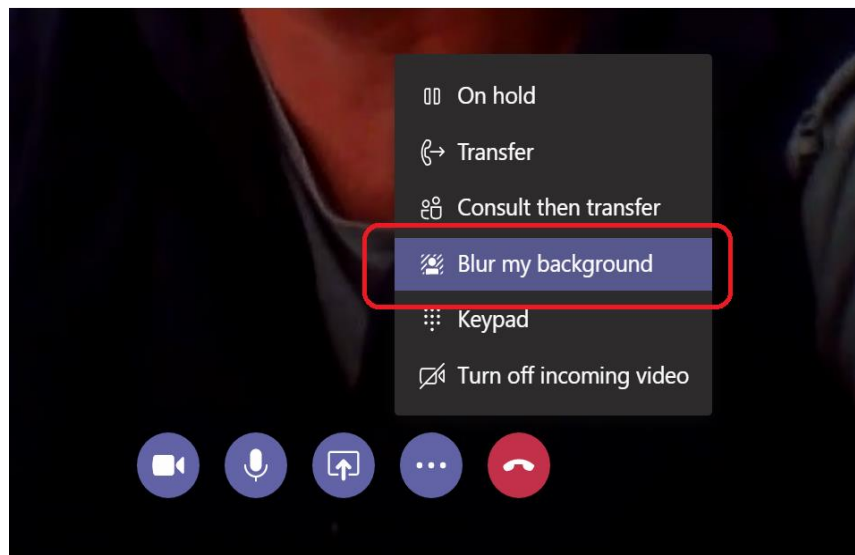


Figure 2.15: Blur the Meeting Background

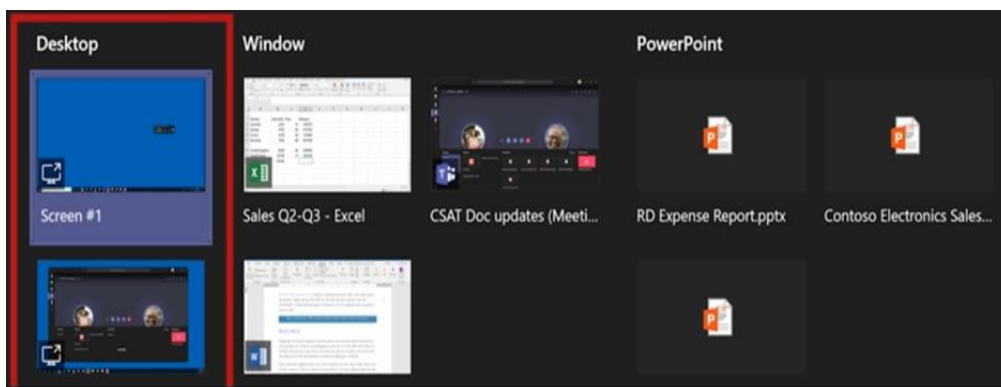


Figure 2.16: Screen Sharing Option



Figure 2.17: Whiteboard Tools

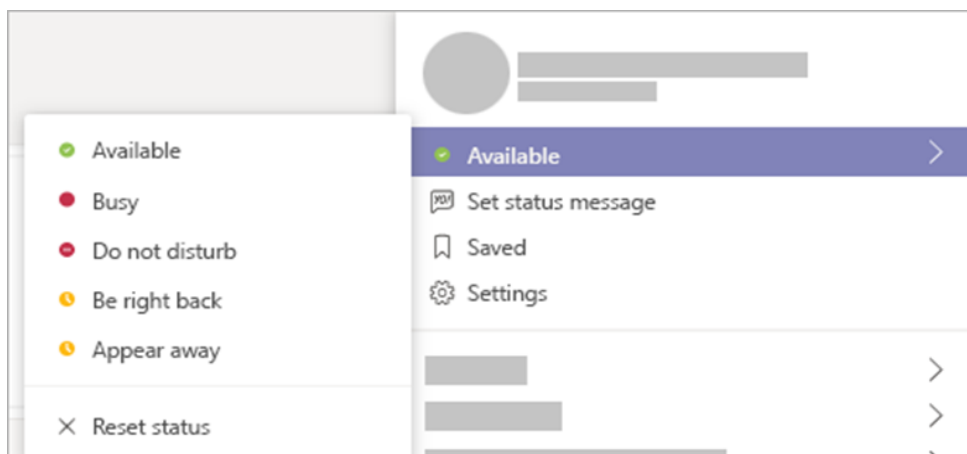


Figure 2.18: User Status Settings

2.2 Development Methodology

2.2.1 Software Process

A software development life cycle (SDLC) or software methodology is a set of guidelines for managing, planning, and developing software. There are many software development models used in various organizations and it is very useful for the organization. All these models have their own strength and limitations and there is no ideal model. It is important to choose the model based on the characteristics of the systems that are being developed. The Table shows four fundamental activities of software process and the explanation (Elgabry, 2017; Ulbert, 2014).

2.2.2 Waterfall Model

The basic SDLC model is the waterfall model. This model used to be popular, but it is now rarely used. It is important, however, because all other SDLC models are based on the waterfall model (GeeksforGeeks,2019). The following are the stages of the waterfall model: Requirements, Design, Development, Evaluation, and Maintenance. (Elgabry, 2017; GeeksForGeeks, 2019; Ulbert, 2014)

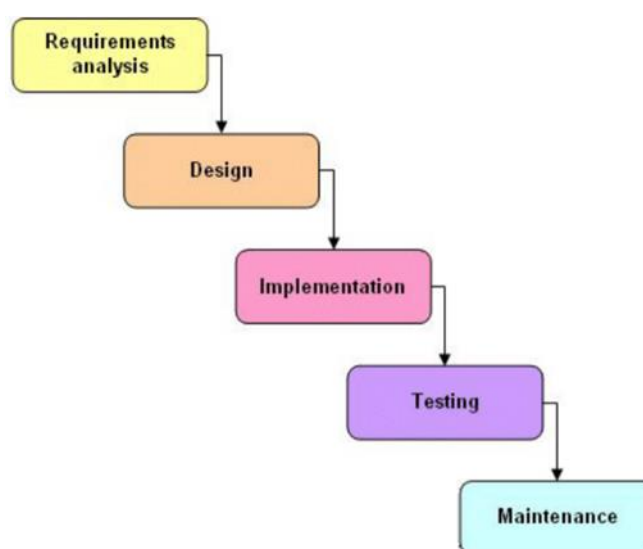


Figure 2.19: Waterfall Model (Rather and Bhatnagar, 2015)

Table 2.3: Advantages and Disadvantages of Waterfall Model (Elgabry,2017; Rather and Bhatnagar,2015; Sharma and Singh, 2015)

Advantages of Waterfall Model
<ul style="list-style-type: none"> a. Simple and easy to comprehend. b. Phases are processed one by one. c. There is a clear definition of each stage in the model. d. This model has a realistic and achievable milestone. e. This model suitable for small projects and projects where there is a clear understanding of the requirements.
Disadvantages of Waterfall Model
<ul style="list-style-type: none"> a. This model does not provide an error correction mechanism. b. After the requirements specification process is done, it is impossible to adapt any scope changes. c. This model suggests starting a new phase only after the preceding phase finish. However, phases could overlap in real projects.

By theory, each phase should produce one or more documents to be authorized, and the subsequent phase should not begin while waiting for the preceding phase to finish. However, in reality, these phases overlap and pass data to each other. The model has a linear architecture that makes it extremely difficult to accept change during development. The model can only be implemented while specifications are fully established and are unlikely to alter. (Elgabry, 2017; Ulbert, 2014).

2.2.3 Prototyping Model

The prototyping method is a model of system development in which a prototype is created, tested, and refined until it meets the user's expectations, then only an actual system is created. (Sharma and Singh, 2015). A prototype helps users to come up with specifications and define the software's strengths and weaknesses. Furthermore, it may expose the errors in the requirements and acts as a guide for the design phase and testing phase. (Elgabry,2017; Tanvir et al, 2017).

Table 2.4: Advantages and Disadvantages of Prototype Model (GeeksforGeeks, 2018; Rather and Bhatnagar,2015; Sharma and Singh,2015)

Advantages of Prototyping Model
<ul style="list-style-type: none"> a. Users are involved in the construction of the system. b. Using the user interface design, provide a clearer understanding of the application being created. c. Identify critical features and detect errors easily. d. More immediate customer reviews, which can help refine specifications early on and contribute to better solutions. e. Missing features can be quickly identified.
Disadvantages of Prototype Model
<ul style="list-style-type: none"> a. As the scale of the system expands beyond original plans, the system's complexity grows. b. The incomplete or inadequate reusable component may lead to project failure c. The cost is high and not suitable for small scale projects

The prototyping model is categorized into two types: throwaway and evolutionary. The purpose of using throwaway prototyping is to gain understanding about a design idea. Each prototype focus on one feature and it will be abandoned when the prototype is done testing (Elgabry,2017; Kahlid,2018; Sharma and Singh,2015). Throwaway prototyping is usually used in the early phases of design when the system requirements are still being considered (Elgabry, 2017; Kahlid,2018).

In evolutionary prototyping, the first prototype will present to the client or user to collect feedback then the prototypes are reused in a new test cycle. At some point the user agreed that the prototype fulfils all the requirements then finally the prototype will become the final product (Elgabry, 2017; Kahlid,2018) In contrast to throwaway prototyping, evolutionary prototyping is applied in late development stages. It enables the involvement of end-user throughout the development process (GeeksforGeeks,2018; Sadabadi,2013).

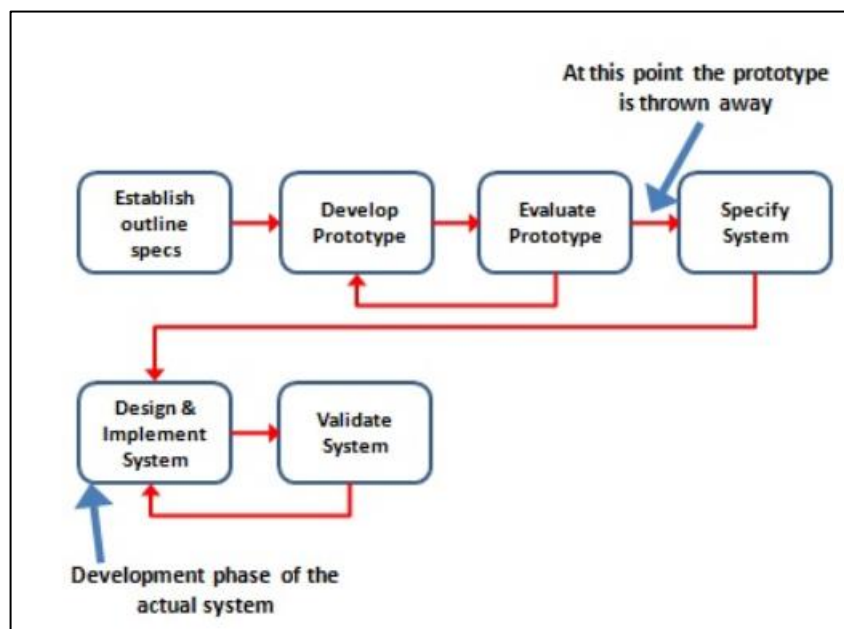


Figure 2.20: Throwaway Prototyping (Khalid,2018)

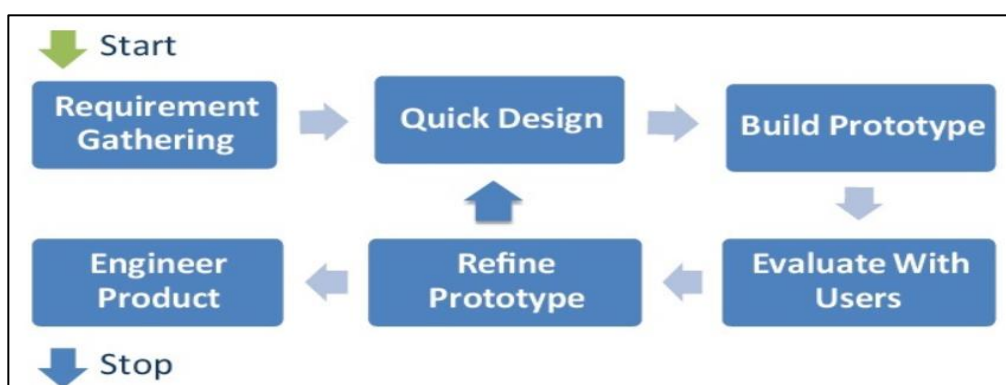


Figure 2.21: Evolutionary Prototyping (Khalid,2018)

The word fidelity explains how the prototypes can be differentiated from the end product, and how they can be modified to highlight design features (Walker et al, 2002). Low-fidelity prototypes show the overall design and the interface feel of a system. These prototypes are designed to interact, teach, and provide information, but not to test, evaluate, or act as a foundation for the source code. Low-fidelity prototypes are easily accessible as they can

be displayed on cardboard, sketches, or whiteboards (Rudd, Stern and Isensee, 1996). According to Inbragimova (2016), low-fidelity prototypes are typically limited function, are easily designed and have minimal or no features. On the contrary, high-fidelity prototypes are completely interactive. Users can enter information in the text field, click buttons and interact with the user interface. (Rudd, Stern and Isensee, 1996). Axure, Form, Principle, Framer, Adobe XD, InVision, Proto.io are examples of web app prototyping tools (Inbragimova, 2016; Ye,2017).

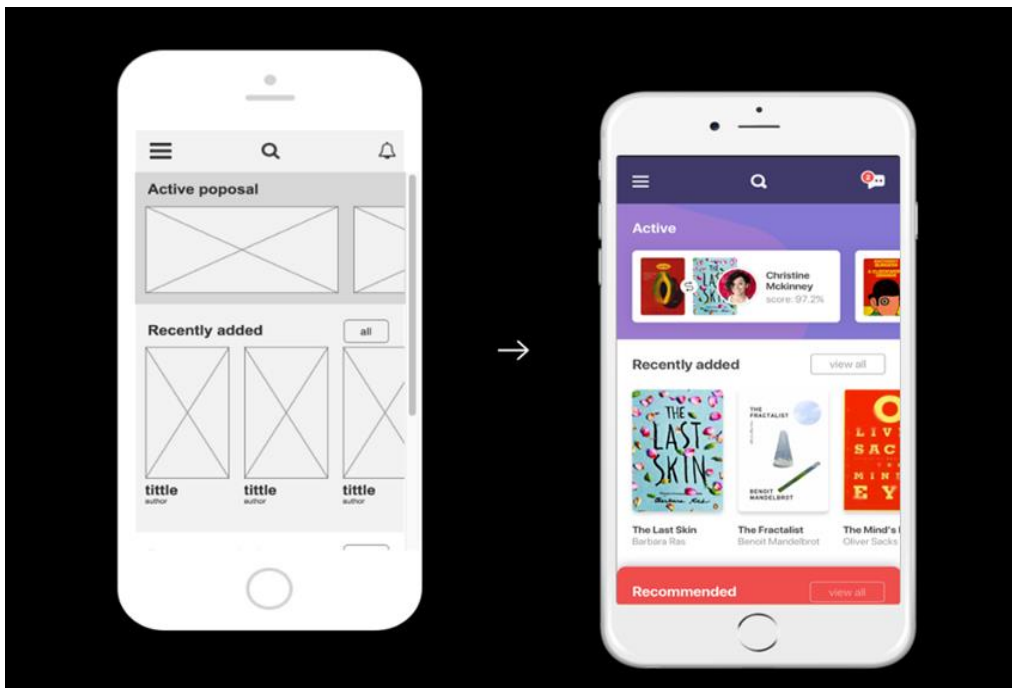


Figure 2.22: Low Fidelity vs High Fidelity Prototype (Pierzchała, 2018)

2.2.4 Spiral Model

Spiral model, a risk-driven software model driven that design to provide risk handling support (GeeksforGeeks,2018; Sharma and Singh, 2015). It looks like a spiral in its graphical model, with several loops. The precise number of spiral loops is depending on the project risks. A spiral loop is considered a phase and there are 4 phases: planning, risk analysis, engineering and evaluation (Elgabry, 2017; Govardhan and Munassar 2010).

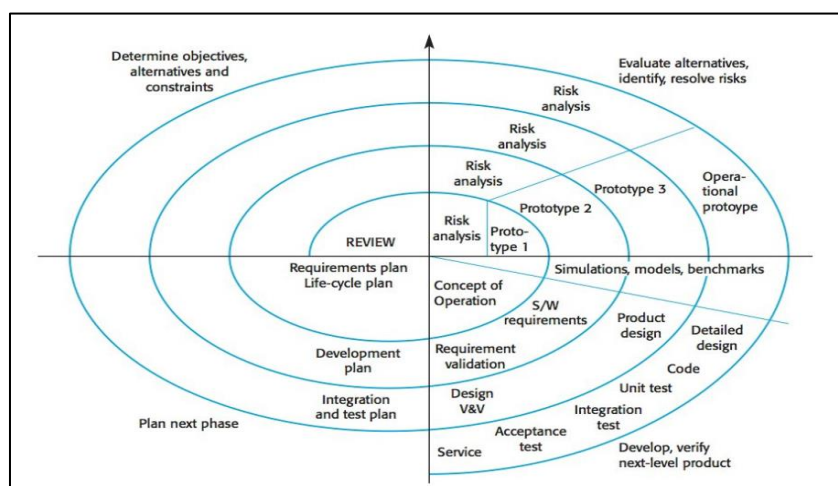


Figure 2.22: Spiral Model (Sharma and Singh, 2015)

Table 2.3: Advantages and Disadvantages of Spiral Model (Alshamrani and Bahattab,2015; Elgabry,2017; GeeksforGeeks, 2018; Rather and Bhatnagar,2015)

Advantages of Spiral Model
a. Risk analysis and risk handling that enhances the risk avoidance
b. Suitable for complex and huge projects
c. Flexible to adapt the change of requirements at a later phase
Disadvantages of Spiral Model
a. This model is more complex than other models due to many documentations required in the intermediate stages
b. The cost is high and not suitable for small and low-risk projects
c. High dependent on the risk analysis phase and require highly experienced experts to develop a successful project
d. Difficult to estimate the time due to the unknown number of phases at the beginning stage.

2.3 Communication Technology

2.3.1 Real-Time Communication

Real-time communication (RTC) is any mode of communication in which sender and recipient can exchange data over a channel without any delay. In this context, it is also known as live communication and it belongs to peer-to-peer communication (Rouse, 2020; Singh and Passi, 2014). RTC can take place in two transmission mode: half duplex and full duplex. In half duplex, the data transmission is bidirectional but asynchronously. For example, walkie-talkie. In full duplex, data transmission is bidirectional and concurrently. For instance, an internet telephone. (Singh and Passi, 2014).

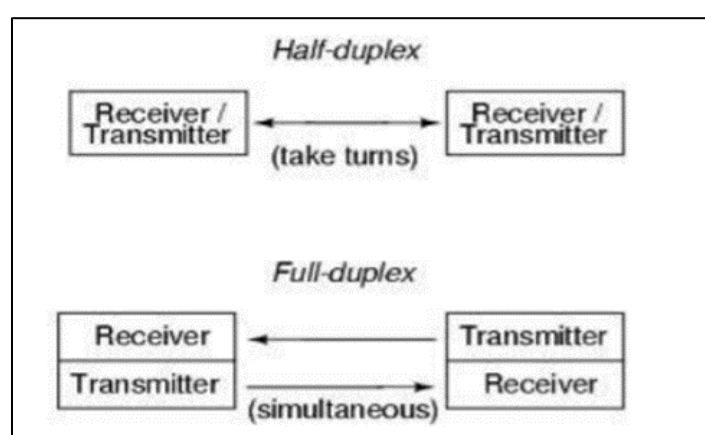


Figure 2.23: Modes of Transmission (Singh and Passi, 2014)

2.3.2 Application of Real-Time Communication

a) Instant Messaging

Instant Messaging is taking place in a private room, between two or more persons. It provides feature such as send a private chat and showing the online or offline status of a person in the contact list. Recently Instant Messaging became popular. This is due to the message instantly pop out on a user screen if the user switches to online mode, without waiting for the recipient to reply.

b) Live Video Conferencing

Live video conference is a conference that use communications technology to transmit audio and video data between two or more individuals at various locations. Each person must have a camera, speaker and microphone connected. Example, Skype enables the user to share a screen or a file during the video conference.

c) Internet Telephony and VoIP

Internet telephony allows the user to start a telephone conversation using the Internet. Tools to set up computer-to-computer telephony requires a cable modem, a microphone and a voice-over with the support of telephony apps built on both sides. VoIP is an internet-based communication approach where software and hardware operate together to transmit phone calls (Singh and Passi, 2014). There is many software for Internet telephony, for instance, pool talk, net meeting, and Viber.

d) Internet Telephony and VoIP

Multimedia information is a form of audio and radio. The multimedia server is often used to collect data from diverse receivers located at geographical locations, for example, Facebook and Twitter.

2.3.3 Web Sockets

Web Sockets offers full duplex communication channels through a single TCP connection and keep it running as long as necessary. It enables bidirectional communication between browsers and servers. Both parties can instantly share data simultaneously and close the connection easily (Chowhury,2018; Educba, n.d.; Tsahi, 2019). Web Sockets supports real concurrency and performance optimisation to create more responsive and rich web applications. It is also very efficient if the application needs frequent messages such as a notification system. It also provides a data framing feature that includes masking every message sent so that the data is encrypted. (Chowhury,2018).

2.3.4 WebRTC

WebRTC is a peer-to-peer type of transport that provides real-time communication between browsers (clients). It can use UDP, TCP, SCTP, or more abstract layers since it is transport-agnostic (Chowhury, 2018). The WebRTC API includes media capture, encoding and decoding, transport layer, audio and video, and session management (Educba, n.d.). It is designed for high-performance, high-quality communication and high-volume data transmission.

WebRTC provides useful key JavaScript API elements for the developer to acquire and communicate streaming data (Dutton,2012; Tsahi,2019)

- a) `getUserMedia` or `Media Stream` enables the access to data streams from the user's device such as camera and microphone.
- b) `MediaRecorder` records audio and video available from the user's device.
- c) `RTCPeerConnection` allows peer-to-peer audio and video calling with facilities for data encryption and bandwidth management. It includes initialise, monitor, and close the connection.
- d) `RTCDataChannel` enables peer-to-peer bidirectional data transmission.

2.4 Conclusion

In this chapter, various studies had been carried out to provide a basic understanding of video conferencing. Telepresence, integrated, desktop, service-based, and codec are the four types of video conferencing systems. Video conferencing has been widely applied such as meeting or collaboration, education, video interviews, work from home and healthcare professionals. Both videos conferencing and face-to-face meetings have distinct pro and con. Travel constraint, meeting content and social relationship are factors to influence decisions to select the mode of communication. This chapter also compared three existing video conferencing: Zoom, Cisco Webex and Microsoft Team. Furthermore, different software development methodologies were compared. This chapter also studies about the application of real-time communication and two RTC protocols: Web Sockets and WebRTC.

CHAPTER 3

METHODOLOGY AND WORK PLAN

3.1 Introduction

After reviewing the studies on different software development method in the previous chapter, evolutionary prototyping methodology has been chosen to apply in the development of web-based video conferencing application. This chapter includes a Work breakdown structure (WBS), Gantt chart and explanation on the development tool used.

3.2 System Development Methodology

In order to create great software, one needs to accomplish a variety of complicated tasks, and if any of the tasks fail, the whole project will fail. Software development methodologies are then established to help keeping the development plan on track (Stephens,2015). In this project, evolutionary prototyping is chosen as the methodology. The main reason for using this approach is to give users a more realistic feel about how the completed system would look like. The prototype will evolve over time until it finally becomes the completed application and satisfies consumer requirements.

3.2.1 Requirement Gathering Phase

The most crucial part of a software project is requirement gathering. This is to make sure that the developed product will address the problems of the users and the specifications meet the expectation of the users. Gather requirements at the project's beginning to find out what functionality to create. The requirements will lead the development and make sure all goes in the right direction. The requirements at the project's completion validate that the completed product is really achieving what it is expected to do (Stephens,2015).

Numerous studies and research were performed to determine the project background, the problem statement, the goal, the solution, the approach and the scope of the project. In addition, the various similar systems were analysed and compared to determine the possible beneficial functionalities of

these systems so that these features may be integrated into the new system to create a more reliable system.

The requirements in this project were divided into functional and non-functional types. After that, user interface designs, use case diagrams, and ER diagrams were developed. The diagrams depict a overall view of the application and the functionality that it will provide to users.

3.2.2 Develop Prototype

There are three phases in an iterative process: build a prototype, evaluate by users and refine the prototype. The number of iterations generally depends on the needs of a project so the number may vary from project to project. For this project, there are two major iterations of prototype implementation.

a) First Prototype Iteration

The product scope for the first prototype iteration is build the entire system by writing code using the chosen tools and programming language. The objective of this iteration is to develop a workable prototype with basic features and integrated with back-end service. The use case diagrams and use case descriptions are used to show the application's comprehensive process flow. After the first prototype is developed, the working prototype will be tested by the volunteers. During a test, the volunteers need to complete some tasks while the observer will watch and record. After the test, the volunteers must complete a survey. The feedbacks and suggestions are recorded and incorporated into the second iteration.

b) Second Prototype Iteration

The product scope of the second iteration was a prototype with more comprehensive and complete features. In the second iteration, the objective is to improve the user experience. The second prototype will be tested by the same volunteers and the testing process is same as the first prototype. The iterative process is repeated until the final prototype meets the user requirements and expectations.

3.2.1 Product Deliver Phase

Once the final prototype is agreed and approved by the stakeholders, the prototype will be finalized. Then, various tests will be carried out to make sure that the system is working well, for example, unit, integration, usability and user acceptance testing.

3.3 Work Plan

Esther Cohen (2018) clarified that all the tasks a project needs to achieve can be described by a work breakdown structure, categorized into several levels and presented graphically. This project used the WBS and Gantt chart to plan the project effectively. The top-down approach was used in which all the complex tasks are subdivided into small and simple tasks. A Gantt chart was used to track projects from the beginning (June 2020) to the end (April 2020) of this project. Four key phases of this project include planning, design, development and testing.

3.3.1 Work Breakdown Structure (Detailed)

1. Planning

- 1.1 Perform background research
- 1.2 Determine problem statement
- 1.3 Define project objectives
- 1.4 Determine project's proposed solution
- 1.5 Determine project's proposed approach
- 1.6 Determine project's scope
- 1.7 Perform literature review
 - 1.7.1 Research on video conferencing
 - 1.7.2 Research on development methodology
 - 1.7.3 Research on communication technology
- 1.8 Methodology and Work Plan
 - 1.8.1 Choose appropriate methodology
 - 1.8.2 Develop work breakdown structure
 - 1.8.3 Develop Gantt chart
 - 1.8.4 Choose development tools

2. Design

2.1 Develop use case diagrams

2.1.1 Develop use case descriptions

2.2 Develop data models

2.2.1 Develop conceptual data model

2.2.2 Develop logical data model

2.2.3 Develop physical data model

2.3 Develop Activity Diagrams

2.3.1 Develop Activity Diagrams for user

2.3.2 Develop Activity Diagrams for admin

2.4 Develop User Interface Prototypes

2.4.1 Develop Low-fidelity Prototype

2.4.2 Develop High-fidelity Prototype

3 Development

3.1 Develop prototype

3.1.1 First prototype iteration

3.1.1.1 Implement features of system

3.1.1.2 Evaluate prototype

3.1.1.3 Refine prototype

3.1.2 Second prototype iteration

3.1.2.1 Improve first prototype

3.1.2.2 Evaluate prototype

3.1.2.3 Refine prototype

3.2 Product engineering/ delivery

3.2.1 Enhance final prototype

4 Testing

4.1 Perform unit testing

4.2 Perform integration testing

4.3 Perform usability testing

4.4 Perform user acceptance testing

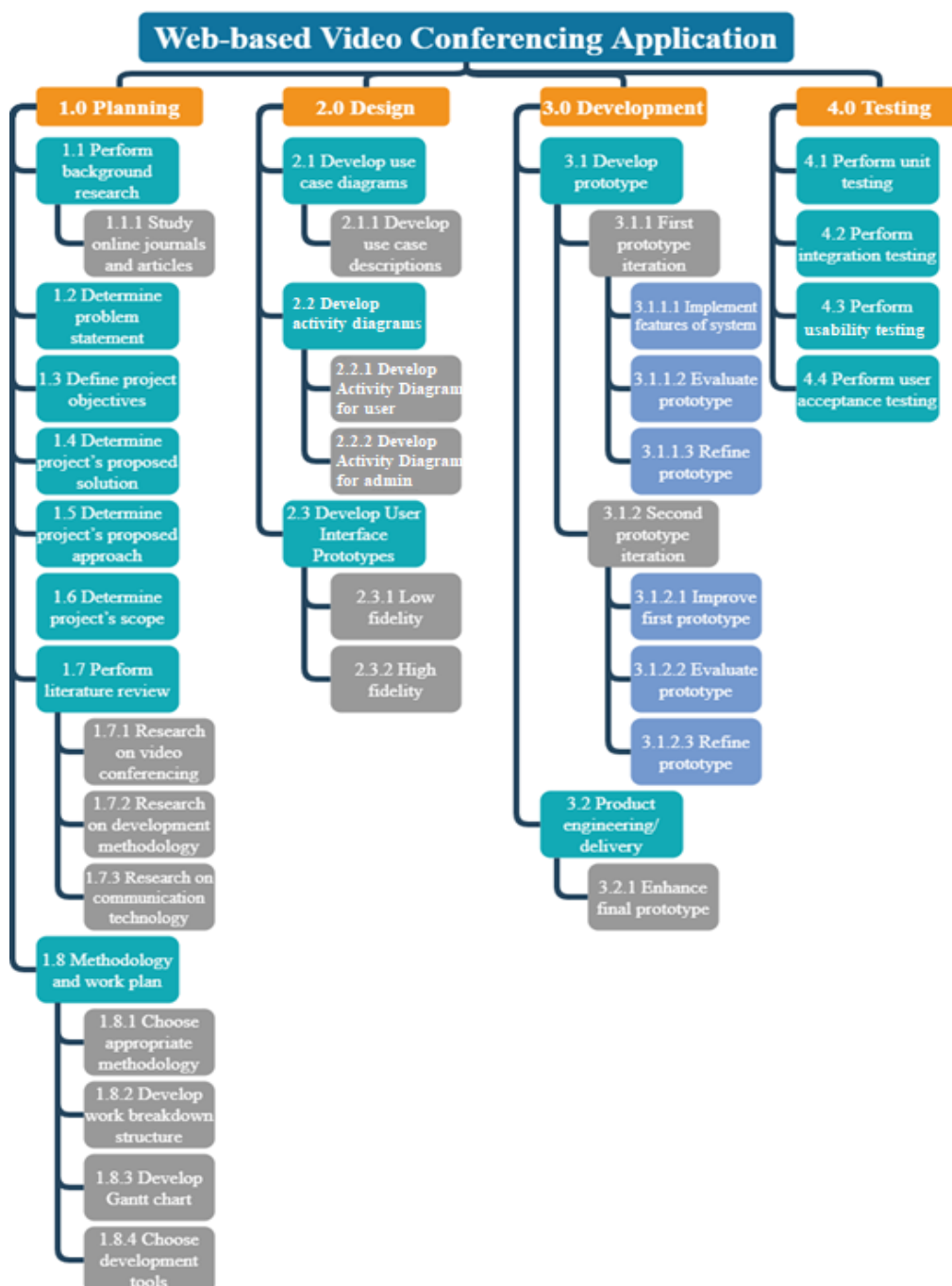


Figure 3.1: Work Breakdown Structure

3.3.1 Gantt Chart

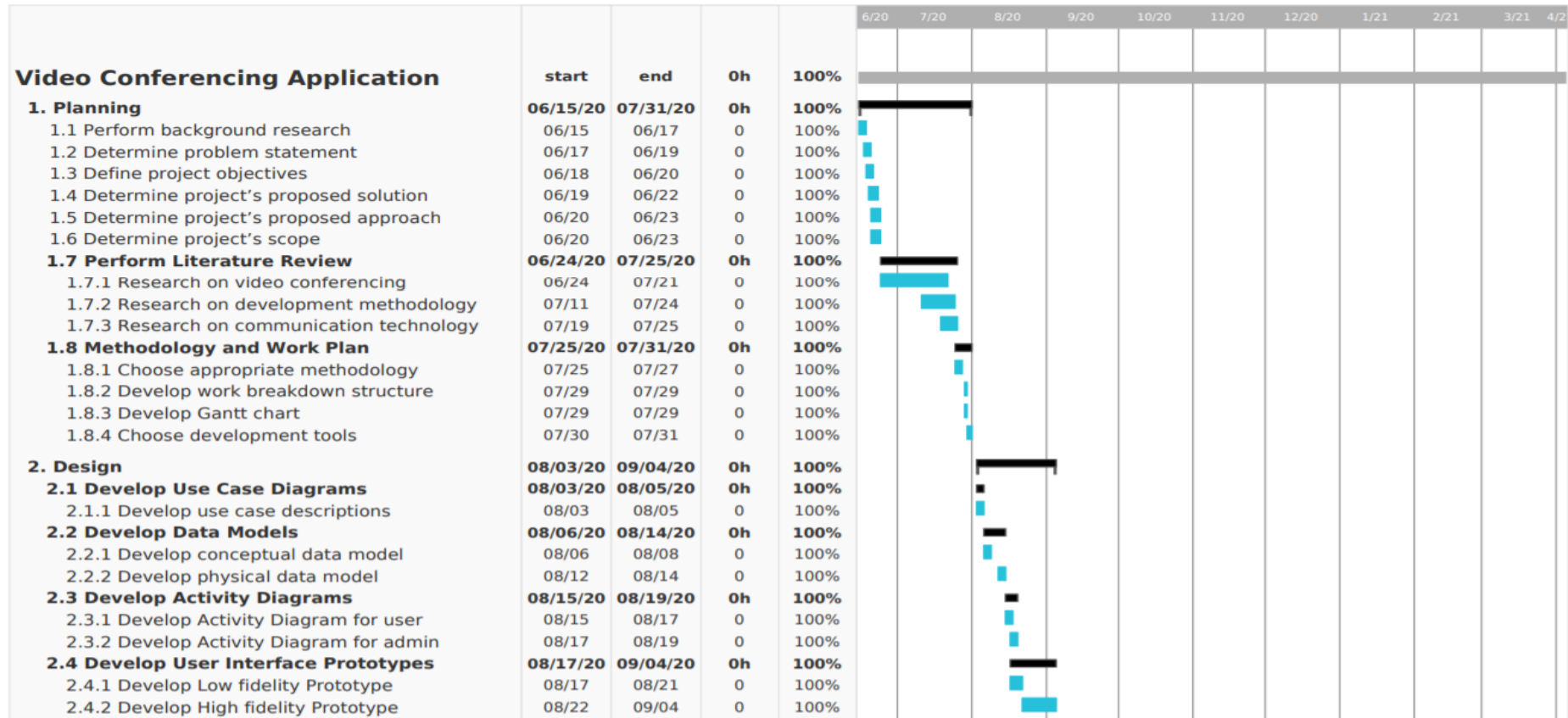


Figure 3.2: Gantt Chart

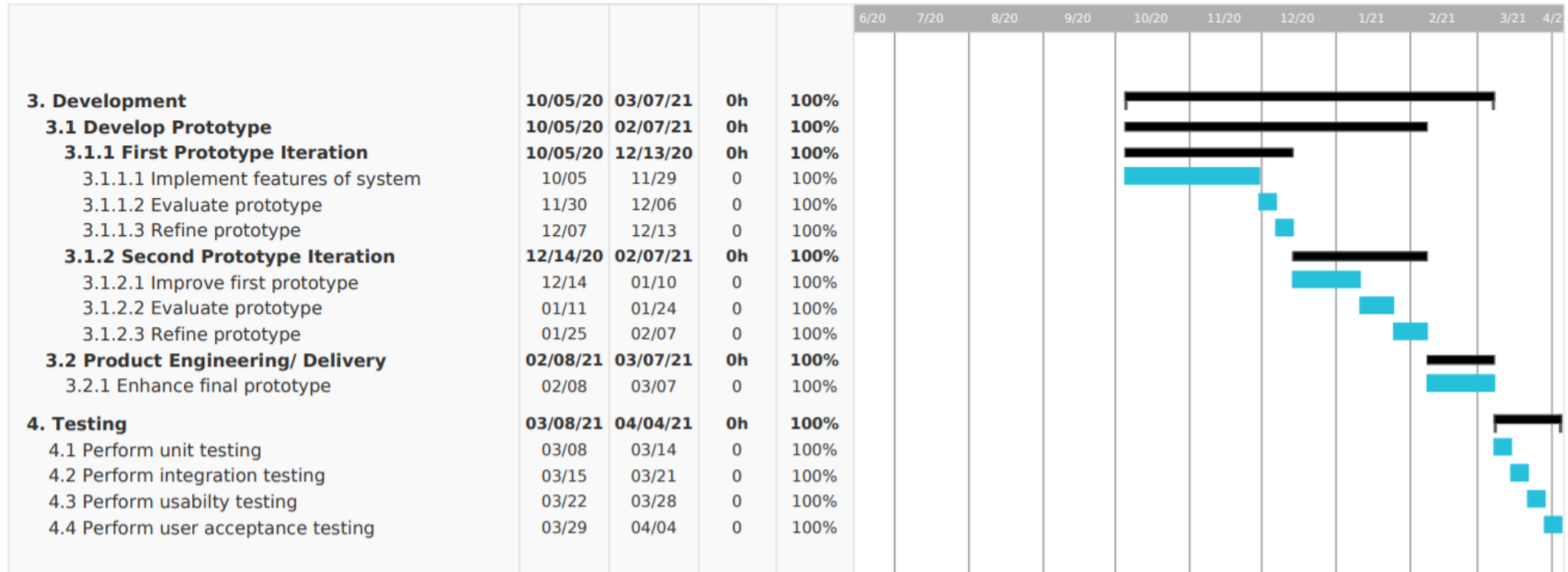


Figure 3.3: Gantt Chart (continue)

3.4 Development Tools

3.4.1 Bootstrap

Bootstrap was released in August 2011 by Mark Otto and Jacob Thornton (Spurlock, 2013). It is the most common open-source platform for creating responsive websites using HTML, CSS and JavaScript. Segal (n.d.) states that Bootstrap supports JavaScript plugins and includes font style, forms, links, menus, modals, carousel and many more. The reason of choosing Bootstrap is to design of a responsive website faster, since it is simple to set up and completely customizable.

3.4.2 Visual Studio Code

Visual Studio Code is a versatile code editor for macOS, Windows, and Linux. It comes with built-in support for Node.js and JavaScript, as well as a number of other extensions. Visual Studio Code was chosen as a code editor because it is simple to install and free to use.

3.4.3 GitHub

Github is used as a version control system to tracks the various versions of the code. Every file on GitHub has a history to record the modifications that have occurred at different times. Github is selected to keep track of the work and easily navigate among different versions of the files while maintaining an online backup.

3.4.4 WampServer

WampServer (Windows, Apache, MySQL, and PHP) is a virtual server for web creation and internal testing that serves live websites (Artūras, 2019). A web developer can monitor websites in a web browser without uploading to the Internet because it is saved locally on the computer (Artūras, 2019; TechTerms, 2013).

3.4.5 Heroku

Heroku is a container-based cloud Platform. Heroku is being used to deploy, handle, and scale real-time applications in this project. By using Heroku, it reduces the time taken to launch an app and improve the efficiency of the app development life cycle (Smallcombe, 2020).

3.4.6 Node.js

Node.js is a bundled compilation of Google's V8 JavaScript engine. The main functionality of Node.js is incorporated in a JavaScript library that will assist in the development of fast and flexible network applications. Node.js is mainly used to develop apps that involve real-time connectivity between end devices. In simple words, it is a JavaScript cross-platform that's free and open source and is useful at applications that depend on I/O operations.

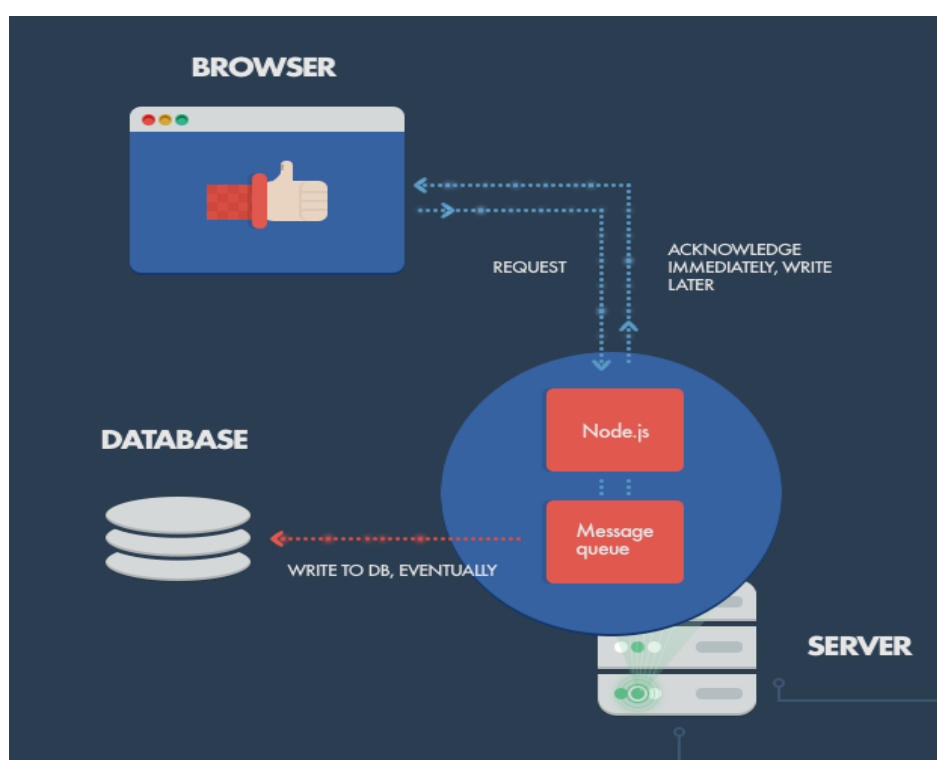


Figure 3.4 : How Nodejs works (Capan, n.d.)

3.4.7 Express.js

Express.js is a framework based on Node.js. It provides route support that helps users to write responses to different URLs in response to requests. It also supports a variety of templating engines to make HTML generation easier (Vivah, 2017).

3.4.8 Web Programming Language

Web programming language is very important to control the actions of a machine. This project uses different programming languages to write the source code.

First is HTML (Hyper Text Markup Language). HTML is the standard mark-up language for webpages, and it contains many elements like heading, title, link, tables and so on. HTML5 is the latest version of HTML which has new features to interact with internet technologies for content structure and layout. According to MDN contributors (2019), HTML5 supports web socket enabling full duplex communication between client and server. In addition, HTML5 supports both audio and video through the integration into it. Compared to HTML, HTML5 is more able to handle errors, but also has a JavaScript web worker API that allows JavaScript and web browser interface to execute in different threads (Educba, n.d.).

Second is CSS (Cascading Style Sheets). CSS is used to style an HTML element like font size, font family, background colour. In this project, CSS is used to design the appearance of the web application. Third is JavaScript. It supports functional and object-oriented programming style. In this project, JavaScript is used to program the behaviour of the webpages, like show and hide an HTML element. Finally, there is also SQL (Structures Query Language). It's a programming language for storing, managing, and retrieving information from databases. In this project, SQL is used to access and manipulate databases.

3.4.9 Chrome DevTools

Chrome provides a set of built-in tools for web developers. It provides features such as inspect network activity, run and debug JavaScript in the console. In this project, Chrome DevTools provides a device mode's screen emulator to test the responsiveness of the web application.

3.5 Conclusion

This chapter contains a detailed description of how the evolutionary prototyping methodology was applied to this project, a work breakdown structure, a Gantt chart as well as a list of useful development tools used to build the web-based video conferencing application.

CHAPTER 4

PROJECT INITIAL SPECIFICATION

4.1 Introduction

This chapter contains a list of all functional requirements, a use case diagram and use case descriptions. A use case diagram can show how a user interacts with the device, while a use case description can go into great detail about each use case.

4.2 Functional Requirements

4.2.1 Video Conference Application

User

a) Register and Signing in

1. The system must allow the user to register for a new account.
2. The system must allow the user to log in to the application using the registered account.
3. The system must provide a dashboard for the user to access the features after log in.

b) Contact List

1. The system must allow the user to view a list of contact of other users.
2. The system must allow the user to add a new user to the contact list.
3. The system must allow the user to delete the user from the contact list.
4. The system must allow the user to search a user from the contact list.

c) Room

1. The system must allow the user to create a room (owner).
2. The system must allow the owner of the room to add channel to room.
3. The system must allow the owner of the room to invite user to room.
4. The system must allow the owner of the room to delete channel from room.
5. The system must allow the owner of the room to remove user from room.
6. The system must allow the owner of the room to delete room.
7. The system must allow all the room member to view member list in a room.

8. The system must allow the room member to leave the room.
- d) Channel Conversation
 1. The system must allow the user to send message in a channel.
 2. The system must allow the user to view message in a channel.
 3. The system must allow the user to upload a file in a message.
 4. The system must allow the owner of the room to clear chat history of the channel.
- e) Schedule a Meeting
 1. The system must allow the user to view the upcoming meeting.
 2. The system must allow the user to schedule a meeting.
 3. The system must allow the user to edit a scheduled meeting detail.
 4. The system must allow the user to delete a scheduled meeting.
- f) Agenda Planner
 1. The system must allow the user to view the meeting agenda.
 2. The system must allow the user to create a meeting agenda.
 3. The system must allow the user to edit the meeting agenda.
 4. The system must allow the user to delete the meeting agenda.
- g) Meeting
 1. The system must allow the user (host) to start a meeting.
 2. The system must allow the user (participant) to join a meeting.
 3. The system must allow the user to toggle the audio.
 4. The system must allow the user to toggle the camera.
 5. The system must allow the user to view all the attendees joining a meeting.
 6. The system must allow the user to see the meeting information.
 7. The system must allow the user to leave a meeting.
 8. The system must allow the user to share the meeting to others.
 9. The system must allow the user to gain points for attending a meeting.
- h) Private Conversation
 1. The system must allow the user to view private chat conversations.
 2. The system must allow the user to start a conversation with another user.
 3. The system must allow the user to send a message in the conversation.
 4. The system must allow the user to upload a file.
- i) Notification

1. The system must send notification to the participant.

2. The system must allow the user to view notification.

j) Profile Management

1. The system must allow the user to view the profile details.

2. The system must allow the user to edit the profile details.

3. The system must allow the user to delete the account.

4. The system must allow the user to change profile picture.

5. The system must allow the user to change password.

k) Speed Test

1. The system must allow the user to test the internet speed.

l) Feedback

1. The system must allow the user to rate the application.

2. The system must allow the user to give comment.

m) Reward System

1. The system must allow the user to view the point gain by herself.

2. The system must allow the user to claim reward based on the point.

n) Log out

1. The system must allow the user to log out the application.

Guest

1. The system must allow the guest to join a meeting room using a meeting room ID.

2. The system must allow the guest to fill in name before the meeting.

3. The system must allow the guest to toggle the audio button in a meeting.

4. The system must allow the guest to toggle the video button in a meeting.

5. The system must allow the guest to leave a meeting.

6. The system must allow the guest to send feedback after the meeting.

4.2.2 Administrator System

1. The system must allow the admin to log in / log out to the admin application.
2. The system must provide a dashboard for the admin to access the features after log in.
3. The system must allow the admin to view the list of users.
4. The system must allow the admin to view the list of guests.
5. The system must allow the admin to view the list of admin.
6. The system must allow the admin to create a new admin account.
7. The system must allow the admin to delete the admin account.
8. The system must allow the admin to view the feedback of the user.

4.3 Non-functional Requirements

a) Usability Requirement

1. The system shall provide a simple guide to allow the users to be familiar to all the system's features.
2. The system shall have responsive user interface designs.

b) Performance Requirement

1. The system shall allow up to 5 users to join a meeting concurrently.

c) Operational Requirement

1. The system shall only be accessed over the Internet.

d) Development Requirement

1. The system shall be built with web programming languages

e) Accuracy Requirement

1. The system shall enable form validation.

f) Physical Requirement

Table 4.1: Physical Requirement

System Requirements	Descriptions
Web Browser	Google Chrome, Mozilla Firefox
Camera	A webcam capable of producing high-quality video
Bandwidth	600kbps for high quality video 1.2 Mbps for 720p HD video
Ram and Processor	A computer with at least 1 GB of RAM and a dual-core processor.
Audio	Built-in microphone or Headset

4.4 Use Case**4.4.1 Use Case Diagram**

A use case is an overview of how actors and systems communicate. A use case diagram is drawn to show the interactions of the users and the video conferencing application. It consists of four actors: administrator, user and guest, a series of use cases and their relationship.

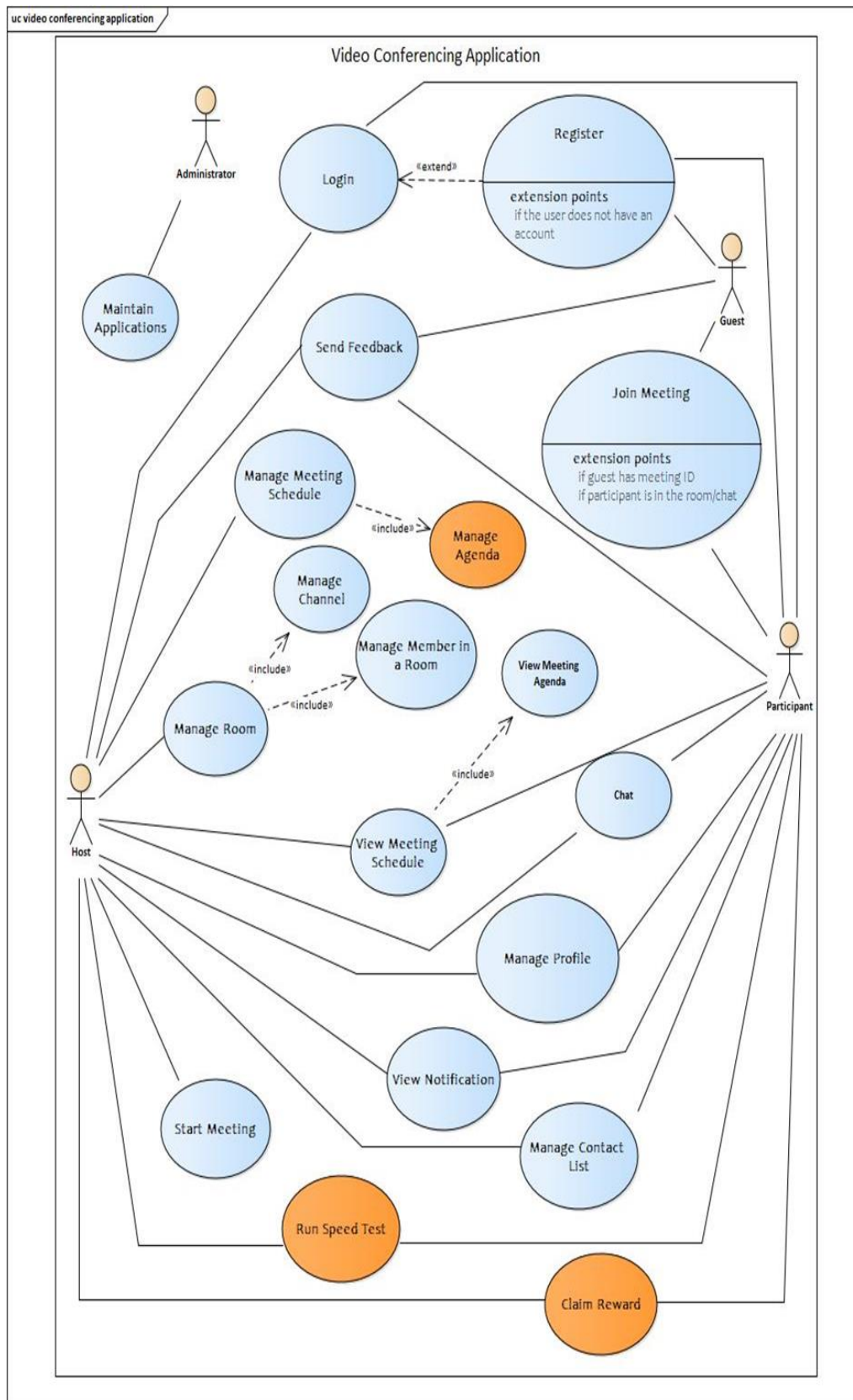


Figure 4.1: Use Case Diagram

4.4.2 Use Case Description

Use Case ID	1
Use Case Name	Login
Actors	User
Description	User logs in to the video conferencing application.
Pre-condition	User must have a registered account.
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. A user enters email and password. 2. The system validates user email and password. 3. The system redirects to the user's dashboard.
Alternative Flow	<ol style="list-style-type: none"> 2.1 The email or password is wrong. <ol style="list-style-type: none"> 2.1.1 The system displays an error message.

Use Case ID	2
Use Case Name	Register
Actors	User, Guest
Description	User registers for a new account.
Pre-condition	-
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. User enter username, email, password and confirm-password. 2. The system validates username, email, password and confirm-password. 3. The system displays a message to indicate
Alternative Flow	<ol style="list-style-type: none"> 2.1 Duplicated accounts detected. <ol style="list-style-type: none"> 2.1.1 The system displays an error message.

Use Case ID	3
Use Case Name	Manage Room
Actors	User
Description	The user creates, edits and deletes a room.
Pre-condition	-
Post-condition	-
Normal Flow	<p>A. Create Room</p> <ol style="list-style-type: none"> 1. The user clicks to create a room. 2. The user enters details of a room. 3. The user clicks the add button. <p>B. View Room</p> <ol style="list-style-type: none"> 1. The user clicks home button from the menu. 2. The user select a room. <p>C. Delete Room</p> <ol style="list-style-type: none"> 1. The user clicks home button from the menu. 2. The user select a room to delete. 3. The user click delete room button.
Alternative Flow	<p>A. Create Room</p> <ol style="list-style-type: none"> 3.1. The system validates the input of user entered. <ol style="list-style-type: none"> 3.1.1 If the inputs are valid, create a room successfully. 3.1.2 If the inputs are invalid, the system shows an error message. <p>B. Delete Room</p> <ol style="list-style-type: none"> 3.1. The system shows a message to confirm delete action. <ol style="list-style-type: none"> 3.1.1 If the user confirms the delete action, the room will be deleted.

Use Case ID	4
Use Case Name	Manage Channel
Actors	User
Description	The user view, add and deletes a channel.
Pre-condition	The user had created a room.
Post-condition	-
Normal Flow	<p>A. View Channel within a Room</p> <ol style="list-style-type: none"> 1. The user clicks home button from the menu. 2. The user select a room. 3. The user select the channel. 4. The system shows the channel. <p>B. Add Channel to Room</p> <ol style="list-style-type: none"> 1. The user selects home button from the menu. 2. The user selects a room. 3. The user click add channel. 4. The user enter channel details and submit the form. <p>C. Delete Channel</p> <ol style="list-style-type: none"> 1. The user selects the view channel feature. 2. The user selects to delete a channel. 3. The system shows the channel list.
Alternative Flow	<p>B. Add Channel to Room</p> <ol style="list-style-type: none"> 4.1. The system validates the input of user entered. <ol style="list-style-type: none"> 4.1.1 If the inputs are valid, create a channel successfully. 4.1.2 If the inputs are invalid, the system shows an error message. <p>C. Delete Channel</p> <ol style="list-style-type: none"> 2.1. The system shows a message to confirm delete action. <ol style="list-style-type: none"> 2.1.1 If the user confirms the delete action, the channel will be deleted.

Use Case ID	5
Use Case Name	Manage Member in a Room
Actors	User
Description	The user adds and deletes a member in the room.
Pre-condition	The user had created a room.
Post-condition	-
Normal Flow	<p>A. View Member within a Room</p> <ol style="list-style-type: none"> 1. The user clicks home button from the menu. 2. The user select a room. 3. The user select the channel. 4. The system shows the member list. <p>B. Add Member to Room</p> <ol style="list-style-type: none"> 1. The user selects home button from the menu. 2. The user selects a room. 3. The user click insert member. 4. The user select member and submit the form. <p>C. Remove Room Member</p> <ol style="list-style-type: none"> 1. The user selects home button from the menu. 2. The user selects a room and a channel. 3. The system shows the member list. 4. The user click delete member button.
Alternative Flow	<p>B. Add Member to Room</p> <ol style="list-style-type: none"> 4.1. The system validates the input of user entered. <ol style="list-style-type: none"> 4.1.1 If the inputs are valid, member added successfully. 4.1.2 If the inputs are invalid, the system shows an error message. <p>C. Remove Room Member</p> <ol style="list-style-type: none"> 4.1. The system shows a message to confirm delete action. <ol style="list-style-type: none"> 4.1.1 If the user confirms the delete action, the member will be removed.

Use Case ID	6
Use Case Name	Manage Contact List
Actors	User
Description	The user adds, edits and deletes a contact.
Pre-condition	-
Post-condition	-
Normal Flow	<p>A. Add contact</p> <ol style="list-style-type: none"> 1. The user selects contact button from menu. 2. The user selects add contact button. 3. The user enters username or user email. 4. The user selects add user button. <p>B. Delete contact</p> <ol style="list-style-type: none"> 1. The user selects contact button from menu. 2. The user selects delete contact button. 3. The systems shows the contact list.
Alternative Flow	<p>A. Add contact</p> <ol style="list-style-type: none"> 4.1 The system validates the user inputs <ol style="list-style-type: none"> 4.1.1 If the inputs match one or more user, the system shows the user 4.1.2 If the inputs do not match a user, the system shows a message <p>B. Delete contact</p> <ol style="list-style-type: none"> 2.1. The system shows a message to confirm delete action. <ol style="list-style-type: none"> 2.1.1 If the user confirms the delete action, the contact will be deleted.

Use Case ID	7
Use Case Name	Start a Meeting
Actors	User (Host)
Description	The user can start a meeting in a chat or a channel.
Pre-condition	The user is in a conversation or in a channel.
Post-condition	-
Normal Flow	1. The user selects a conversation/ a channel. 2. The user select video call or audio call button to starts a meeting.
Alternative Flow	-

Use Case ID	8
Use Case Name	Join Meeting via Channel / Chat
Actors	User (Participant)
Description	The user joins a meeting.
Pre-condition	1. The host has started a meeting. 2. The user is a member of the channel 3. The user is in the conversation.
Post-condition	-
Normal Flow	1. The user selects the room and channel. 2. The user selects to join meeting.
Alternative Flow	-

Use Case ID	9
Use Case Name	Join Meeting via Meeting ID
Actors	Guest
Description	The guest joins a meeting room.
Pre-condition	1. The host has started a meeting. 2. The guest has the meeting room ID.
Post-condition	-
Normal Flow	1. The guest enter meeting ID. 2. The guest enter name, gender and click join

	meeting.
Alternative Flow	<p>1.1. The system validates the meeting ID of user entered.</p> <p>1.1.1 If the ID are valid, the system shows a guest loading page for guest to enter basic info.</p> <p>1.1.2 If the inputs are invalid, the system shows an error message.</p>

Use Case ID	10
Use Case Name	View Notification
Actors	User
Description	The user views the notification received.
Pre-condition	-
Post-condition	-
Normal Flow	<p>1. The user select the notification button from the menu.</p> <p>2. The system shows the notifications.</p>
Alternative Flow	-

Use Case ID	11
Use Case Name	Chat
Actors	User
Description	The user sends a private message to another user.
Pre-condition	The recipient is in the user's contact list.
Post-condition	-
Normal Flow	<p>A. Start a new chat</p> <p>1. The user selects chat button from the menu.</p> <p>2. The user clicks to create a new conversation.</p> <p>3. The user selects recipient and enter chat content.</p> <p>4. The user clicks the send button.</p> <p>B. Send chat message</p> <p>1. The user selects chat button from the menu.</p>

	<ol style="list-style-type: none"> 2. The user selects a conversation. 3. The user enter the message. 4. The user clicks the send button <p>C. Clear Chat History</p> <ol style="list-style-type: none"> 1. The user selects chat button from the menu. 2. The user selects a conversation. 3. The user click clear history button.
Alternative Flow	<p>A. Start a new chat</p> <ol style="list-style-type: none"> 3.1. The system validates the input of user entered. <ol style="list-style-type: none"> 3.1.1 If the inputs are invalid, the system shows an error message. 3.1.2 If the inputs are valid, the system check if the conversation exist <ol style="list-style-type: none"> 3.1.2.1 If the conversation exists, the system inserts a chat message with the existing conversation. 3.1.2.2 If the conversation does not exist, the system inserts a new conversation and insert a chat message to the inserted conversation. <p>B. Send chat message</p> <ol style="list-style-type: none"> 4.1. The system validates the input of user entered. <ol style="list-style-type: none"> 4.1.1 If the inputs are valid, save the change. 4.1.2 If the inputs are invalid, shows an error message. <p>C. Clear Chat History</p> <ol style="list-style-type: none"> 2.1. The system shows a message to confirm the clear history action. <ol style="list-style-type: none"> 2.1.1 If the user confirms the delete action, the chat messages will be deleted.

Use Case ID	12
Use Case Name	Manage Meeting Schedule
Actors	User (Host)
Description	The user creates, edits and deletes a meeting schedule.
Pre-condition	-
Post-condition	-
Normal Flow	<p>A. Create Meeting Schedule</p> <ol style="list-style-type: none"> 1. The user clicks to create a meeting into the meeting schedule. 2. The user enters details of a meeting. 3. The user clicks the add button. <p>B. Edit Meeting Schedule</p> <ol style="list-style-type: none"> 1. The user selects schedule button from the menu. 2. The user selects a schedule to edit. 3. The user change the details of the meeting schedule. 4. The user submit the change. <p>C. Delete Meeting Schedule</p> <ol style="list-style-type: none"> 1. The user selects view schedule feature. 2. The user selects to delete a meeting schedule.
Alternative Flow	<p>A. Create Meeting Schedule</p> <ol style="list-style-type: none"> 3.1. The system validates the input of user entered. <ol style="list-style-type: none"> 3.1.1 If the inputs are valid, create a meeting into the schedule successfully. 2.1.2 If the inputs are invalid, the system shows an error message. <p>B. Edit Meeting Schedule</p> <ol style="list-style-type: none"> 4.1. The system validates the input of user entered. <ol style="list-style-type: none"> 4.1.1 If the inputs are valid, save the change.

	<p>4.1.2 If the inputs are invalid, shows an error message.</p> <p>C. Delete Meeting Schedule</p> <p>2.1. The system shows a message to confirm delete action.</p> <p>2.1.1 If the user confirms the delete action, the meeting will be deleted.</p>
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Use Case ID	13
Use Case Name	View Meeting Schedule
Actors	User (Participant)
Description	The user views the meeting schedule.
Pre-condition	The user created the meeting schedule.
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The user selects view meeting schedule feature. 2. The system shows the meeting schedule. 3. The user clicks to see the details of a scheduled meeting.
Alternative Flow	-
Use Case ID	14
Use Case Name	Manage Agenda
Actors	User
Description	The user creates, edits and deletes a meeting agenda.
Pre-condition	The user creates a meeting schedule.
Post-condition	-
Normal Flow	<p>A. Create Meeting Agenda</p> <ol style="list-style-type: none"> 1. The user clicks to create a meeting agenda. 2. The user enters details of the agenda. 3. The user clicks the add button. <p>B. Edit Meeting Agenda</p> <ol style="list-style-type: none"> 1. The user selects schedule button from the menu.

	<ol style="list-style-type: none"> 2. The user selects a schedule to edit the agenda. 3. The user change the details of the meeting agenda. 4. The user submit the change. 5. The system shows the meeting agenda. <p>C. Delete Meeting Agenda</p> <ol style="list-style-type: none"> 1. The user selects schedule button from the menu. 2. The user selects a schedule. 3. The user selects an agenda. 4. The user selects to delete a meeting agenda.
Alternative Flow	<p>A. Create Meeting Agenda</p> <ol style="list-style-type: none"> 3.1. The system validates the input of user entered. 3.1.1 If the inputs are valid, create a meeting agenda successfully. 2.1.2 If the inputs are invalid, the system shows an error message. <p>B. Edit Meeting Agenda</p> <ol style="list-style-type: none"> 4.1. The system validates the input of user entered. 4.1.1 If the inputs are valid, save the change. 4.1.2 If the inputs are invalid, shows an error message. <p>C. Delete Meeting Agenda</p> <ol style="list-style-type: none"> 4.1. The system shows a message to confirm delete action. 4.1.1 If the user confirms the delete action, the meeting agenda will be deleted.

Use Case ID	15
Use Case Name	View Meeting Agenda
Actors	User
Description	The user views the meeting agenda.
Pre-condition	The user created the meeting agenda.
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The user selects schedule button from the menu. 2. The user selects a schedule. 3. The system extracts the meeting agenda from the database and display to the user.
Alternative Flow	-

Use Case ID	16
Use Case Name	Manage Profile
Actors	User
Description	The user manages the profile and customizes the settings.
Pre-condition	The user has registered an account and sign-in to the application.
Post-condition	-
Normal Flow	<p>A. Edit Personal Info</p> <ol style="list-style-type: none"> 1. The user selects settings button from the menu. 2. The user selects my profile tab. 3. The system shows user personal info. 4. The user edits the personal info. 5. The user clicks apply button to save change. <p>B. Edit Profile Picture</p> <ol style="list-style-type: none"> 1. The user selects settings button from the menu. 2. The user selects my profile tab. 3. The system shows the user's current profile picture. 4. The user selects upload new profile picture.

	<p>5. The user clicks apply button to save the change.</p> <p>C. Edit Password</p> <ol style="list-style-type: none"> 1. The user selects settings button from the menu. 2. The user selects my profile tab. 3. The system shows edit password form. 4. The user enter the current password and new password. 5. The user select apply button to save change. <p>D. Delete Account</p> <ol style="list-style-type: none"> 1. The user selects settings button from the menu. 2. The user selects my profile tab. 3. The user selects delete account.
Alternative Flow	<p>C. Edit Password</p> <ol style="list-style-type: none"> 4.1 The system checks the user current password. 4.1.2 If the current password does not match, the system will show an error message.

Use Case ID	17
Use Case Name	Run Speed Test
Actors	User
Description	The user starts a speed test to check the internet bandwidth.
Pre-condition	-
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The user selects settings button from the menu. 2. The user selects speed test feature and clicks start button. 2. The system measures the user's connection speed to the internet. 3. The system shows the test result.
Alternative Flow	-

Use Case ID	18
Use Case Name	Claim Reward
Actors	User
Description	The user claims reward based on point earned.
Pre-condition	-
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The user selects the settings button from the menu. 2. The system shows the point gain by the user. 3. The user clicks claim reward button.
Alternative Flow	<ol style="list-style-type: none"> 3.1. The system checks the point of user. <ol style="list-style-type: none"> 3.1.1 If the points are above 2, the system shows a reward page. 3.1.2 If the points are more than 10, the system unlocks the first reward. 3.1.2 If the points are more than 30, the system unlocks the first and second reward. 3.2.3 If the points are more than 50, the system unlocks the third reward.

Use Case ID	19
Use Case Name	Send Feedback
Actors	User
Description	The user sends a feedback to report a bug or provide suggestion.
Pre-condition	-
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The user selects the settings button from the menu. 2. The user select send feedback button. 3. The system show user a page with feedback form. 4. The user enter the rating and comment, then click submits button to submit the feedback.
Alternative Flow	-

Use Case ID	20
Use Case Name	Maintain Application
Actors	Administrator
Description	The admin can maintain the application.
Pre-condition	-
Post-condition	-
Normal Flow	<ol style="list-style-type: none"> 1. The administrator logs in to the administrator system. 2. The system shows a dashboard to administrator. 3. The administrator clicks on view user list to view the details of users. 4. The administrator clicks on view guest list to view the details of guests. 5. The administrator clicks on view admin list to view the details of admin. 4. The administrator clicks the view feedback list to view the feedback send by the users and guest.
Alternative Flow	-

4.5 Conclusion

This chapter shows the detailed functional and non-functional requirements. Besides, the use case diagram and use case descriptions are used to clarify the user requirements and to serve as a guide for the development process.

CHAPTER 5

DESIGN

5.1 Introduction

This chapter comprises of three different parts namely architecture design, database design and user interface design. The web application architecture is important as it is the blueprint for supporting future implementation. The database design will involves determine what data need to be stored and explain the relationships between the data using a ER Digram. The user interface design shows the visual layout of the web application.

5.2 Web Application Architecture

Web application architecture defines how application elements work with one another. Web application architecture, in simply term, defines how the client and server are connected.

According to a blog post published on Altexsoft (2019), there are three key concepts when creating a web application. The application should be easy, aesthetically appealing, and solve the majority of the user's concerns. From the company perspective, the web application should have a commercial value. A web application should be usable, and able to handle heavy traffic loads, according to a software developer. A web application architecture should consider all these concepts.

Meego video conferencing application architecture falls into “Three Tier Architecture” model. This architectural model is selected to ensure the flexibility, security, and performance of the application. The functionality is separated into three tiers: the client tier, or user interface; the business login tier for data processing; and the data tier, for data storing and management. These tiers can be developed and tested separately.

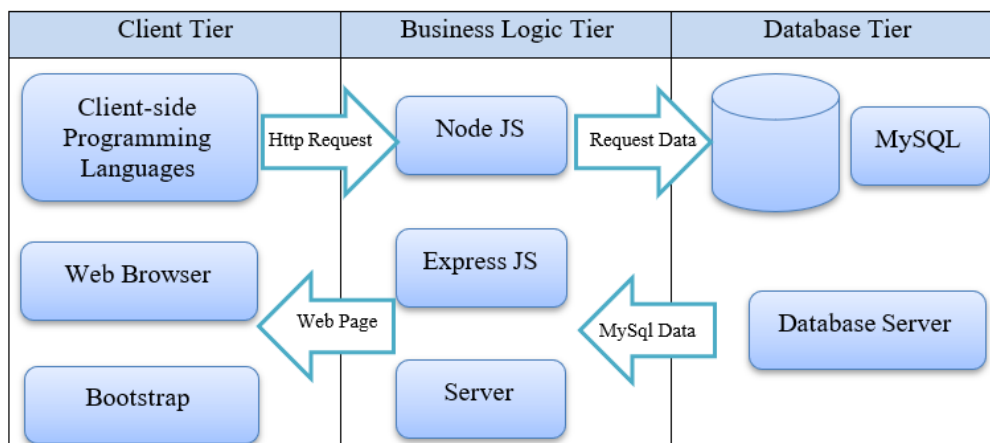


Figure 5.1: Three Tiers Architecture

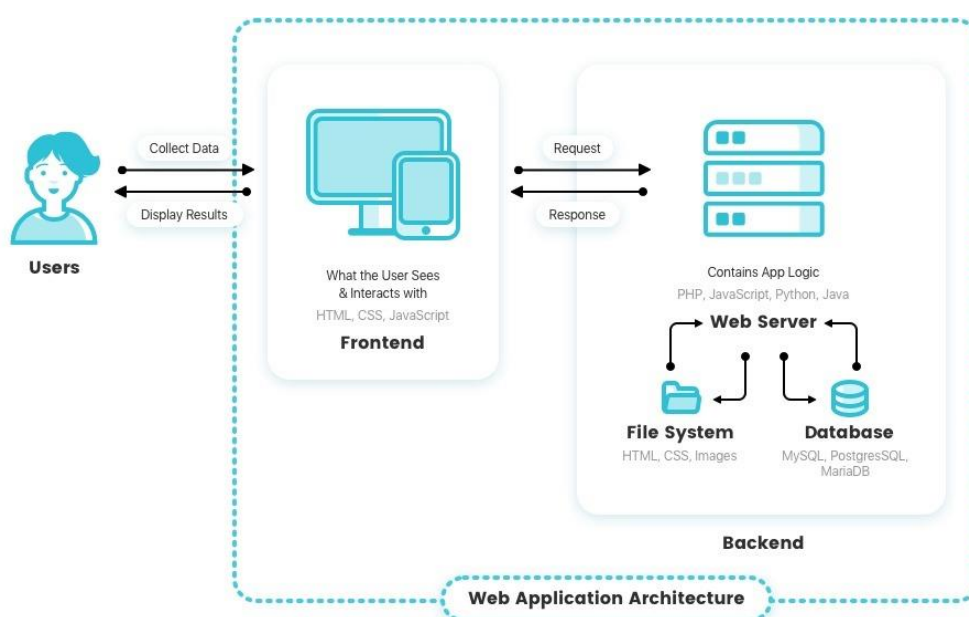


Figure 5.2 Web Application Architecture (Maury, 2020)

The Figure 5.1 shows the three-tiers architecture while and Figure 5.2 further explains the web application architecture. The user will interact with the web application at the first tier of the architecture. The client-side programming languages are Javascript, HTML, and CSS using one of the most popular frameworks, Bootstrap. Bootstrap is incredibly simple to use and aids in the creation of responsive websites as well as improving overall website consistency.

The second tier, Business Logic Tier is the medium of communication for the first and third tier. It will be written using NodeJs and ExpressJS. Nodejs is a JavaScript open-source cross-platform while ExpressJS is a flexible Node.js web app framework that makes the implementation much

easier. This tier delivers HTML pages to the remote browser. It also receives HTTP requests from the user and responds appropriately.

The third tier, Database Tier will be hosting MySQL. It stores all the important data of this application needs to function, for example: the user information, the conversations between users and the scheduled meeting agenda.

This three-tier architecture can improve development efficiency and allows for a focus on core competencies during implementation. Because the first and third tier are unable to interact directly, a well-designed application tier can act as an internal firewall, protecting against SQL injections and malicious hacks.

5.3 Entity Relationship Diagram

An ER diagram illustrates the structure of the database will be designed by describing the entities, their characteristics, and showing the relationships between them. The figures below show the entity relationship diagrams and the relationship between the entities.

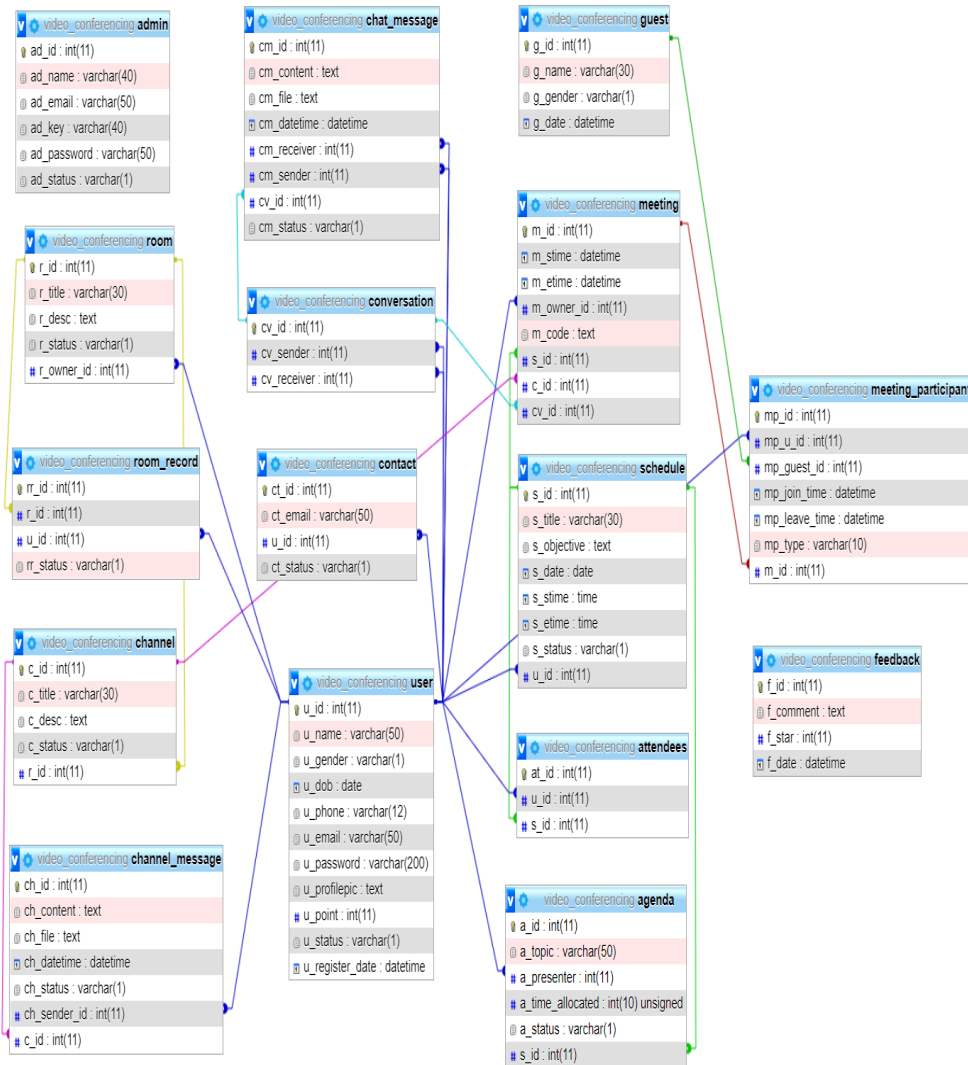


Figure 5.3: Entity Relationship Diagram

Table 5.1: Description of Tables

Table Name	Description	Attribute	Data Type and Length
user	contains the information for every user	u_id u_name u_gender u_dob u_phonenum u_email u_password u_profilepic u_point u_status u_register_date	11 numbers 50 variable characters 1 variable character Date 12 variable characters 50 variable characters 200 variable characters text 11 numbers 1 variable character Datetime
guest	contains the information for every guest	g_id g_name g_gender g_date	11 numbers 30 variable characters 1 variable character Datetime
admin	contains the information for every admin	ad_id ad_name ad_email ad_key ad_password ad_status	11 numbers 40 variable characters 50 variable characters 40 variable characters 50 variable characters 1 variable character
room	contains the information for every meeting room.	r_id r_title r_desc r_status r_owner_id	11 numbers 30 variable characters Text 1 variable character 11 numbers
channel	contains the information for every channel.	c_id c_title c_desc c_status	11 numbers 30 variable characters Text 1 variable character

		r_id	11 numbers
channel_message	contain the messages within a channel	ch_id ch_content ch_file ch_datetime ch_status ch_sender_id c_id	11 numbers Text Text Datetime 1 variable character 11 numbers 11 numbers
schedule	contain the information for meeting schedule.	s_id s_title s_objective s_date s_stime s_etime s_status u_id	11 numbers 30 variable characters Text Date Time Time 1 variable character 11 numbers
meeting	contain the information for a meeting.	m_id m_start_time m_end_time m_owner_id m_code s_id c_id cv_id	11 numbers Datetime Datetime 11 numbers Text 11 numbers 11 numbers 11 numbers
agenda	contain the information for a meeting agenda.	a_id a_topic a_presenter a_time_allocated a_status s_id	11 numbers 50 variable characters 11 numbers 10 numbers 1 variable character 11 numbers
contact	contain the information for a contact.	ct_id ct_email u_id	11 numbers 50 variable characters 11 numbers

		ct_status	1 variable character
conversations	Contain the information for private (one to one) conversation	cv_id cv_sender cv_receiver	11 numbers 11 numbers 11 numbers
chat_message	contain the information for a chat message.	cm_id cm_content cm_file cm_datetime cm_receiver cm_sender cv_id cm_status	11 numbers Text Text Datetime 11 numbers 11 numbers 11 numbers 1 variable character
Meeting_participant		mp_id mp_u_id mp_guest_id mp_join_time mp_leave_time mp_type m_id	11 numbers 11 numbers 11 numbers Datetime Datetime 10 variable characters 11 numbers
feedback	Contains the feedback send by users and guest	f_id f_comment f_star f_date	11 numbers text 11 numbers Datetime

5.4 Activity Diagram

5.4.1 Activity diagram for user

a) Sign Up

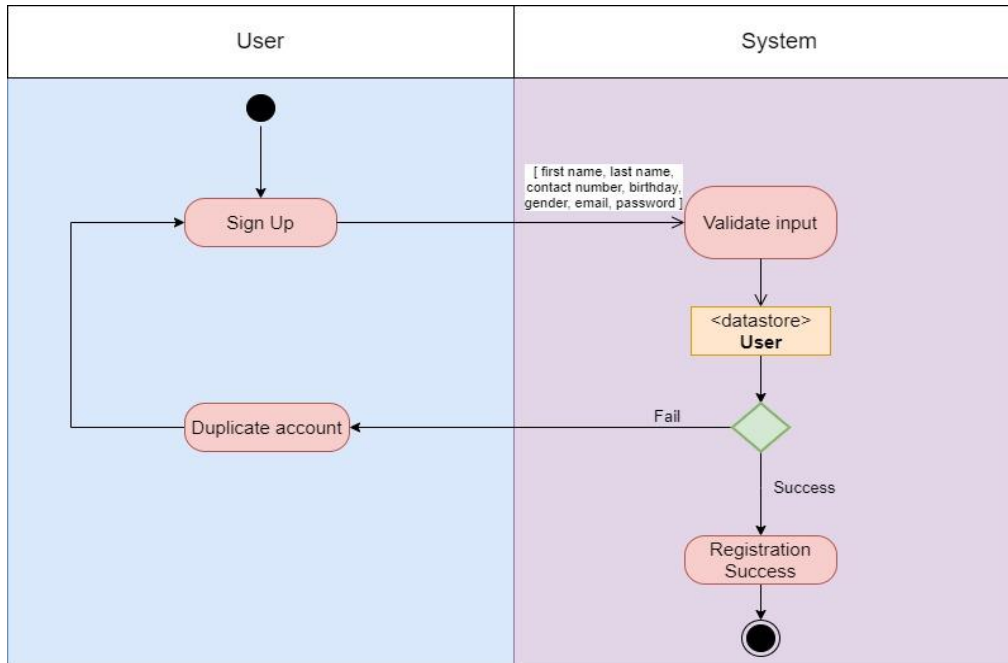


Figure 5.4 Activity diagram for user sign up

b) Sign In

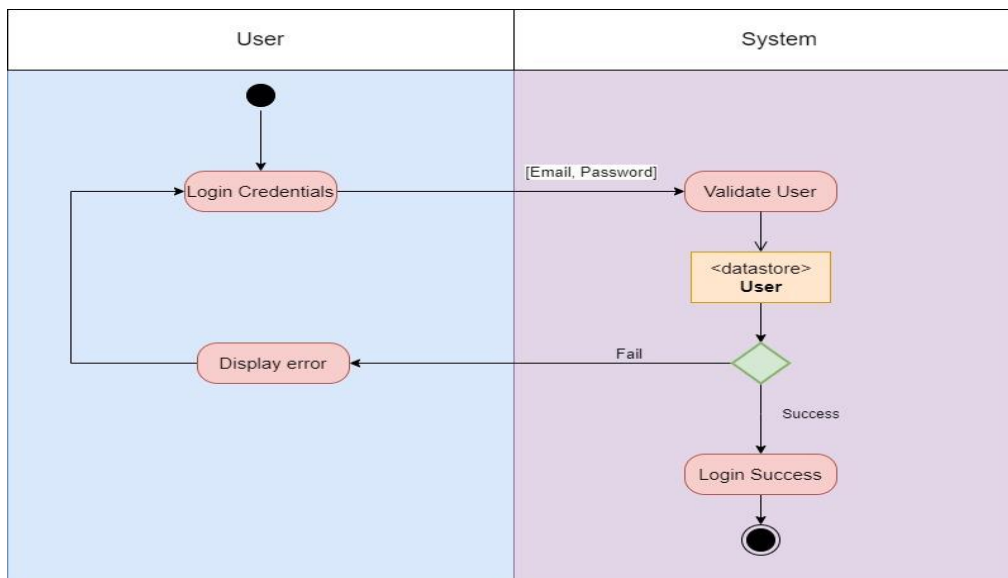


Figure 5.5 Activity diagram for user sign in

c) Create New Room

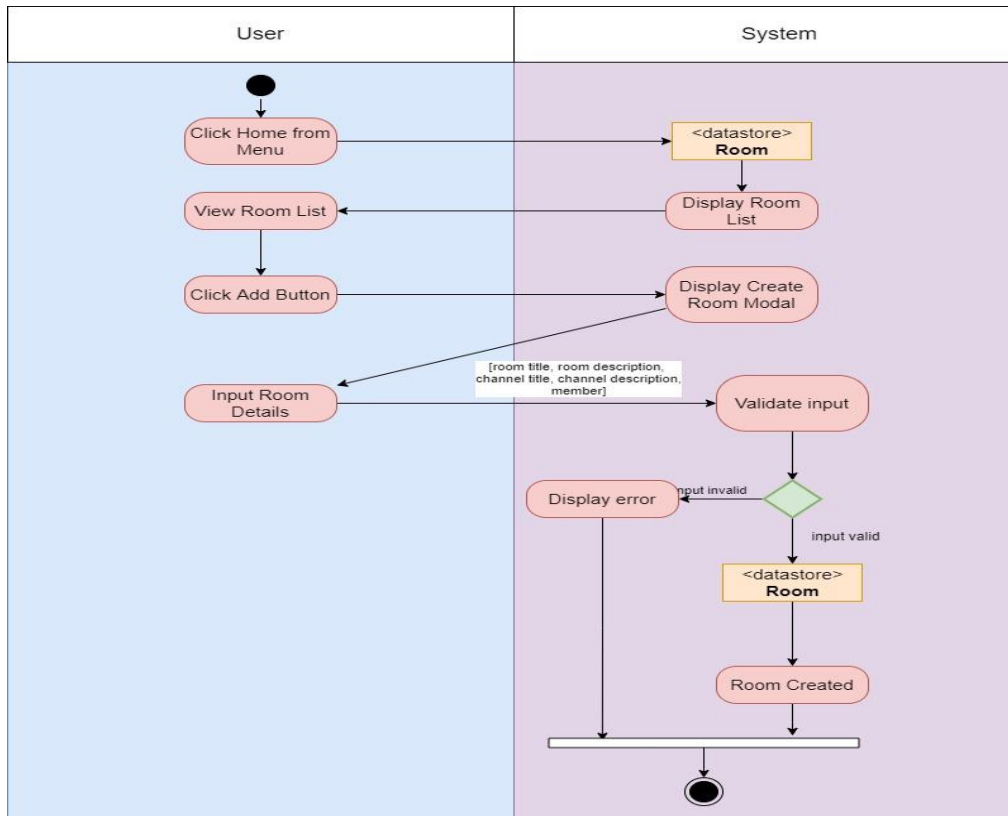


Figure 5.6 Activity diagram for user create room

d) Delete Room

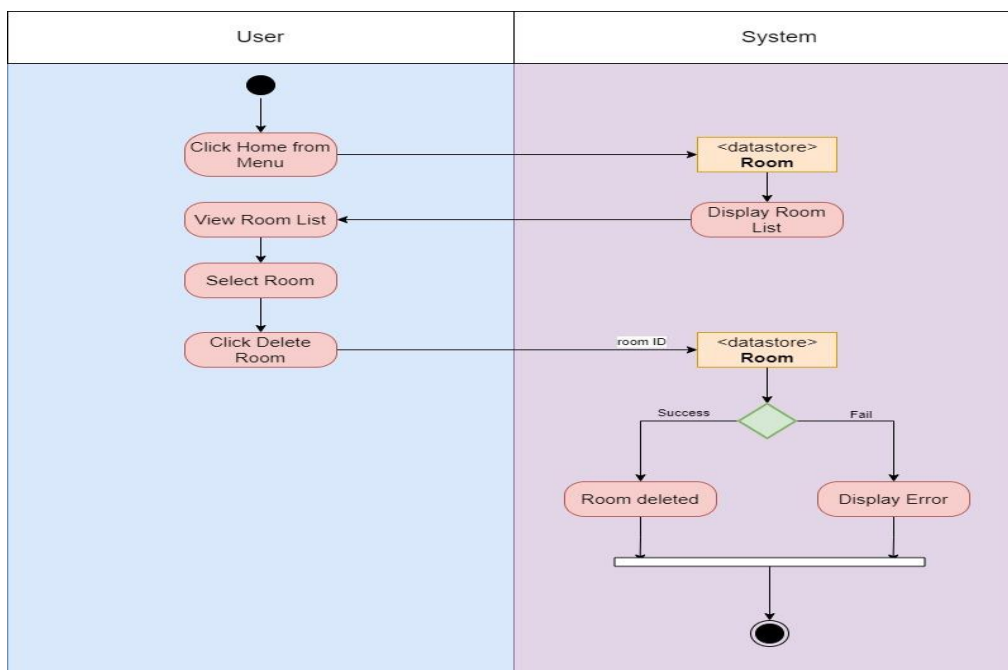


Figure 5.7 Activity diagram for user delete room

e) View channel with member and channel chat messages

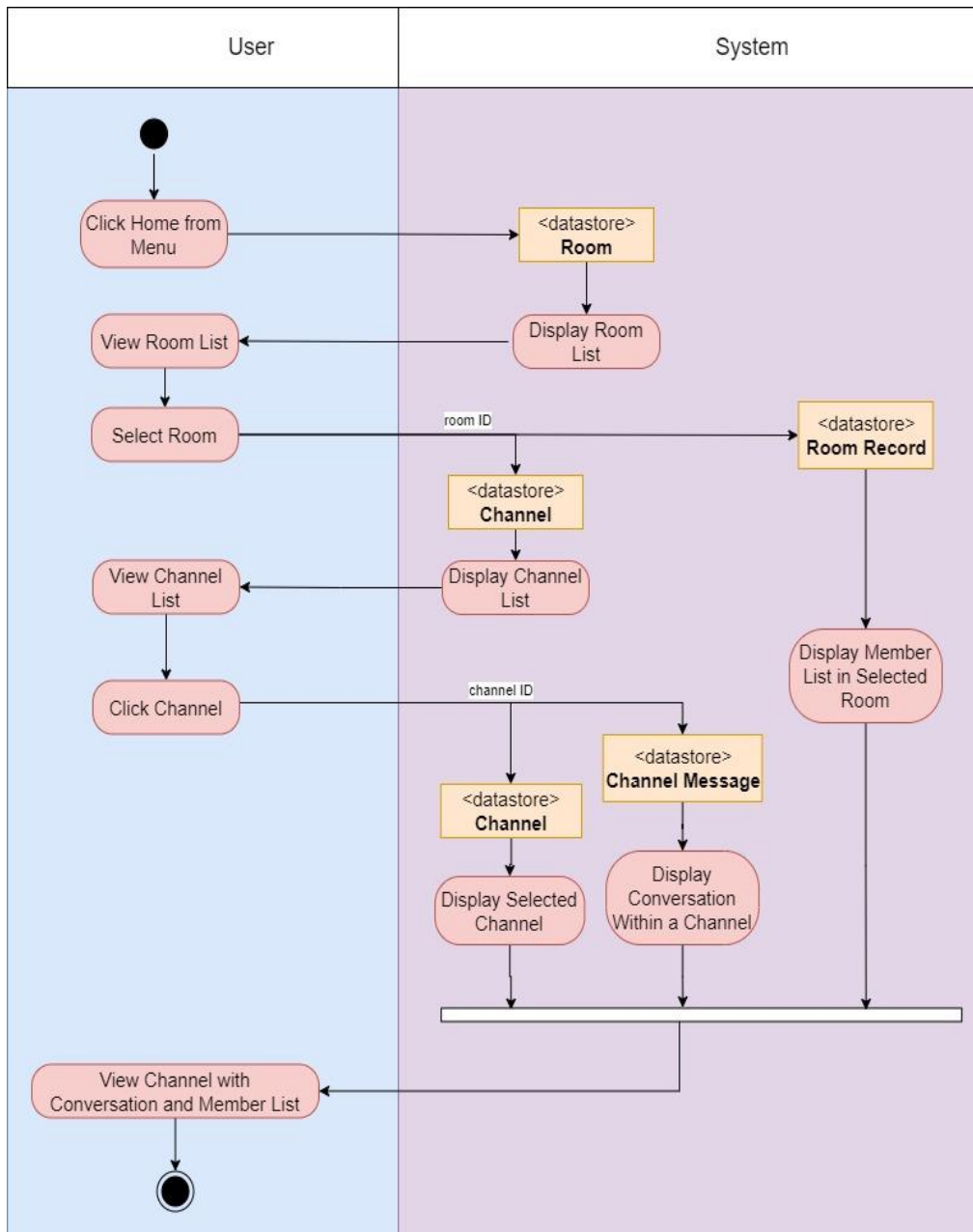


Figure 5.8 Activity diagram for user view channel

f) Add channel into room

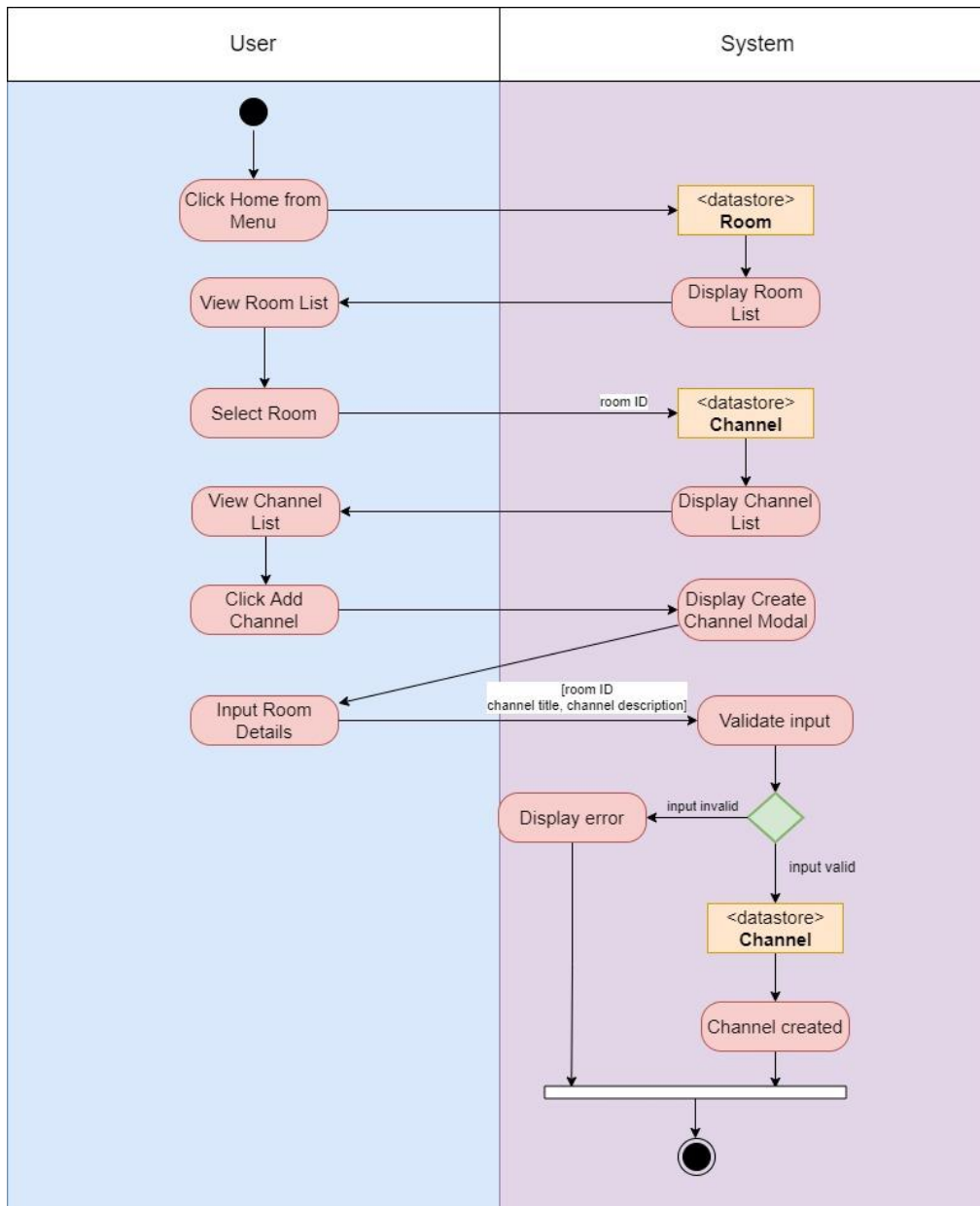


Figure 5.9 Activity diagram for user add new channel

g) Delete channel

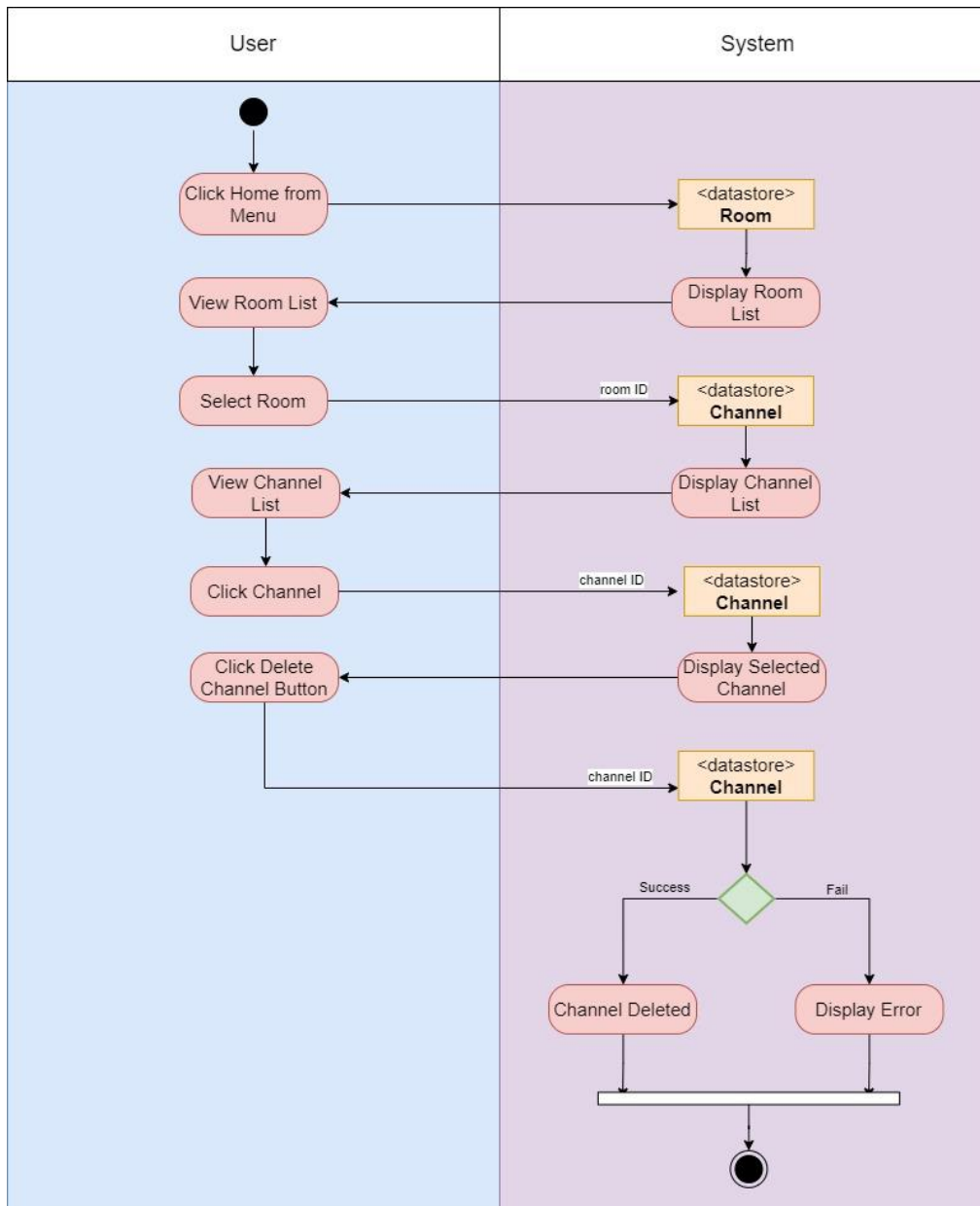


Figure 5.10 Activity diagram for user delete channel

h) Insert member into room

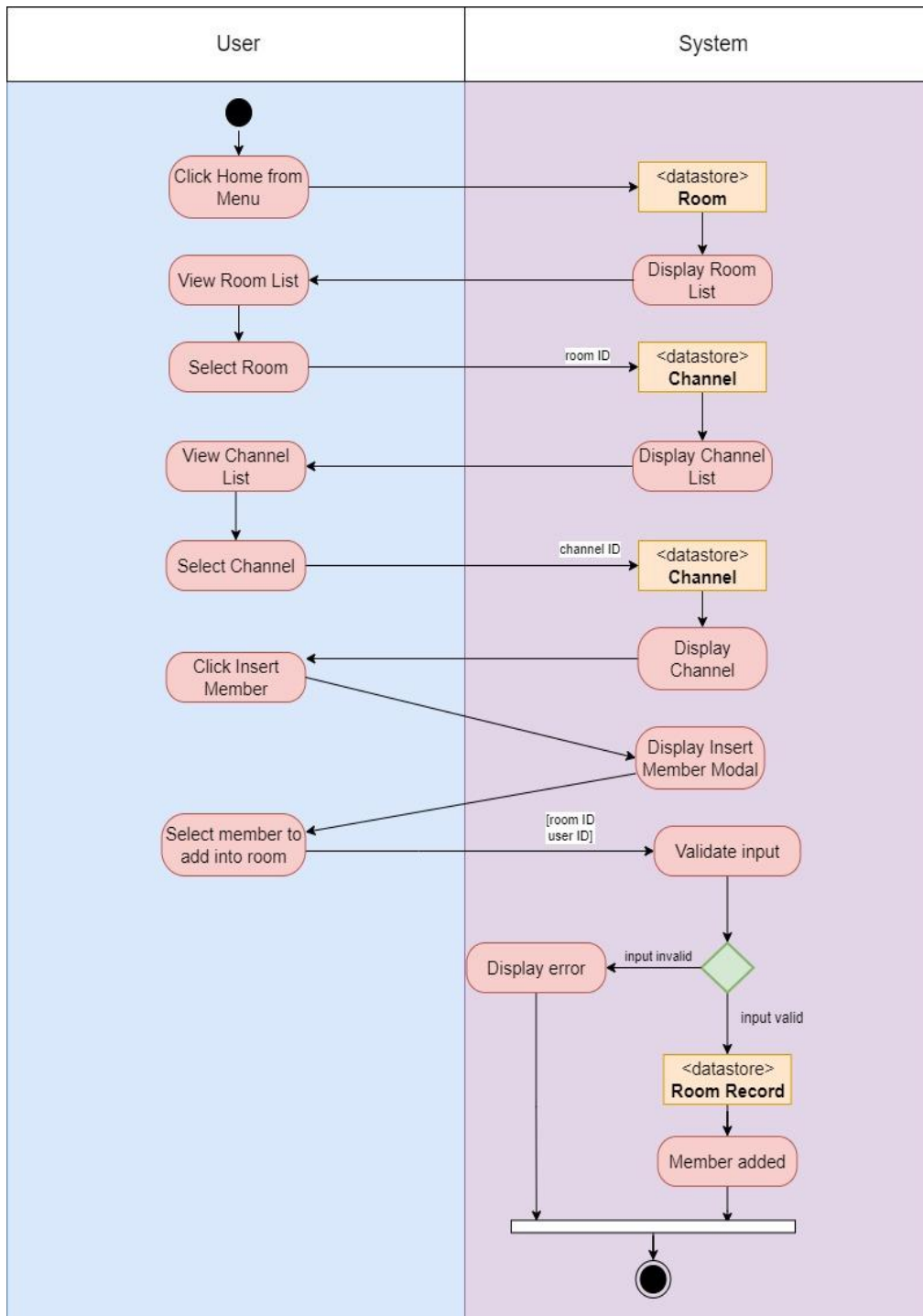


Figure 5.11 Activity diagram for user insert member into room

i) Remove member from room

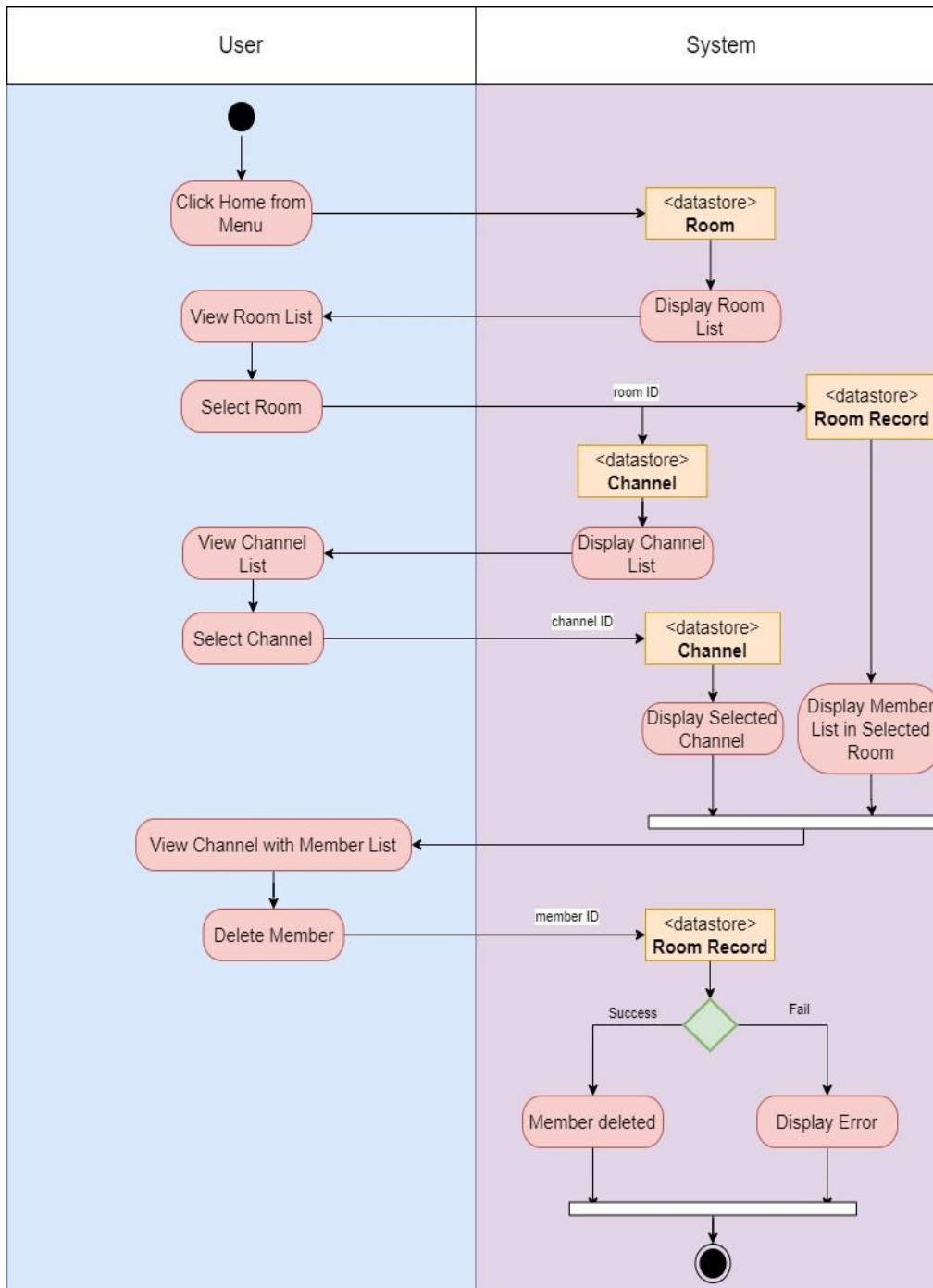


Figure 5.12 Activity diagram for user delete member

j) Send message in channel

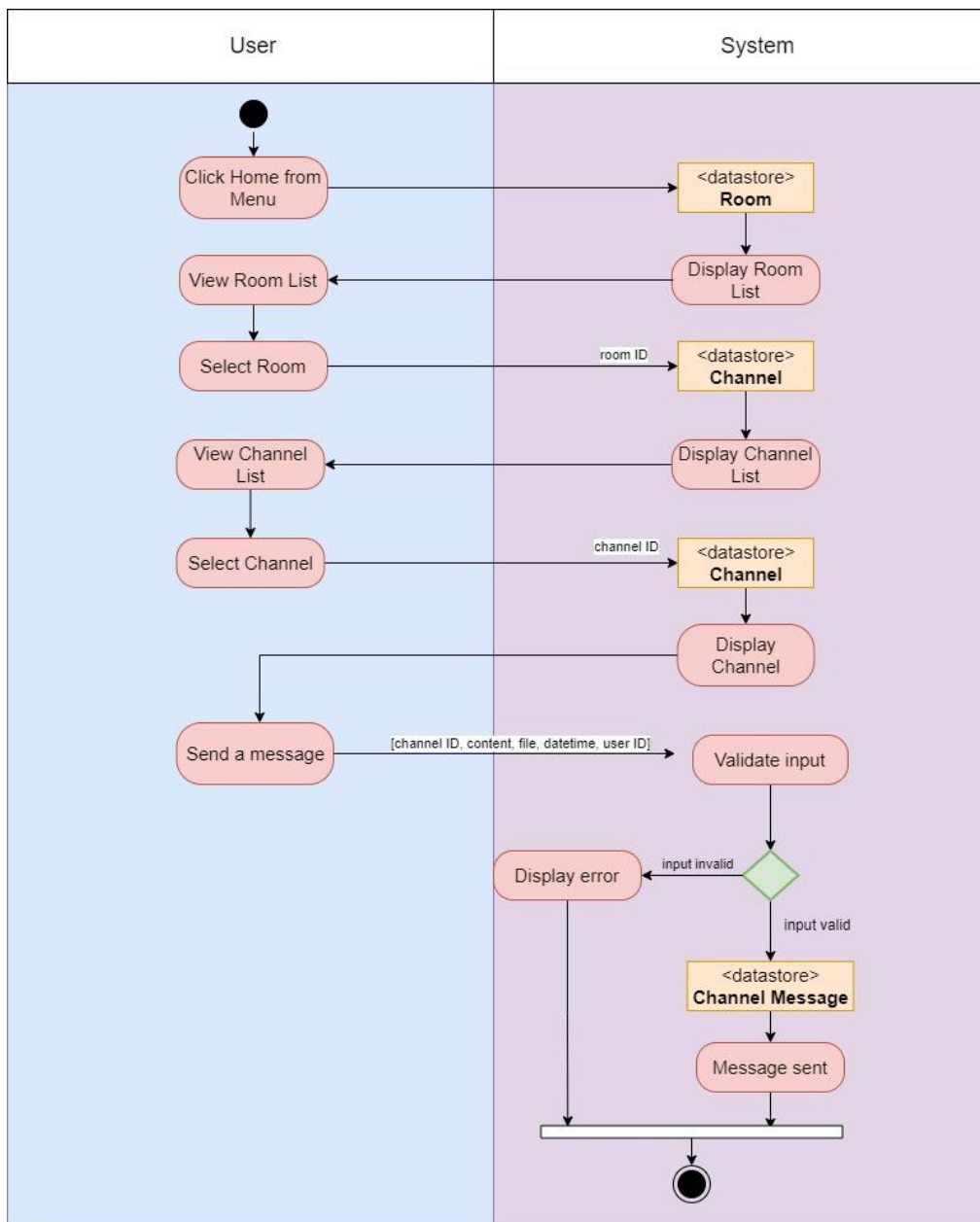


Figure 5.13 Activity diagram for user send a message in channel

k) Clear channel conversation history

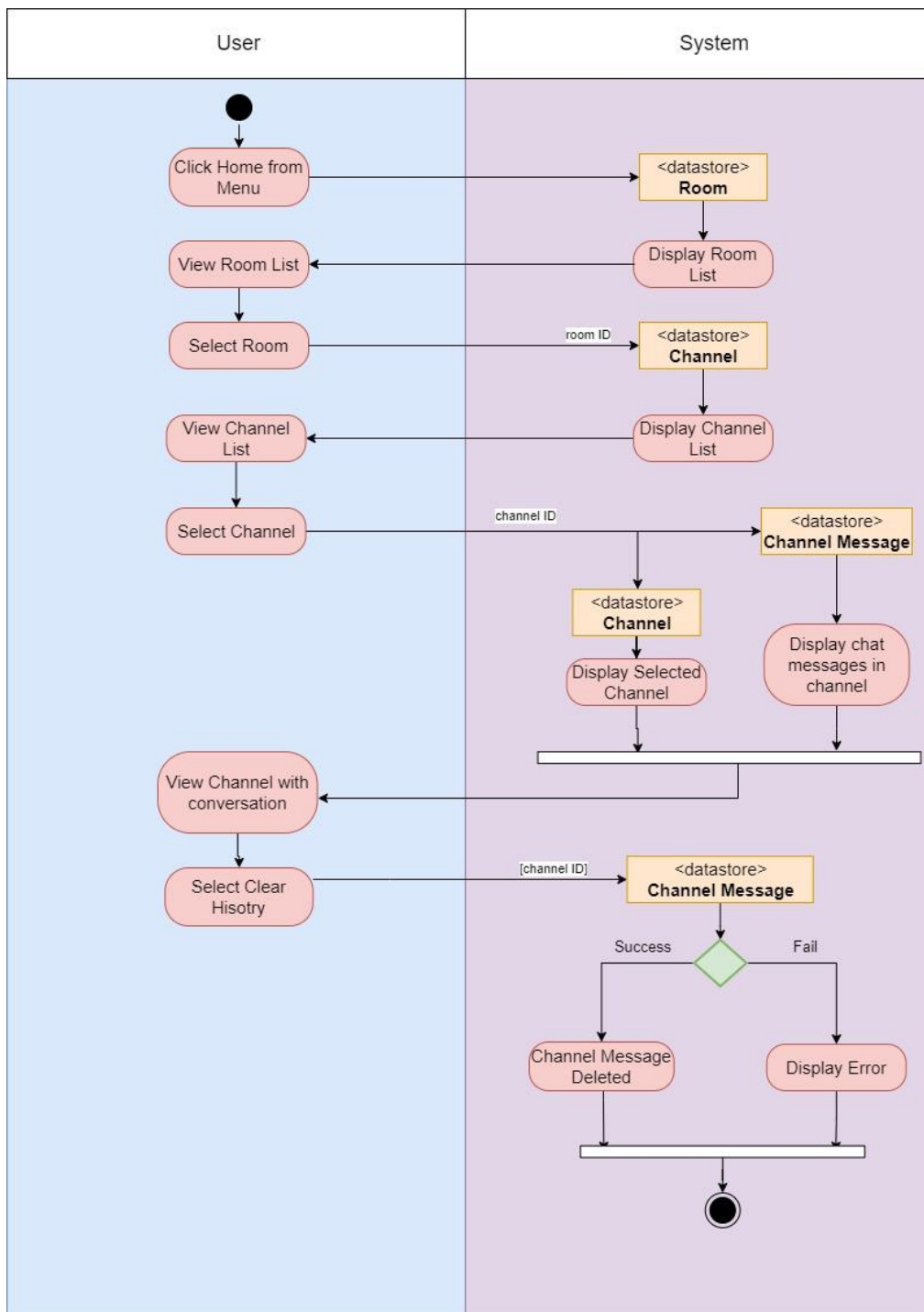


Figure 5.14 Activity diagram for user clear chat messages in channel

1) Start Meeting in Channel

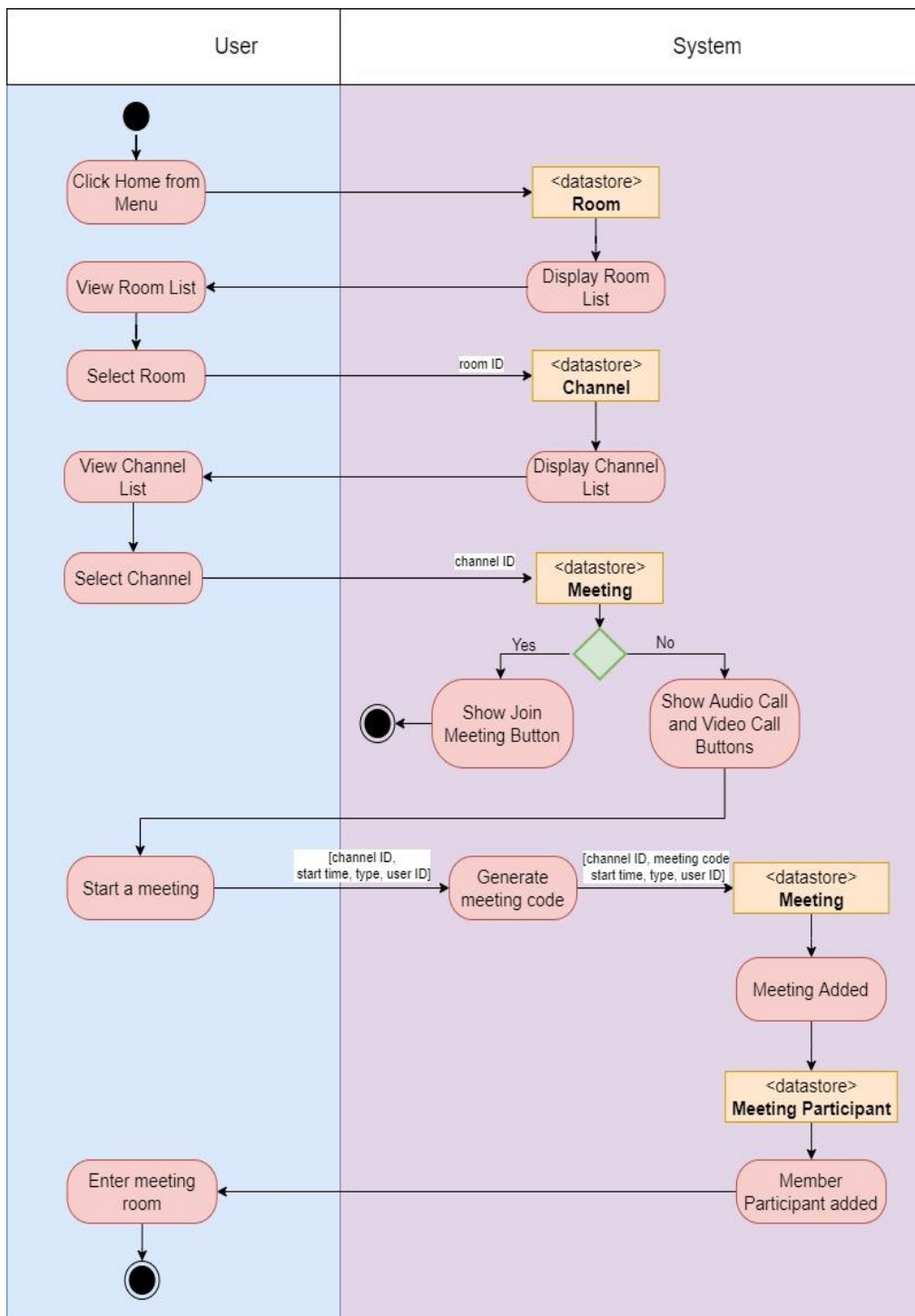


Figure 5.15 Activity diagram for user start a meeting in channel

m) Join Meeting in Channel

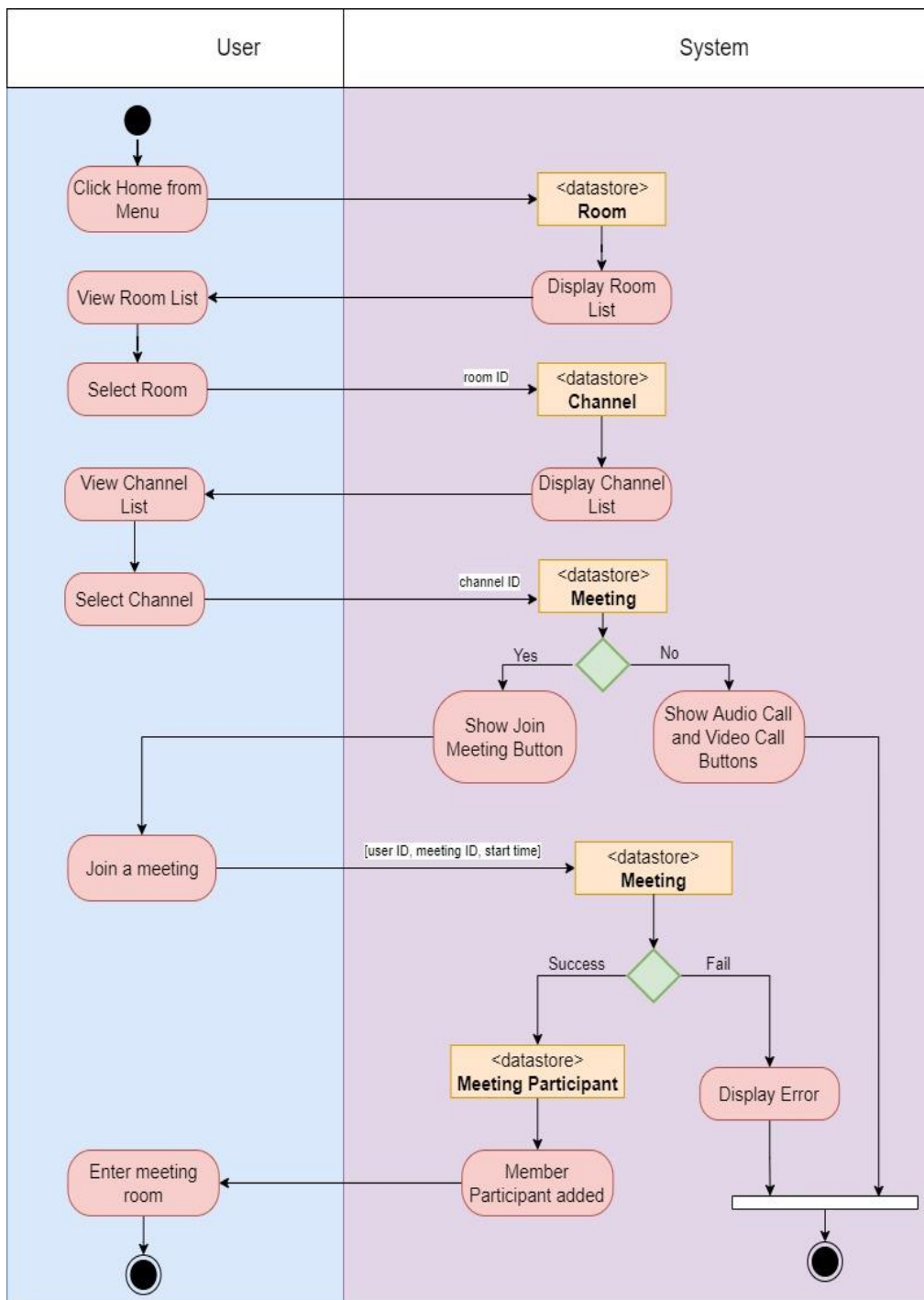


Figure 5.16 Activity diagram for user join meeting in a channel

n) Enter meeting room

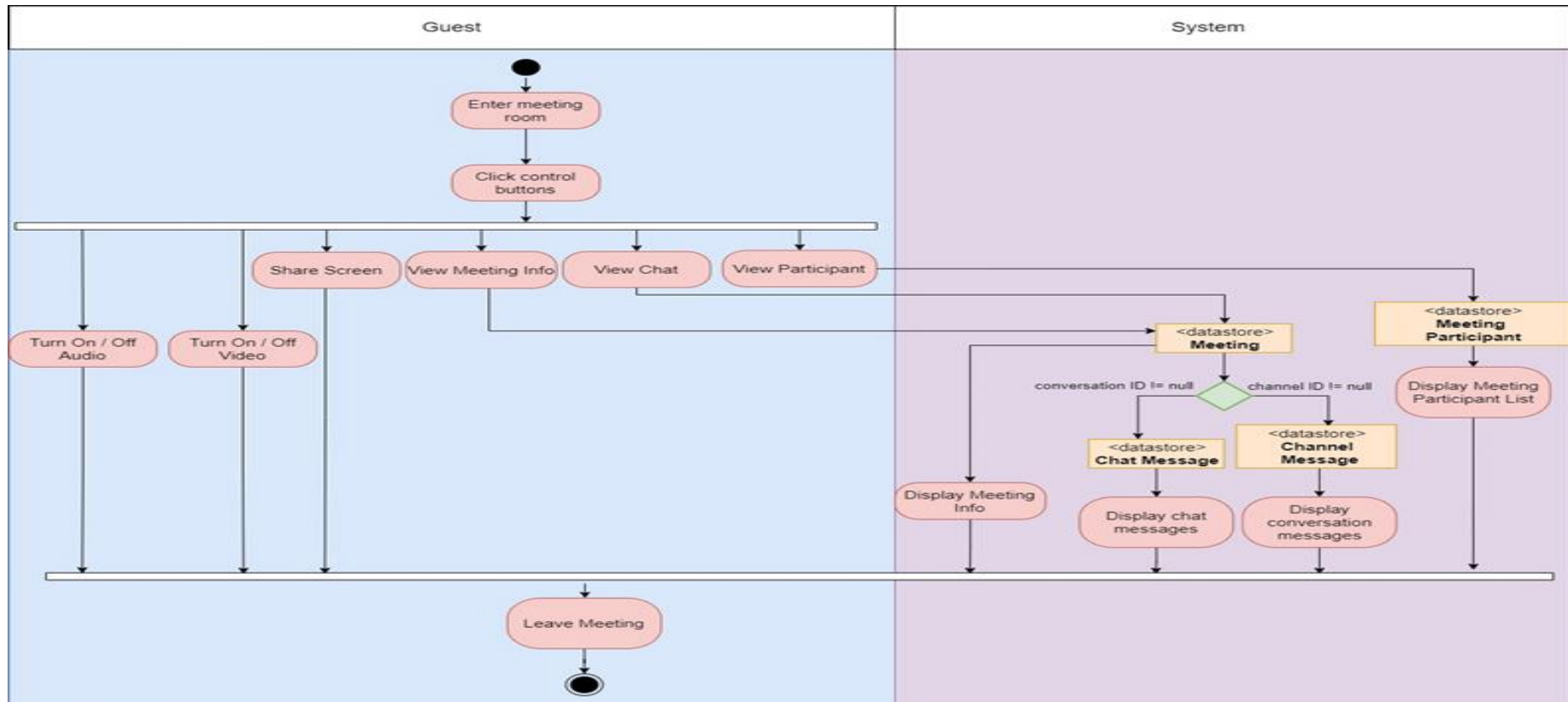


Figure 5.17 Activity diagram for user enter a meeting room

o) View Notification

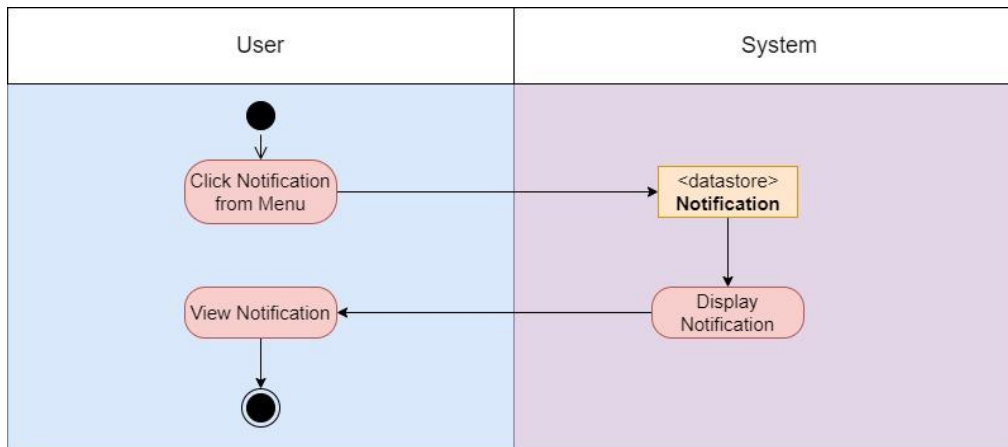


Figure 5.18 Activity diagram for user view notification

p) Start a new chat

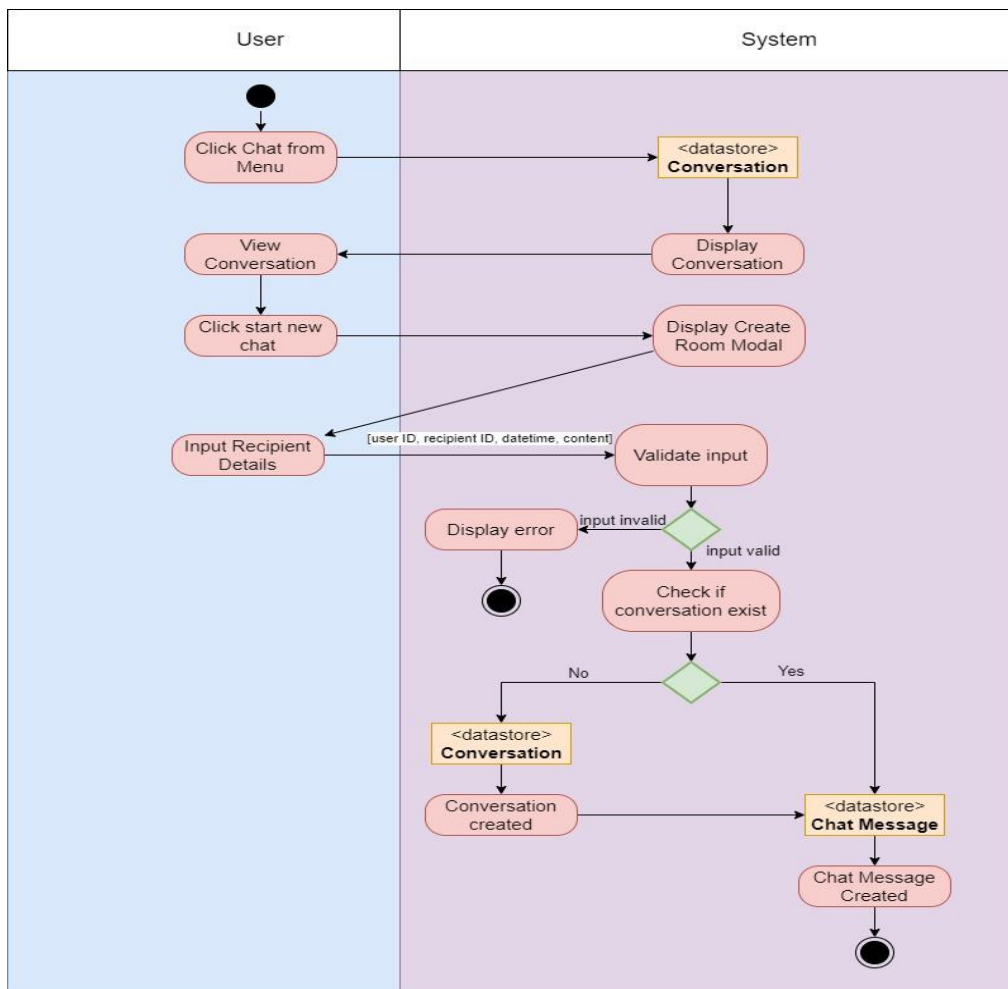


Figure 5.19 Activity diagram for user start a new chat

q) Send message in chat

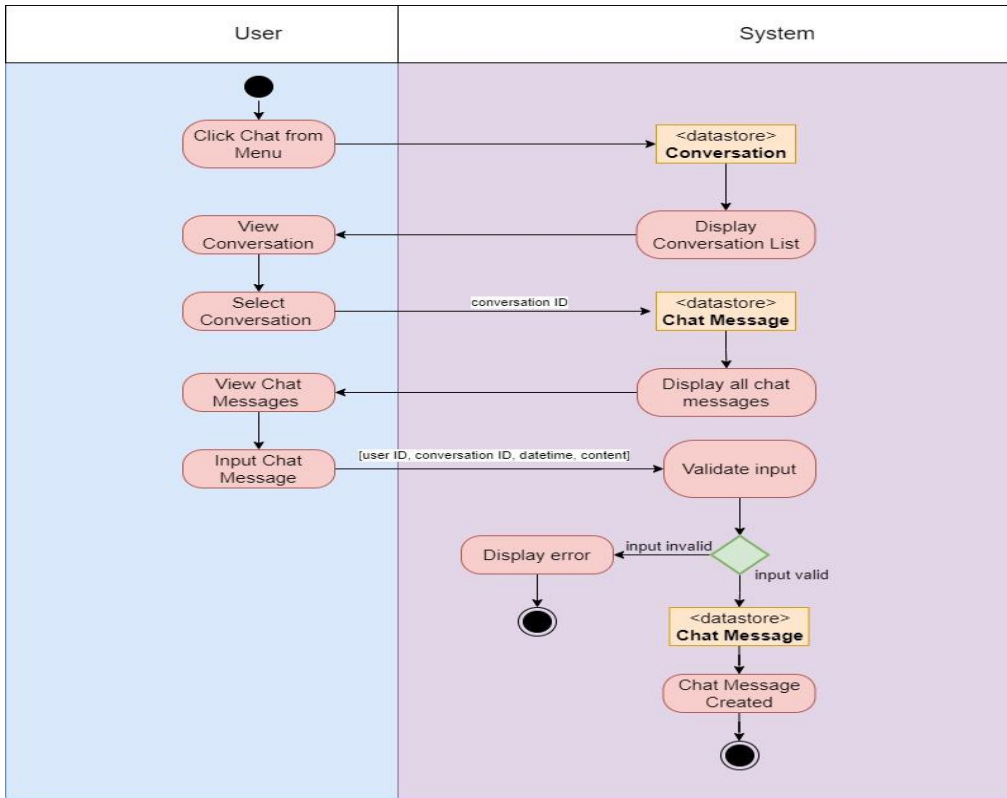


Figure 5.20 Activity diagram for user send a message in chat

r) Clear chat history

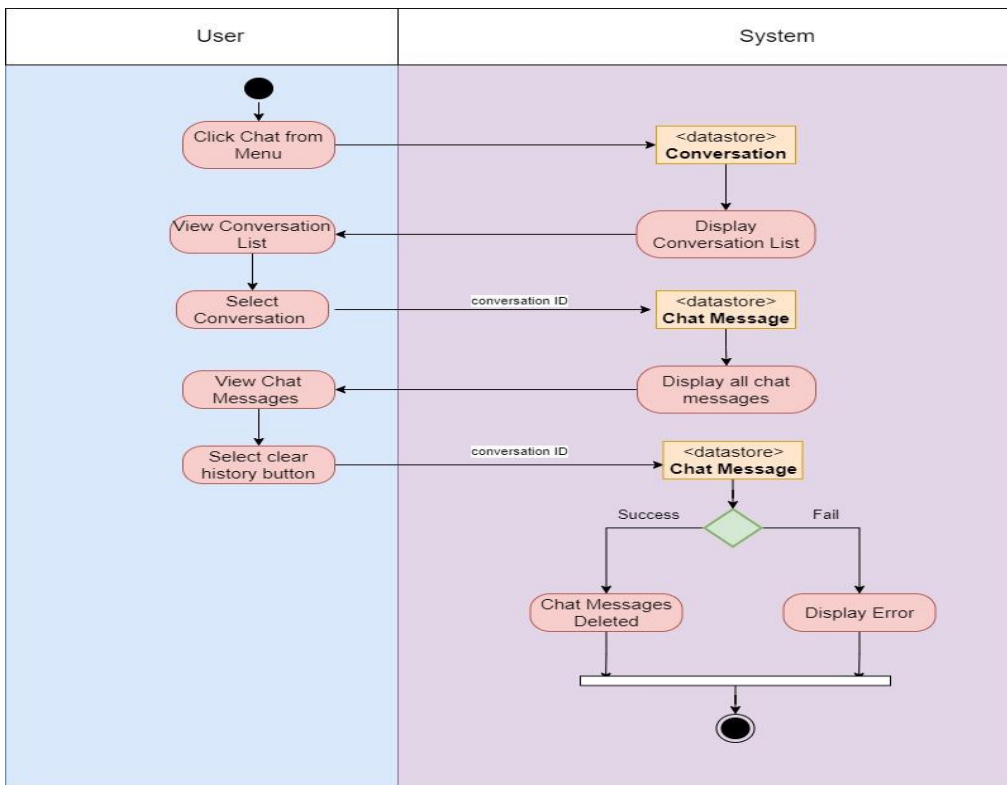


Figure 5.21 Activity diagram for user clear chat history

s) Start meeting in Chat

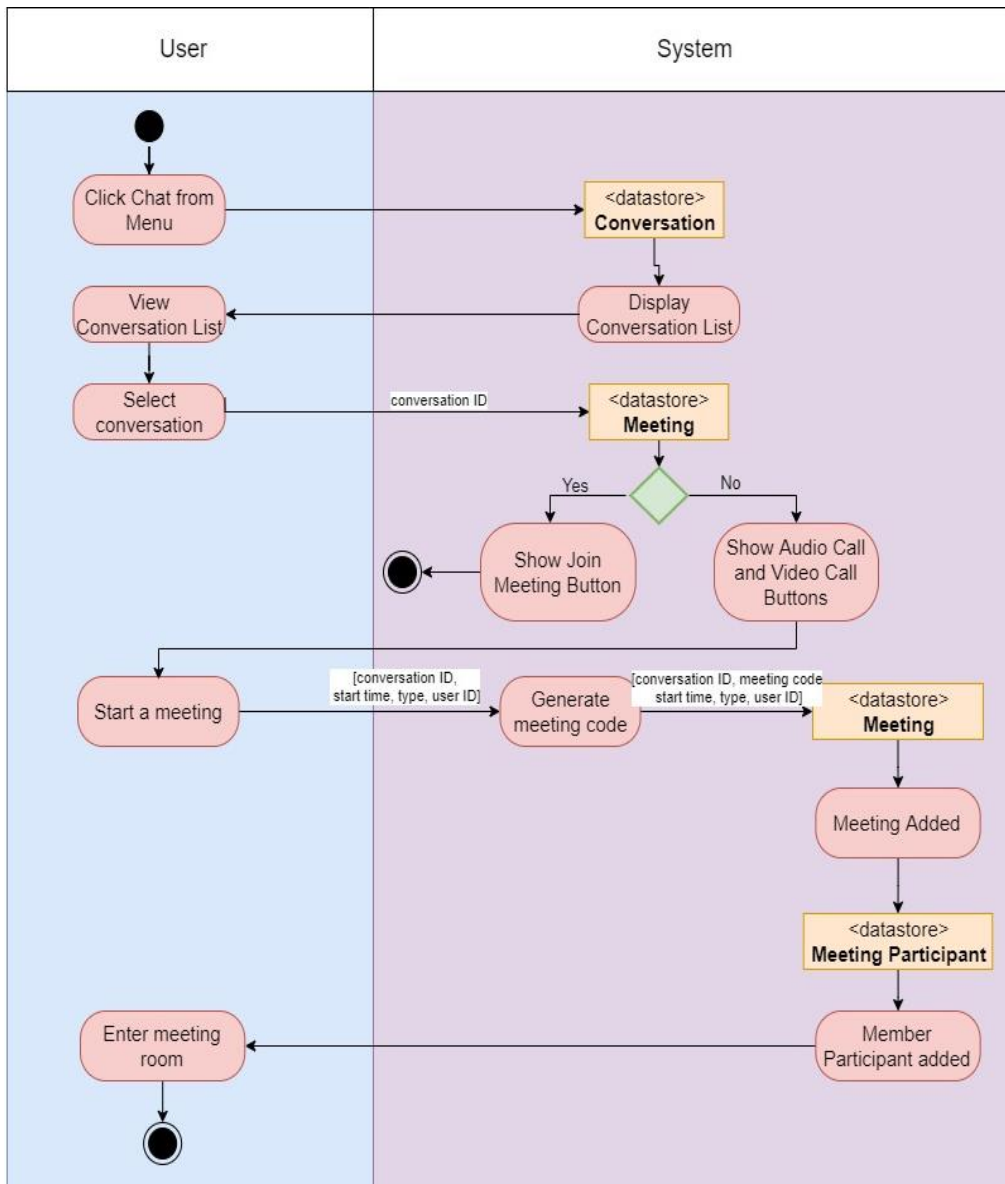


Figure 5.22 Activity diagram for user start a meeting in a chat

t) Join meeting in Chat

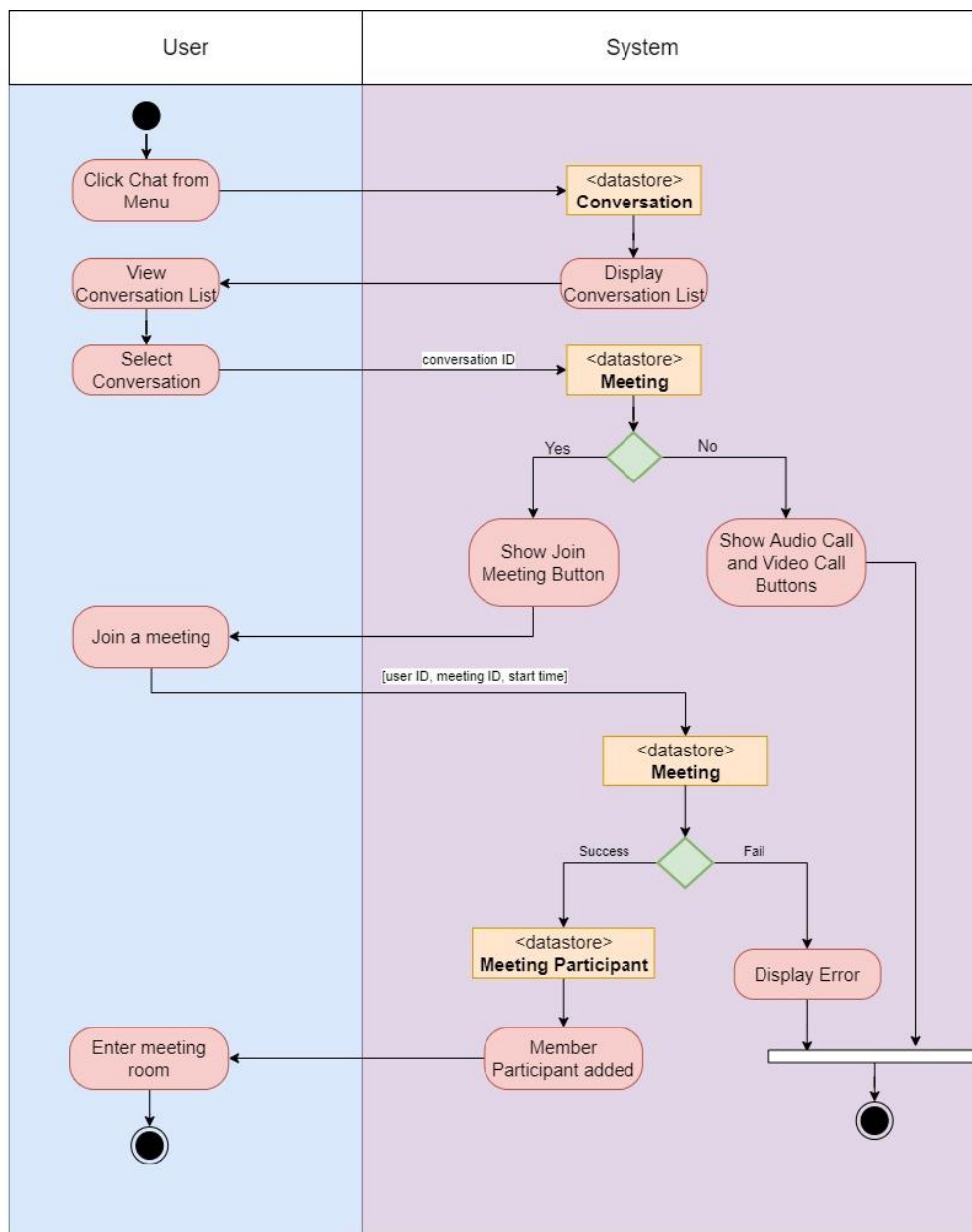


Figure 5.23 Activity diagram for user join meeting in a chat

u) Create new Schedule

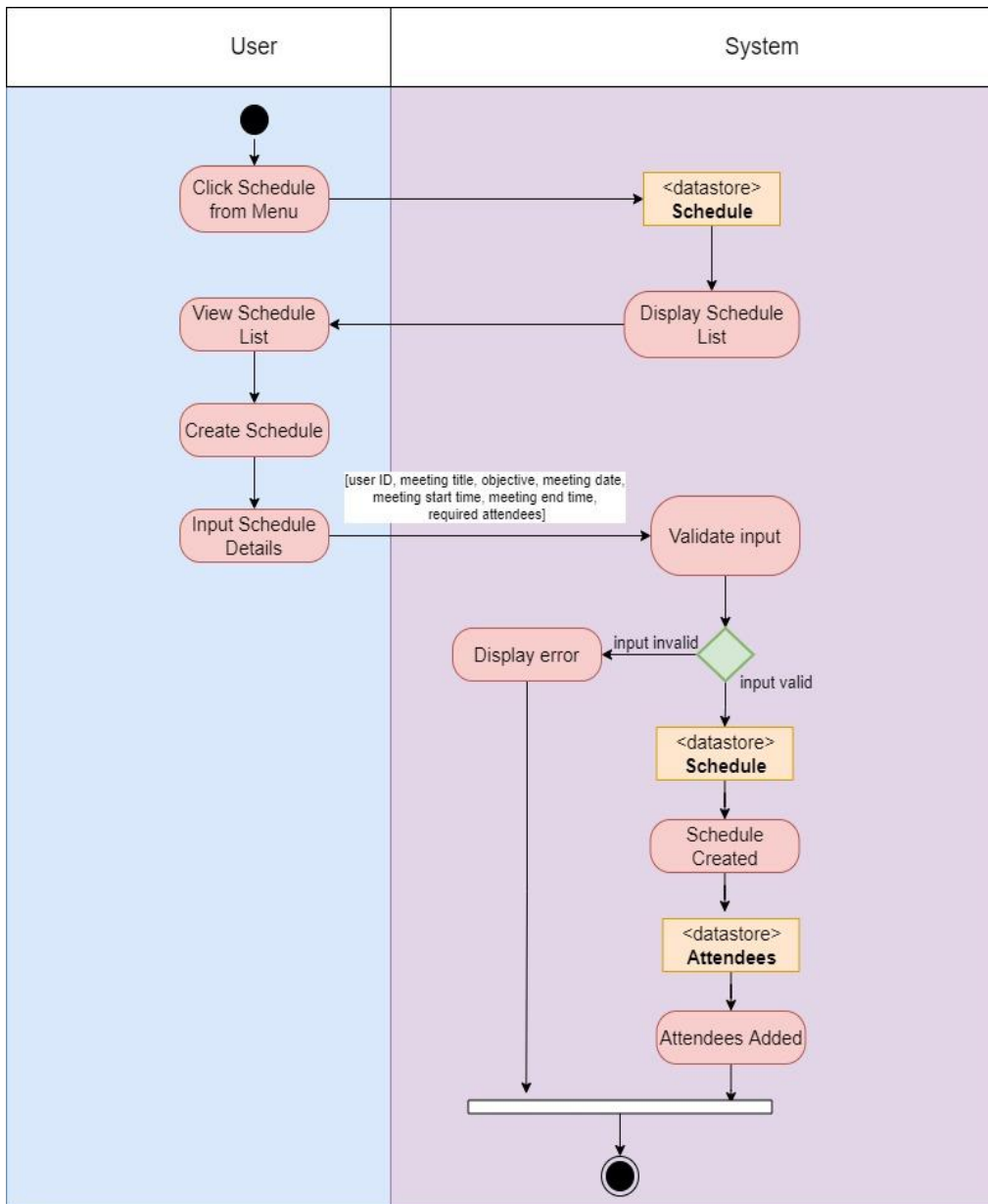


Figure 5.24 Activity diagram for user create a new schedule

v) Manage Agenda in Schedule

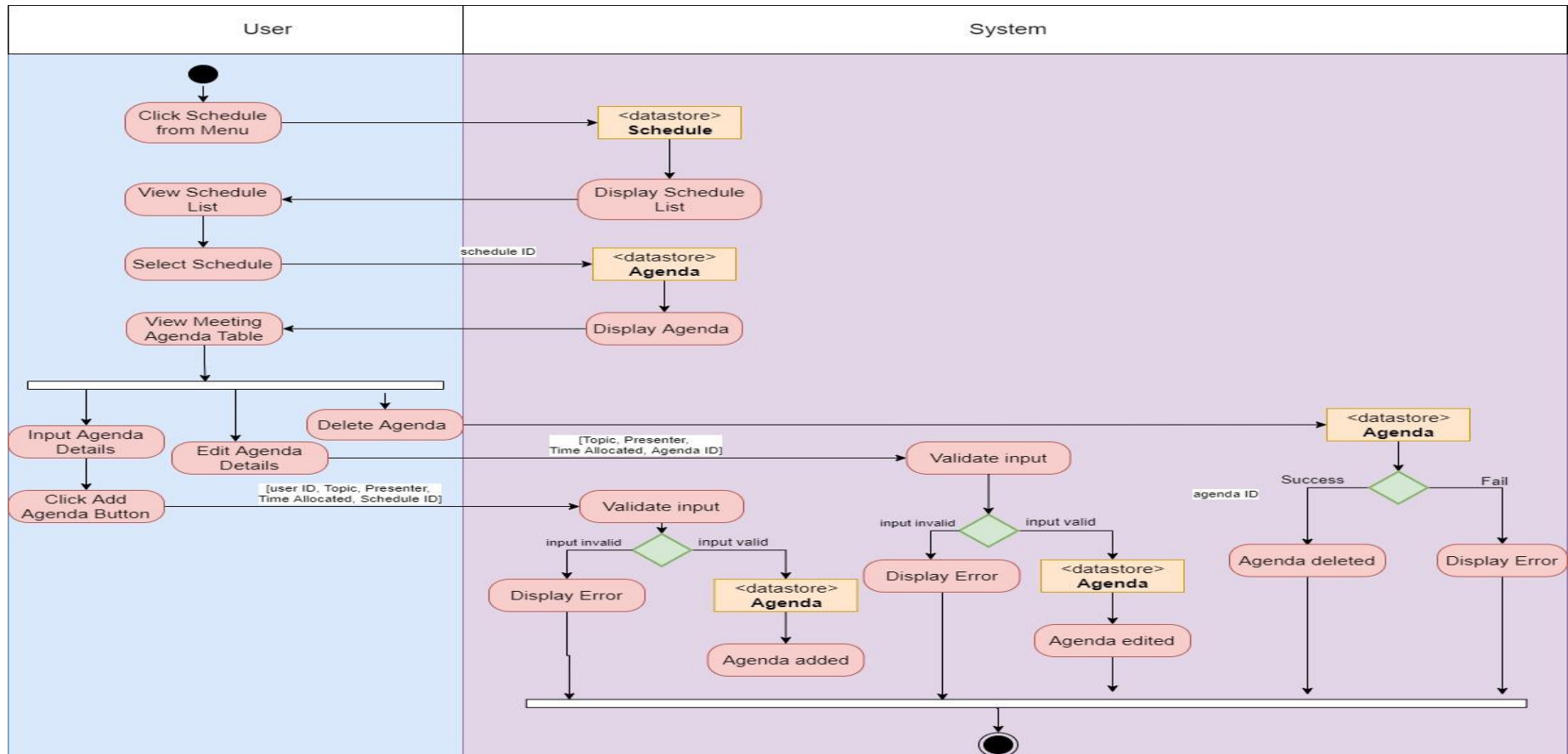


Figure 5.25 Activity diagram for user manage agenda (add, edit, delete)

w) Manage Profile

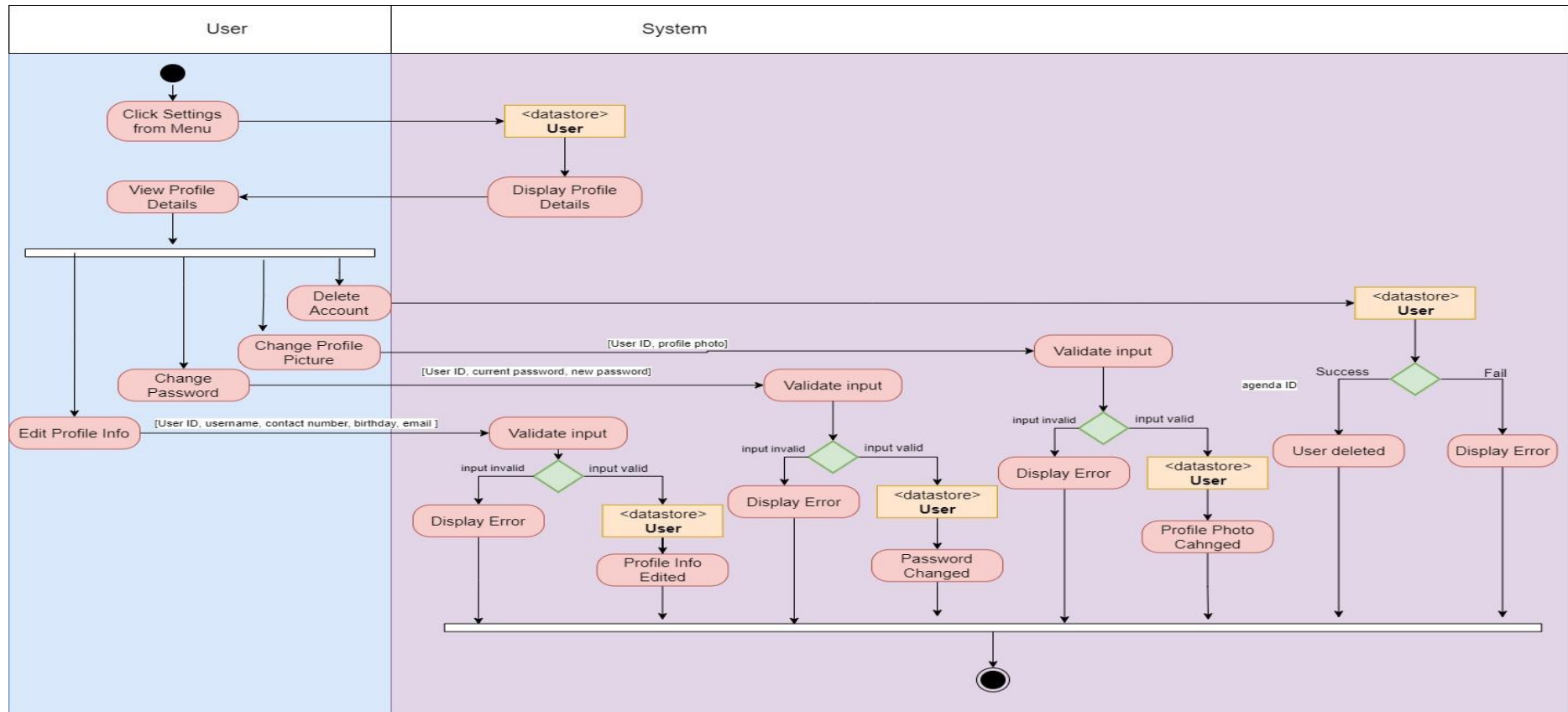


Figure 5.26 Activity diagram for user manage profile

x) Speed Test

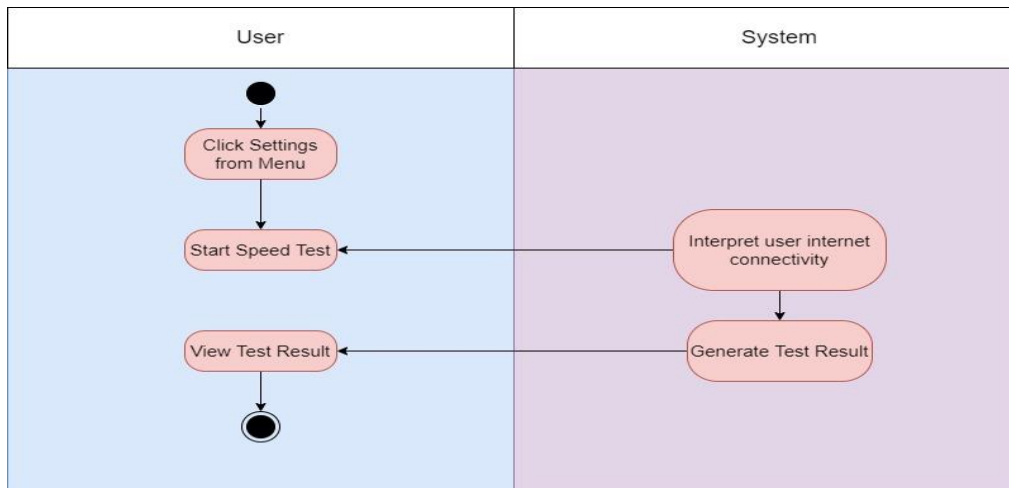


Figure 5.27 Activity diagram for user start a speed test

y) Claim Reward

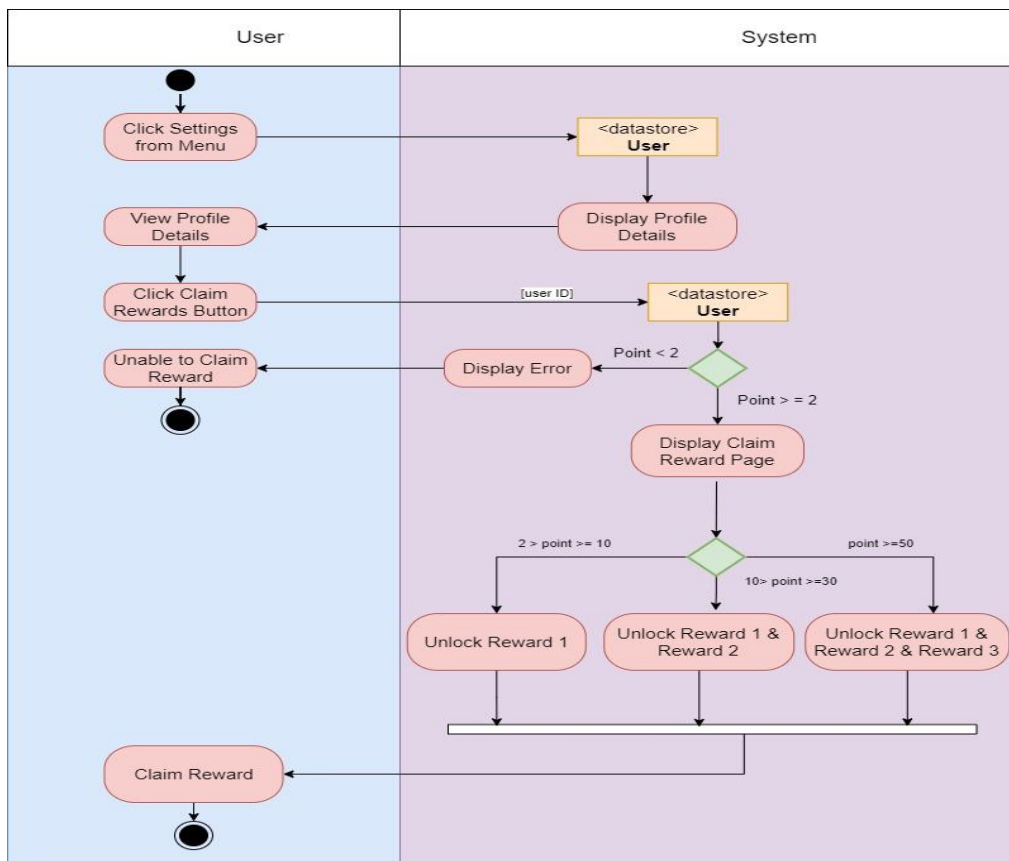


Figure 5.28 Activity diagram for user claim reward

z) Send Feedback

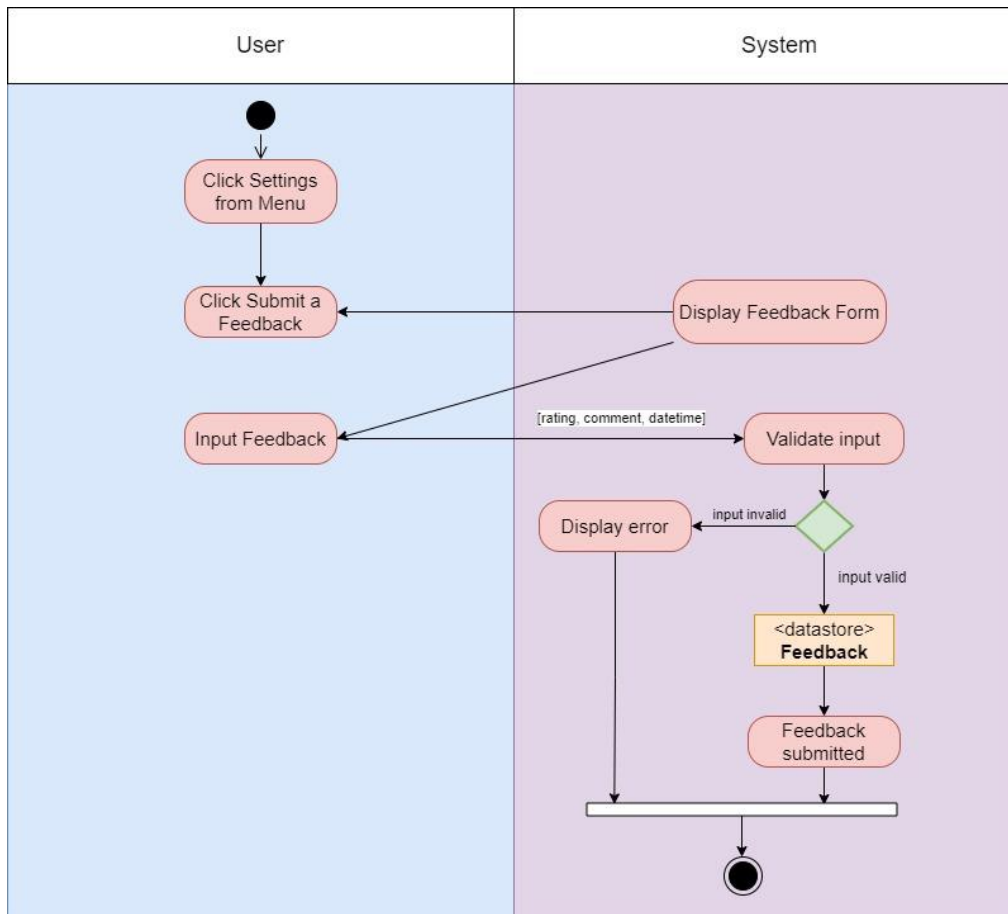


Figure 5.29 Activity diagram for user submit a feedback

5.4.2 Activity diagram for guest

a) Join meeting via meeting code

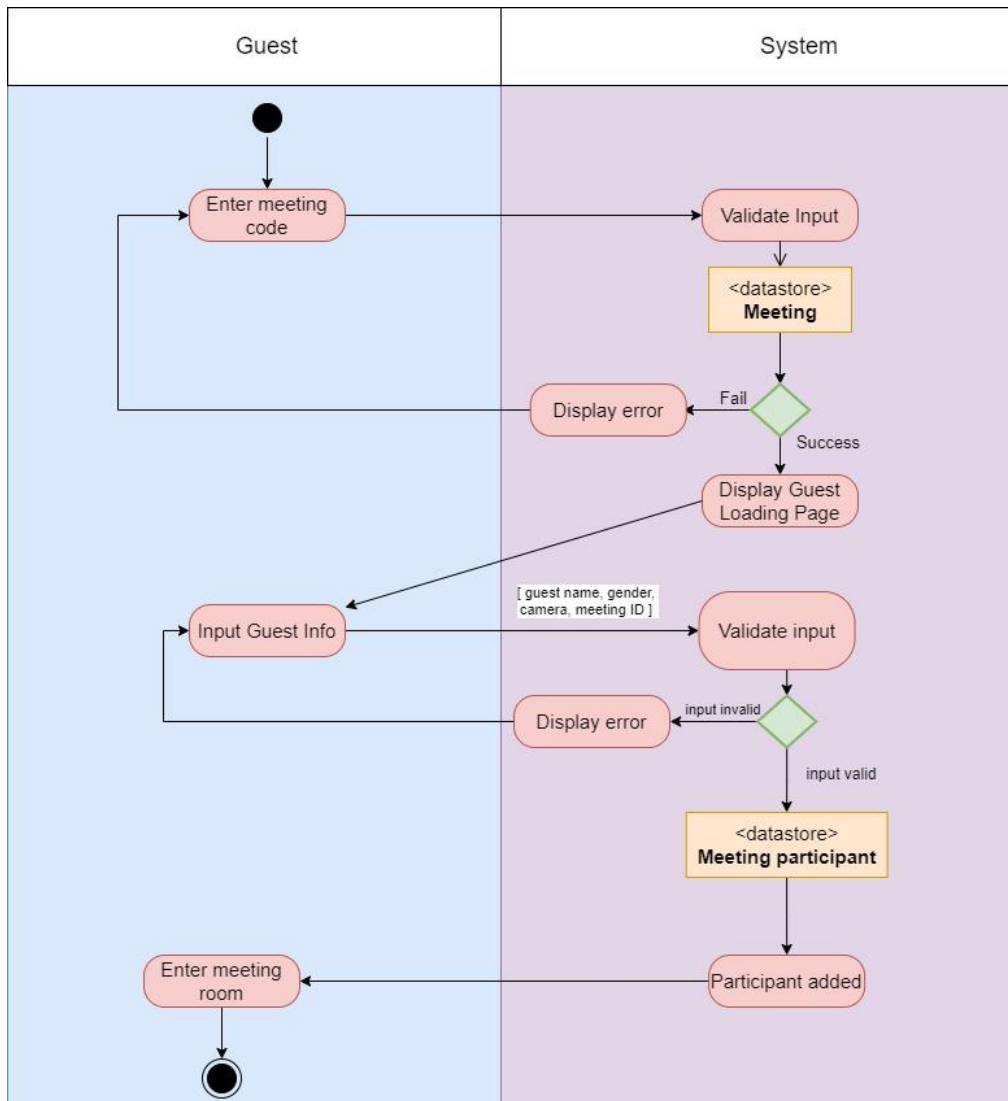


Figure 5.30 Activity diagram for guest join a meeting

b) Enter meeting room

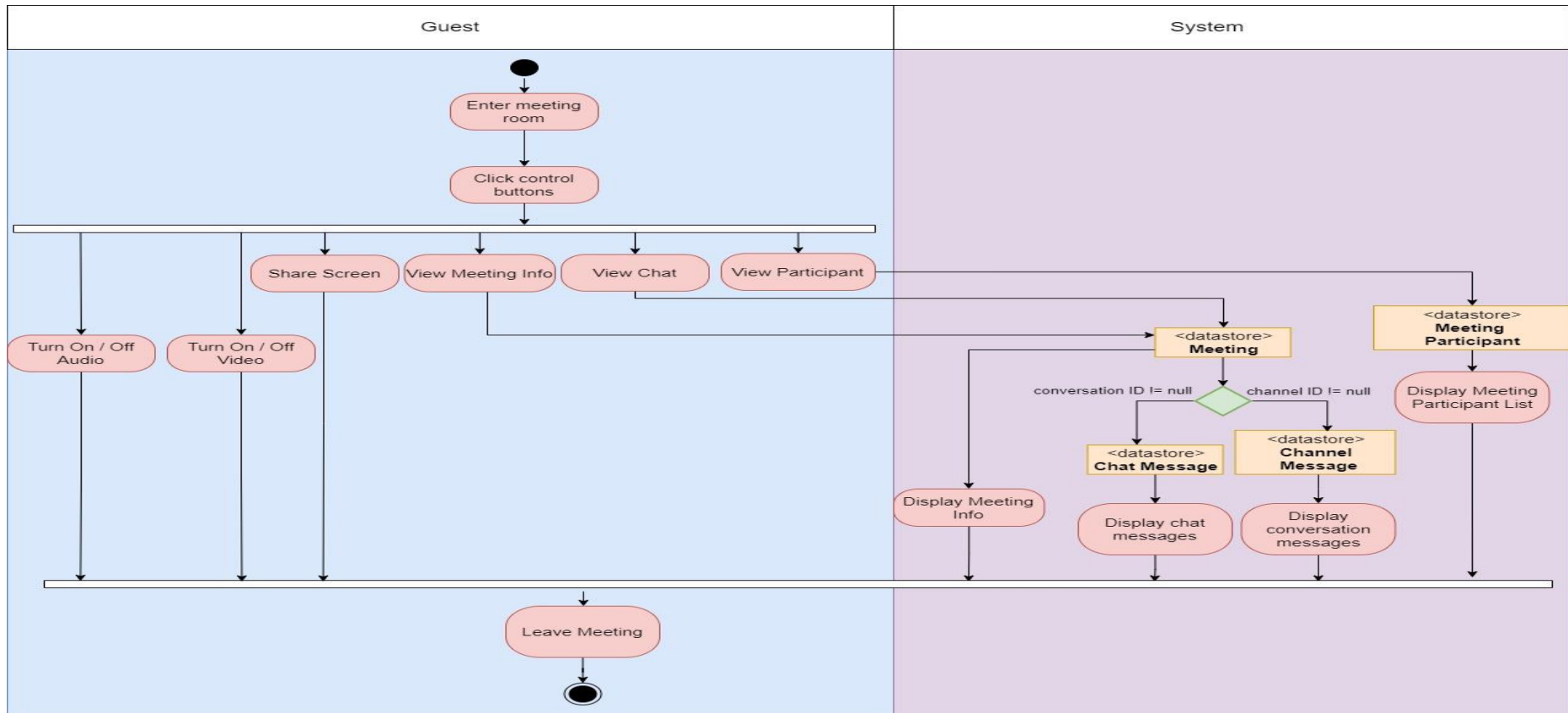


Figure 5.31 Activity diagram for guest enter a meeting room

c) Submit Feedback after a meeting

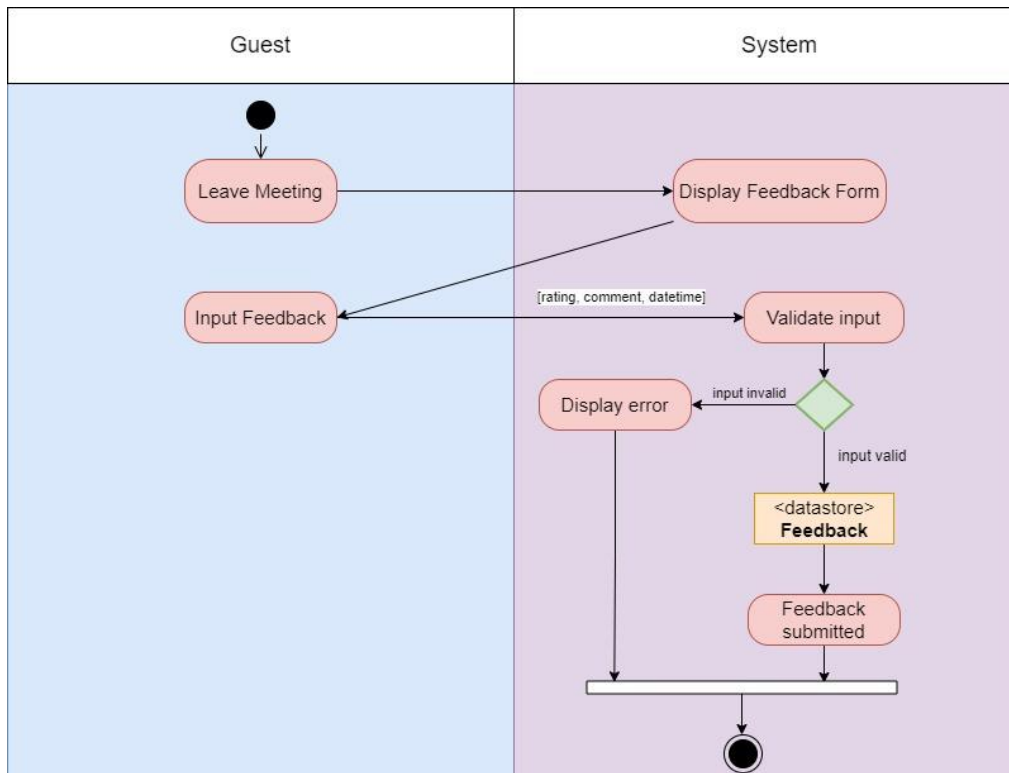


Figure 5.32 Activity diagram for guest submit a feedback

5.4.3 Activity diagram for admin

a) Login

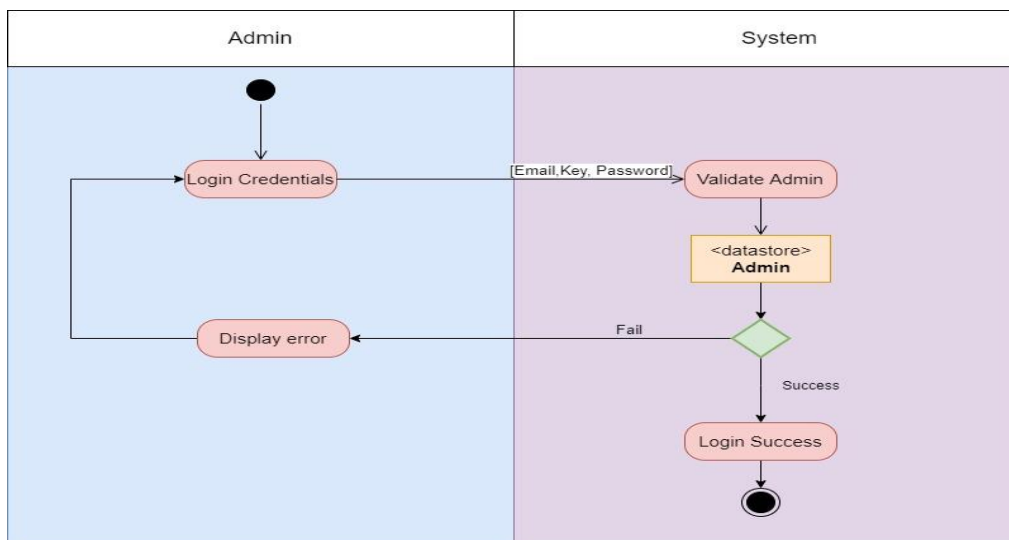


Figure 5.33 Activity diagram for admin log in

b) View dashboard

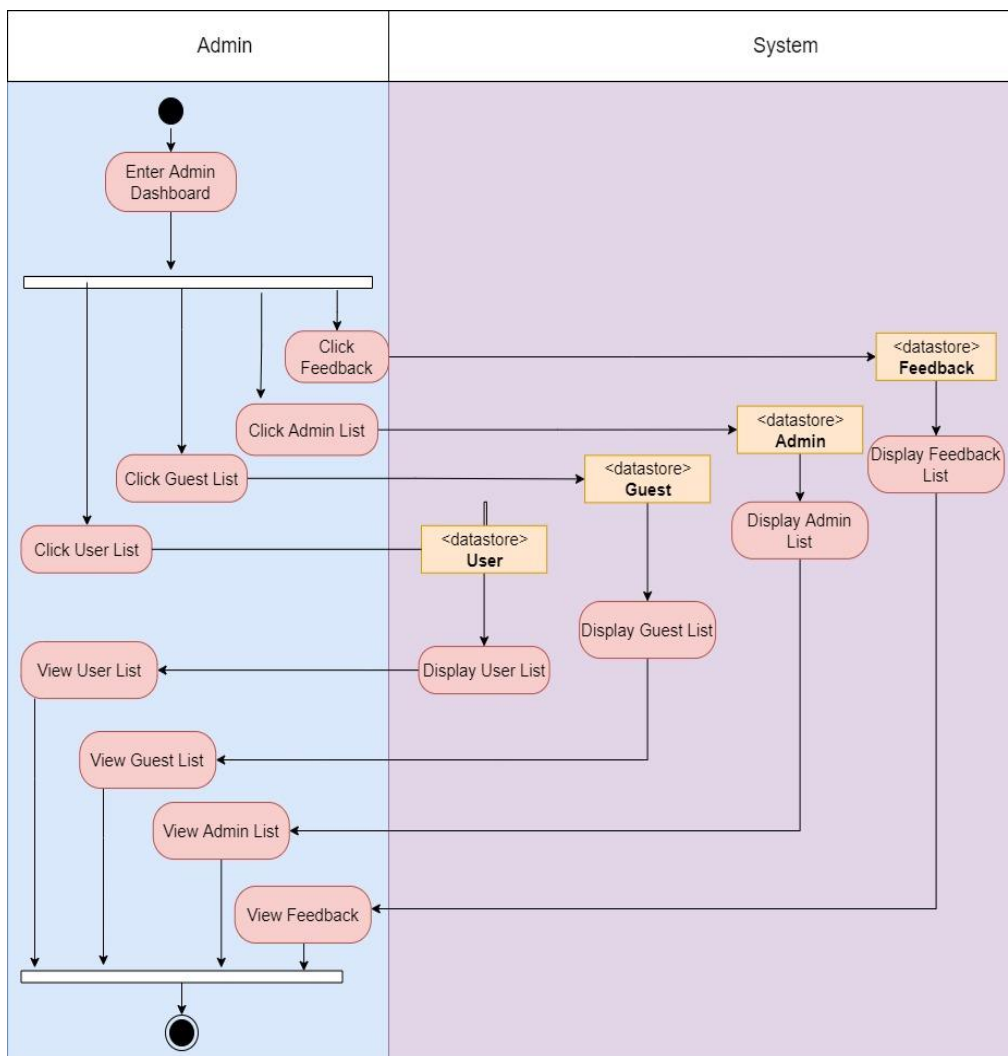


Figure 5.34 Activity diagram for admin view dashboard

c) Manage User List

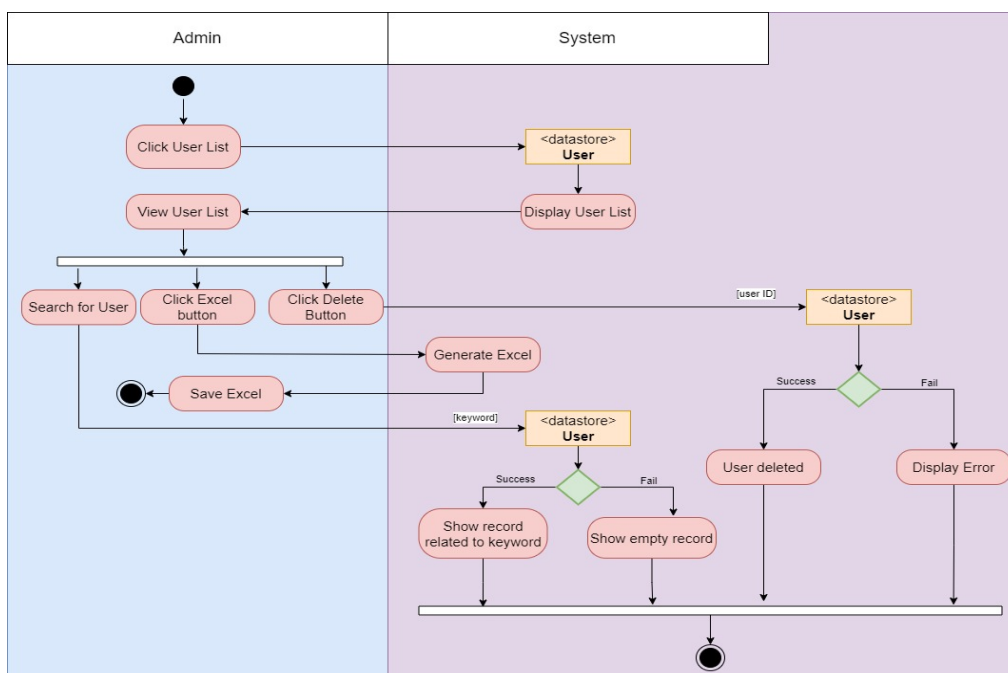


Figure 5.35 Activity diagram for admin manage user list

d) Manage Guest List

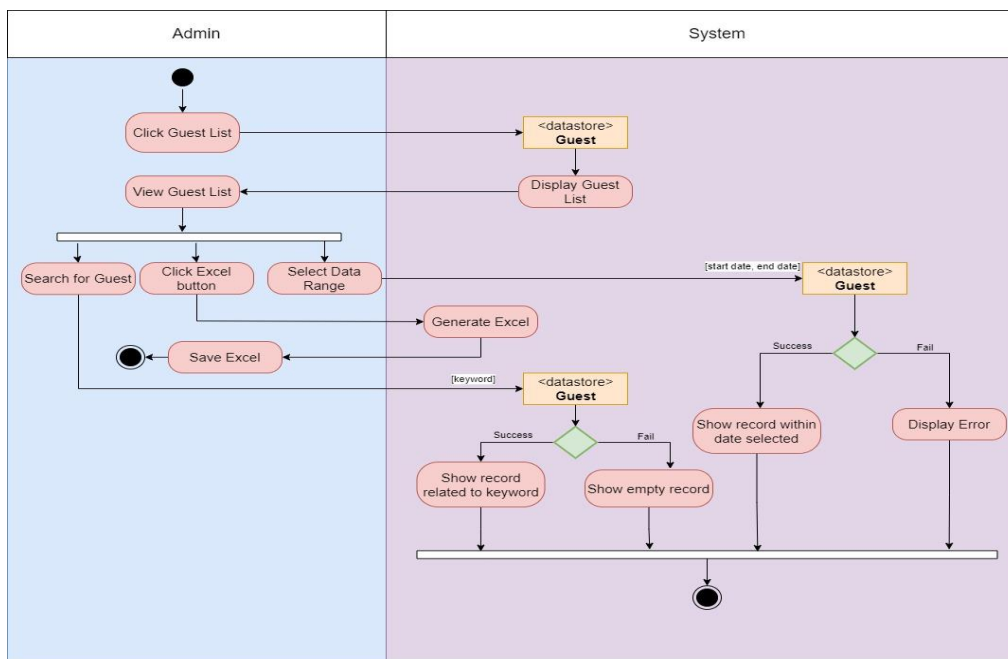


Figure 5.36 Activity diagram for admin manage guest list

e) Manage Admin List

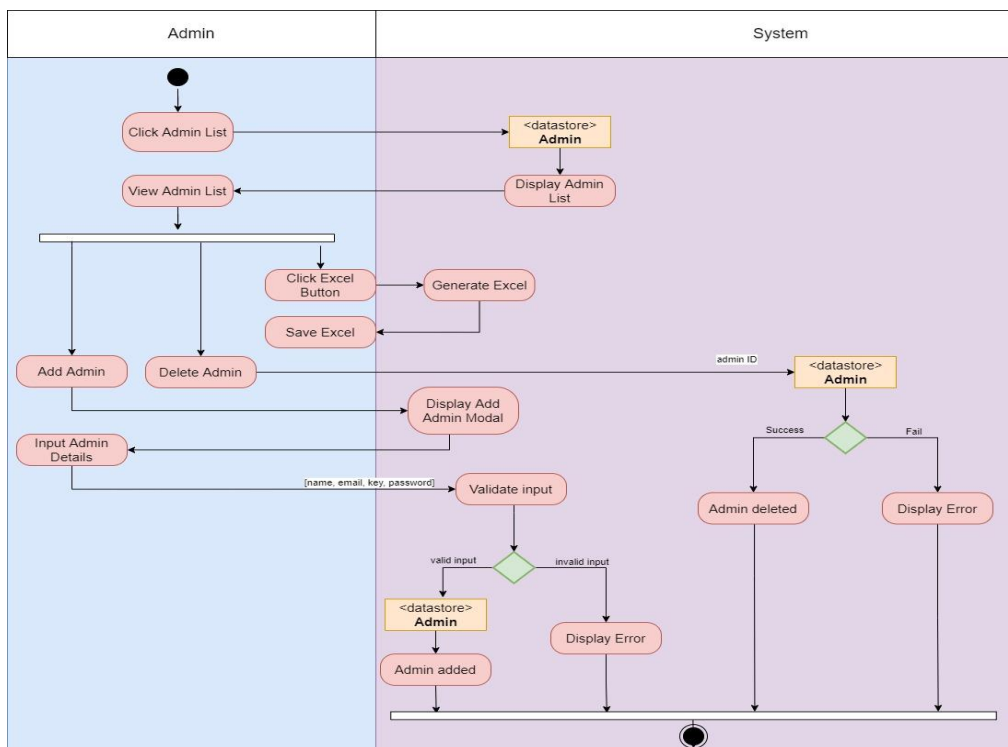


Figure 5.37 Activity diagram for admin manage admin list

f) Manage Feedback List

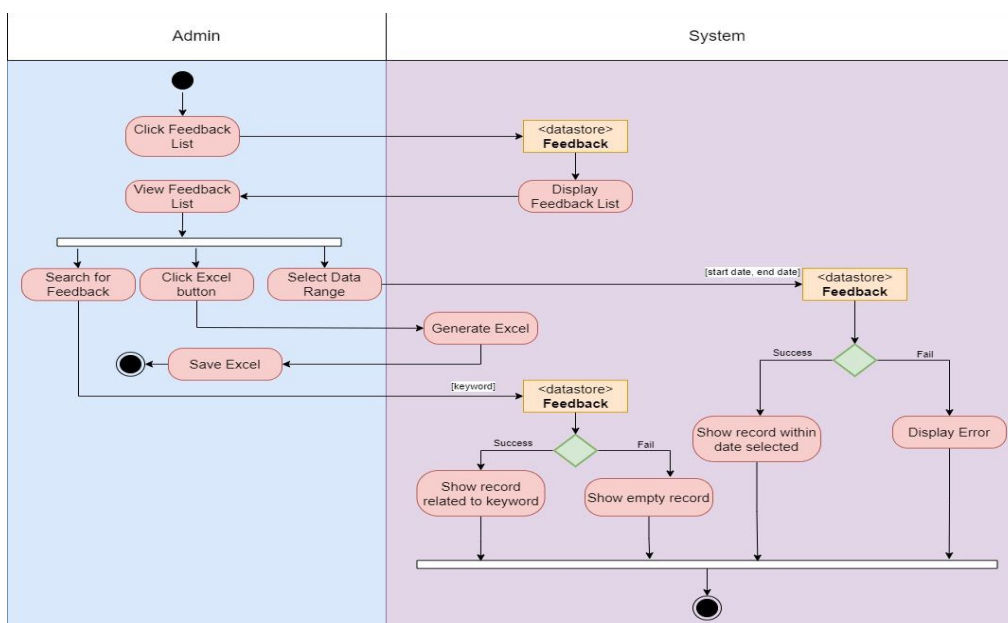


Figure 5.38 Activity diagram for admin manage feedback

5.5 User Interface Prototype – Low Fidelity

When user first enters the web application, the application will show a login form. If the user has a registered account, then he can enter email address and password to sign in. If the user does not have an account, but he has an invitation link, then he can enter the invitation link to join a meeting. If the user does not have an account and an invitation link, he must click the “sign up” button to register a new account.







Figure 5.39: Sign in Page

To register a new account, the user needs to enter all the personal data and click on the sign-up button as shown in Figure 5.40. The system will show a message indicate that the user creates an account successfully. Then the user needs to sign in.

Figure 5.40: Sign Up Page

Every page has a side navigation bar on the left.

Table 5.2: Navigation Bar and Descriptions

	If the user wants to view the main page, select the first button.
	If the user wants to view the contact list, select the second button.
	If the user wants to view the notification, select the third button.
	If the user wants to view text message, select the fourth button.
	If the user wants to view the meeting schedule, select the fifth button.
	If the user wants to change setting, select the sixth button.

When the user enters the main page, the application will show the room panel. It contains a search engine, add button and a list of room.

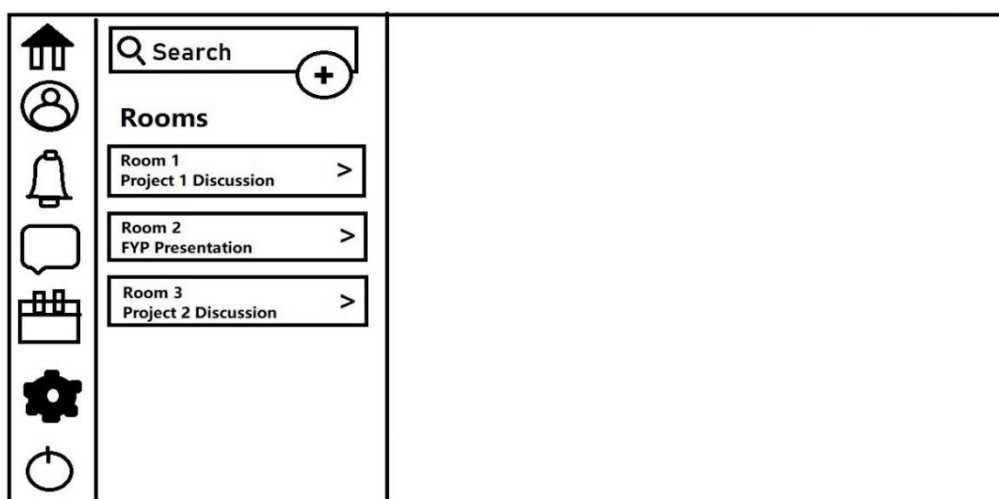


Figure 5.41: Main Page

To start a group meeting, a user needs to create a meeting room and a channel. To create a new room, the user can click the add button will pop out a form to create a room.

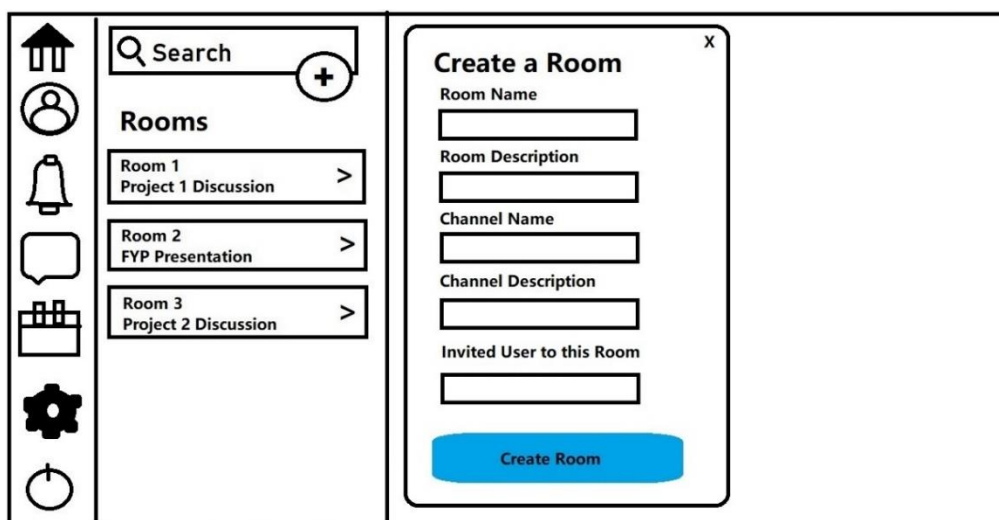


Figure 5.42: Create a Room

The user can click on a room to see the channel of the room.

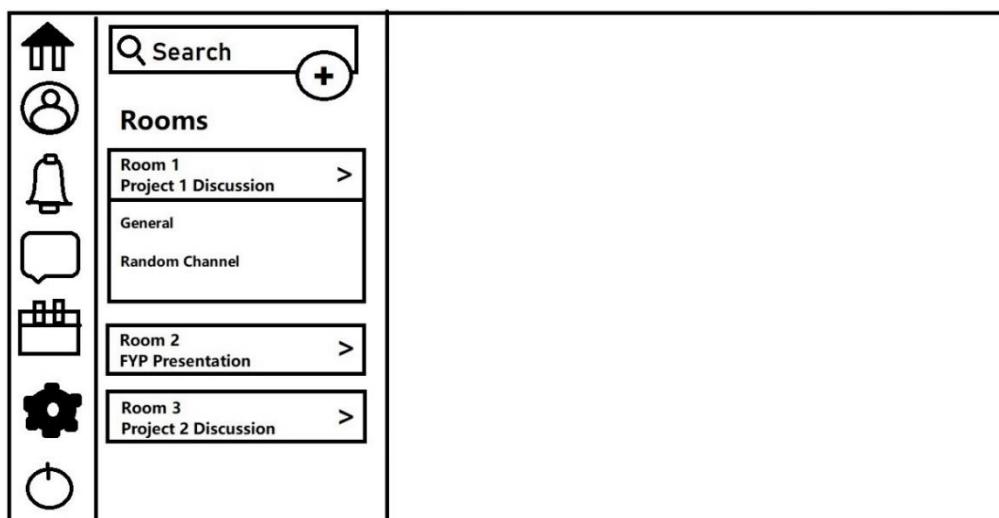


Figure 5.43: Channels of a Room

The user can click on the channel to enter the channel. The user can view conversation in the channel. On the top right there are three buttons. The first button is to start an audio call, second is to start a video call while the third is setting. Besides, there is a user list and a meeting agenda.

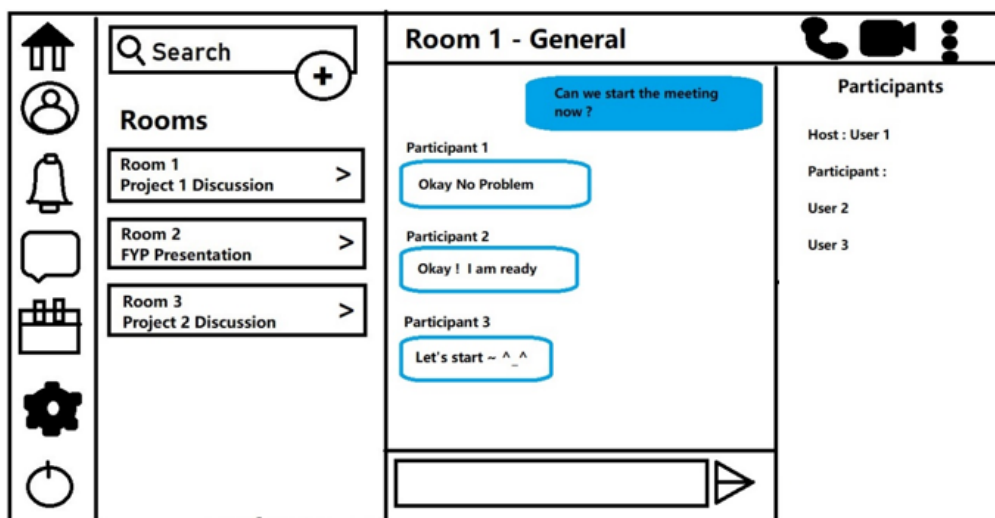


Figure 5.44: View in Channel

When the user clicks on the contacts button, the application will show the contact list panel. It contains a search engine, an add button and a list of contact with username and email. Beside each contact there is a delete button.

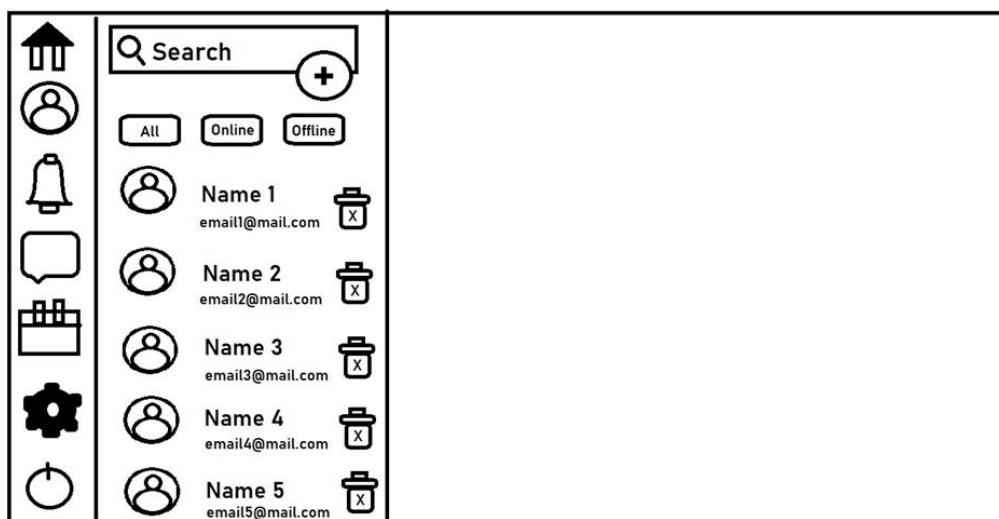


Figure 5.45: Contact List

If the user wants to add a contact, click the add button and a form will be shown. The user can search a friend by entering a phone number or an email address. If the user wants to delete a contact, click the delete button.

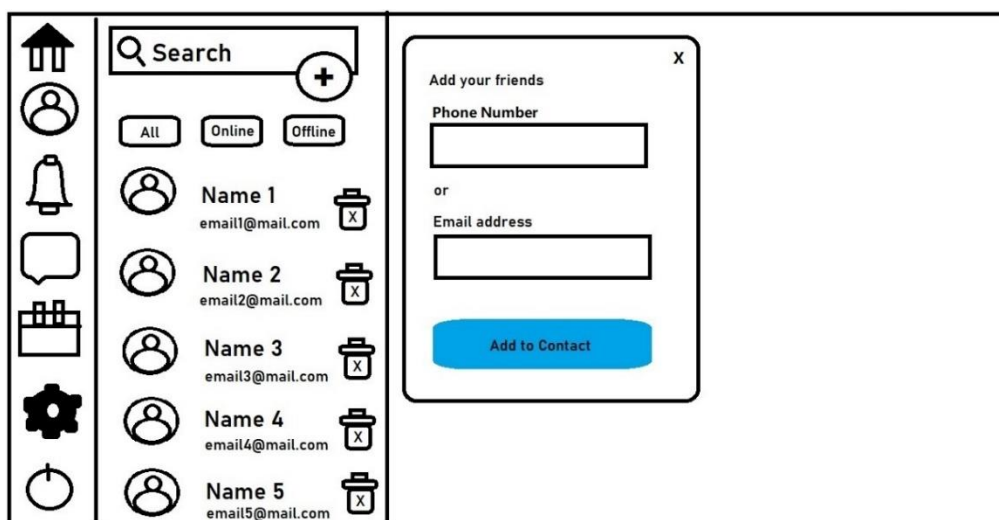


Figure 5.46: Add Friends

If the user wants to view the notification received, click on the notification button. The system will show a notification panel. It contains a search engine and a list of notification.

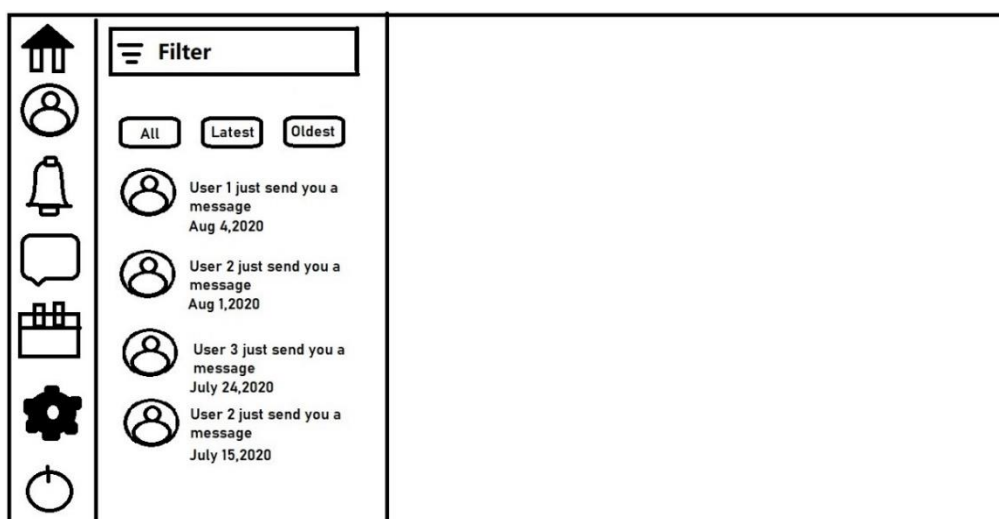


Figure 5.47: Notifications

If the user wants to view the chat box, click on the chat button. The system will show the conversation panel. It contains a search engine, add button and a list of conversation

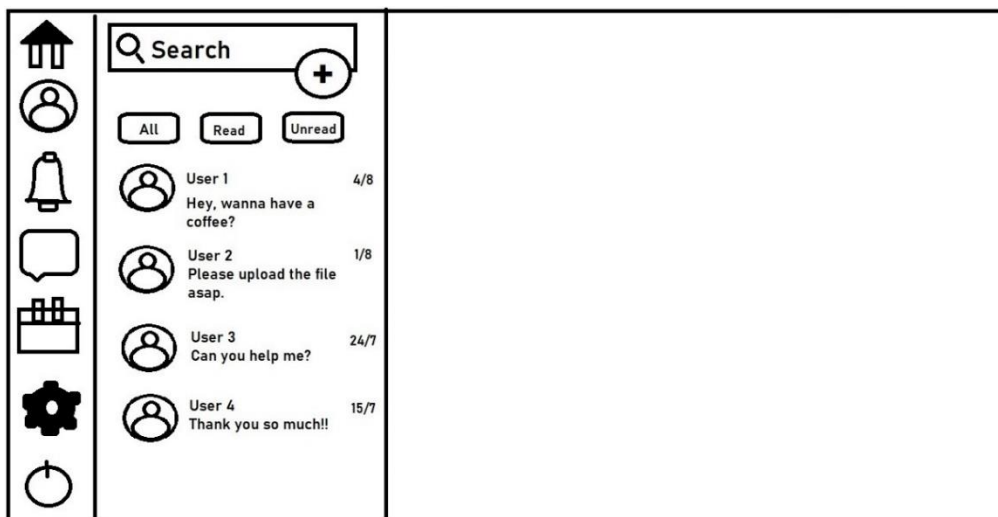


Figure 5.48: View of Chat Box

The user can select on a conversation to see the whole conversation. On the top right there are three buttons. The first button is to start an audio call, second is to start a video call while the third is setting.

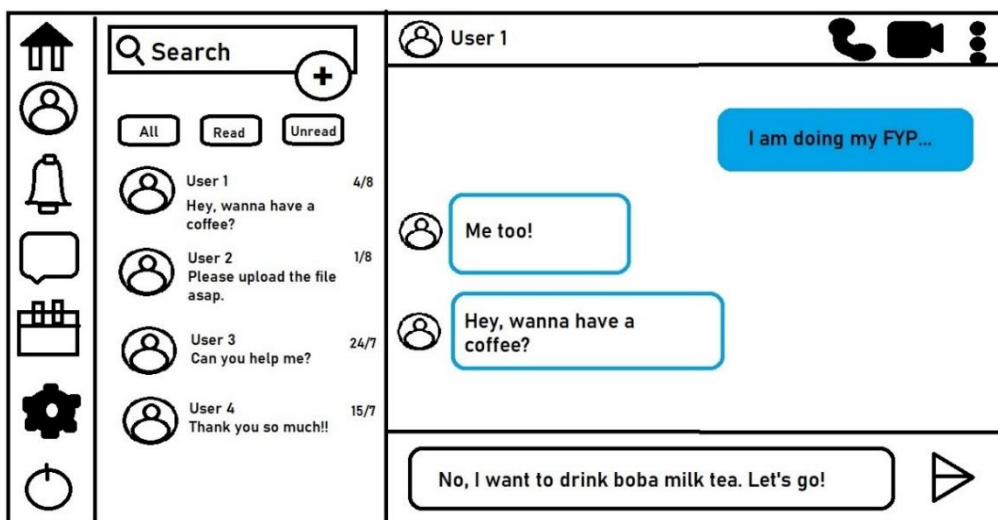


Figure 5.49: View of Conversation Window

If the user wants to send a chat message to a new recipient, select on the add button and the system will show a form. The user can enter the recipient and send a new message.

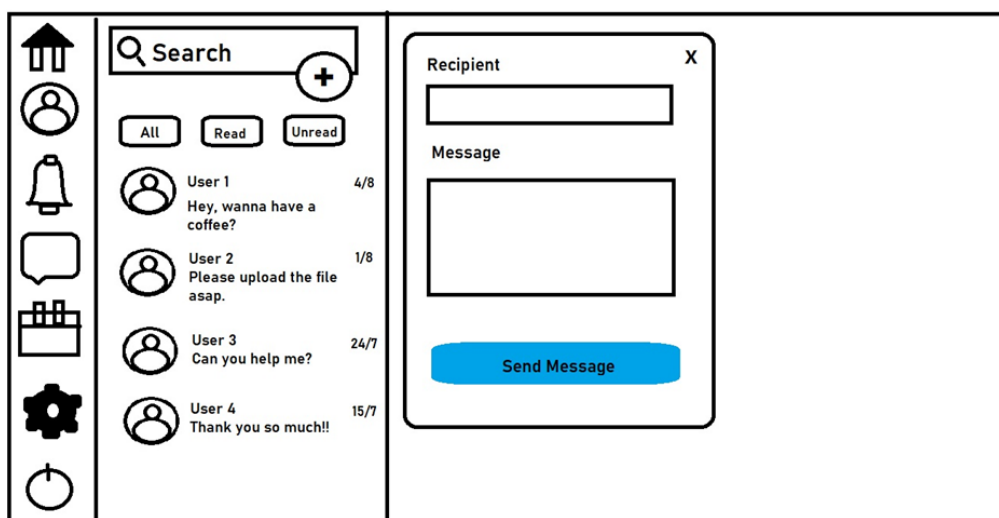


Figure 5.50: Creating a New Chat

If the user wants to view the meeting schedule, click on the schedule button. The system will show a schedule panel. It contains a search engine, add button, three filter buttons (All, Latest, Oldest) and a list of meeting schedule.

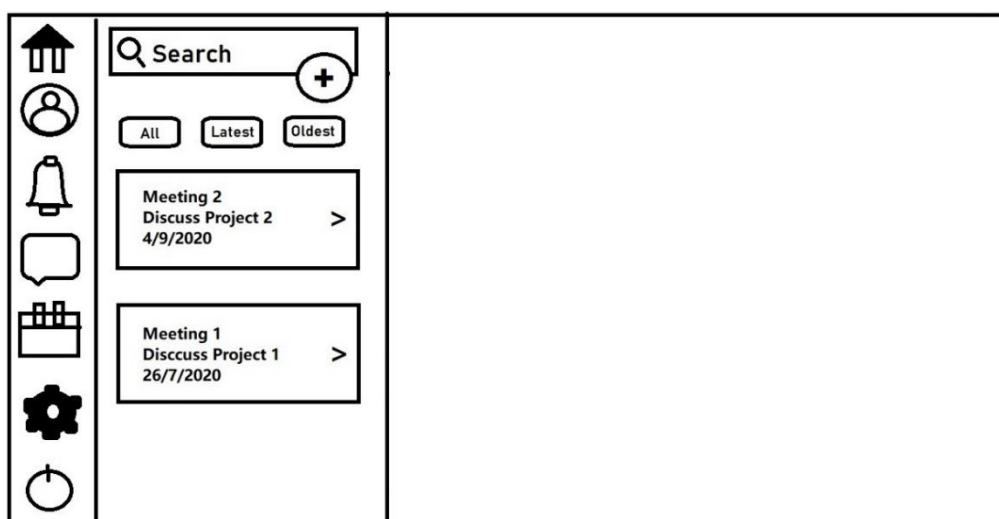


Figure 5.51: Overview of Meeting Schedule

The user can select on a meeting schedule to view and edit the meeting agenda.

Meeting 1 - Agenda		
Title : Meeting 1		
Date : 4/9/2020	Time : 1400	Duration : 1 hour
Objective : To distribute task of project 1		
Preparation : Review project guideline		
Participants		
User 1	User 2	User 3
Topic	Presenter	Time Allocated

Figure 5.52: Details of Meeting Schedule

If the user wants to create a new schedule, click the create button and the system will show a add schedule form.

Add a Schedule x

Meeting Title

Meeting Desc

Meeting Date

Add Schedule

Figure 5.53: Add a Schedule

If the user wants to manage his profile and edit the setting, click on the setting button. The system will show a setting panel. It contains the user's information and four buttons.

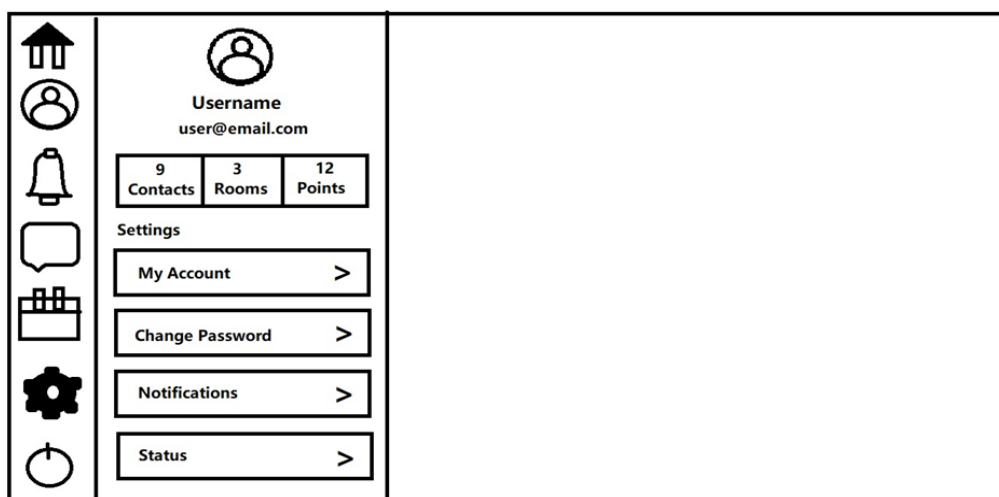


Figure 5.54: Account Settings

5.6 User Interface Prototype – High Fidelity

A high-fidelity prototype looks like a live application. It allows the user to get a better idea of how the web application will look and function. The high-fidelity prototype also helps to establish realistic expectations at the beginning stage of the project.

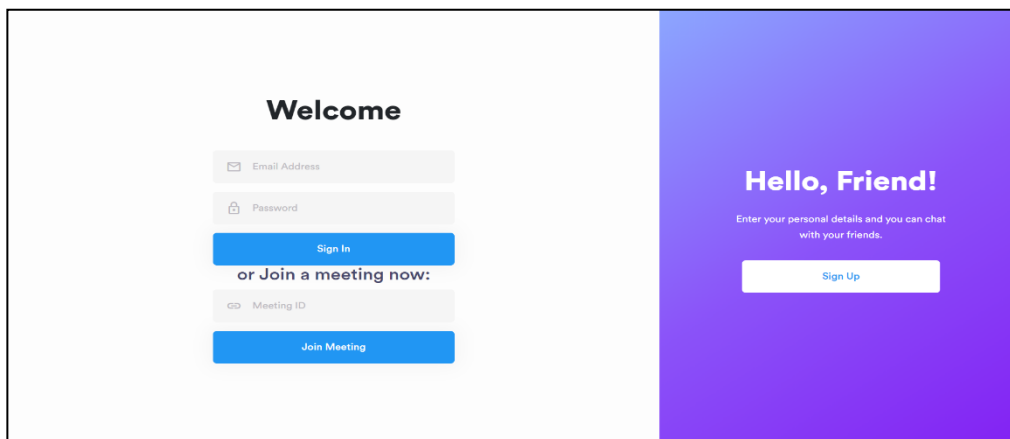


Figure 5.55: User Login Page

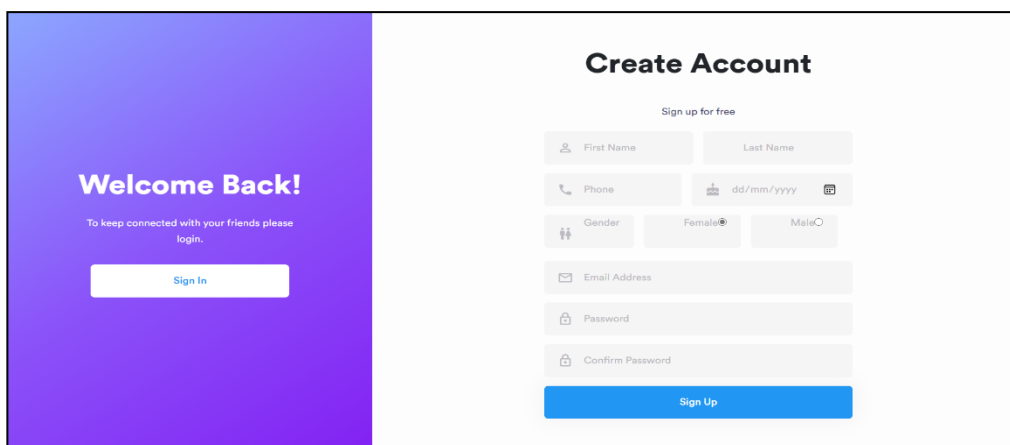


Figure 5.56: User Sign Up Page



Figure 5.57: Main Page

Create a Room
✕

ROOM TITLE:

ROOM DESCRIPTION:

CHANNEL TITLE:

CHANNEL DESCRIPTION:

ROOM MEMBER:

Figure 5.58: Create Room Form

The screenshot displays a chat application interface. On the left is a sidebar with navigation options: Home, Contact, Notification, Chat, Schedule, Settings, and Log out. The main area is titled "Room 1 - General" with a sub-header "Project 2 Discussion". Below the header is a search bar "Search for room..." and a list of rooms: "Room 1" (Project 1 Discussion), "General" (This is a default channel), "Random" (This is a random channel), and "Room 2" (Stress Free Campaign 2020). The chat area shows a conversation from "Yesterday" with messages: "Hey guys, I just started my FYP chapter 3 ...", "Me too, I am still doing my FYP chapter 2 |", "Hahaha I have completed.", "OMG why you so fast??", and "I cannot liao I need to burn midnight oil liao!". On the right is a "Members" list with 6 members and their status indicators.

#	Members	Status
1	Harmony Otero Merlin	●
2	Janette Dalton Perceival	●
3	Keith Morris Oberon	●
4	Michael Knudsen Mordred	●
5	Ryan Foster Assassin	●
6	Milred Bennett Morgana	●

Figure 5.59: Room and Channel



Figure 5.60: Contact List

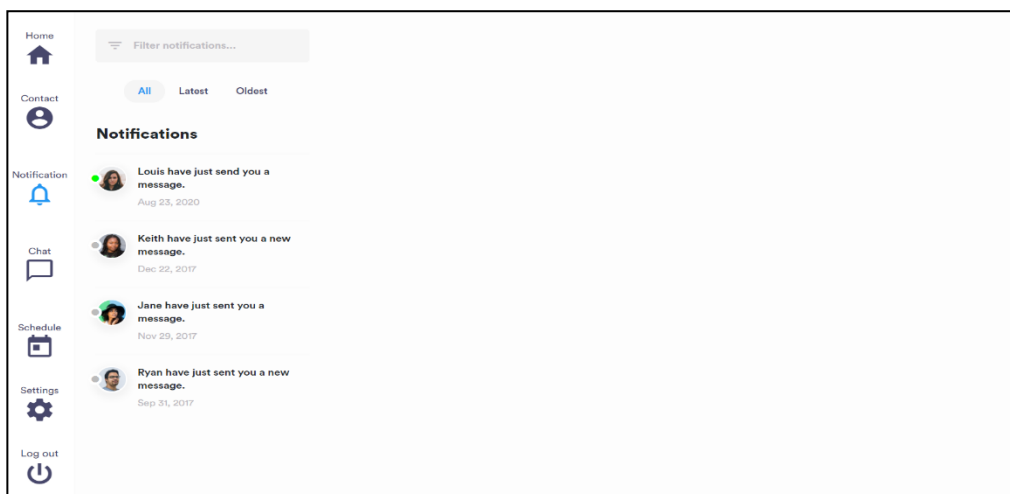


Figure 5.61: Notifications

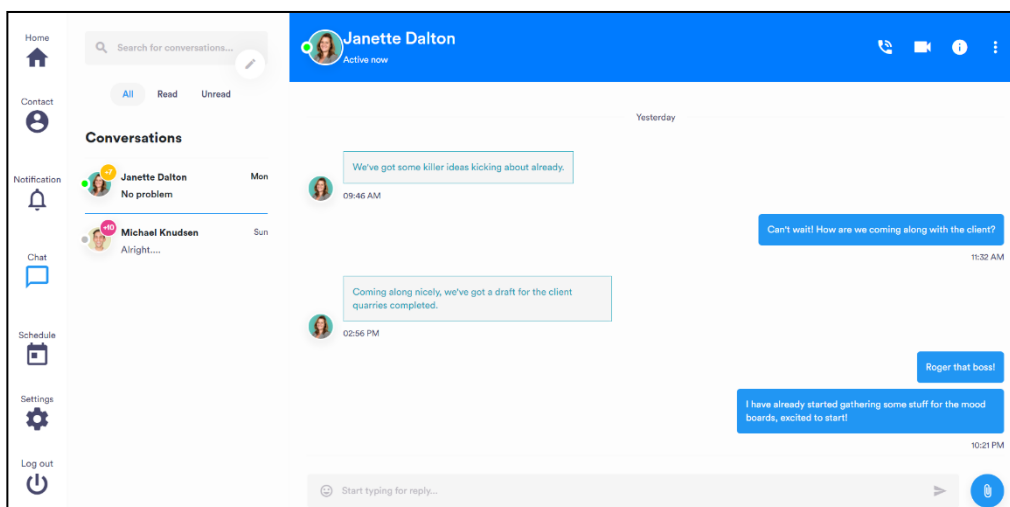


Figure 5.62: Conversations

Add a Schedule ✕

MEETING TITLE:

MEETING DESC

MEETING DATE

MEETING START TIME

MEETING END TIME

REQUIRED ATTENDEES

[Add to Contact](#)

Figure 5.63: Add Schedule Form

Home

Contact

Notification

Chat

Schedule

Settings

Log out

+

All
Upcoming
Past

Schedule

Meeting 1 2 Aug 2020 - Wed

Discussion about Assignment
Room 1 2 pm

Meeting 2 15 Aug 2020 - Tue

Discussion about Assignment
Room 2 10 am

Meeting 3 17 Aug 2020 - Thurs

Discussion about Assignment
Room 1 3 pm

Meeting 4 21 Aug 2020 - Mon

Discussion about Assignment
Room 2

Meeting Agenda ⋮

Meeting 1					
Title					
Date	9/9/2019	Time	1400	Location	Room 1
Objective	To present the report of the assignment 1				
Preparation	Power Point Slide				
Participants	Rebecca , Winnie , Michael				
#	Topic	Presenter	Time Allocated	Sort	Delete
1	Introduction	Rebecca	5 mins	↑ ↓	Remove
2	Advantages and Disadvantages	Winnie	10 mins	↑ ↓	Remove
2	Tools Used	Michael	5 mins	↑ ↓	Remove

Figure 5.64: Schedule and Meeting Agenda

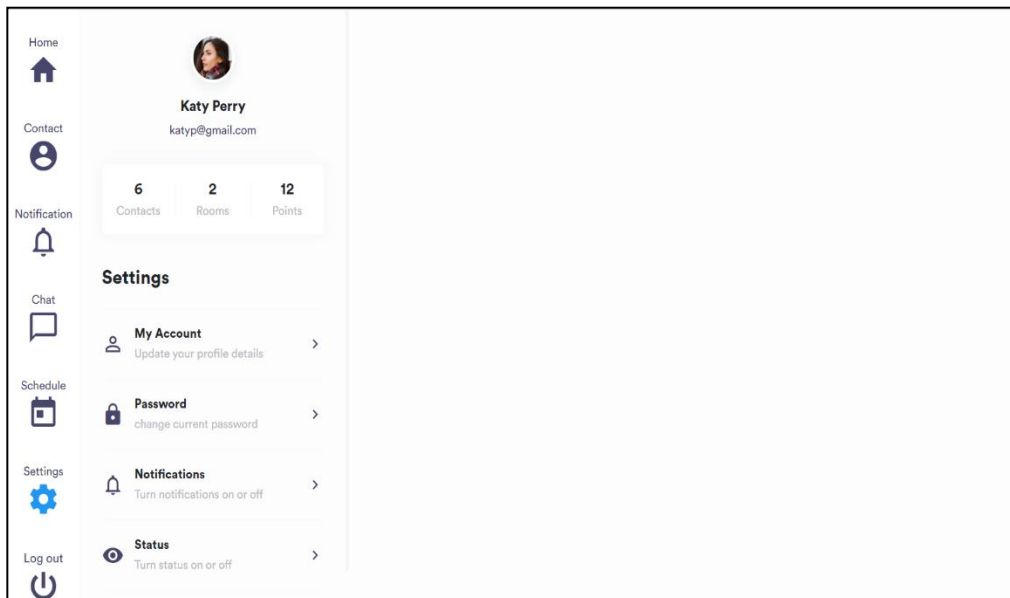


Figure 5.65: Settings

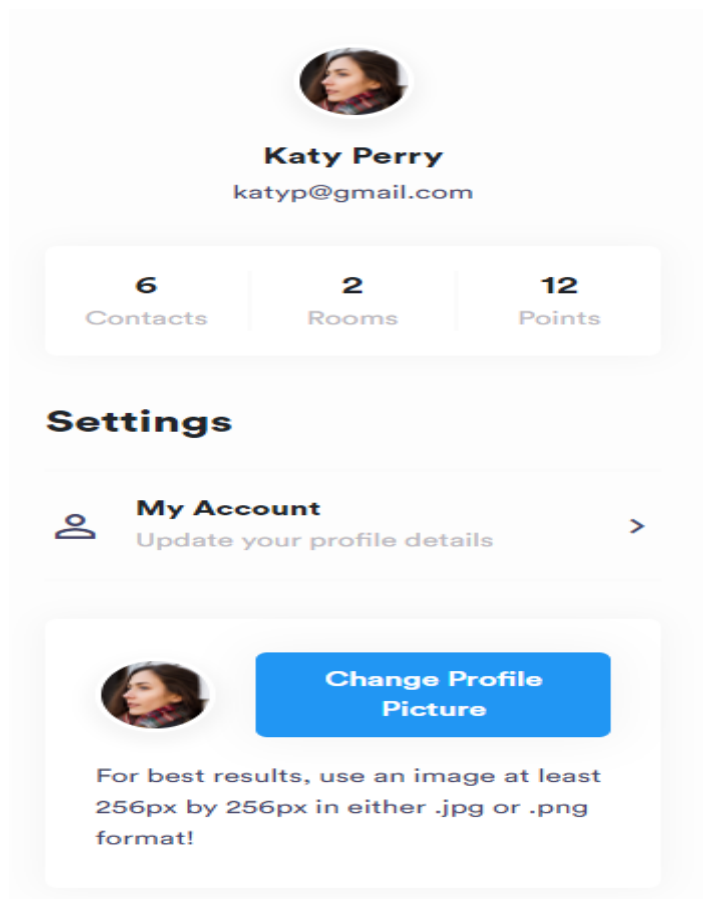
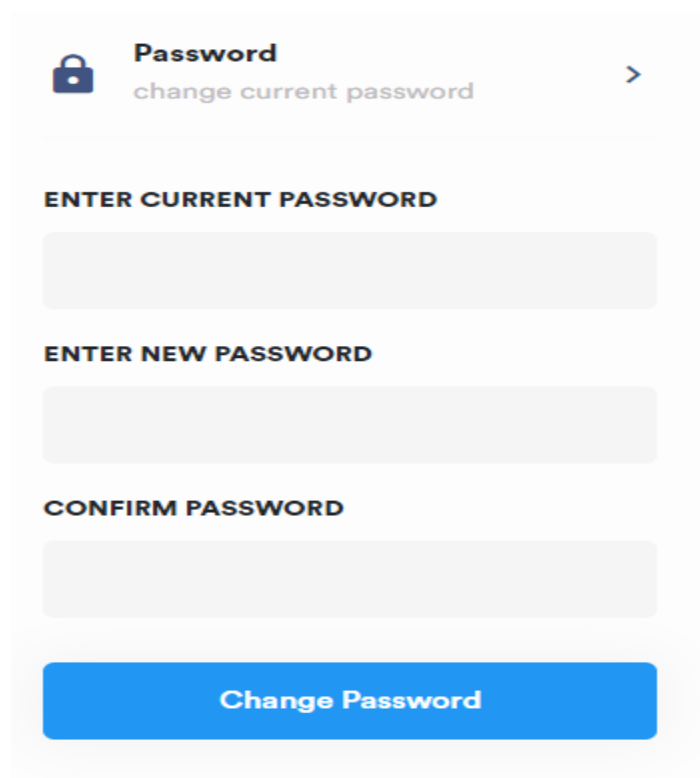


Figure 5.66: User Profile and Change Profile Picture



The image shows a mobile application interface for changing a password. At the top, there is a header with a lock icon, the title "Password", and the subtitle "change current password" with a right-pointing chevron. Below the header, there are three input fields, each with a label above it: "ENTER CURRENT PASSWORD", "ENTER NEW PASSWORD", and "CONFIRM PASSWORD". At the bottom of the form is a large blue button with the text "Change Password".

Figure 5.67: Change Password Form

5.7 Conclusion

In summary, this chapter explained the web application architecture overview by introducing Three Trier Architecture model. In addition, an ER diagram was created to display the relationships between different entities. The activity diagrams show the activities performed by the user, admin and guest while using the system. This chapter also included a low-fidelity prototype and a high-fidelity prototype.

CHAPTER 6

IMPLEMENTATION

6.1 Introduction

This chapter describes the development, deployment and the testing of the web application and the administrative system, follow the evolutionary prototyping method. After the implementation of the features into the first prototype, it is evaluated and refined into the second prototype. At the end of the project, an aesthetically pleasing second prototype is developed and deployed.

6.2 Implementation of Meego Video Conferencing Application

The implementation phase has by far been the most challenging and longest phase in this project. In the Meego Video Conferencing Application, there are three types of users in this system namely user, guest and administrator. Each user role will have its own module containing the functionalities that he or she can perform via this application.

6.2.1 User

a) Sign Up

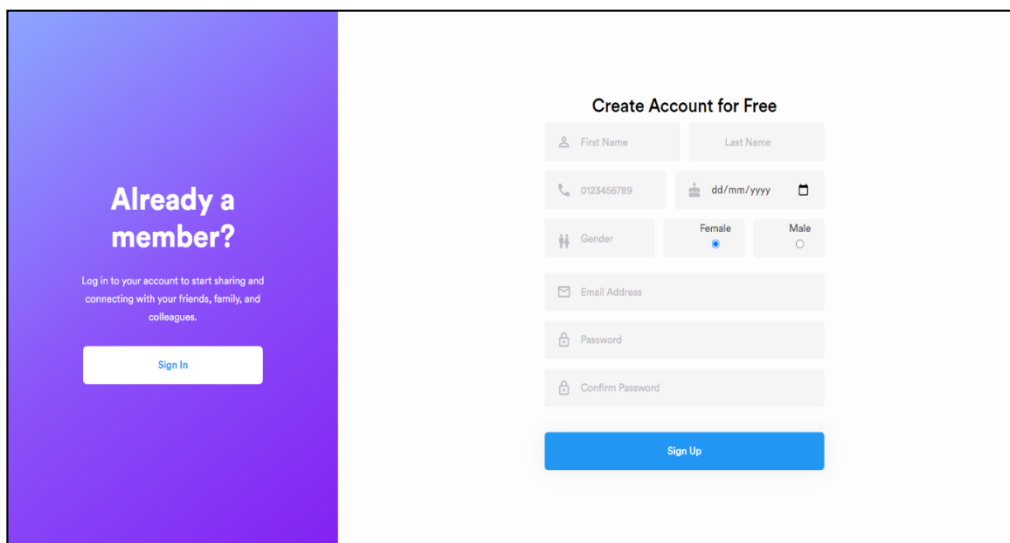


Figure 6.1 Sign Up Page

Sign up means a new user to register himself for a new account.

If the user wants to access the application for the very first time, then he needs to sign up.

It requires the user to fill in his personal details like name, contact number, birthday, email address, and a password.

Validation is implemented in the sign-up form to check if the information entered by a user is correct. For instance, the password must contain at least 8 characters that include an upper and a lower case letter and a number. The validation of the password can be done by JavaScript, as shown in Figure 6.3.

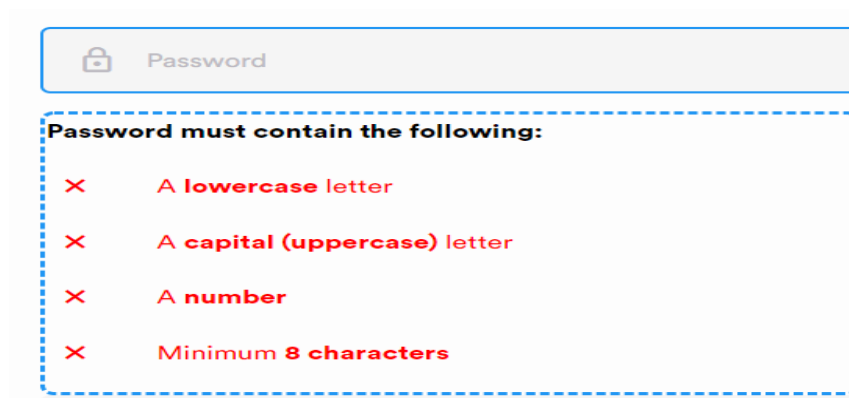


Figure 6.2 Password Validation

```
// When the user starts to type something inside the password field
password.onkeyup = function() {
  // Validate lowercase letters
  var lowerCaseLetters = /[a-z]/g;
  if(password.value.match(lowerCaseLetters)) {
    letter.classList.remove("invalid");
    letter.classList.add("valid");
  } else {
    letter.classList.remove("valid");
    letter.classList.add("invalid");
  }

  // Validate capital letters
  var upperCaseLetters = /[A-Z]/g;
  if(password.value.match(upperCaseLetters)) {
    capital.classList.remove("invalid");
    capital.classList.add("valid");
  } else {
    capital.classList.remove("valid");
    capital.classList.add("invalid");
  }

  // Validate numbers
  var numbers = /[0-9]/g;
  if(password.value.match(numbers)) {
    number.classList.remove("invalid");
    number.classList.add("valid");
  } else {
    number.classList.remove("valid");
    number.classList.add("invalid");
  }
}
```

Figure 6.3 Password Validation Code Sample

b) Sign In

Once the user already signed up, he can proceed to sign in. There are two options for the user to sign in: via a Meego account or via his Google account.

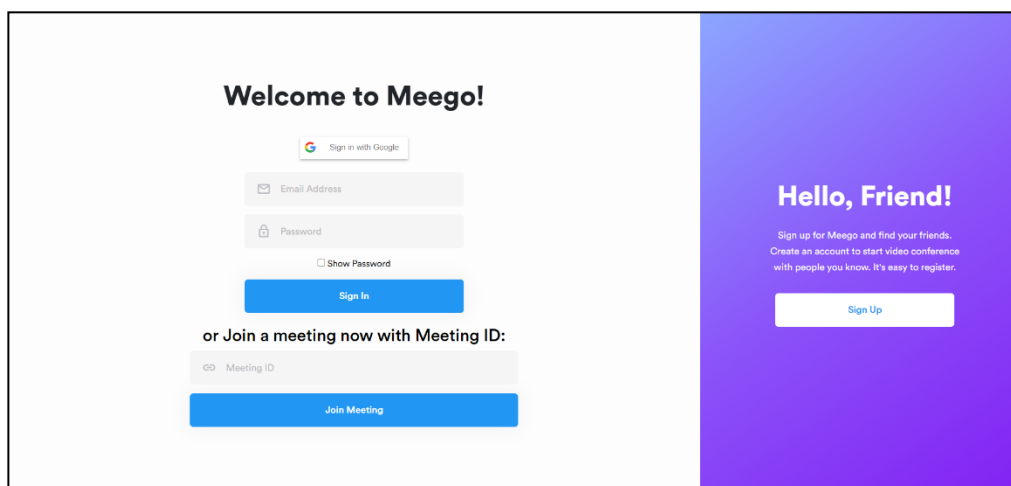


Figure 6.4: Sign In Page

Repeated registration process may irritate a user. Therefore, this system enables the user to log in with third party: Google Sign-in. This system uses OAuth 2.0 to access the Google APIs to get the user Google ID and information like name and profile URL (Google Identity, 2020). The figure shows the client id created for the app in Google Developers Console with the google-sign-in-client_id meta elements.

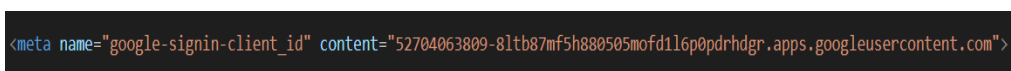


Figure 6.5 Google Sign in Client ID

c) Navigation Bar

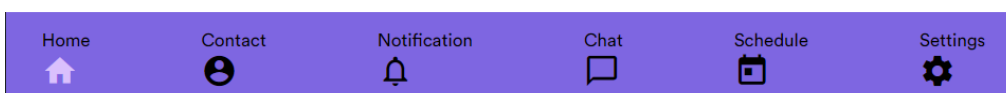


Figure 6.6 Navigation Bar

When the user signs in the system successfully, the user will see a navigation bar on the left of the page content. A navigation bar is a list of links to other sections of the system. When the user first enter the web application, the current active tab is the Home pane.

d) Room

A user can create a room or join a room. A room is like a virtual room where a group of users can share ideas and information and conduct a meeting. After the user log in to the web application, the user can view the room list.

The user can create their own room and add members to it. The user can create as many rooms as he wants and there are no restrictions on the number of room members and number of channels to add. If the user creates a room, then the user will automatically become the owner of the room.

To create a new room, follow these steps.

1. Click on **Home** button from the left navigation bar to open the Room List pane.
2. On the top of the Room List Pane, click the add button.
3. When the Create a Room modal appears on the screen, fill in the form.
4. After filling in the form, click “Create Room” button.

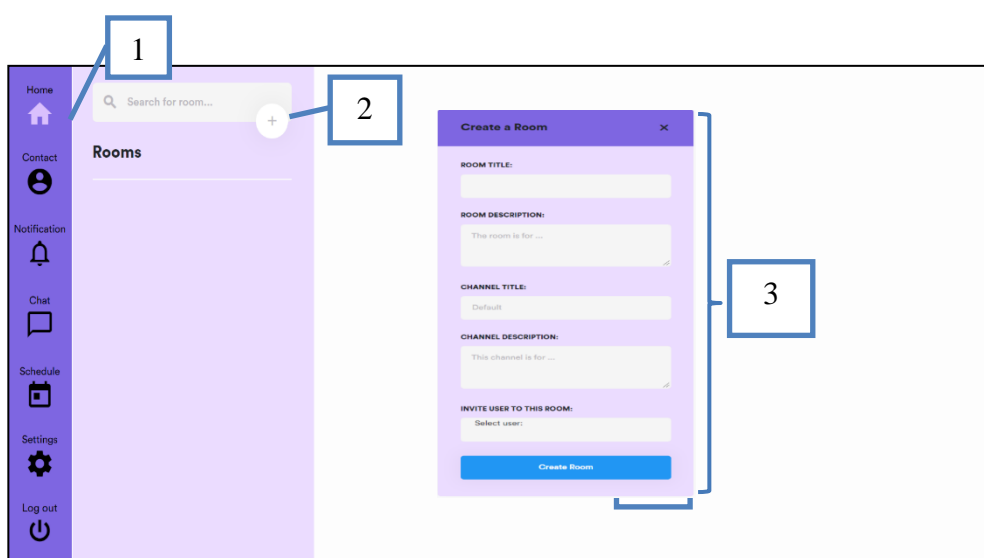


Figure 6.7 Steps to create a room

In this form, the user can only create one channel for one room. The user may add more channel to this room later.

e) Room channel

In a real world, channels can refer to the methods people use to communicate as well as the specific tools used in the communication process. In this application, channels within a room are allow the user to keep the conversations in a room organised. For example, if the user is using a room for a project, then a new channel could be created for each of the project with the same team member. To see a channel, click on the room and all the channel of that room will appear below the room title.

To add a channel into a room, follow these steps.

1. select a room and expands the channel list. The add channel button is below the channel list, beside the delete room button.
2. Click the add channel and Create Channel modal will appear on the screen.
3. Fill in the channel details.
4. Click Create Channel button to submit the form.

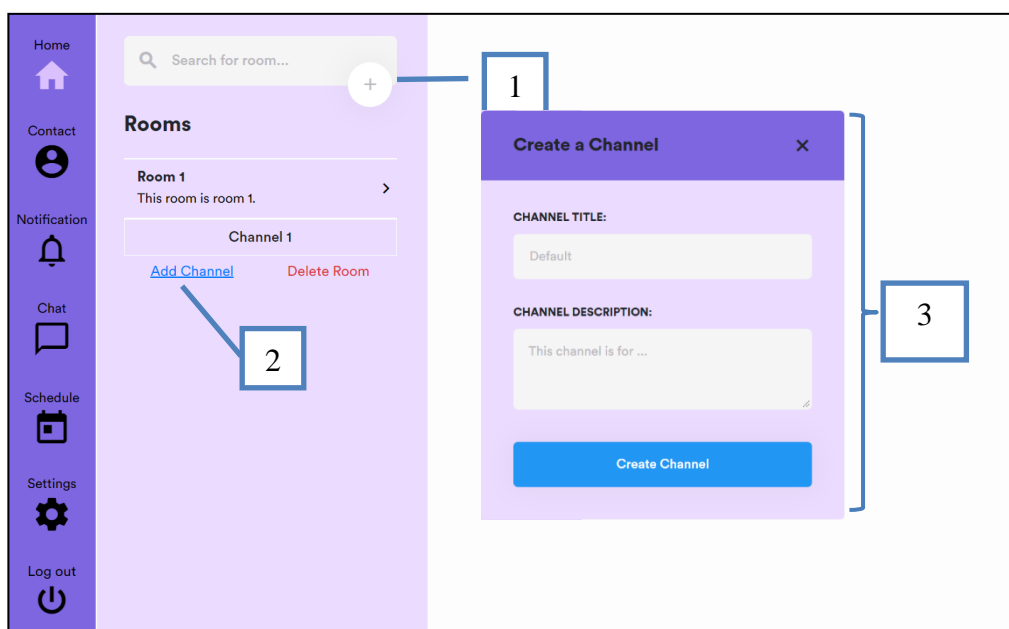


Figure 6.8 Steps to add channel into a room

A room owner has access to perform some administrative actions while a room member cannot. For example, a room owner can manage the room like delete the room, add a new channel, or remove a channel. He can also manage the member in the room by inviting a new member to join the room or delete the member. If the user can join a room if he is invited by the room owner to become a member of the room.

Only the owner of the room can delete a channel or delete a room. Once the channel is deleted then the member cannot access any messages or file shared within it. All the conversation records in the room will be gone and cannot be restored.

To add more member to the room, follow these steps.

1. The room owner selects a channel and click on the kebab menu on top right.
2. Select insert member button and a add member modal will appear on the screen.
3. Select any user from the list
4. Click add member button.

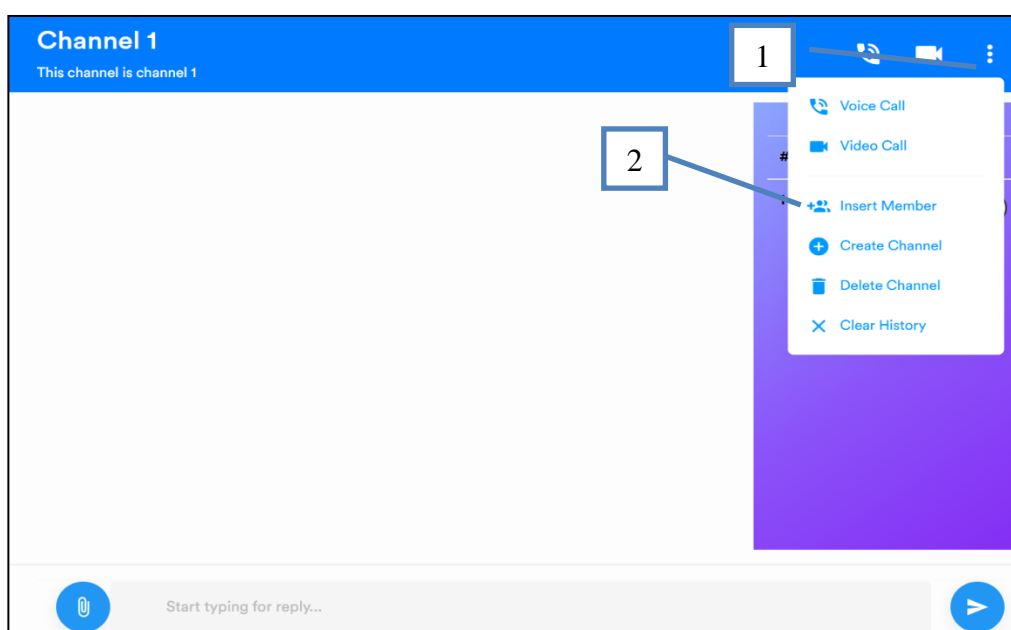


Figure 6.9 Steps to insert a new member

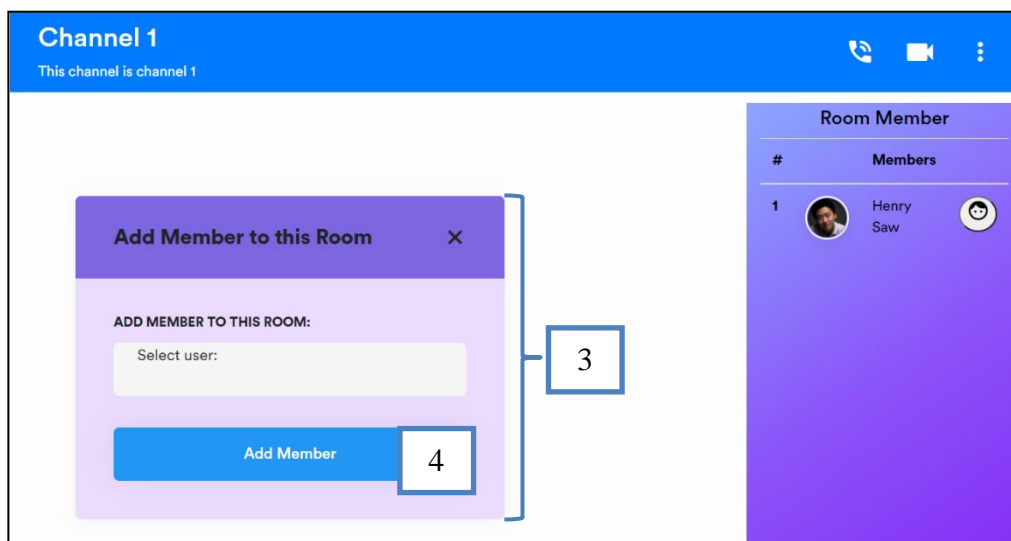


Figure 6.10 Steps to insert a new member (continue)

Existing users can be removed from a room by simply clicking on the recycle bin icon next to the member name in the room member table. Notice that this is an irreversible action, the system will send a confirmation message to confirm before removing the member.

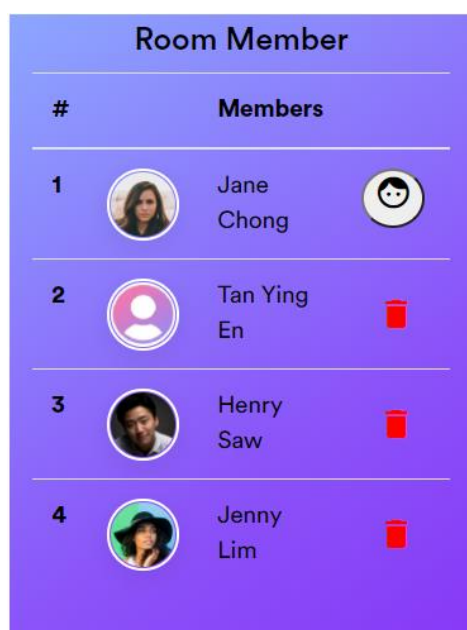


Figure 6.11 From Room Owner's
view

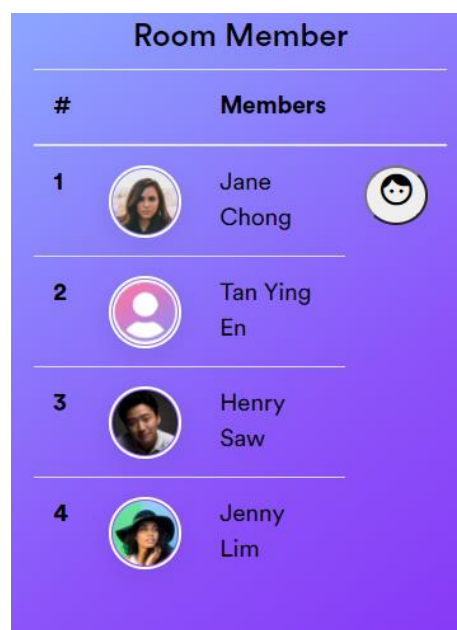


Figure 6.12 From Room Member's
view

A room owner can see the delete buttons beside room member, but the room member cannot see the delete buttons. A room member can leave any room that he joined. To leave a room, the user can select on the room, and select any channel, then click on the kebab menu and select leave room button.

The system will send a confirmation message to confirm the user really want to leave the room.

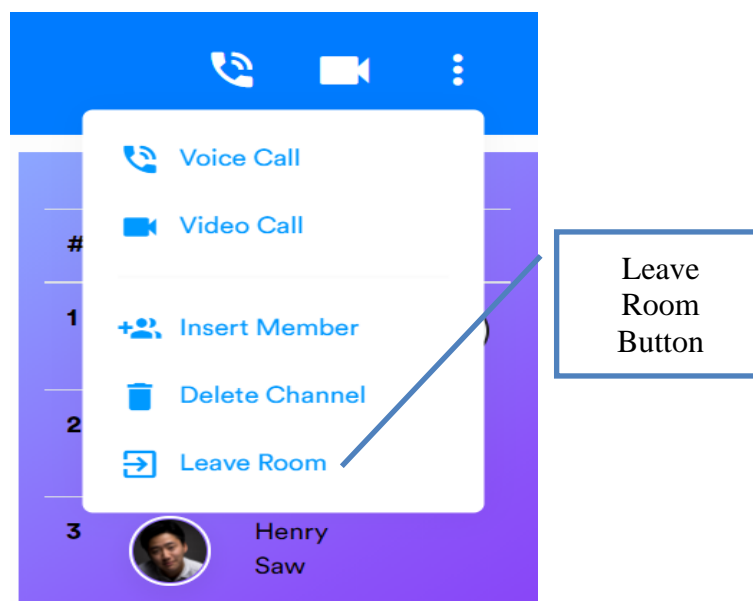


Figure 6.13 Leave Room Button

Every member in a room can send a message within the channel.

To send a message within a channel, follow these steps.

1. Click on the message field to enter a message
2. Click on the file button to select a file from local computer (optional).
3. Click on the send button

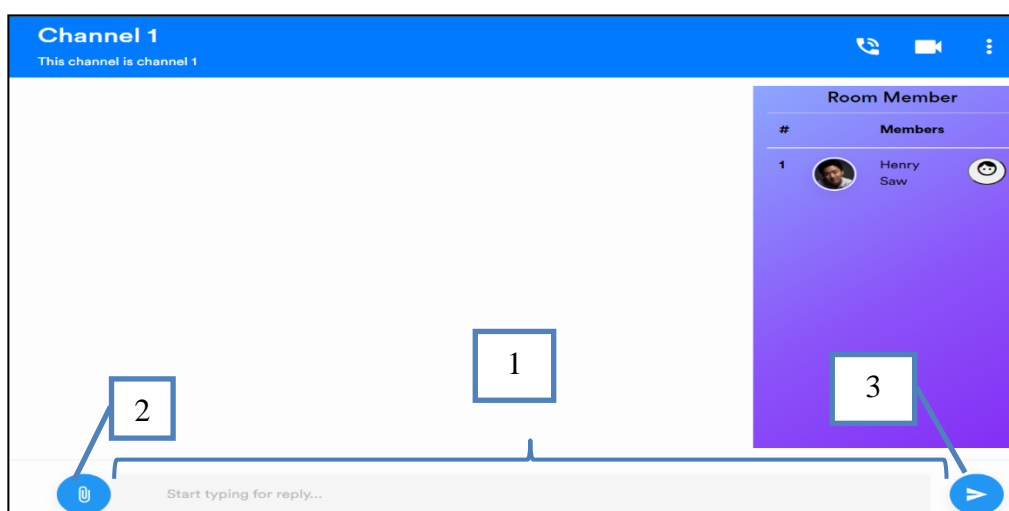


Figure 6.14 Steps to send a message in a channel

Once the file is selected, the name of the selected file will be shown.

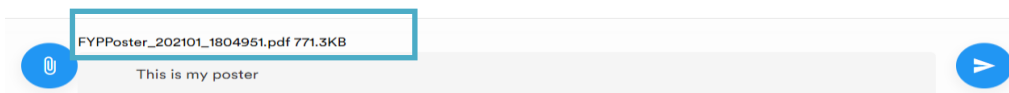


Figure 6.15 Selected Filename Preview

To delete the messages in a channel, on the top pane of a channel and click on kebab menu on the right for more options. Then choose Clear History.

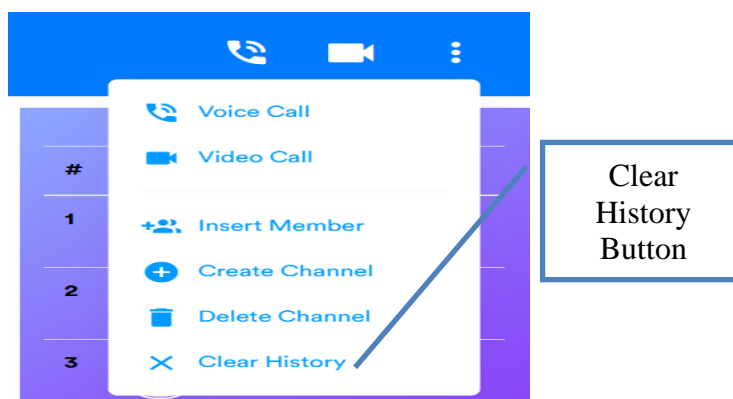


Figure 6.16 Clear Channel Conversation History

f) Contact

A video conferencing application must have a contact list feature so that the user can contact other user, send messages, add another user in agenda planner.

To create a new contact, follow these steps.

1. Click on Contact button from the left navigation bar to open the Contact List pane.
2. On the top of the Contact List Pane, click the add button.
3. When the “Add your friends” modal appears on the screen, fill in the form.
4. After filling in the form, click “Add to Contact” button.

To delete a contact, click on the delete button beside the contact list.

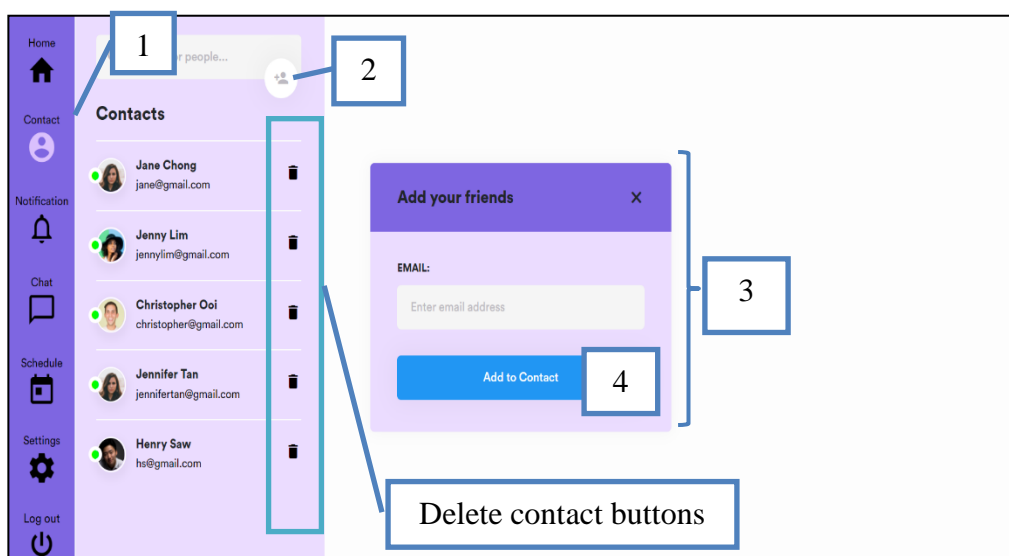


Figure 6.17 Steps to add new contact

g) Notifications

Notifications will enhance the user experience. It is used to inform the user about something happen. For example, a user would be alerted when someone started a meeting or when they receive a message in the conversation. To view all the notifications, click on Notification button from the left navigation bar to open the Notification pane.

Another way the system used to notify the user is toast notification. It appears on the top right of the web application. It contains the button for the user to navigate to certain page quickly.

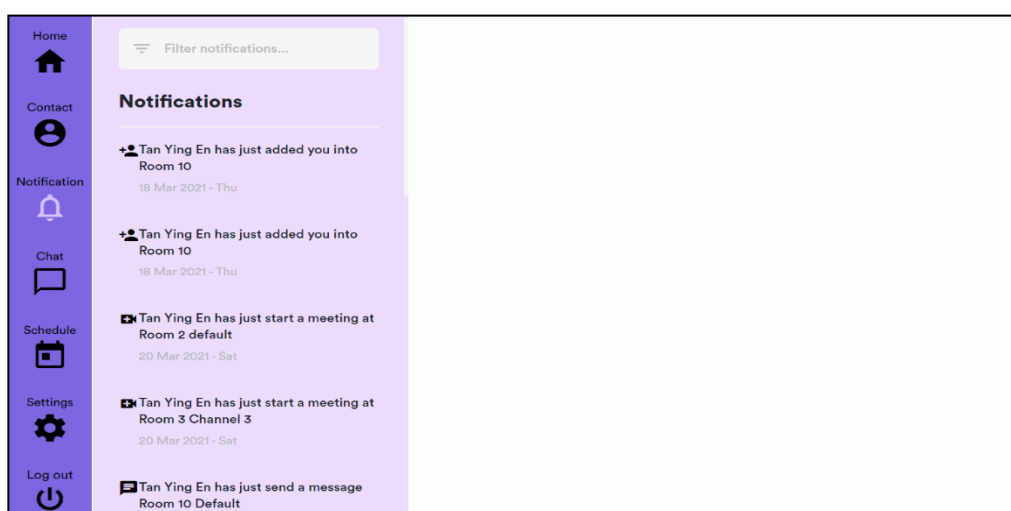


Figure 6.18 Notifications Pane

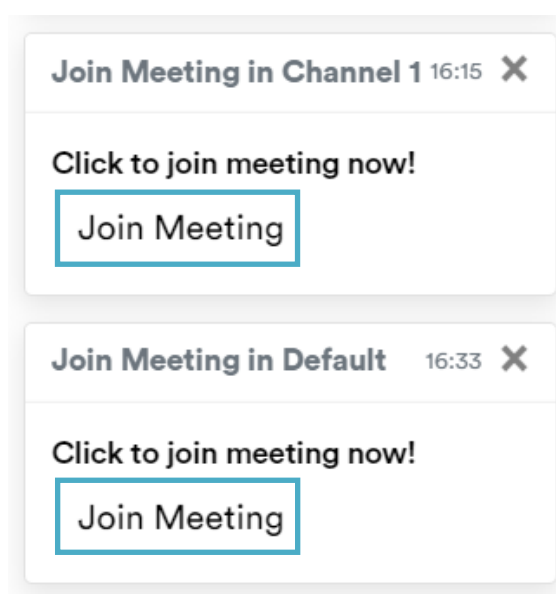


Figure 6.19 Toast Notification

h) Chat

Sometimes, the user may want to chat privately with another user. Then, the user can choose to start a private conversation. The messages in the conversation between two persons will not be accessed by other third parties.

To start a new conversation, follow these steps.

1. Click on Chat button from the left navigation bar to open the Conversation pane.
2. On the top of the Chat Pane, click the add button.
3. When the “Start new chat” modal appears on the screen, select the recipient and edit the message.
4. After filling in the form, click “Send message” button.

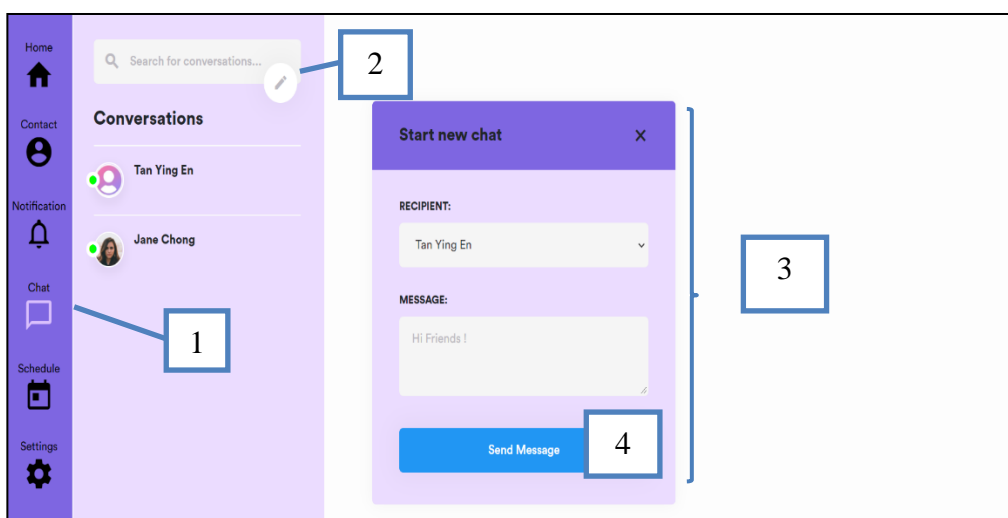


Figure 6.20: Steps to start a new conversation

To send a message, follow these steps.

1. Click on the message field to enter a message
2. Click on the file button to select a file from local computer (optional).
3. Click on the send button



Figure 6.21: Steps to send a message

i) Meeting

This system allows the user to make free voice and video calls, or in other term, start a meeting in a channel or in a conversation.

All the member in a room can start a meeting. The user who started the meeting is a host. When a user joins a meeting hosted by another user, then he is considered as an attendee.

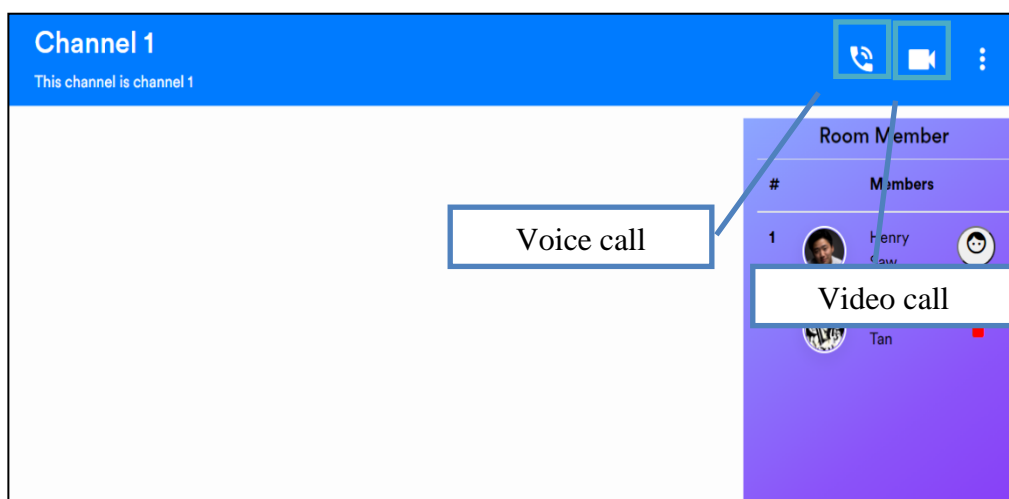


Figure 6.22: Voice Call Button and Video Call Button in Channel

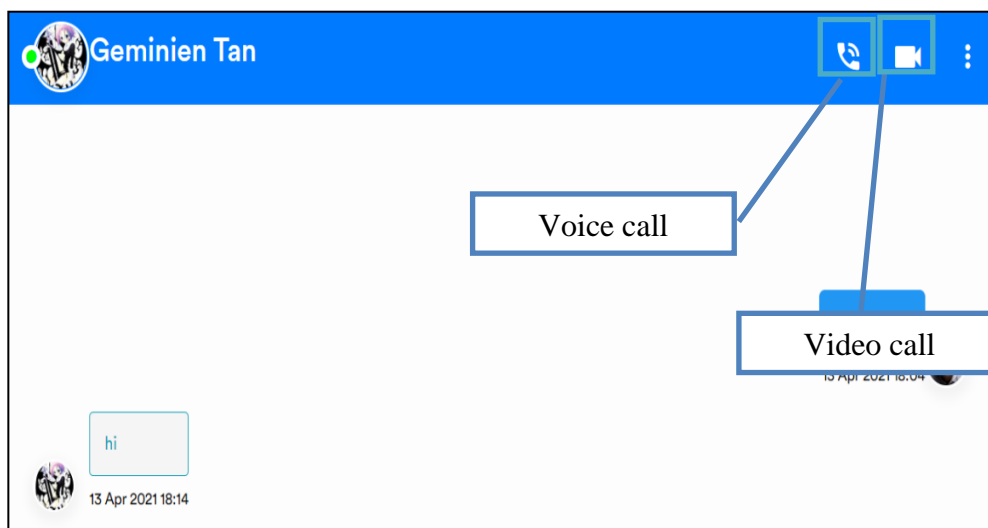


Figure 6.23: Voice Call Button and Video Call Button in Conversation

There are a few ways for a user to join a meeting.

First is join meeting through toast notification.

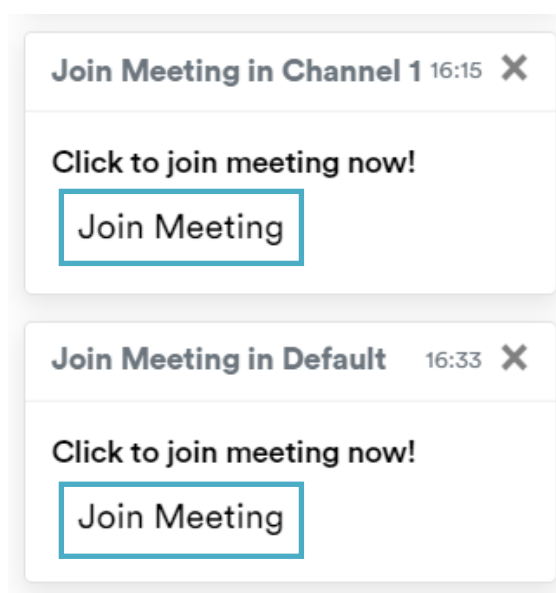


Figure 6.24: Join meeting via toast notification

Second is join meeting through channel conversation/ private conversation. Locate where the meeting is taking place within (either a channel or a conversation) and open it. Click on the “Join meeting” button.

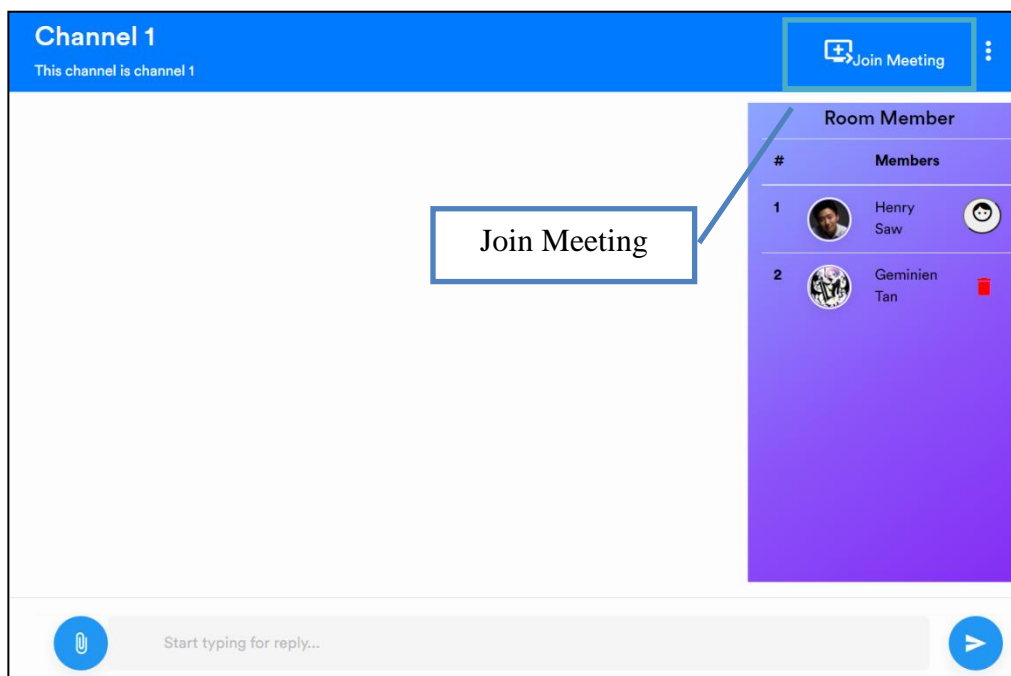


Figure 6.25: Join Meeting in a conversation

Once the user enters the meeting room, he will see a page like this.

1. Mute or unmute the microphone
2. Turn the camera on or off
3. Start the share screen
4. Toggle the room info pane
5. Toggle the participants pane
6. Toggle the chat pane
7. Toggle the whiteboard
8. Leave the meeting
9. User's own video (currently off)
10. Share meeting button to invite participants to this meeting
11. Right information pane (control by buttons 3-5)

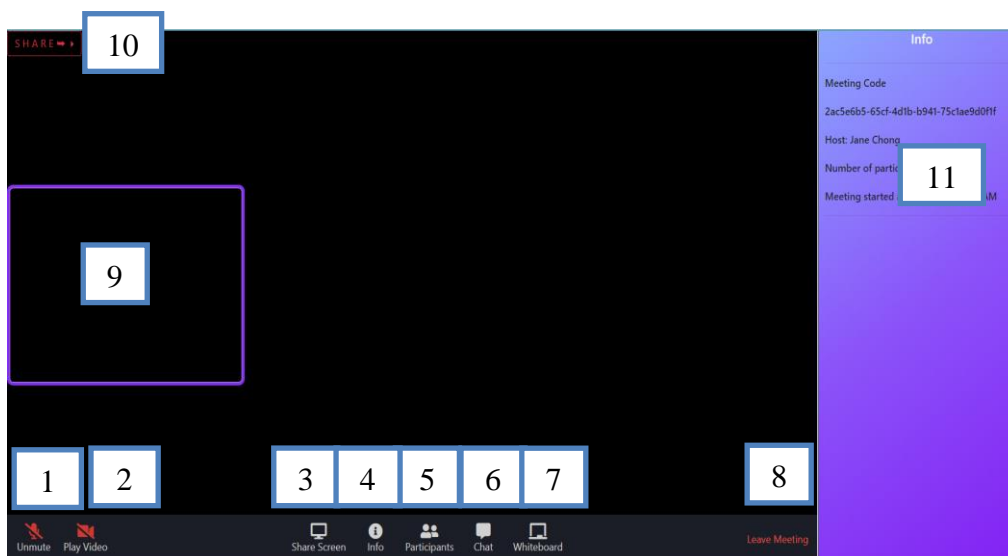


Figure 6.26: Meeting Room

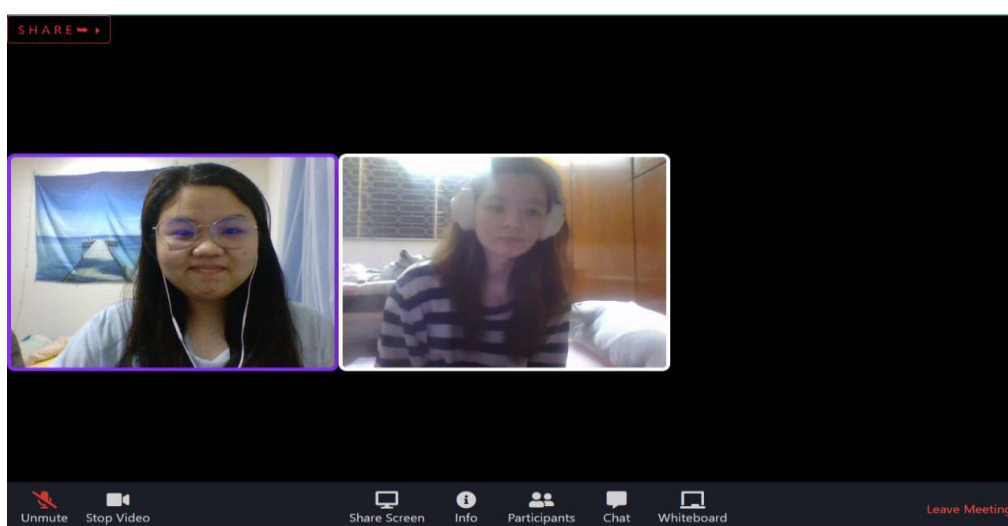


Figure 6.27: One-to-One Meeting

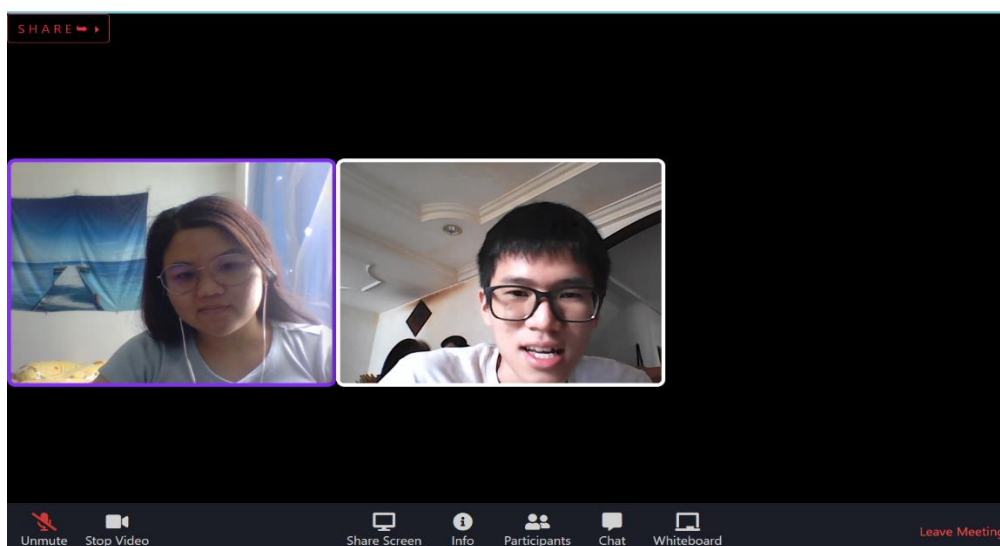


Figure 6.28: One-to-One Meeting



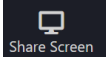
Figure 6.29: Group Meeting (3 participants)



Figure 6.30: Group Meeting (3 participants)



Figure 6.31 Group meeting (6 participants)

The share screen button  allows user to start share screen. When user click on share screen button, the system will ask the user to choose which content to share.

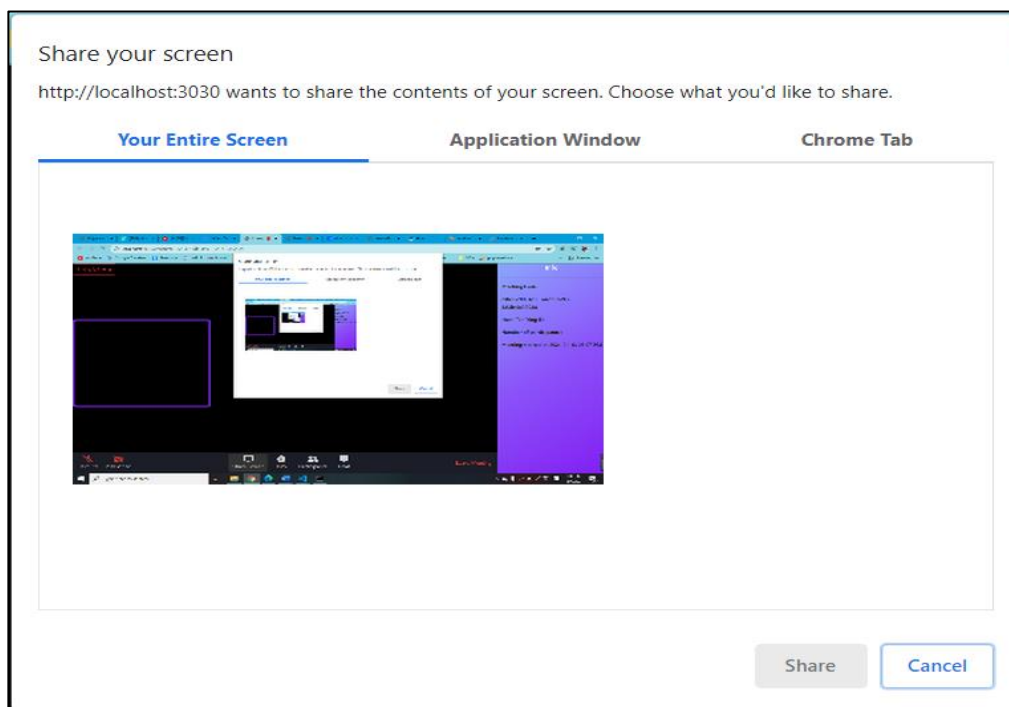


Figure 6.32 Screen Sharing Options

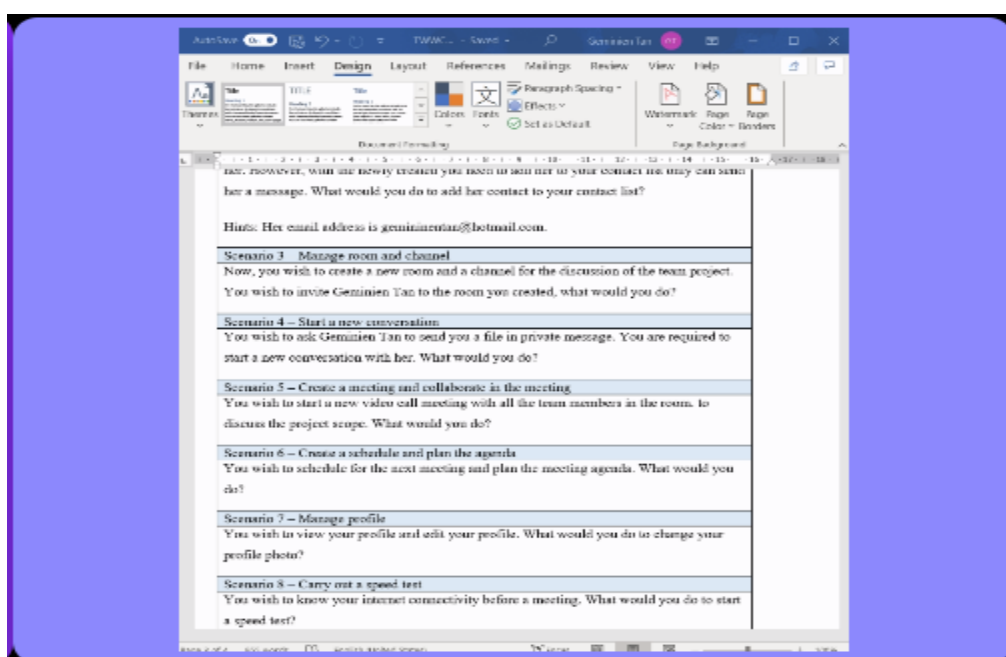



Figure 6.33: Screen Sharing

When the user enters the room, there is an information pane on the right-hand side of the screen. The Info pane show the basic information of the meeting.

The info button  allows the user to toggle the information pane.

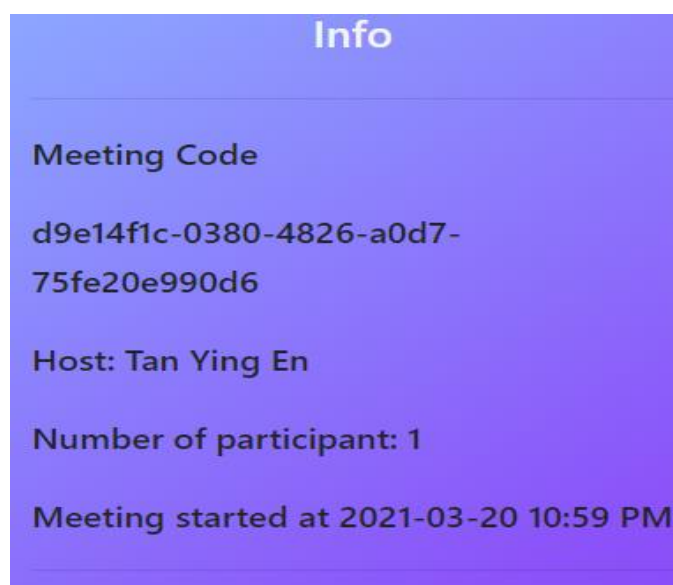
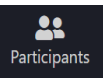


Figure 6.34: Meeting Information

The Participants button  opens a participant pane on the right-hand side of the screen shows who is currently in the meeting.

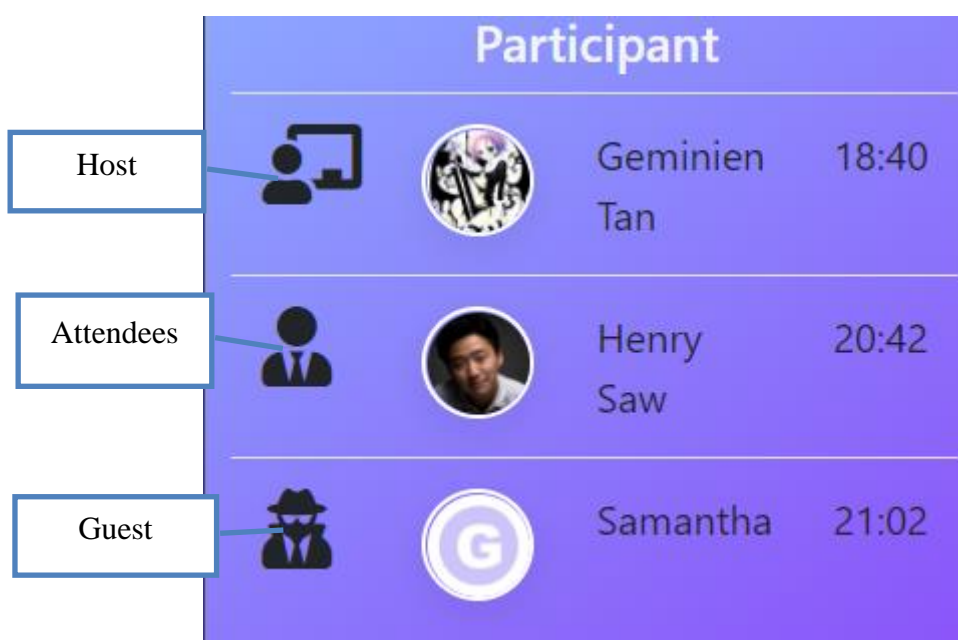



Figure 6.35: Meeting Participant List

The Chat button  opens a meeting chat pane on the right-hand side of the screen during the meeting. The chat can be viewed by everyone in the meeting.

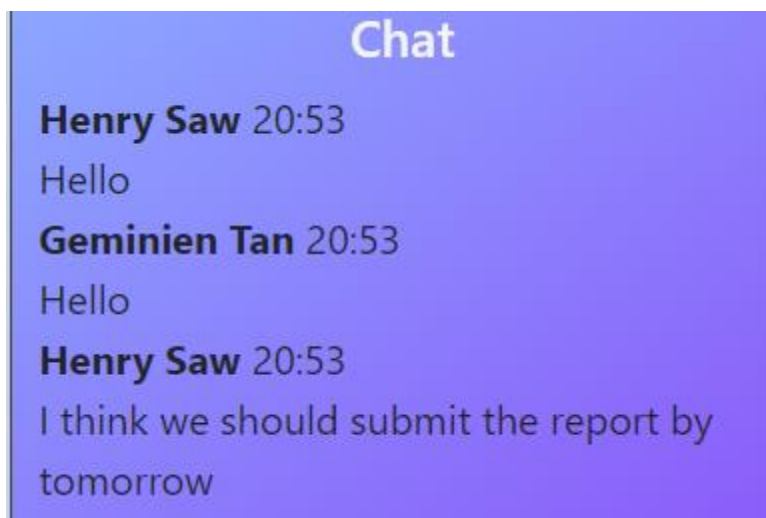



Figure 6.36: Meeting Chat

When the user clicks the share button , it will show a list of social media for the user to share the link of the web application to the person he/she wishes to invite.

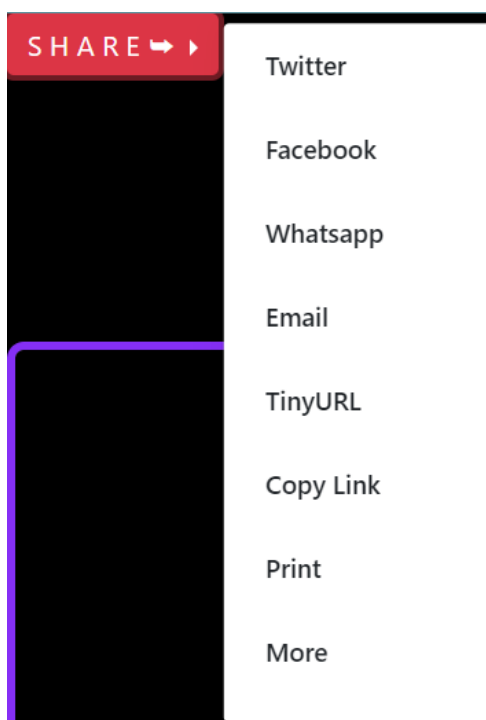
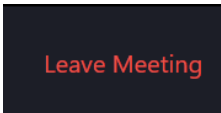


Figure 6.37: Share Button



The leave meeting button allows the user to leave the meeting.

Enhanced Feature

Whiteboard is an enhanced feature that implemented into the meeting as a collaboration tool. It enables the meeting host or the attendees to collaborate and present ideas on a single whiteboard.



Figure 6.38: Start to collaborate on a whiteboard

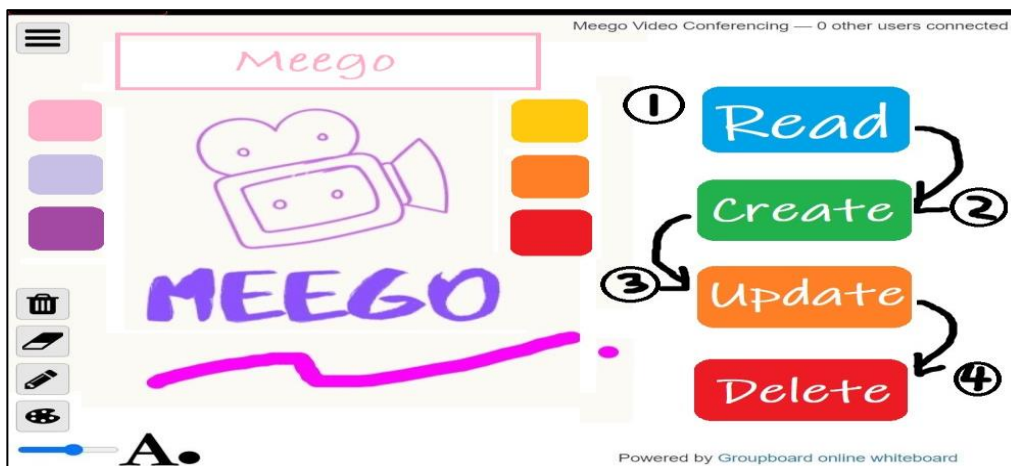


Figure 6.39 Collaborate on a whiteboard

The Whiteboard menu contains buttons to enable user to upload photo, clear whiteboard, print, and help.



Figure 6.40 Whiteboard Menu

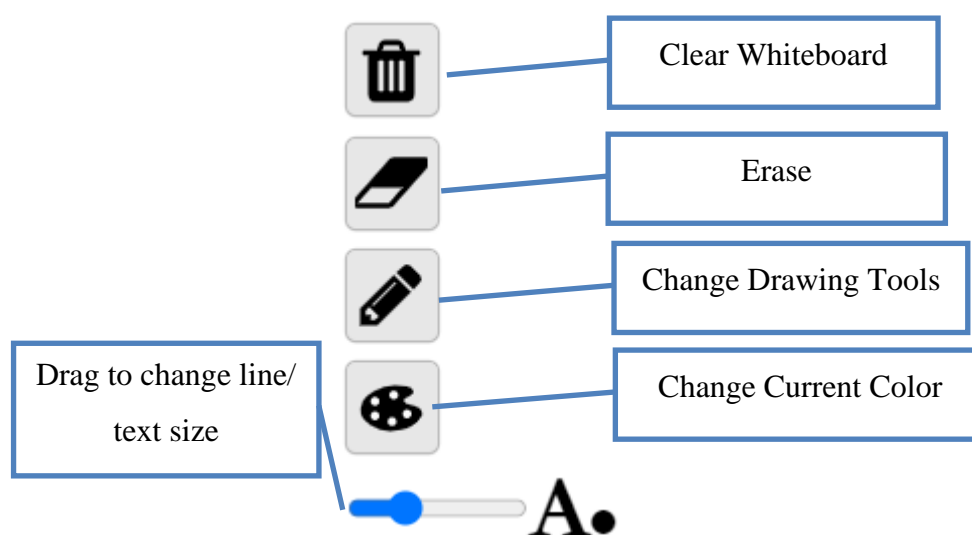


Figure 6.41 Drawing Tools

j) Schedule and Agenda

A meeting agenda is a range of tasks that meeting attendees are planning to achieve during a meeting. It gives the attendees prior notification of what will be presented. It enables the attendees to know what must prepare before a meeting.

To create a new schedule, follow these steps.

1. Click on Schedule button from the left navigation bar to open the Schedule pane.
2. On the top of the Schedule Pane, click the add button.
3. When the “Add a schedule” modal appears on the screen, enter all the information.
4. After filling in the form, click “Add schedule” button.

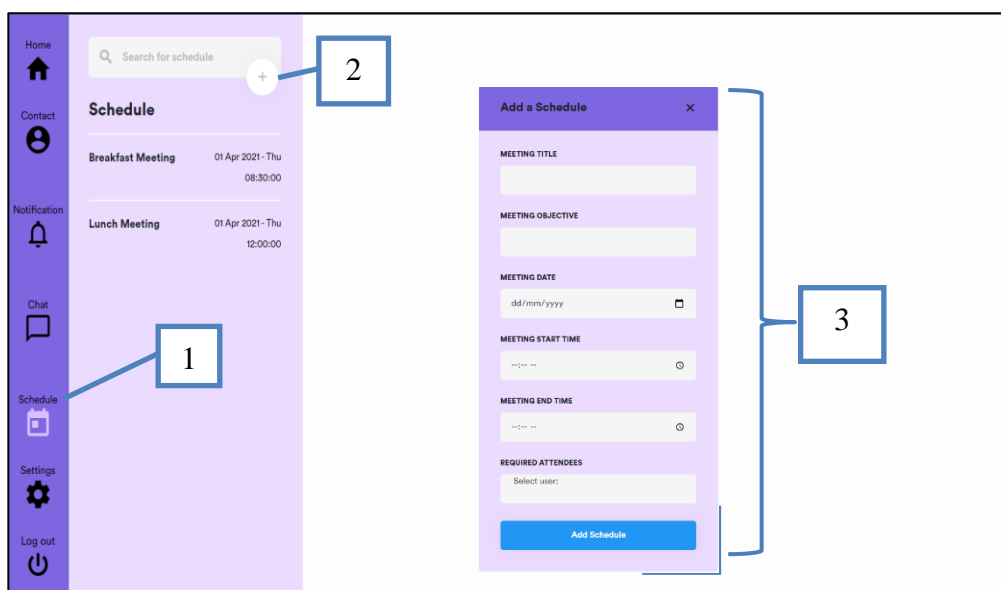


Figure 6.42: Steps to add a schedule

Meeting Agenda - Lunch Meeting					
Schedule					
Lunch Meeting					
Date	01 Apr 2021 - Thu	Start Time	12:00:00	End Time	13:00:00
Objective	Have a lunch together in meego				
Participants	Geminien Tan Henry Saw				
#	Topic	Presenter	Time Allocated (min)	Action	
		Geminien Tan		Add	
1	Show your lunch	Geminien Tan	5	Remove	
2	Show your lunch	Henry Saw	5	Remove	

Figure 6.43: Schedule and agenda

The first row of the agenda table is empty. It is for the user to insert new agenda. After the user key in the data, then click the add button to insert.

#	Topic	Presenter	Time Allocated (min)	Action
	Present part A	Henry Saw	5	Add

Figure 6.44 Add new agenda

To edit the agenda, the user can click on the column. There is also a remove button on the last column of the agenda that allows the user to delete the agenda.

#	Topic	Presenter	Time Allocated (min)	Action
		Geminien Tan		Add
1	Show your lunch	Geminien Tan	5	Remove
2	Show your lunch	Henry Saw	5	Remove

Figure 6.45: Edit agenda

k) Settings

When the user clicks on the Settings button from the left navigation bar, it will open the Settings pane. The settings pane contains:

1. Information of the current user like user profile picture, username, email
2. Three white columns. The first column shows the total number of contacts in the user contact lists, the second column shows the total number of rooms of the user join while the third number shows the point earned by the user.
3. Claim the special rewards button.

4. “My account” button allows the user to update his/her info or delete the account.
5. “Profile Picture” button

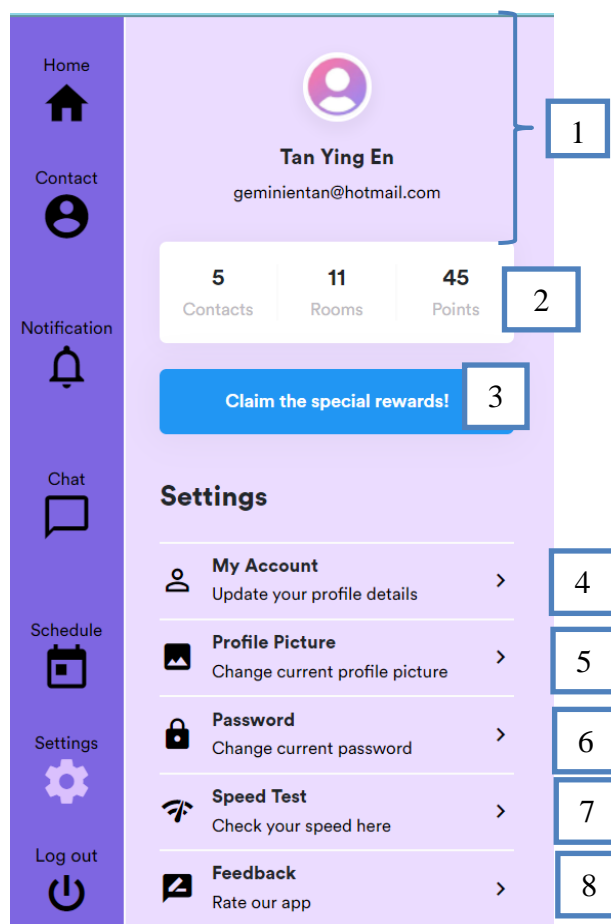


Figure 6.46: Profile Settings Pane

To claim a reward, the user can click on the claim reward button. However, the user can only enter the claim reward page if the point is above 5 points.

The first reward will be unlocked if the points reach 10, the second is 30 and the third is 50. The first reward is Mini Checkers game, second is Mini Reversi game while third is Mini Chess. The user can choose to play with computer or choose two players.

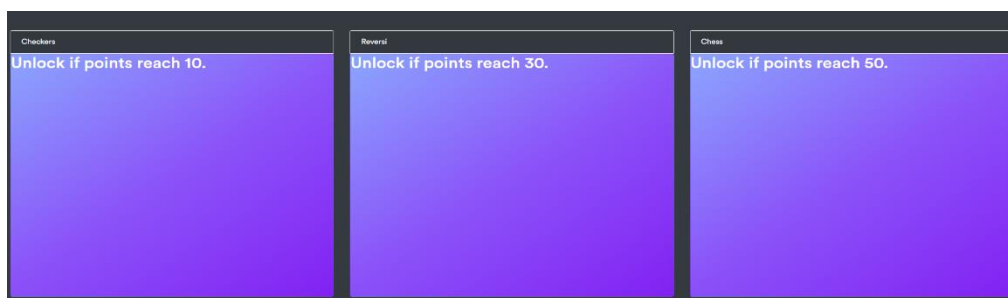


Figure 6.47: Unable to claim reward

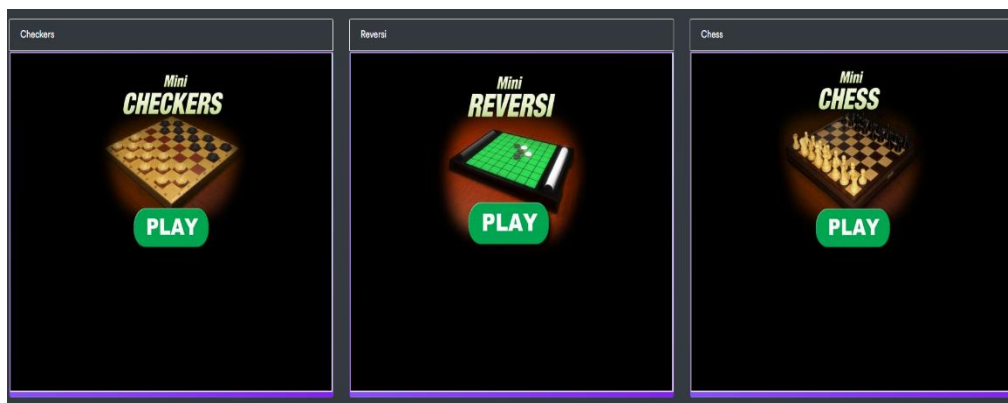


Figure 6.48: Rewards unlock

If the user wants to update his/her profile, follow these steps.

1. Click on Settings button from the left navigation bar to open the Settings pane.
2. Click the “My Account”.
3. Click “Edit Profile” button.
4. When the “Update your profile details” modal appears on the screen, all the information are shown. Click on the column to edit.
5. After making some changes, click “Apply” button.

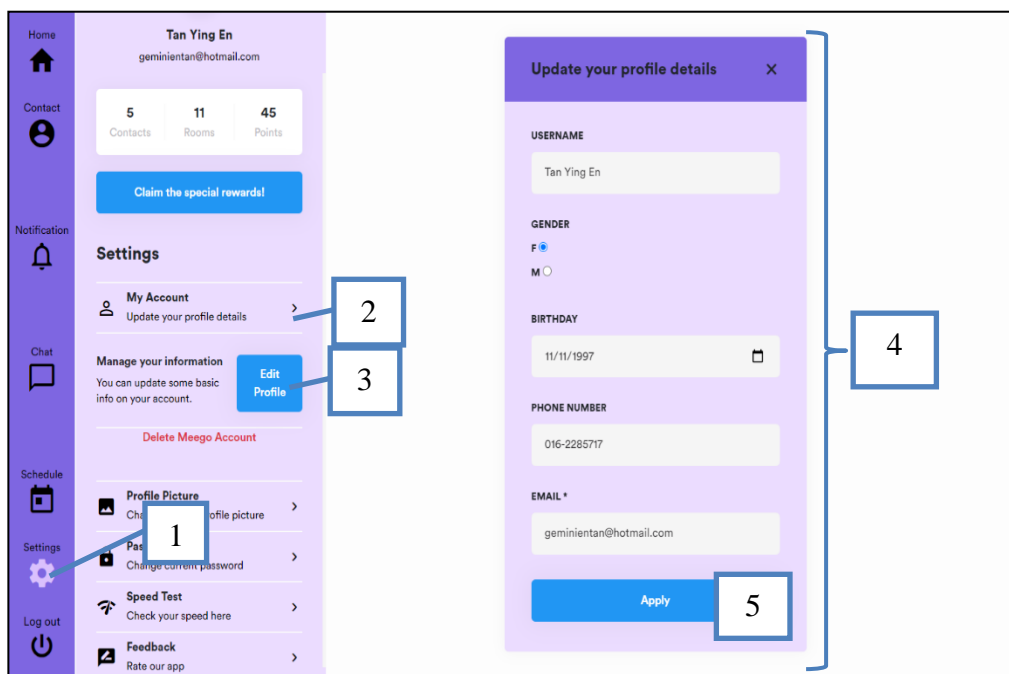


Figure 6.49: Steps to update profile details

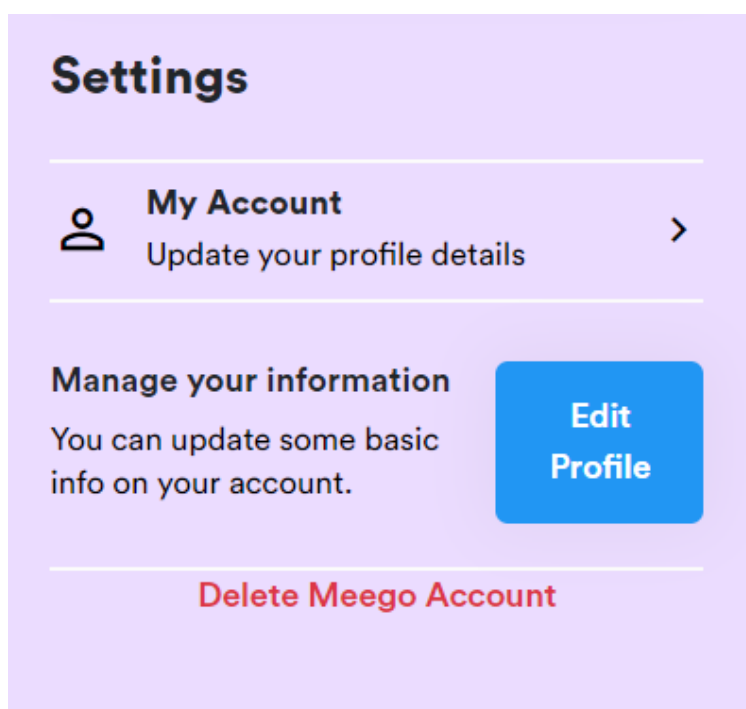


Figure 6.50: Click on “My Account” will expand the edit profile tab

To delete the account, there is a “Delete Meego Account” button under the “My Account” tab. This is an irreversible action, means that once the account is deleted, the user cannot get back his account.

If a user wishes to change his/her profile picture, follow these steps.

1. Click on Settings button from the left navigation bar to open the Settings pane.
2. Click the “Profile Picture”.
3. Click “Select Photo” button and choose a photo from the local computer.
4. The preview photo will appear on the screen. After that, click “Change Profile Picture” button.

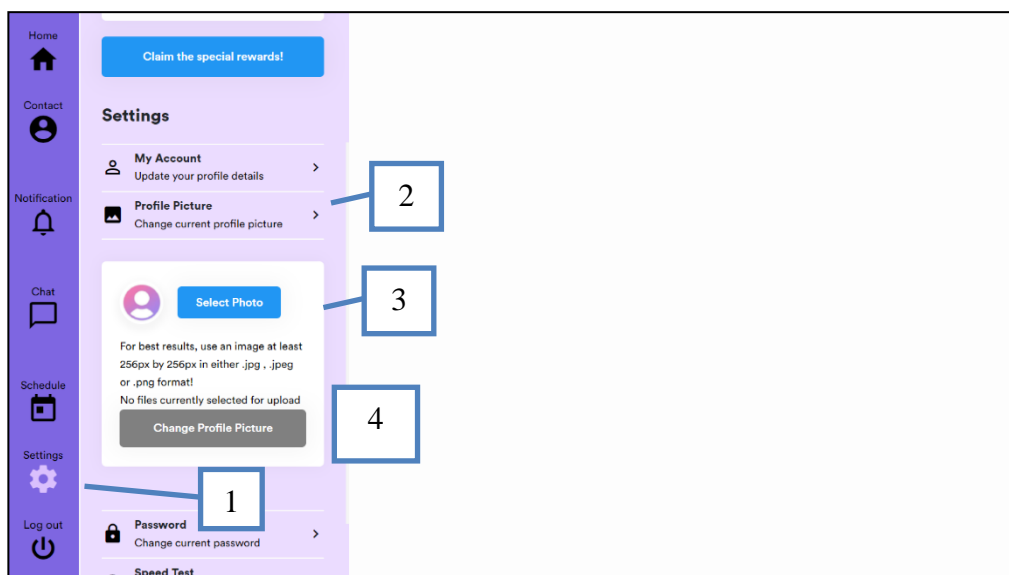


Figure 6.51: Steps to change profile picture

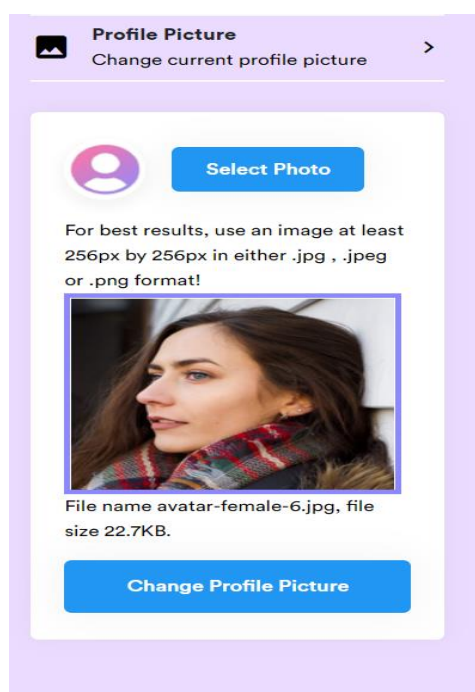


Figure 6.52: Upload a photo

If a user wishes to change his/her password, follow these steps.

1. Click on Settings button from the left navigation bar to open the Settings pane.
2. Click the “Password”.
3. When the “Edit Password” modal appears on the screen, click to enter current password, new password and confirm password.
4. Click “Change Password” button.

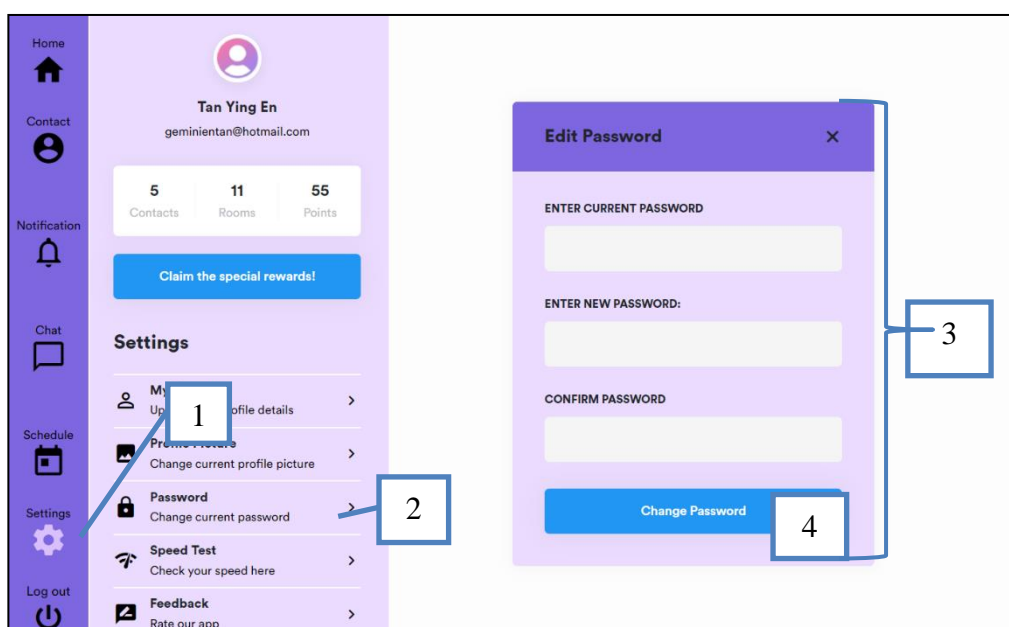



Figure 6.53: Steps to edit password

If a user wishes to start a speed test, follow these steps.

1. Click on Settings button from the left navigation bar to open the Settings pane.
2. Click the “SpeedTest”.
3. When the “Speed Test” meter appears on the right of the screen, click the  button.
4. Wait for a while to get the result.

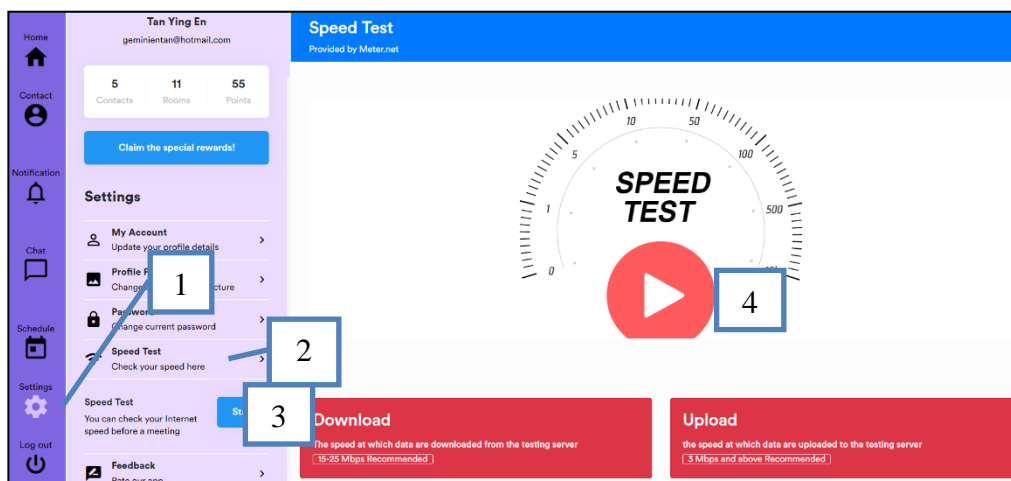


Figure 6.54: Steps to run a speed test

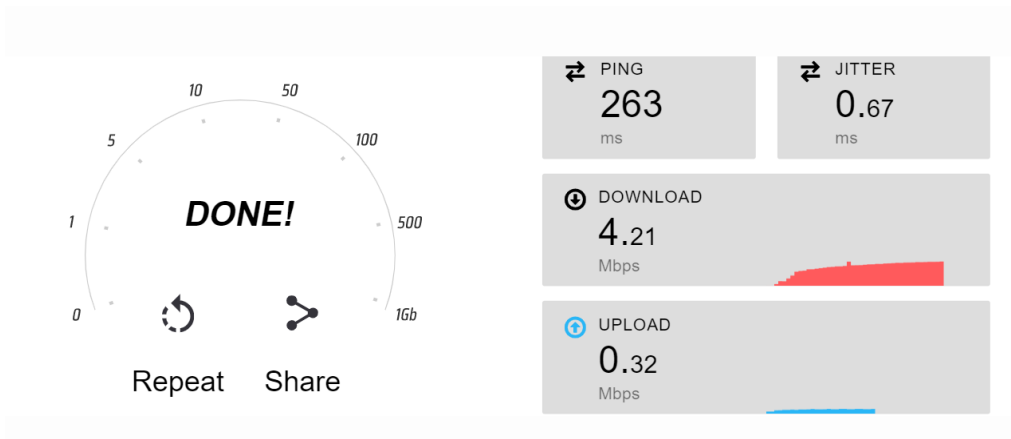


Figure 6.55: Speed Test Result

This application also allows a user to submit feedback and rate the app.

If a user wishes to submit a feedback, follow these steps.

1. Click on Settings button from the left navigation bar to open the Settings pane.
2. Click the “Feedback”.
3. Click the “Open Feedback” button.
4. Select the rating from 1 to 5 and enter the feedback.
5. Click “submit” button.

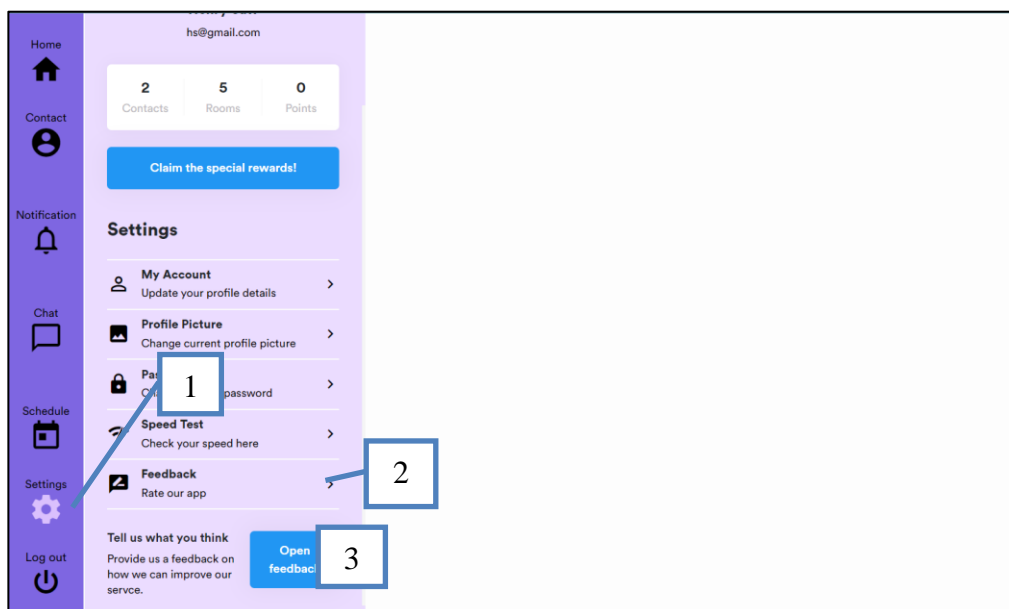


Figure 6.56 Steps to submit a feedback

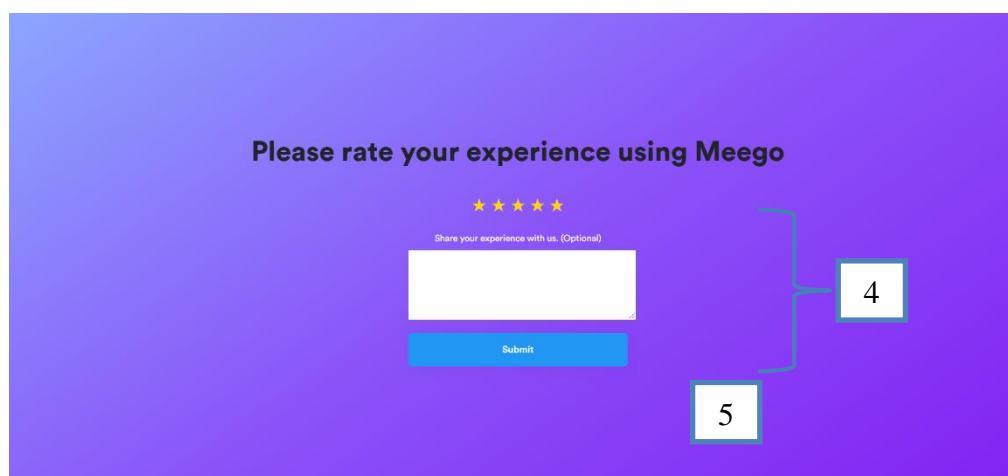
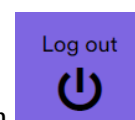


Figure 6.57: Steps to submit a feedback (continue)

1) Log Out



If the user wishes to leave, then click on the log out button on the left navigation bar to logout.

6.2.2 Guest

A guest is a user who is not registered in the Meego Video Conferencing application. He/she is invited to attend the meeting via a meeting code.

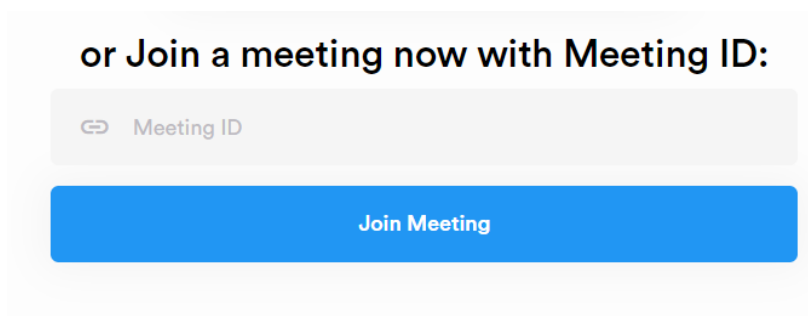


Figure 6.58: Join a meeting as a guest

If the meeting ID entered by the guest is valid, then the web application will ask the user to enter his/her name, gender and select to turn on or off the camera.

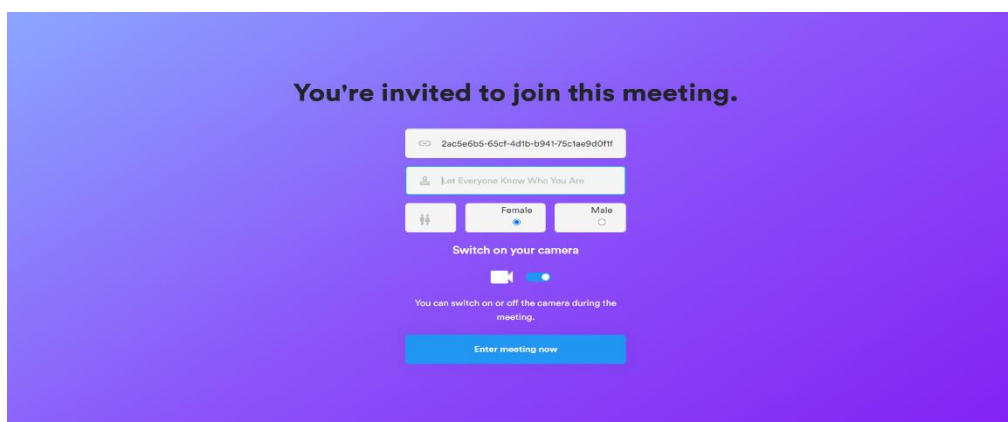


Figure 6.59: Before Guest enter the meeting

After the guest leave the meeting, a feedback form will be shown

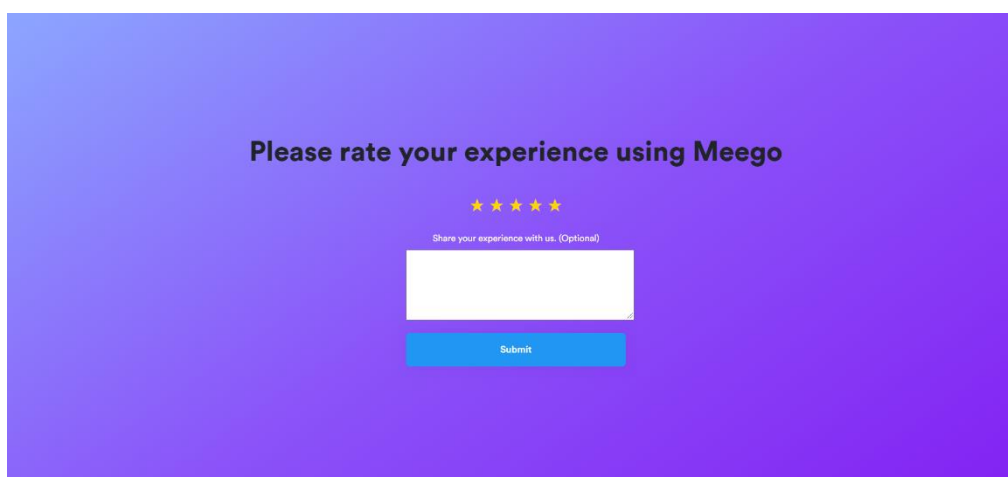
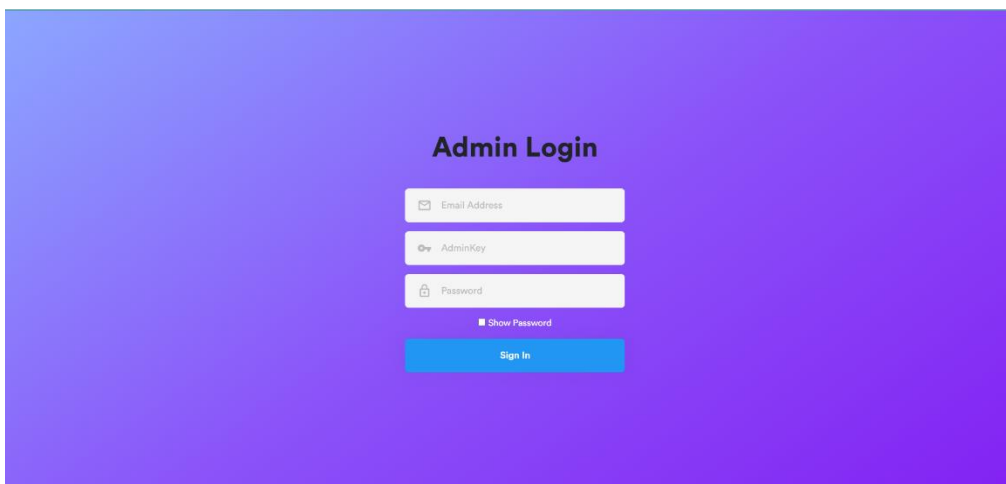


Figure 6.60: Feedback form after guest leave meeting

6.3 Implementation of Administrative System

To enter the admin page, the admin can enter by this link

<https://meego-video-conferencing.herokuapp.com/admin>



Notice that unlike the user, the admin login page only allows an admin to sign in. There is no admin sign-up form. This means that an admin account only can be added via another admin.

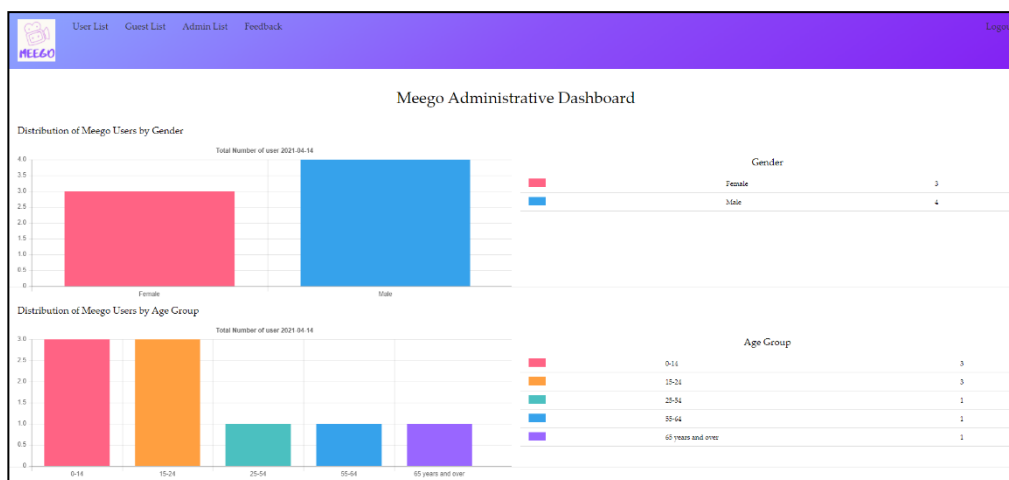


Figure 6.61: Meego Administrative Dashboard

When the admin login successfully, a dashboard will be show. There are two graphs on the dashboard. The first graph shows the distribution of Meego Users by Gender while the second graph shows the distribution of Meego Users by Age Group.

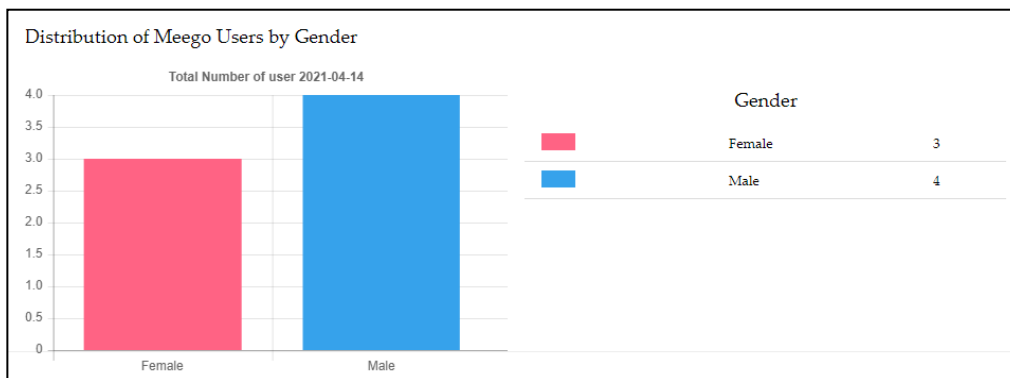


Figure 6.62: Distribution of Meego Users by Gender Graph and Table

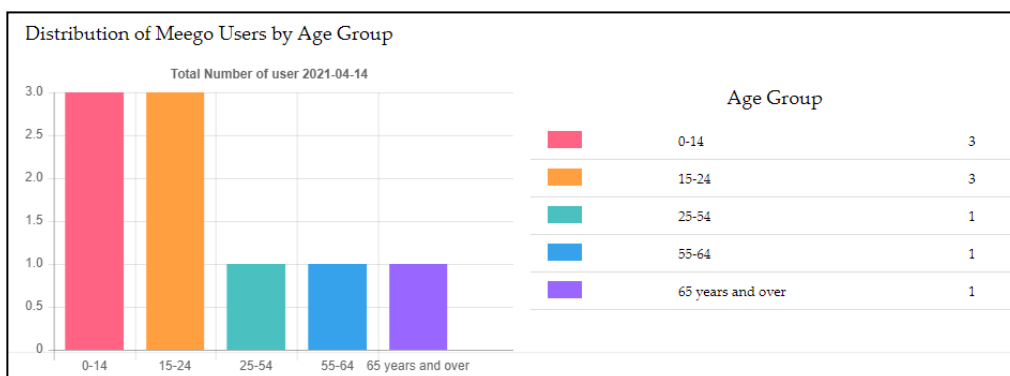


Figure 6.63: Distribution of Meego Users by Age Group Graph and Table

The admin can view all registered user list. The admin can copy the list, generate the user list into an excel file or save as pdf. The delete buttons enable the admin to delete an account.

Meego User List

Show entries

Search:

No	Username	Gender	Date of Birth	Phone	Email	Point	Status	
1	Jane Chong	F	17/05/1990	016-2283717	jane@gmail.com	7	Active	<input type="button" value="Delete"/>
2	Jenny Lim	F	10/03/1997	010-5696002	jennydim@gmail.com	0	Active	<input type="button" value="Delete"/>
3	Christopher Ooi	M	07/01/1958	014-8052645	christopher@gmail.com	1	Active	<input type="button" value="Delete"/>
4	Tan Ying En	M	11/11/1997	016-2283717	geminientan@hotmail.com	55	Active	<input type="button" value="Delete"/>
5	Jennifer Tan	F	07/02/2008	014-3356487	jennifertan@gmail.com	1	Active	<input type="button" value="Delete"/>

Showing 1 to 5 of 11 entries

Previous Next

Figure 6.64: Meego User List

The admin can also view all guest list. There is a filter pane on top of the guest list. The admin can filter the guest list by select the data range and gender of the guest.

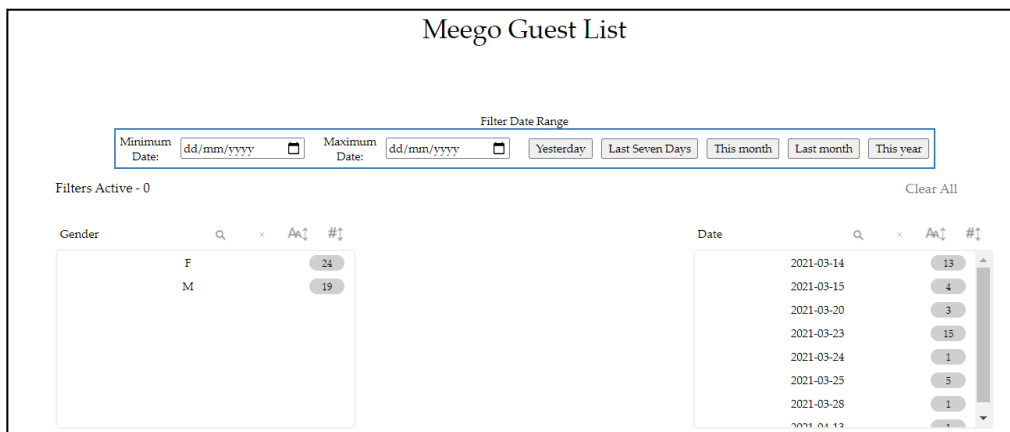


Figure 6.65: Meego Guest List

The admin can also view all admin list. The admin can create a new admin account by select the Add button.

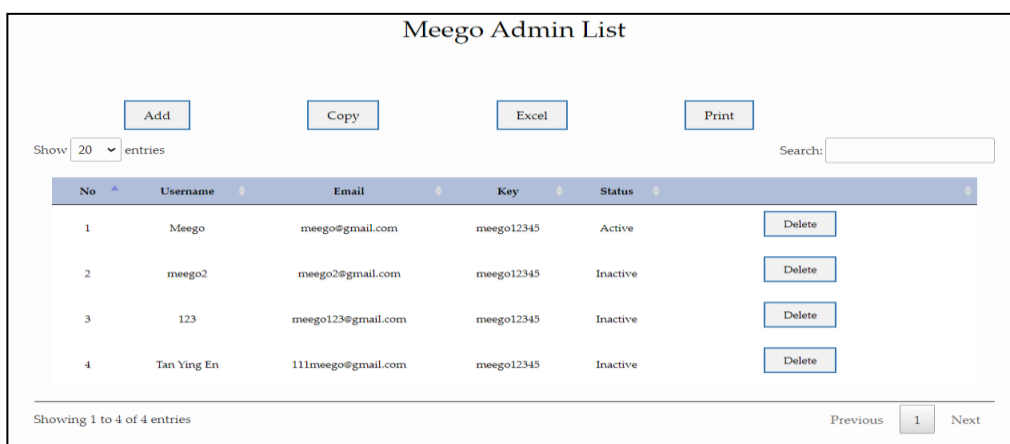


Figure 6.66: Meego Admin List

The screenshot shows a 'Create new Admin Account' form. It has a purple header with a close button. The form contains the following fields:

- ADMIN NAME*
- EMAIL *
- ADMIN KEY*
- PASSWORD*
- CONFIRM PASSWORD

At the bottom of the form is a blue 'Create Admin' button.

Figure 6.67: Create New Admin Account Form

6.4 Deployment

This web application is deployed and managed using Heroku with ClearDB and MySQL database.

First, install Heroku using npm command

```
$ npm install -g heroku
```

After that, run the heroku login command

```
$ heroku login
```

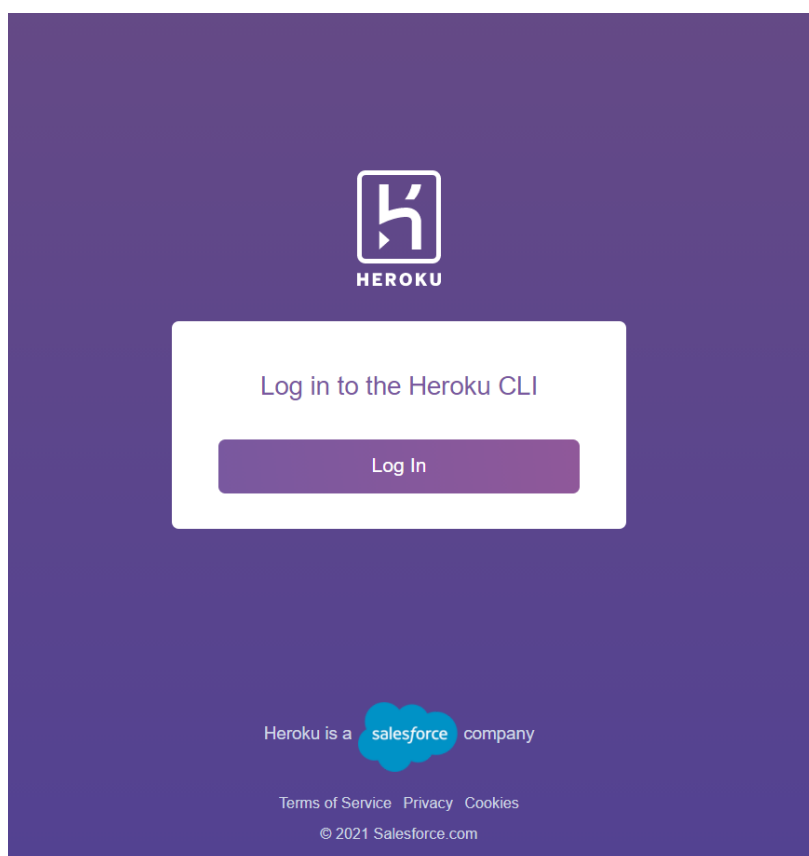


Figure 6.68: Heroku Login

Then, create a Heroku app with command.

```
create Heroku meego-video-conferencing
```

Run the push command to deploy the Nodejs.app to Heroku.

```
git push heroku master
```

```

remote:     engines.node (package.json):  unspecified
remote:     engines.npm (package.json):    unspecified (use default)
remote:
remote:     Resolving node version 14.x...
remote:     Downloading and installing node 14.16.1...
remote:     Using default npm version: 6.14.12
remote:
remote: -----> Restoring cache
remote:     - node_modules
remote:
remote: -----> Installing dependencies
remote:     Installing node modules
remote:
remote:     > nodemon@2.0.6 postinstall /tmp/build_1cd90bdd/node_modules/nodemon
remote:     > node bin/postinstall || exit 0
remote:
remote:     Love nodemon? You can now support the project via the open collective:
remote:     > https://opencollective.com/nodemon/donate
remote:
remote:     added 300 packages in 6.926s
remote:
remote: -----> Build
remote:
remote: -----> Caching build
remote:     - node_modules
remote:
remote: -----> Pruning devDependencies
remote:     audited 300 packages in 2.794s
remote:
remote:     13 packages are looking for funding
remote:     run `npm fund` for details
remote:
remote:     found 4 vulnerabilities (3 low, 1 high)
remote:     run `npm audit fix` to fix them, or `npm audit` for details
remote:
remote: -----> Build succeeded!
remote: -----> Discovering process types
remote:     Procfile declares types      -> (none)
remote:     Default types for buildpack -> web
remote:
remote: -----> Compressing...
remote:     Done: 41.2M
remote: -----> Launching...
remote:     Released v27
remote:     https://meego-video-conferencing.herokuapp.com/ deployed to Heroku
remote:
remote: Verifying deploy... done.

```

Figure 6.69: Push Heroku for deploy

The next step is to setup ClearDB for Node.js on Heroku app. Run the command to install ClearDB.

```
heroku addons:create cleardb:ignite
```

Get the cleardb url with command.

```
heroku config | findstr CLEARDB_DATABASE_URL
```

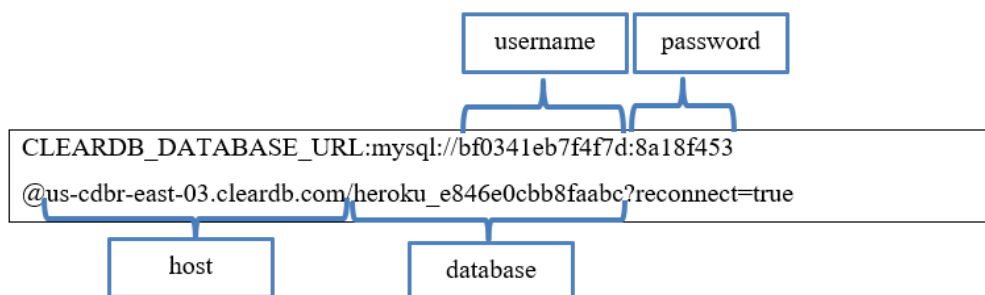


Figure 6.70: cleardb_database_url

Now, change the configuration of the database based on the cleardb database url.

```
const mysql = require("mysql");

const mysqlConnection = mysql.createPool({
  host: 'us-cdbr-east-03.cleardb.com',
  user: 'bf0341eb7f4f7d',
  password: '8a18f453',
  database: 'heroku_e846e0cbb8faabc',
  multipleStatements: true
});

mysqlConnection.getConnection(function(error){
  if(!error) {
    console.log(error);
  } else {
    console.log('Database connected!');
  }
});

module.exports = mysqlConnection;
```

Figure 6.71 Code to connect mysql to cleardb database

After changing the database configuration, push the updated code to Heroku remote repository again.

Now, it can add in the tables into the clearDB. Run the following command to connect to the Heroku database.

```
mysql --host=us-cdbr-east-03.cleardb.com --user=bf0341eb7f4f7d --password=8a18f453 --reconnect heroku_e846e0cbb8faabc
```

Figure 6.72 mysql command to connect database

Table 6.1: SQL Commands to add Table

<pre>CREATE TABLE IF NOT EXISTS `admin` (`ad_id` int(11) NOT NULL AUTO_INCREMENT, `ad_name` varchar(40) COLLATE utf8mb4_unicode_ci NOT NULL, `ad_email` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL, `ad_key` varchar(40) COLLATE utf8mb4_unicode_ci NOT NULL, `ad_password` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL, `ad_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL, PRIMARY KEY (`ad_id`)) ENGINE=MyISAM AUTO_INCREMENT=5 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;</pre>
<pre>CREATE TABLE IF NOT EXISTS `agenda` (`a_id` int(11) NOT NULL AUTO_INCREMENT, `a_topic` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL, `a_presenter` int(11) NOT NULL, `a_time_allocated` int(10) UNSIGNED NOT NULL, `a_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL, `s_id` int(11) NOT NULL, PRIMARY KEY (`a_id`), KEY `s_id` (`s_id`), KEY `a_presenter` (`a_presenter`)) ENGINE=InnoDB AUTO_INCREMENT=50 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;</pre>
<pre>CREATE TABLE IF NOT EXISTS `attendees` (`at_id` int(11) NOT NULL AUTO_INCREMENT, `u_id` int(11) NOT NULL, `s_id` int(11) NOT NULL, PRIMARY KEY (`at_id`), KEY `u_id` (`u_id`), KEY `s_id` (`s_id`)) ENGINE=InnoDB AUTO_INCREMENT=34 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;</pre>
<pre>CREATE TABLE IF NOT EXISTS `channel` (`c_id` int(11) NOT NULL AUTO_INCREMENT, `c_title` varchar(30) COLLATE utf8mb4_unicode_ci NOT NULL, `c_desc` text COLLATE utf8mb4_unicode_ci NOT NULL, `c_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL, `r_id` int(11) NOT NULL, PRIMARY KEY (`c_id`), KEY `r_id` (`r_id`)) ENGINE=InnoDB AUTO_INCREMENT=58 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;</pre>

```
CREATE TABLE IF NOT EXISTS `channel_message` (
  `ch_id` int(11) NOT NULL AUTO_INCREMENT,
  `ch_content` text COLLATE utf8mb4_unicode_ci NOT NULL,
  `ch_file` text COLLATE utf8mb4_unicode_ci,
  `ch_datetime` datetime NOT NULL,
  `ch_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  `ch_sender_id` int(11) NOT NULL,
  `c_id` int(11) NOT NULL,
  PRIMARY KEY (`ch_id`),
  KEY `channel_message_ibfk_1` (`c_id`),
  KEY `ch_sender` (`ch_sender_id`)
) ENGINE=InnoDB AUTO_INCREMENT=26 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `chat_message` (
  `cm_id` int(11) NOT NULL AUTO_INCREMENT,
  `cm_content` text COLLATE utf8mb4_unicode_ci NOT NULL,
  `cm_file` text COLLATE utf8mb4_unicode_ci,
  `cm_datetime` datetime NOT NULL,
  `cm_receiver` int(11) NOT NULL,
  `cm_sender` int(11) NOT NULL,
  `cv_id` int(11) NOT NULL,
  `cm_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  PRIMARY KEY (`cm_id`),
  KEY `cm_receiver` (`cm_receiver`),
  KEY `cm_sender` (`cm_sender`),
  KEY `chat_message_ibfk_3` (`cv_id`)
) ENGINE=InnoDB AUTO_INCREMENT=68 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `contact` (
  `ct_id` int(11) NOT NULL AUTO_INCREMENT,
  `ct_email` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_id` int(11) NOT NULL,
  `ct_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  PRIMARY KEY (`ct_id`),
  KEY `u_id` (`u_id`)
) ENGINE=InnoDB AUTO_INCREMENT=21 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `conversation` (
  `cv_id` int(11) NOT NULL AUTO_INCREMENT,
  `cv_sender` int(11) NOT NULL,
  `cv_receiver` int(11) NOT NULL,
  PRIMARY KEY (`cv_id`),
  KEY `cv_receiver` (`cv_receiver`),
  KEY `cv_sender` (`cv_sender`)
) ENGINE=InnoDB AUTO_INCREMENT=16 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `feedback` (
  `f_id` int(11) NOT NULL AUTO_INCREMENT,
  `f_comment` text COLLATE utf8mb4_unicode_ci,
  `f_star` int(11) NOT NULL,
  `f_date` datetime NOT NULL,
  PRIMARY KEY (`f_id`)
) ENGINE=MyISAM AUTO_INCREMENT=5 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `guest` (
  `g_id` int(11) NOT NULL AUTO_INCREMENT,
  `g_name` varchar(30) COLLATE utf8mb4_unicode_ci NOT NULL,
  `g_gender` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  `g_date` datetime NOT NULL,
  PRIMARY KEY (`g_id`)
) ENGINE=InnoDB AUTO_INCREMENT=43 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `meeting` (
  `m_id` int(11) NOT NULL AUTO_INCREMENT,
  `m_time` datetime NOT NULL,
  `m_etime` datetime DEFAULT NULL,
  `m_owner_id` int(11) NOT NULL,
  `m_code` text COLLATE utf8mb4_unicode_ci NOT NULL,
  `s_id` int(11) DEFAULT NULL,
  `c_id` int(11) DEFAULT NULL,
  `cv_id` int(11) DEFAULT NULL,
  PRIMARY KEY (`m_id`),
  KEY `cv_id` (`cv_id`),
  KEY `c_id` (`c_id`),
  KEY `m_owner_id` (`m_owner_id`),
  KEY `s_id` (`s_id`)
) ENGINE=InnoDB AUTO_INCREMENT=55 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `meeting_participant` (
  `mp_id` int(11) NOT NULL AUTO_INCREMENT,
  `mp_u_id` int(11) DEFAULT NULL,
  `mp_guest_id` int(11) DEFAULT NULL,
  `mp_join_time` datetime NOT NULL,
  `mp_leave_time` datetime DEFAULT NULL,
  `mp_type` varchar(10) COLLATE utf8mb4_unicode_ci NOT NULL,
  `m_id` int(11) NOT NULL,
  PRIMARY KEY (`mp_id`),
  KEY `m_id` (`m_id`),
  KEY `mp_u_id` (`mp_u_id`),
  KEY `mp_guest_id` (`mp_guest_id`)
) ENGINE=InnoDB AUTO_INCREMENT=135 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `room` (
  `r_id` int(11) NOT NULL AUTO_INCREMENT,
  `r_title` varchar(30) COLLATE utf8mb4_unicode_ci NOT NULL,
  `r_desc` text COLLATE utf8mb4_unicode_ci,
  `r_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  `r_owner_id` int(11) NOT NULL,
  PRIMARY KEY (`r_id`),
  KEY `r_owner_id` (`r_owner_id`)
) ENGINE=InnoDB AUTO_INCREMENT=39 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `room_record` (
  `rr_id` int(11) NOT NULL AUTO_INCREMENT,
  `r_id` int(11) NOT NULL,
  `u_id` int(11) NOT NULL,
  `rr_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  PRIMARY KEY (`rr_id`),
  KEY `r_id` (`r_id`),
  KEY `u_id` (`u_id`)
) ENGINE=InnoDB AUTO_INCREMENT=43 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```
CREATE TABLE IF NOT EXISTS `schedule` (
  `s_id` int(11) NOT NULL AUTO_INCREMENT,
  `s_title` varchar(30) COLLATE utf8mb4_unicode_ci NOT NULL,
  `s_objective` text COLLATE utf8mb4_unicode_ci,
  `s_date` date NOT NULL,
  `s_stime` time NOT NULL,
  `s_etime` time NOT NULL,
  `s_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_id` int(11) NOT NULL,
  PRIMARY KEY (`s_id`),
  KEY `u_id` (`u_id`)
) ENGINE=InnoDB AUTO_INCREMENT=23 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;
```

```

CREATE TABLE IF NOT EXISTS `user` (
  `u_id` int(11) NOT NULL AUTO_INCREMENT,
  `u_name` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_gender` varchar(1) COLLATE utf8mb4_unicode_ci DEFAULT NULL,
  `u_dob` date DEFAULT NULL,
  `u_phone` varchar(12) COLLATE utf8mb4_unicode_ci DEFAULT NULL,
  `u_email` varchar(50) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_password` varchar(200) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_profilepic` text COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_point` int(11) NOT NULL,
  `u_status` varchar(1) COLLATE utf8mb4_unicode_ci NOT NULL,
  `u_register_date` datetime DEFAULT NULL,
  PRIMARY KEY (`u_id`)
) ENGINE=InnoDB AUTO_INCREMENT=42 DEFAULT CHARSET=utf8mb4 COLLATE=utf8mb4_unicode_ci;

```

Table 6.2: Set constraints for tables

```

-- Constraints for table `agenda`
--
ALTER TABLE `agenda`
  ADD CONSTRAINT `agenda_ibfk_1` FOREIGN KEY (`s_id`) REFERENCES `schedule` (`s_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `agenda_ibfk_2` FOREIGN KEY (`a_presenter`) REFERENCES `user` (`u_id`);
--
-- Constraints for table `attendees`
--
ALTER TABLE `attendees`
  ADD CONSTRAINT `attendees_ibfk_1` FOREIGN KEY (`u_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `attendees_ibfk_2` FOREIGN KEY (`s_id`) REFERENCES `schedule` (`s_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `channel`
--
ALTER TABLE `channel`
  ADD CONSTRAINT `channel_ibfk_1` FOREIGN KEY (`r_id`) REFERENCES `room` (`r_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `channel_message`
--
ALTER TABLE `channel_message`
  ADD CONSTRAINT `channel_message_ibfk_1` FOREIGN KEY (`c_id`) REFERENCES `channel` (`c_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `channel_message_ibfk_2` FOREIGN KEY (`ch_sender_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `chat_message`
--
ALTER TABLE `chat_message`
  ADD CONSTRAINT `chat_message_ibfk_1` FOREIGN KEY (`cm_receiver`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `chat_message_ibfk_2` FOREIGN KEY (`cm_sender`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `chat_message_ibfk_3` FOREIGN KEY (`cv_id`) REFERENCES `conversation` (`cv_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `contact`
--
ALTER TABLE `contact`
  ADD CONSTRAINT `contact_ibfk_1` FOREIGN KEY (`u_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `conversation`
--
ALTER TABLE `conversation`
  ADD CONSTRAINT `conversation_ibfk_1` FOREIGN KEY (`cv_receiver`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `conversation_ibfk_2` FOREIGN KEY (`cv_sender`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `meeting`
--
ALTER TABLE `meeting`
  ADD CONSTRAINT `meeting_ibfk_1` FOREIGN KEY (`cv_id`) REFERENCES `conversation` (`cv_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `meeting_ibfk_2` FOREIGN KEY (`c_id`) REFERENCES `channel` (`c_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `meeting_ibfk_3` FOREIGN KEY (`m_owner_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `meeting_ibfk_4` FOREIGN KEY (`s_id`) REFERENCES `schedule` (`s_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `meeting_participant`
--
ALTER TABLE `meeting_participant`
  ADD CONSTRAINT `meeting_participant_ibfk_1` FOREIGN KEY (`m_id`) REFERENCES `meeting` (`m_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `meeting_participant_ibfk_2` FOREIGN KEY (`mp_u_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `meeting_participant_ibfk_3` FOREIGN KEY (`mp_guest_id`) REFERENCES `guest` (`g_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `room`
--
ALTER TABLE `room`
  ADD CONSTRAINT `room_ibfk_1` FOREIGN KEY (`r_owner_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;

```

```
-- Constraints for table `room_record`
--
ALTER TABLE `room_record`
  ADD CONSTRAINT `room_record_ibfk_1` FOREIGN KEY (`r_id`) REFERENCES `room` (`r_id`) ON DELETE CASCADE ON UPDATE CASCADE,
  ADD CONSTRAINT `room_record_ibfk_2` FOREIGN KEY (`u_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;
--
-- Constraints for table `schedule`
--
ALTER TABLE `schedule`
  ADD CONSTRAINT `schedule_ibfk_1` FOREIGN KEY (`u_id`) REFERENCES `user` (`u_id`) ON DELETE CASCADE ON UPDATE CASCADE;
COMMIT;
```

```
mysql> show tables;
+-----+
| Tables_in_heroku_e846e0cbb8faabc |
+-----+
| admin                             |
| agenda                             |
| attendees                           |
| channel                             |
| channel_message                     |
| chat_message                       |
| contact                             |
| conversation                         |
| feedback                             |
| guest                               |
| meeting                             |
| meeting_participant                 |
| room                                 |
| room_record                         |
| schedule                             |
| user                                 |
+-----+
16 rows in set (0.26 sec)
```

Figure 6.73 Check all tables in database

```
Connection id: 76401316
Current database: heroku_e846e0cbb8faabc

+-----+-----+-----+-----+-----+-----+
| Field          | Type          | Null | Key | Default | Extra          |
+-----+-----+-----+-----+-----+-----+
| u_id           | int(11)       | NO   | PRI | NULL     | auto_increment|
| u_name         | varchar(50)   | NO   |     | NULL     |                |
| u_gender       | varchar(1)    | YES  |     | NULL     |                |
| u_dob          | date          | YES  |     | NULL     |                |
| u_phone        | varchar(12)   | YES  |     | NULL     |                |
| u_email        | varchar(50)   | NO   |     | NULL     |                |
| u_password     | varchar(200)  | NO   |     | NULL     |                |
| u_profilepic   | text          | NO   |     | NULL     |                |
| u_point        | int(11)       | NO   |     | NULL     |                |
| u_status       | varchar(1)    | NO   |     | NULL     |                |
| u_register_date| datetime      | YES  |     | NULL     |                |
+-----+-----+-----+-----+-----+-----+
11 rows in set (4.78 sec)
```

Figure 6.74 Check user table inserted in database

CHAPTER 7

TESTING

7.1 Introduction

Software testing is a process that aims to examine the quality of a software as well as improve it by finding flaws and failures. The testing for the Meego Video Conferencing system can be divided into different levels: unit, integration, usability and user acceptance testing.

Each part of the software is tested separately to check the features provided by the software are fulfilling the functionalities or not. The second level of testing is integration. Different units are combined together and tested to make sure that the integrated software can work together without any defects. The usability testing is a testing that involves a group of representative users to test the software. Last but not least, user acceptance testing is performed at the final stage to assess if the programme is ready for release. In this project, the tests are limited due to restrictions such as time restrictions and the Covid-19 pandemic. As there are restrictions on crowd size and time, the testing may not detect certain errors and exhaustive testing is impossible in present scenario.

7.2 Unit Testing

Unit testing is conducted in this project by using two laptop devices to test the functionality of each individual unit. The purpose of unit test is to ensure that all functionality of web application and API can work well before integrated with backend website.

7.2.1 Test Modules

Ten areas that will be evaluated for the Meego Video Conferencing web application are:

- a) Sign up
- b) Sign in
- c) Contact
- d) Room
- e) Chat
- f) Meeting
- g) Schedule
- h) Settings
- i) Log Out
- j) Guest

Six areas that will be evaluated for the Meego Administrative System are:

- a) Sign in
- b) Dashboard
- c) User List
- d) Guest List
- e) Admin List
- f) Log Out

7.2.2 Meego Video Conferencing System

a) Sign up

	Test Cases	Test Condition	Expected Result	Remark
1	Create new user account with valid data	Enter valid first name, phone number, birthday, email address, and password and submit sign up	User create account successfully	Pass
2	Incomplete field form validation	Press sign up button with incomplete details	Fail to register, warning is shown to ask user fill out the empty field	Pass
3	Email address validation	Press sign up with incorrect email address format	Fail to register, a warning is shown to ask user key in the correct format of email	Pass
4	Password validation	Enter password less than 8 characters, no capital letter, no number	A message shown like (X) A capital (upper case) letter (X) A number (X) Minimum 8 characters	Pass
5	Confirm Password Validation	Enter confirm password not the same as the password	A "Not Matching" message is shown	Pass

b) Sign in

	Test Cases	Test Condition	Expected Result	Remark
1	Login with Google account	Click the “Sign in with Google button” and select Google account to sign in	User login to the application successfully	Pass
2	Login with valid Meego account	Enter valid email and password and click the sign in button	User login to the application successfully	Pass
3	Login with invalid Meego account	Enter invalid email and password and click the sign in button	Fail to login, error message invalid email or wrong password is shown	Pass
4	Incomplete field validation	Press sign in button without filled email address or password	Fail to login, a warning is shown to ask user fill out the empty field	Pass
5	Show Password Validation	Check the show password checkbox	Password is shown	Pass

c) Contact

	Test Cases	Test Condition	Expected Result	Remark
1	View contact list	Click on contact button in menu to view contact	User can view a list of user contact with name, profile picture and email	Pass
2	Search a contact with name or email	Click on the search bar and enter keyword	User can view all the user which the name or email are related to the keyword	Pass

			entered	
3	Create a contact with valid email	Click on add contact button. Enter valid email and press create add to contact button.	User add a contact successfully.	Pass
4	Create a contact with own email	Click on add contact button. Enter the user's own email and press create add to contact button.	Fail to add contact, a warning is shown.	Pass
5	Create a contact with email not registered	Click on add contact button. Enter email of not registered and press create add to contact button.	Fail to add contact, a warning is shown.	Pass
6	Create a contact with existing contact	Click on add contact button. Enter email that same as the existing contact.	Fail to add contact, a warning is shown.	Pass
6	Delete contact with confirmation	Click delete contact button. A confirmation message is shown. User select "OK".	User deletes the contact successfully.	Pass

d) Room

	Test Cases	Test Condition	Expected Result	Remark
1	View room list	Click on room button in menu to view room	User can view a list of rooms with title and description	Pass
2	Search a room with room title	Click on the search bar and enter title	User can view all the room which the titles	Pass

		keyword	are related to the keyword entered	
3	Create a room with correct data and without invite any user	Click on the add button. Enter the room details, channel details, and invite user to the room. Press creates room button.	User creates a room successfully.	Pass
	Create a room and invite one user	Click on the add button. Enter the room details, channel details, and invite one user to the room. Press create room button.	User creates a room successfully.	Pass
	Create a room and invite multiple user	Click on the add button. Enter the room details, channel details, and invite multiple users to the room. Press "create room" button.	User creates a room successfully.	Pass
4	Delete room with confirmation	Select a room and click on the delete room button. A confirmation message is shown. User selects "OK".	User deletes the room successfully.	Pass
5	Delete room without confirmation	Select a room and click on the delete room button. A	User does not delete the room.	Pass

		confirmation message is shown. User selects “Cancel”.		
--	--	---	--	--

e) Chat

	Test Cases	Test Condition	Expected Result	Remark
1	View conversations	Click on chat button in menu to view conversation and select to see all the chat messages in the conversation.	User can view all the chat messages in the conversation.	Pass
2	Search a conversation with name	Click on the search bar and enter keyword	User can view all the conversation which the names are related to the keyword entered	Pass
3	Start a new conversation	Click on start new chat button. Select recipient, enter message, and click send message.	User sends message to selected recipient successfully.	Pass
4	Send a message without file to a selected user	Enter message and click send.	User sends message successfully.	Pass
5	Send a message with file to a selected user.	Upload a file, enter message, and click send.	User sends file and message successfully.	Pass

6	Clear chat history	Click on clear chat history button. A confirmation message is shown. User selects "OK".	User clears the chat history successfully.	Pass
---	--------------------	---	--	------

f) Meeting

	Test Cases	Test Condition	Expected Result	Remark
1	User starts a meeting	Select a conversation and click call button.	User starts a new meeting successfully.	Pass
2	User joins a meeting	Select a conversation and click join meeting button.	User joins a meeting room successfully.	Pass
3	User leaves meeting	Click leave meeting button to exit the meeting room	User leaves a meeting successfully.	Pass
4	User views meeting information	User clicks on meeting info button to view meeting information	User view meeting info successfully.	Pass
5	User views meeting participant	User clicks on meeting info button to view meeting participant	User views meeting participant successfully.	Pass
6	User views messages in the meeting	User clicks on meeting info button to view meeting messages	User views chat messages successfully.	Pass
7	User sends a message in the meeting	User enters message and send to the chat	User sends message successfully	Pass
8	Turn on	User turns on video.	Another user in the	Pass

	video		meeting room can see his video. The user himself also can see his video.	
9	Turn off video	User turns off video.	Another user in the meeting room cannot see his video. The user himself also cannot see his video.	Pass
10	Turn on audio	User turns on audio.	User turns on the audio and another user in the meeting room can see hear his voice.	Pass
11	Turn off audio	User turns off audio.	User turns off the audio and another user in the meeting room cannot hear his voice.	Pass
14	Share meeting	User selects share meeting.	User shares the link of the web application successfully.	Pass

g) Schedule

	Test Cases	Test Condition	Expected Result	Remark
1	View schedule list	Click on schedule button in menu to view schedule	User can view a list of schedules with title and description	Pass
2	Search a schedule with schedule title	Click on the search bar and enter schedule keyword	User can view all the schedule which the details are related to the keyword entered	Pass

3	Create a schedule with valid input	Click on the add button. Enter the correct meeting details and invite user to the meeting. Press “create schedule” button.	User creates a schedule successfully.	Pass
4	Meeting start time and end time validation	Enter meeting end time earlier than start time	An error message is shown to alert the user that end time should be later than start time.	Pass
5	Delete schedule with confirmation	Select a schedule click the kebab menu, select delete schedule. A confirmation message is shown. User selects “OK”.	User deletes the schedule successfully.	Pass
6	Edit Schedule Details	Select a schedule, click the table column to edit and click on anywhere outside the table column to save the changes.	User updates the schedule successfully.	Pass
7	Edit Schedule Details with null value	Select a schedule, click the table column and remove all the word in the column. Click on anywhere outside the table column to	An error message is shown to alert the user that the column should not be empty.	Pass

		save the changes.		
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h) Settings

	Test Cases	Test Condition	Expected Result	Remark
1	View my account details	Click on my account button in the menu to view account	User can view the account name, email, profile picture, number of contacts, number of room and point earned.	Pass
2	Edit Profile	Click on the “My Account” and click edit profile button	User can edit the details and click apply to save changes	Pass
3	Delete Account with confirmation	Click on the delete Meego account button. A confirmation message is shown. User select “OK”.	User deletes the account successfully.	Pass
4	Upload image and change profile picture	Click on the profile picture and select photo in valid format, click change profile picture button	User changes the profile picture successfully.	Pass
5	Change profile picture without upload the image	Click on the profile picture and do not select any photo, click change profile picture button	An error message is shown to alert the user that no image selected.	Pass
6	Change password by entering	Click on the “Edit Password” and enter correct current	User changes the password successfully.	Pass

	correct current password	password, valid new password and click change password button		
7	Change password by entering wrong current password	Click on the “Edit Password” and enter wrong current password, valid new password and click change password button.	An error message is shown to alert the user that current password is incorrect.	Pass
8	Speed Test	Click on the start button to start speed test	User tests the speed successfully.	Pass
9	Claim Reward	Click on the claim reward button	User can view the rewards page	Pass
10	Submit Feedback	Click on the feedback button	User can view the feedback page and submit feedback	Pass

i) Log Out

	Test Cases	Test Condition	Expected Result	Remark
1	Log out Google Account	User log in using Google account and click on log out button in the menu. A confirmation message is shown. User select “OK”.	User logs out successfully.	Pass
2	Log out Meego Account	User log in using Meego account and click on log out	User logs out successfully.	Pass

		button in the menu. A confirmation message is shown. User select “OK”.		
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j) Guest

	Test Cases	Test Condition	Expected Result	Remark
1	Join meeting with valid meeting id	Enter valid meeting id to join meeting	Guest enters join meeting page to ask for guest name and gender	Pass
2	Join meeting with invalid meeting id	Enter valid email and password and click the sign in button	An error message is shown to indicate that the room not found.	Pass
3	Enter valid name and gender	Enter name and gender and click the enter meeting button	Guest joins the meeting successfully	Pass
4	Incomplete field validation	Press enters meeting button without filled name	Fail to join meeting, a warning is shown to ask user fill out the empty field	Pass

7.2.3 Meego Administrative System

a) Sign in

	Test Cases	Test Condition	Expected Result	Remark
1	Login with valid Admin account	Enter valid email, key and password and click the sign in button	Admin login to the application successfully	Pass
2	Login with invalid Admin account	Enter invalid email, key and password and click the sign in button	Fail to login, error message invalid email or wrong password is shown	Pass
3	Incomplete field validation	Press sign in button without filled email address, key or password	Fail to login, a warning is shown to ask admin fill out the empty field	Pass
4	Show Password Validation	Check the show password checkbox	Password is shown	Pass

b) User List

	Test Cases	Test Condition	Expected Result	Remark
1	View user list	Click on user list button to view all user	Admin can view the username, gender, email, contact number, point and status	Pass
2	Copy User List	Click on the "Copy" and paste at a work file	Admin can copy the user list	Pass
3	Save User List as Excel	Click on the "Excel" button	Admin can save the user list as a Excel file	Pass
4	Print User List	Click on the "Print"	Admin can print the	Pass

		button	user list	
5	Delete Account with confirmation	Click on the delete Meego account button. A confirmation message is shown. Admin selects "OK".	Admin deletes the account successfully.	Pass

c) Guest List

	Test Cases	Test Condition	Expected Result	Remark
1	View guest list	Click on guest list button to view all guest	Admin can view the guest name, gender and date	Pass
2	Copy Guest List	Click on the "Copy" and paste at a work file	Admin can copy the guest list	Pass
3	Save Guest List as Excel	Click on the "Excel" button	Admin can save the guest list as a Excel file.	Pass
4	Print Guest List	Click on the "Print" button	Admin can print the guest list	Pass
5	Filter Guest List by date	Click on the data range buttons to filter the guest list by data	Admin filters the date successfully	Pass

d) Admin List

	Test Cases	Test Condition	Expected Result	Remark
1	View admin list	Click on admin list button to view all admin	Admin can view the admin name, email, key and status	Pass
2	Add new admin	Click on the “Add” button and enter admin data, submit the form	Admin can add a new admin account successfully.	Pass
3	Copy Admin List	Click on the “Copy” and paste at a work file	Admin can copy the admin list	Pass
4	Save Admin List as Excel	Click on the “Excel” button	Admin can save the admin list as a Excel file	Pass
5	Print Admin List	Click on the “Print” button	Admin can print the admin list	Pass
6	Delete Account with confirmation	Click on the delete button. A confirmation message is shown. Admin selects “OK”.	Admin deletes the account successfully.	Pass

e) Feedback List

	Test Cases	Test Condition	Expected Result	Remark
1	View feedback list	Click on feedback list button to view all feedback	Admin can view the comment and rating.	Pass
3	Copy Feedback List	Click on the “Copy” and paste at a work file	Admin can copy the feedback list	Pass
4	Save Feedback	Click on the “Excel”	Admin can save the	Pass

	List as Excel	button	feedback list as a Excel file	
5	Print Feedback List	Click on the "Print" button	Admin can print the feedback list	Pass
5	Filter Feedback by date	Click on the data range buttons to filter the feedback list by data	Admin filters the feedback by date successfully	Pass

f) Log Out

	Test Cases	Test Condition	Expected Result	Remark
1	Log out Admin Account	Admin clicks log out button in the menu. A confirmation message is shown. Admin selects "OK".	Admin logs out successfully.	Pass

7.3 Integration Testing

a) Room and Channel

	Test Cases	Test Condition	Expected Result	Remark
1	View channels in a room	Select a room to view all the channels in that room	User can view a list of channels in the selected room	Pass
2	Authorized user adds a new channel to the room.	Select a room and click on the add channel button. Enter valid channel title and description. Press create channel.	User creates a channel successfully.	Pass
3	Authorized user deletes channel	Select a room and select a channel. Click on the kebab menu and select delete channel button. A confirmation message is shown. User selects "OK".	User deletes the channel successfully.	Pass
4	Unauthorized user deletes channel	Select a room and select a channel. Click on the kebab menu and select delete channel button.	A message is shown to indicate that the user is not authorized to delete channel.	Pass

b) Room and Channel and Member

	Test Cases	Test Condition	Expected Result	Remark
1	View members in a room	Select a room and select a channel to view all the members in that room.	User can view a list of members in the selected channel. There is an icon beside the owner of the room.	Pass
2	Authorized user adds a new member to the room	Select a room and select a channel. Click on the kebab menu and select insert member button. Click add member button.	User adds member successfully.	Pass
3	Unauthorized user adds a new member to the room	Select a room and select a channel. Click on the kebab menu and select insert member button.	A message is shown to indicate that the user is not authorized to add member.	Pass
4	Authorized user deletes member	Select a room and select a channel. From the member list, select delete button beside the member. A confirmation message is shown. User selects "OK".	User deletes the member successfully.	Pass
5	Unauthorized user deletes member	Select a room and select a channel. From the member	A message is shown to indicate that the user is not	Pass

		list, select delete button beside the member.	authorized to delete member.	
6	User leaves room	Select a room and select a channel. Click on the kebab menu and select leave room button.	User leaves the room successfully.	Pass

c) Room and Channel and Channel Messages

	Test Cases	Test Condition	Expected Result	Remark
1	View messages in channel	Select a room and select a channel to view all message in the channel.	User can view the message in the channel.	Pass
2	Send a message without file in the channel.	Enter message and click send.	User sends message in the channel successfully.	Pass
3	Send a message with file in the channel.	Upload a file, enter message, and click send.	User sends file and message in the channel successfully.	Pass
4	Authorized user clear history	Click on the kebab menu and select clear history button. A confirmation message is shown. User selects "OK".	User clears the message in the channel successfully.	Pass
5	Download file in the message	From the messages, select one link of the file. Select download.	User downloads the file successfully.	Pass

d) Notification

	Test Cases	Test Condition	Expected Result	Remark
1	New chat message notification	User A sends a message to User B in conversation.	User B received a notification indicate that a new message received.	Pass
2	Invitation to room notification	User A invites User B to room A.	User B received a notification about the invitation.	Pass
3	New channel message notification	User A sends a message in channel A.	User B in channel A received the notification.	Pass
4	One to one meeting notification	User A starts a meeting with User B.	User B received a notification about the meeting.	Pass
5	Channel meeting notification	User A starts a meeting in Channel A.	User B in channel A received a notification about the meeting.	Pass

7.4 Usability Testing

In this project, ten persons were invited to conduct usability testing. This usability testing was conducted on the user only. There were nine scenarios prepared for the tester to try to use the web application naturally. The testers could explore the web application by their own rather than guided with detailed instructions. The consent form and survey is in Appendix A.

This usability testing is in remote mode which means the testers conduct the tests on their own devices from their own locations. Remote usability testing is selected because of the covid-19 pandemic, the tester may not be able to test the system physically.

7.4.1 Usability Test Plan

A usability test plan is used to determine what is being tested, how to conduct the test, number of participants to test, when and where to conduct the test, what are the test procedures. The figure is the usability test plan dashboard used to plan the testing.

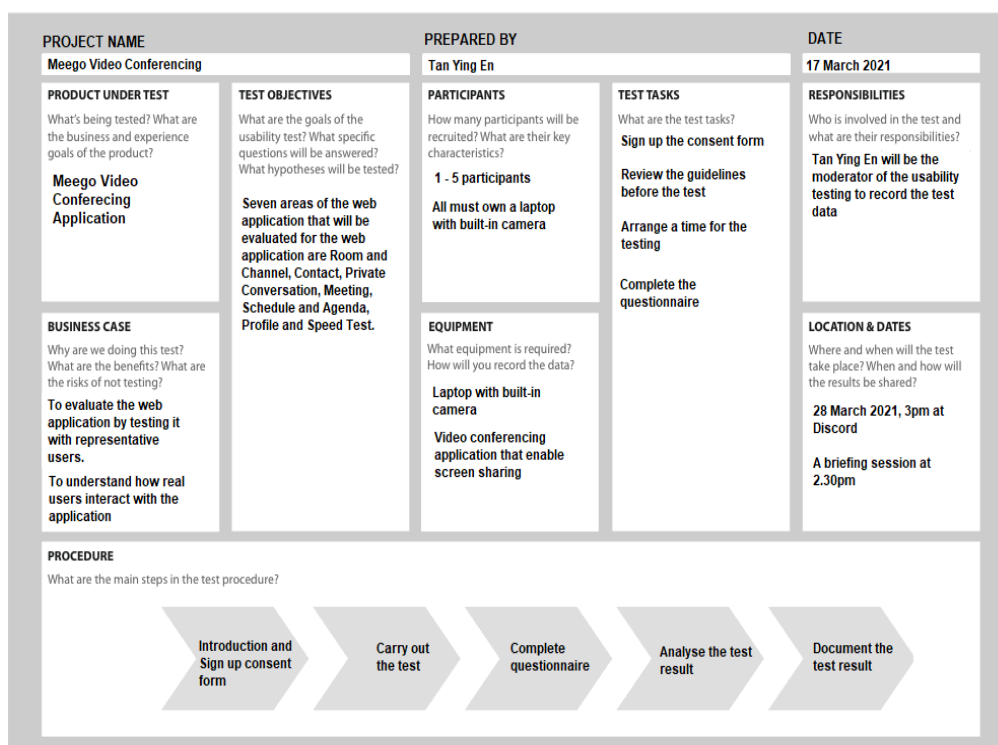


Figure 7.1: Usability Test Plan

The purpose of this test is to evaluate how well a representative sample of target users can interpret and interact with the Meego Video Conferencing Web Application.

Nine areas of the web application that will be evaluated for the web application are

- a) Registration and Login
- b) Contact
- c) Room and Channel
- d) Private Conversation
- e) Meeting
- f) Schedule and Agenda
- g) Profile Management
- h) Speed Test
- i) Reward

The following is the test procedures.

1. At first, the moderator will give a brief introduction to the web application and the tester required to sign-up the consent form.
2. The tester will carry out the tests based on the scenarios prepared and the moderator will observe how the tester interact with the web application.
3. The moderator will observe and record the time for each section being tested.
4. The tester completes a questionnaire after the test session completed. Test results will be analysed and documented.

7.4.2 Test Scenario

The following table is the list of test scenario used in the usability test.

Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

7.4.3 Usability Test Result

Table 7.1 Characteristic of Participants

Gender	Female	60%
	Male	40%
Age	Below 18	0%
	19 to 30 years old	100%
	50 years and over	0%
Occupation	Student	40%
	Engineer	30%
	Insurance Agent	10%
	Accountant	10%
	Leasing Executive	10%

Table 7.2 Test Equipment

Laptop	HP	30%
	ASUS	30%
	ACER	20%
	DELL	10%
	Macbook	10%
Web Browser	Google Chrome	80%
	Firefox	10%
	Safari	10%
Internet Connection	Unifi	80%
	Maxis	10%
	Celcom	10%

Table 7.3 Experience of using existing video conferencing

Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.	Zoom	33.33%
	Microsoft Team	26.67%
	Discord	10%
	Webex	6.67%
	Skype	6.67%
	Other	16.67%
For the past one week, how often have you use a video conferencing app for your work/ study?	Everyday	40%
	4 to 6 days	50%
	2 to 3 days	10%
	0 to 1 day	0%
	Never	0%

This user satisfaction survey scoring survey is taken from a journal (Brooke, 2020).The formula for calculating the SUS score is as follows:

1. The score is subtracted by one for odd-numbered questions.
2. The score is subtracted from 5 for even-numbered questions.
3. All values are scaled from 0 to 4, with 4 representing the most satisfactory answer.
4. For each individual, the converted answer is totalled and multiplied by 2.5.

Table 7.4 User Survey Satisfaction Scoring

Question	Tester										Avg
	1	2	3	4	5	6	7	8	9	10	
1. Usability	3	4	4	4	3	4	4	3	4	3	
2. Complexity	3	3	4	3	3	3	3	4	4	4	
3. Ease of use	4	4	3	3	3	3	4	4	4	3	
4. Learnability	4	4	4	3	2	4	4	4	3	4	
5. Navigability	3	4	4	2	3	4	3	4	4	4	
6. Consistency	3	4	4	4	4	4	3	2	3	3	
7. Learnability	3	3	4	3	2	4	4	4	4	4	
8. Satisfaction	4	4	4	3	4	4	3	2	3	3	
9. Satisfaction	3	4	4	4	2	3	4	3	2	2	
10. Learnability	4	3	3	4	2	3	4	4	4	2	
Total	34	37	38	33	28	36	36	34	35	32	34.3
SUS Score	85	92.5	95	82.5	70	90	90	85	87.5	80	85.75

Table 7.5 User Impression

On a scale of 1-5, how would you rate your overall satisfaction with this system?	Very Satisfied	40%
	Satisfied	40%
	Neutral	20%
	Dissatisfied	0%
	Very Dissatisfied	0%
Which are the features you find helpful/like the most?	Schedule and agenda	42.86%
	Reward	35.71%
	Video call	21.43%
Which are the features you don't find helpful/like the least?	None	60%
	Speed Test	10%
	Notification	10%
	Private Chat	10%
	Contact	10%
What is a feature you wish this system had?	Video Recording	38.46%
	Change video background	23.08%
	Remove member from meeting	15.38%
	Send emoji	15.38%
	Instant Screenshot	7.70%

7.5 User Acceptance Testing

User Acceptance Testing (UAT) is the process of testing application by the user or client to see if this can be approved. It is the final stage of testing. Ten participants are invited to perform the user acceptance testing. The result of UAT is in appendix B.

7.5.1 UAT Test Case Listing

No	Test Case ID	Test Form ID	Tested Module	Test Description
1	001	F01, F10, F19, F28, F37, F46, F55, F64, F73, F82	Registration and Login	Able to select sign-up form
				Able to register
				Able to login
				Able to enter user homepage after login
2	002	F02, F11, F20, F29, F38, F47, F56, F65, F74, F83	Contact	Able to create contact
				Able to delete contact
3	003	F03, F12, F21, F30, F39, F48, F57, F66, F75, F84	Room and Channel	Able to add channel to room
				Able to add member to room
				Able to view member list
				Able to send message in the channel
				Able to clear channel messages
4	004	F04, F13, F22, F31, F40, F49, F58, F67, F76, F85	Private Conversation	Able to send message
				Able to receive message
				Able to clear chat messages
5	005	F05, F14, F23, F32, F41, F50, F59, F68, F77, F86	Meeting	Able to create meeting
				Able to join meeting
				Able to turn on video camera
				Able to turn off video camera
				Able to turn on audio
				Able to turn off audio
				Able to see another user video
Able to hear another user speak				

				Able to view meeting information
				Able to view participant list
				Able to send chat
				Able to leave meeting
6	006	F06, F15, F24, F33, F42, F51, F60, F69, F78, F87	Schedule and Agenda	Able to create a schedule
				Able to add meeting agenda details
				Able to edit agenda details
				Able to delete agenda details
7	007	F07, F16, F25, F34, F43	Profile Management	Able to view profile
				Able to change profile info
				Able to change profile photo
				Able to change password
8	008	F08, F17, F26, F35, F44	Speed Test	Able to carry out a speed test
				Able to view speed test result
9	009	F09, F18, F27, F36, F45	Reward	Able to view user points
				Able to view claim reward

7.6 Conclusion

Four types of testing were carried out in this project: unit, integration, usability and user acceptance testing. The usability testing and user acceptance testing were carried out by ten volunteer participants. The participants were given a consent form to fill up before the testing.

CHAPTER 8

CONCLUSION AND FUTURE WORK

8.1 Conclusion

With the completion of the project, all the objectives were achieved with the respective features in the web-based video conferencing application.

The main objective of this project is to a new web-based video conferencing system that delivers enhanced engagement for team collaboration and productivity using Prototyping approach in 24 weeks.

With Meego video conferencing application, the user can have virtual meeting that support both audio and video call and text messaging. The user can schedule a meeting with agenda planner and test the network connectivity with the built-in speed test. This web application also incorporated gamification to increase work productivity and encourage engagement.

8.2 Limitations

Undeniably, the project had successfully delivered a web application that fulfilled all the objectives. However, some limitations have prevented the project from being perfect.

Table 8.1: Limitations

Limitations	Explanations
Lack of meeting follow-up feature	The activities carried out after a meeting are referred to as meeting follow-up. After a meeting, the attendee needs to prepare a meeting minutes, check the attendees record and collects feedback. However, this web application does not keep track of the meeting history. A meeting history will keep track of all the meeting records in a channel or in a conversation and the meeting details like the attendees list. It is important because it will help the attendees to recall back the meeting content and tell the absentees about the call that he/she missed.
Risk of data exposure	When data is left exposed in a folder or directory for everyone to see, it is known as data exposure. Hackers are looking for personally identifiable information and other data to steal money, compromise identity, or sell on the dark web. The user information may be targeted for theft, modification, or destruction. Hence, it is important to protect the privacy of the user. However, there is no message encryption in this application, leads to the risk of data breach.
Limitations of chat message	A face-to-face dialogue can provide physical interaction and viewpoint that text messages cannot. The application allows for the messages to be sent from one user to another user. However, the chat message in this application is

	<p>impersonal. Because of the brevity of letters, the lack of voice, facial expressions, eye contact, and body language, misinterpretation is normal in text messaging. Furthermore, the chat message is designed to be simple, quick conversation and is ineffective at communicating complex or confidential information. It is not recommended if the user wants to communicate something complex using the chat messaging feature in the application.</p>
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8.3 Future Work

There are several features and functionalities that could be implemented into the proposed system, but the project scope was restricted due to time constraints. Future enhancements can be considered for functionality that are not currently included in the system. The following are suggestions for future work.

Table 8.2: Suggestions

Suggestion	Explanation
Video recording and meeting history feature	Presently the web application does not allow the users to view the meeting history. A meeting history will keep track of all the meeting records in a channel or in a conversation, so that it will tell the users about the call that he/she missed. If someone missed a meeting, he could view the recorded meeting to catch up.
End-to-end encryption and virtual background to protect privacy	End-to-end encryption messaging means that only the sender and recipient can read to what is sent. This is because the messages are locked with end-to-end encryption, and only the sender and the receiver have special key to open and read them. Presently the web application enables the user to view the video but does not implement virtual

	<p>background. Sometimes, the user does not want to show their background, maybe because of the room is messy. With this virtual background, the user is able to set himself as being professional and trustworthy while meeting with his customer. The attendees of the meeting may rely on the presenter's presentation instead of writing notes.</p> <p>The review of video recordings also allows the attendees for further in-depth analysis of the meeting content and errors.</p>
<p>GIF, stickers and Emojis in chat messages</p>	<p>The web application enables the user to send message and communicates with other users. Verbal signals such as sound, voice, and body language can readily reveal the true message behind words in a face-to-face conversation. But the user can only type simple message in this web application. This application can provide more multimedia media like GIF and stickers to be used for text messages, giving users more freedom to express themselves. Enter emojis in live chat also can help a user to express his feelings.</p>

Table 8.3: Competitor Feature Comparison (Mio, 2021; Anon, 2021)

Features		MS Team	Zoom	Webex	Meego
Notification	Receive alert	✓	✓	✓	✓
Contact Management	Manage contact list	✓	✓	✗	✓
Audio and Video Call	Join Meeting with Audio Only	✓	✓	✓	✓
	Join Meeting with Audio and Video	✓	✓	✓	✓
Chat	Chat Within Meetings	✓	✓	✓	✓
	Chat Outside Meetings	✓	✓	✓	✓
	Private Chat (1 to 1)	✓	✓	✓	✓
	Send file in chat message	✓	✓	✓	✓
Content sharing	Application Sharing	✓	✓	✓	✓
	Screen Sharing	✓	✓	✓	✓
	Chrome Tab Sharing	✓	✓	✓	✓
Whiteboard	Upload image	✗	✓	✓	✓
	Annotation tools	✓	✓	✓	✓
	Save whiteboard	✓	✓	✓	✓
Schedule Meeting	Create a schedule	✓	✓	✓	✓
	Plan meeting agenda	✗	✗	✓	✓
	File Sharing in meeting schedule	✗	✗	✗	✓
Built-in Speed Test	Instant speed test	✗	✗	✗	✓

Rewarding System	Gain reward points	x	x	x	✓
	Claim reward points	x	x	x	✓

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APPENDICES

APPENDIX A: Usability Testing and User Acceptance Testing Informed Consent Form and Survey


Tester 1:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@lutar.my.

Statement of Informed Consent	
Please read the following carefully and sign if you comply with it.	
<i>I have read and understand the information above and agree to take part in this testing. I am aware of my rights as a participant and have had all of my questions answered. My signature does not represent a granting of any legal rights. Furthermore, I understand that a copy of the informed consent form would be required for my records.</i>	
Name: OOI HAN WEI	Signature 
Date: 28 MARCH 2021	

Section A: Introductory Questions and Survey									
Name	Ooi Han Wei			Gender	Female	Age	24		
Email	hanwei97@hotmail.com			Occupation	DV Engineer				
Equipment used for testing									
Laptop	HP								
Web Browser	Google chrome								
Internet Connection	Maxis 300Mbps								
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. MS Teams			2. Zoom			3. Webex			
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday	<input checked="" type="checkbox"/>	4 to 6 days	<input type="checkbox"/>	2 to 3 days	<input type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never	<input type="checkbox"/>

Section B: Test Scenarios	
Scenario 1 – Create new account and Login	Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact	Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel	Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation	You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting	You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda	You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile	You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test	You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward	You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.				✓	
2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use					✓
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.				✓	
6	I thought there was too much inconsistency in this system/website.		✓			
7	I would imagine that most people would learn to use this website very quickly.				✓	
8	I found the system/website very awkward to use.	✓				
9	I felt very confident using the system/website.				✓	
10	I needed to learn a lot of things before I could get going with this system/website.	✓				

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	✓	Satisfied		Neutral	Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?						
The schedule and agenda planner feature come in handy when we have a lot of meetings to hold. The claim rewards also very interesting.						
Which are the features you don't find helpful/ like the least?						
Speed test.						
What is a feature you wish this system had?						
Change video background, video recording.						


Tester 2:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

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I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@lutar.my.

Statement of Informed Consent	
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<i>I have read and understand the information above and agree to take part in this testing. I am aware of my rights as a participant and have had all of my questions answered. My signature does not represent a granting of any legal rights. Furthermore, I understand that a copy of the informed consent form would be required for my records.</i>	
Name: THOR WIN WIN	Signature 
Date: 28 MARCH 2021	

Section A: Introductory Questions and Survey									
Name	Thor Win Win			Gender	Female	Age	24		
Email	thorwinwin@lutar.my			Occupation	Mechanical Engineer				
Equipment used for testing									
Laptop	HP								
Web Browser	Google Chrome								
Internet Connection	Unifi 30 Mbps								
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. Microsoft Teams			2. Discord			3. Zoom			
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday		4 to 6 days	✓	2 to 3 days		0 to 1 day		Never	

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
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You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
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You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
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2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use					✓
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.	✓				
7	I would imagine that most people would learn to use this website very quickly.				✓	
8	I found the system/website very awkward to use.	✓				
9	I felt very confident using the system/website.					✓
10	I needed to learn a lot of things before I could get going with this system/website.		✓			

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	✓	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	
Which are the features you find helpful/like the most?						
Video call.						
Which are the features you don't find helpful/ like the least?						
None.						
What is a feature you wish this system had?						
Video recording Enter emoji when chat.						


Tester 3:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

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Name: CHEAH XIAN LIANG	Signature 
Date: 28 MARCH 2021	

Section A: Introductory Questions and Survey							
Name	Cheah Xian Liang			Gender	Male	Age	24
Email	cheahxianliang@yahoo.com			Occupation	Insurance Agent		
Equipment used for testing							
Laptop	ASUS						
Web Browser	Google Chrome						
Internet Connection	Unifi 100Mbps						
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.							
1. Zoom			2. Skype			3. WhatsApp	
For the past one week, how often have you use a video conferencing app for your work/ study?							
Everyday	4 to 6 days	✓	2 to 3 days		0 to 1 day	Never	

Section B: Test Scenarios	
Scenario 1 – Create new account and Login	
	Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
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	Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation	
	You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
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	You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda	
	You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile	
	You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test	
	You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward	
	You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.					✓
2	I found the system/website unnecessarily complex.	✓				
3	I thought the system/website was easy to use				✓	
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.	✓				
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.	✓				
9	I felt very confident using the system/website.					✓
10	I needed to learn a lot of things before I could get going with this system/website.		✓			

Section D: Comments/ Feedback					
On a scale of 1-5, how would you rate your overall satisfaction with this system?					
Very Satisfied	Satisfied	✓	Neutral	Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?					
Schedule and agenda planner, reward.					
Which are the features you don't find helpful/ like the least?					
None.					
What is a feature you wish this system had?					
Video recording, Virtual background during video call.					


Tester 4:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@lutar.my.

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Name: CHEAH HE SHUN	Signature 
Date: 28 MARCH 2021	

Section A: Introductory Questions and Survey									
Name	Cheah He Shun			Gender	Male	Age	25		
Email	cheahhs96@gmail.com			Occupation	Regulatory Engineer				
Equipment used for testing									
Laptop	DELL								
Web Browser	Firefox								
Internet Connection	Unifi 100Mbps								
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. MS Teams			2. Zoom			3. Messenger			
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday	<input checked="" type="checkbox"/>	4 to 6 days	<input type="checkbox"/>	2 to 3 days	<input type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never	<input type="checkbox"/>

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.					✓
2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use				✓	
4	I think that I would need the support of a technical person to be able to use this system/website.		✓			
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.			✓		
6	I thought there was too much inconsistency in this system/website.	✓				
7	I would imagine that most people would learn to use this website very quickly.				✓	
8	I found the system/website very awkward to use.		✓			
9	I felt very confident using the system/website.					✓
10	I needed to learn a lot of things before I could get going with this system/website.	✓				

Section D: Comments/ Feedback							
On a scale of 1-5, how would you rate your overall satisfaction with this system?							
Very Satisfied	✓	Satisfied		Neutral		Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?							
Schedule, Agenda Planner and Reward.							
Which are the features you don't find helpful/ like the least?							
None.							
What is a feature you wish this system had?							
Remove member from meeting and able to send emoji during chat/meeting.							


Tester 5:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@lutar.my.

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Name: CHONG KHAI LIN	Signature 
Date: 28 MARCH 2021	

Section A: Introductory Questions and Survey							
Name	Chong Khai Lin		Gender	Female	Age	24	
Email	khailinchong@gmail.com		Occupation	Accountant			
Equipment used for testing							
Laptop	ASUS						
Web Browser	Google Chrome						
Internet Connection	Unifi 100 Mbps						
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.							
1. Zoom		2. Webex			3. Microsoft Teams		
For the past one week, how often have you use a video conferencing app for your work/ study?							
Everyday	4 to 6 days	<input checked="" type="checkbox"/>	2 to 3 days	<input type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never

Section B: Test Scenarios	
Scenario 1 – Create new account and Login	Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact	Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel	Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation	You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting	You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda	You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile	You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test	You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward	You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.				✓	
2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use				✓	
4	I think that I would need the support of a technical person to be able to use this system/website.			✓		
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.				✓	
6	I thought there was too much inconsistency in this system/website.	✓				
7	I would imagine that most people would learn to use this website very quickly.			✓		
8	I found the system/website very awkward to use.	✓				
9	I felt very confident using the system/website.			✓		
10	I needed to learn a lot of things before I could get going with this system/website.			✓		

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	Satisfied	Neutral	✓	Dissatisfied	Very Dissatisfied	
Which are the features you find helpful/like the most?						
Reward.						
Which are the features you don't find helpful/ like the least?						
Notification.						
What is a feature you wish this system had?						
Virtual Background.						

Tester 6:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

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I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@utar.my.

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Name: TIN HUI SIM	Signature <i>HuiSim</i>
Date: 24 April 2021	

Section A: Introductory Questions and Survey									
Name	Tin Hui Sim			Gender	Female	Age	22		
Email	huisim@1utar.my			Occupation	Student				
Equipment used for testing									
Laptop	HP								
Web Browser	Google Chrome								
Internet Connection	Unifi 30 Mbps								
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. Zoom			2. Microsoft Teams			3. Google Meet			
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday		4 to 6 days	✓	2 to 3 days		0 to 1 day		Never	

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.					✓
2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use				✓	
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.	✓				
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.	✓				
9	I felt very confident using the system/website.				✓	
10	I needed to learn a lot of things before I could get going with this system/website.		✓			

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	✓	Satisfied	Neutral	Dissatisfied	Very Dissatisfied	
Which are the features you find helpful/like the most?						
Video Call, Rewarding						
Which are the features you don't find helpful/ like the least?						
Private chat						
What is a feature you wish this system had?						
Video Recording						

Tester 7:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@lutar.my.

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Name: WON WEI CHENG	Signature <i>Wei Cheng</i>
Date: 24 April 2021	

Section A: Introductory Questions and Survey							
Name	Won Wei Cheng		Gender	Female	Age	22	
Email	wonweicheng@gmail.com		Occupation	Student			
Equipment used for testing							
Laptop	ACER Aspire 4752G						
Web Browser	Google Chrome						
Internet Connection	Unifi 100Mbps						
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.							
1. Microsoft Teams		2. Zoom					
For the past one week, how often have you use a video conferencing app for your work/ study?							
Everyday	4 to 6 days	✓	2 to 3 days		0 to 1 day		Never

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
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Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.					✓
2	I found the system/website unnecessarily complex.		✓			
3	I thought the system/website was easy to use					✓
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.				✓	
6	I thought there was too much inconsistency in this system/website.		✓			
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.		✓			
9	I felt very confident using the system/website.					✓
10	I needed to learn a lot of things before I could get going with this system/website.	✓				

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	Satisfied	✓	Neutral		Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?						
Schedule and agenda planner						
Which are the features you don't find helpful/ like the least?						
Notification						
What is a feature you wish this system had?						
Instant Screenshot						


Tester 8:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

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I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

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Name: TAN JING YING	Signature 
Date: 24 April 2021	

Section A: Introductory Questions and Survey									
Name	Tan Jing Ying			Gender	Female	Age	22		
Email	221jingying@lutar.my			Occupation	Student				
Equipment used for testing									
Laptop	ACER								
Web Browser	Google Chrome								
Internet Connection	Unifi 300Mbps								
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. Microsoft Team			2. Zoom			3. Discord			
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday	<input checked="" type="checkbox"/>	4 to 6 days	<input type="checkbox"/>	2 to 3 days	<input type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never	<input type="checkbox"/>

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
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Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
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You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.				✓	
2	I found the system/website unnecessarily complex.	✓				
3	I thought the system/website was easy to use					✓
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.			✓		
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.			✓		
9	I felt very confident using the system/website.				✓	
10	I needed to learn a lot of things before I could get going with this system/website.	✓				

Section D: Comments/ Feedback						
On a scale of 1-5, how would you rate your overall satisfaction with this system?						
Very Satisfied	Satisfied	✓	Neutral		Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?						
Video Call						
Which are the features you don't find helpful/ like the least?						
Contact						
What is a feature you wish this system had?						
Video Recording						


Tester 9:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

After the testing, you will be requested to complete a survey. Your personal details will be collected (email address, gender, age) and will be used for internal purpose. The results may be published in my Final Year Project Report or presented at a presentation or any publications. If you have any questions after today, you may contact me at geminientan@utar.my.

Statement of Informed Consent	
Please read the following carefully and sign if you comply with it.	
<i>I have read and understand the information above and agree to take part in this testing. I am aware of my rights as a participant and have had all of my questions answered. My signature does not represent a granting of any legal rights. Furthermore, I understand that a copy of the informed consent form would be required for my records.</i>	
Name: LIM YONG KANG	Signature 
Date: 24 April 2021	

Section A: Introductory Questions and Survey									
Name	Lim Yong Kang				Gender	Female	Age	22	
Email	limyongkang0312@gmail.com				Occupation	Student			
Equipment used for testing									
Laptop			ASUS						
Web Browser			Google Chrome						
Internet Connection			Celcom 100Mbps						
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. Microsoft Team				2. Discord			3. Zoom		
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday	<input checked="" type="checkbox"/>	4 to 6 days	<input type="checkbox"/>	2 to 3 days	<input type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never	<input type="checkbox"/>

Section B: Test Scenarios
Scenario 1 – Create new account and Login
Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
Scenario 2 – Manage Contact
Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
Scenario 3 – Manage room and channel
Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
Scenario 4 – Start a new conversation
You wish to ask Geminien Tan to send you a file in private message. You are required to start a new conversation with her. What would you do?
Scenario 5 – Create a meeting and collaborate in the meeting
You wish to start a new video call meeting with all the team members in the room. to discuss the project scope. What would you do?
Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.					✓
2	I found the system/website unnecessarily complex.	✓				
3	I thought the system/website was easy to use					✓
4	I think that I would need the support of a technical person to be able to use this system/website.		✓			
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.		✓			
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.		✓			
9	I felt very confident using the system/website.			✓		
10	I needed to learn a lot of things before I could get going with this system/website.	✓				

Section D: Comments/ Feedback					
On a scale of 1-5, how would you rate your overall satisfaction with this system?					
Very Satisfied	Satisfied	✓	Neutral	Dissatisfied	Very Dissatisfied
Which are the features you find helpful/like the most?					
Upload files in schedule					
Which are the features you don't find helpful/ like the least?					
None					
What is a feature you wish this system had?					
Remove participant from meeting					

Tester 10:

My name is Tan Ying En, and I am a final year undergraduate student from University Tunku Abdul Rahman (UTAR) at Sungai Long Campus. As part of my degree course, I developed a web-based video conferencing application as my Final Year Project.

Meego video conferencing web application is developed to delivers enhanced engagement for team collaboration. It incorporates gamification to boost work productivity. It provides a built-in speed test to detect network connectivity and agenda planner to enable the meeting focused on the topic at hand.

I am looking for ten volunteers to participate the usability testing and user acceptance testing. If you agree to participate, you will be invited into a virtual meeting in Discord and received a testing guideline. You will be requested to follow the testing scenario as provided perform the testing. During the testing, you will be requested to share your screen or open the web camera while performing the tasks. You may take a break as needed and stop your participant in the study at any time. Please let me know when you need a break. The usability testing and user acceptance testing will be on different date.

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<i>I have read and understand the information above and agree to take part in this testing. I am aware of my rights as a participant and have had all of my questions answered. My signature does not represent a granting of any legal rights. Furthermore, I understand that a copy of the informed consent form would be required for my records.</i>	
Name: LEE THUAN PIN	Signature <i>Chriss Lee</i>
Date: 24 April 2021	

Section A: Introductory Questions and Survey									
Name	Lee Thuan Pin		Gender	Male	Age	28			
Email	thuanpin.cme@gmail.com		Occupation	Leasing Executive					
Equipment used for testing									
Laptop		Macbook							
Web Browser		Safari							
Internet Connection		Unifi 30Mbps							
Do you use any video conferencing app for your work/ study? If yes, list out three of the video conferencing apps you've used before.									
1. Zoom			2. Google Meet						
For the past one week, how often have you use a video conferencing app for your work/ study?									
Everyday	<input type="checkbox"/>	4 to 6 days	<input type="checkbox"/>	2 to 3 days	<input checked="" type="checkbox"/>	0 to 1 day	<input type="checkbox"/>	Never	<input type="checkbox"/>

Section B: Test Scenarios
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Imagine that you are a user who want to use Meego video conferencing app for your team project. Hence, you are required to register yourself as a new user and login to the web application. What would you do to create a new account and login?
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Geminien Tan is one of your team members. You need to confirm the project details with her. However, with the newly created you need to add her to your contact list only can send her a message. What would you do to add her contact to your contact list? Hints: Her email address is geminientan@hotmail.com.
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Now, you wish to create a new room and a channel for the discussion of the team project. You wish to invite Geminien Tan to the room you created, what would you do?
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Scenario 6 – Create a schedule and plan the agenda
You wish to schedule for the next meeting and plan the meeting agenda. What would you do?
Scenario 7 – Manage profile
You wish to view your profile and edit your profile. What would you do to change your profile photo?
Scenario 8 – Carry out a speed test
You wish to know your internet connectivity before a meeting. What would you do to start a speed test?
Scenario 9 – Claim a reward
You wish to know your current point and claim a reward. What would you do?

Section C: User Satisfaction Survey						
Please rate the following statements.						
1- Strongly Disagree 5- Strongly Agree		1	2	3	4	5
1	I think that I would like to use this system for video conferencing.				✓	
2	I found the system/website unnecessarily complex.	✓				
3	I thought the system/website was easy to use				✓	
4	I think that I would need the support of a technical person to be able to use this system/website.	✓				
5	I found this system/website was easily moved through without a lot of backtracking or data re-entry.					✓
6	I thought there was too much inconsistency in this system/website.		✓			
7	I would imagine that most people would learn to use this website very quickly.					✓
8	I found the system/website very awkward to use.		✓			
9	I felt very confident using the system/website.			✓		
10	I needed to learn a lot of things before I could get going with this system/website.			✓		

Section D: Comments/ Feedback							
On a scale of 1-5, how would you rate your overall satisfaction with this system?							
Very Satisfied		Satisfied		Neutral	✓	Dissatisfied	
Which are the features you find helpful/like the most?							
Schedule and agenda planner							
Which are the features you don't find helpful/ like the least?							
None							
What is a feature you wish this system had?							
None							

APPENDIX B: Result of User Acceptance Test

Test No	Tester Name	Date
1	Ooi Han Wei	3/4/2021

Test Case ID	001	Test Form ID	F01
Testing Start Time:	8.15pm	Testing End Time:	8.16pm
Test Modules	Test Description	Status	Comments / Observations
a) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F02
Testing Start Time:	8.16pm	Testing End Time:	8.18pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F03
Testing Start Time:	8.18pm	Testing End Time:	8.23pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send	Pass	-

	message in the channel		
	Able to clear channel messages	Pass	-

Test Case ID	004	Test Form ID	F04
Test Scenario	Scenario 4 – Start a new conversation		
Testing Start Time:	8.23pm	Testing End Time:	8.26pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F05
Testing Start Time	8.26pm	Testing End Time	8.40pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F06
Testing Start Time	8.41pm	Testing End Time	8.45pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F07
Testing Start Time:	8.45pm	Testing End Time:	8.48pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F08
Testing Start Time:	8.48pm	Testing End Time:	8.49pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F09
Testing Start Time:	8.49pm	Testing End Time:	8.55pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
2	Thor Win Win	3/4/2021

Test Case ID	001	Test Form ID	F10
Testing Start Time:	9.00pm	Testing End Time:	9.01pm
Test Modules	Test Description	Status	Comments / Observations
a) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F11
Testing Start Time:	9.01pm	Testing End Time:	9.02pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F12
Testing Start Time:	9.03pm	Testing End Time:	9.08pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F13
Testing Start Time:	9.08pm	Testing End Time:	9.11pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F14
Testing Start Time	9.11pm	Testing End Time	9.27pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F15
Testing Start Time	9.28pm	Testing End Time	9.30pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F16
Testing Start Time:	9.30pm	Testing End Time:	9.37pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F17
Testing Start Time:	9.37pm	Testing End Time:	9.38pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F18
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	9.38pm	Testing End Time:	9.42pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
3	Cheah Xian Liang	4/4/2021

Test Case ID	001	Test Form ID	F19
Testing Start Time:	1.35pm	Testing End Time:	1.38pm
Test Modules	Test Description	Status	Comments / Observations
a) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F20
Testing Start Time:	1.38pm	Testing End Time:	1.39pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F21
Testing Start Time:	1.39pm	Testing End Time:	1.43pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F22
Testing Start Time:	1.44pm	Testing End Time:	1.48pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F23
Testing Start Time	1.48pm	Testing End Time	2.00pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
Able to leave meeting	Pass	-	

Test Case ID	006	Test Form ID	F24
Testing Start Time	2.00pm	Testing End Time	2.09pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F25
Testing Start Time:	2.09pm	Testing End Time:	2.17pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F26
Testing Start Time:	2.17pm	Testing End Time:	2.19pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F27
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	2.20pm	Testing End Time:	2.23pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
4	Cheah He Shun	2/4/2021

Test Case ID	001	Test Form ID	F28
Testing Start Time:	8.30pm	Testing End Time:	8.33pm
Test Modules	Test Description	Status	Comments / Observations
a) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F29
Testing Start Time:	8.33pm	Testing End Time:	8.35pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F30
Testing Start Time:	8.35pm	Testing End Time:	8.40pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F31
Testing Start Time:	8.41pm	Testing End Time:	8.45pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F32
Testing Start Time	8.45pm	Testing End Time	8.57pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F33
Testing Start Time	8.57pm	Testing End Time	9.00pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F34
Testing Start Time:	9.00pm	Testing End Time:	9.07pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F35
Testing Start Time:	9.07pm	Testing End Time:	9.08pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F36
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	9.08pm	Testing End Time:	9.10pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
5	Chong Khai Lin	3/4/2021

Test Case ID	001	Test Form ID	F37
Testing Start Time:	10.00pm	Testing End Time:	10.03pm
Test Modules	Test Description	Status	Comments / Observations
b) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F38
Testing Start Time:	10.03pm	Testing End Time:	10.07pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F39
Testing Start Time:	10.07pm	Testing End Time:	10.10pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-

	Able to clear channel messages	Pass	-
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Test Case ID	004	Test Form ID	F40
Testing Start Time:	10.10pm	Testing End Time:	10.13pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F41
Testing Start Time	10.13pm	Testing End Time	10.26pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F42
Testing Start Time	10.26pm	Testing End Time	10.31pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F43
Testing Start Time:	10.31pm	Testing End Time:	10.37pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F44
Testing Start Time:	10.37pm	Testing End Time:	10.39pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F45
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	10.39pm	Testing End Time:	10.42pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
6	Tin Hui Sim	28/4/2021

Test Case ID	001	Test Form ID	F46
Testing Start Time:	7.15pm	Testing End Time:	7.17pm
Test Modules	Test Description	Status	Comments / Observations
c) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F47
Testing Start Time:	7.17pm	Testing End Time:	7.19pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F48
Testing Start Time:	7.19pm	Testing End Time:	7.23pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-

	Able to clear channel messages	Pass	-
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Test Case ID	004	Test Form ID	F49
Test Scenario	Scenario 4 – Start a new conversation		
Testing Start Time:	7.23pm	Testing End Time:	7.26pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F50
Testing Start Time	7.26pm	Testing End Time	7.40pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F51
Testing Start Time	7.41pm	Testing End Time	7.45pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F52
Testing Start Time:	7.45pm	Testing End Time:	7.48pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F53
Testing Start Time:	7.48pm	Testing End Time:	7.49pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F54
Testing Start Time:	7.49pm	Testing End Time:	7.51pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
7	Won Wei Cheng	28/4/2021

Test Case ID	001	Test Form ID	F55
Testing Start Time:	8.00pm	Testing End Time:	8.01pm
Test Modules	Test Description	Status	Comments / Observations
d) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F56
Testing Start Time:	8.01pm	Testing End Time:	8.02pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F57
Testing Start Time:	8.03pm	Testing End Time:	8.08pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F58
Testing Start Time:	8.08pm	Testing End Time:	8.11pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F59
Testing Start Time	8.11pm	Testing End Time	8.27pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F60
Testing Start Time	8.28pm	Testing End Time	8.30pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F61
Testing Start Time:	8.30pm	Testing End Time:	8.38pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F62
Testing Start Time:	8.38pm	Testing End Time:	8.40pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F63
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	9.38pm	Testing End Time:	9.42pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
8	Tan Jing Ying	30/4/2021

Test Case ID	001	Test Form ID	F64
Testing Start Time:	8.35pm	Testing End Time:	8.38pm
Test Modules	Test Description	Status	Comments / Observations
e) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F65
Testing Start Time:	8.38pm	Testing End Time:	8.39pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F66
Testing Start Time:	8.39pm	Testing End Time:	8.43pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F67
Testing Start Time:	8.44pm	Testing End Time:	8.48pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F68
Testing Start Time	8.48pm	Testing End Time	9.00pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F69
Testing Start Time	9.00pm	Testing End Time	9.09pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F70
Testing Start Time:	9.09pm	Testing End Time:	9.17pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F71
Testing Start Time:	9.17pm	Testing End Time:	9.19pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F72
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	9.20pm	Testing End Time:	9.23pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
9	Lim Yong Kang	1/5/2021

Test Case ID	001	Test Form ID	F73
Testing Start Time:	1.30pm	Testing End Time:	1.33pm
Test Modules	Test Description	Status	Comments / Observations
f) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F74
Testing Start Time:	1.33pm	Testing End Time:	1.35pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F75
Testing Start Time:	1.35pm	Testing End Time:	1.40pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F76
Testing Start Time:	1.41pm	Testing End Time:	1.45pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F77
Testing Start Time	1.45pm	Testing End Time	1.57pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F78
Testing Start Time	1.57pm	Testing End Time	2.00pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F79
Testing Start Time:	2.00pm	Testing End Time:	2.07pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F80
Testing Start Time:	2.07pm	Testing End Time:	2.08pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F81
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	2.08pm	Testing End Time:	2.11pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-

Test No	Tester Name	Date
10	Lee Thuan Pin	1/5/2021

Test Case ID	001	Test Form ID	F82
Testing Start Time:	4.00pm	Testing End Time:	4.03pm
Test Modules	Test Description	Status	Comments / Observations
g) Registration and Login	Able to select sign-up form	Pass	-
	Able to register	Pass	-
	Able to login	Pass	-
	Able to enter user homepage after login	Pass	-

Test Case ID	002	Test Form ID	F83
Testing Start Time:	4.03pm	Testing End Time:	4.07pm
Test Modules	Test Description	Status	Comments / Observations
Contact	Able to create contact by filling the email	Pass	-
	Able to delete contact	Pass	-

Test Case ID	003	Test Form ID	F84
Testing Start Time:	4.07pm	Testing End Time:	4.10pm
Test Modules	Test Description	Status	Comments / Observations
Room and Channel	Able to create room	Pass	-
	Able to view all the room	Pass	-
	Able to add channel to room	Pass	-
	Able to add member to room	Pass	-
	Able to view member list	Pass	-
	Able to send message in the channel	Pass	-
	Able to clear	Pass	-

	channel messages		
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Test Case ID	004	Test Form ID	F85
Testing Start Time:	4.10pm	Testing End Time:	4.13pm
Test Modules	Test Description	Status	Comments / Observations
Private Conversation	Able to send message	Pass	-
	Able to receive message	Pass	-
	Able to clear chat message	Pass	-

Test Case ID	005	Test Form ID	F86
Testing Start Time	4.13pm	Testing End Time	4.26pm
Test Modules	Test Description	Status	Comments / Observations
Meeting	Able to create meeting	Pass	-
	Able to turn on video camera	Pass	-
	Able to turn off video camera	Pass	-
	Able to turn on audio	Pass	-
	Able to turn off audio	Pass	-
	Able to see another user video	Pass	-
	Able to hear another user speak	Pass	-
	Able to view meeting information	Pass	-
	Able to use whiteboard	Pass	-
	Able to view participant list	Pass	-
	Able to send chat	Pass	-
	Able to leave meeting	Pass	-

Test Case ID	006	Test Form ID	F87
Testing Start Time	4.26pm	Testing End Time	4.31pm
Test Modules	Test Description	Status	Comments / Observations
Schedule and Agenda	Able to create a schedule	Pass	-
	Able to add meeting agenda details	Pass	-
	Able to edit agenda details	Pass	-
	Able to delete agenda details	Pass	-

Test Case ID	007	Test Form ID	F88
Testing Start Time:	4.31pm	Testing End Time:	4.37pm
Test Modules	Test Description	Status	Comments / Observations
Profile Management	Able to view profile	Pass	-
	Able to change profile info	Pass	-
	Able to change profile photo	Pass	-
	Able to change password	Pass	-

Test Case ID	008	Test Form ID	F89
Testing Start Time:	4.37pm	Testing End Time:	4.40pm
Test Modules	Test Description	Status	Comments / Observations
Speed Test	Able to carry out a speed test	Pass	-
	Able to view speed test result	Pass	-

Test Case ID	009	Test Form ID	F90
Test Scenario	Scenario 9 – Claim a reward		
Testing Start Time:	4.40pm	Testing End Time:	4.42pm
Test Modules	Test Description	Status	Comments / Observations
Reward	Able to view points	Pass	-
	Able to claim reward	Pass	-