



Final Year Project

**CENTRALIZED SCHEDULING SYSTEM FOR LAB BOOKING AND
LECTURER'S CONSULTATION HOUR**

By

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Abstract

The main purpose of this project is to develop an android application “MScheduling” for centralized scheduling system to provide convenience in scheduling lecture time-table, available computer lab booking, lecturer’s consultation hour booking. This application would be helping students in an easier way to book the consolation hour with the lecturers. Moreover, it will also help lecturers to reduce time to set their available consultation hour and available IT lab booking.

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CHAPTER 1: INTODUCTION TO THE STUDY

1.1 Background to the project

Scheduling time for lecturers and lab booking system is one of the most important administrative activities that take place in all academic institutions such as APU. The centralized scheduling system is an online based system that allows student to book consultation hour with lecturer to solve their problems and queries outside the class timetable. This centralized scheduling system will also help lecturer to book available computer lab and availability of their consultation hour with the student through an android application. In this system access is provided to both staff and student.

This android system considered more user-friendly than current web-based system. Security and integrity are well maintained within centralized scheduling system. This system would be facilitating both the student and the lecturer. In this system a Student can book his consultation hour with the lecturer and lecturer can book available computer lab for any additional classes or any changes of lab classes. There would be an auto generated email processing system in this centralized scheduling android application. once the booking has been confirmed or canceled an auto generated email will be reached to both student and the lecturer.

Currently lecturer scheduling system doesn't provide lecturer timetable and available consultation hour in a single web-based system. It doesn't synchronize with the system. So, lecturer need to open multiple tab for setting their available consultation timetable for the student where they need more time to do it. On the other hand, the proposed system would be showing the class timetable to the lecturer in an android application system that they can be setting up their available consultation hour in an easier way for the student. Moreover, this system will help the student to see lecturer's profile, their email address and the office address.

The main purpose of this project is to develop an android application for centralized scheduling system to provide convenience in scheduling lecture time-table, available computer lab booking, lecturer's consultation hour booking. This application would be helping students in an easier way to book the consolation hour with the lecturers.

Moreover, it will also help lecturers to reduce time to set their available consultation hour and available IT lab booking.

1.2 Problem context

This centralized scheduling system would be the perfect platform of booking lecturer's consultation hour and lab booking for any additional or replacement classes. Currently at Asia Pacific University (APU) consultation hour booking system is called 'staff consultation hours system' in the webspace. There are some features need to be enhanced for this project in an android application system to make it more user-friendly. In the webspace if lecturers want to set their available consultation hours, they need to open multiple tab for seeing their timetable and their available consultation hours which is very complicated and time effective. Everyday a lot of student book consultation hours with the lecturers at Asia Pacific University (APU). So, it is very important to maintain the lecturer's consultation hour booking system in a well-managed and user-friendly way.

High number of students:

Due to the high number of lecturers to student ratio and with the limited time and lecture scope, it is not possible for the students to address all their queries in the classroom. Therefore, they require additional consultations with lecturers to address their issues. It becomes almost impossible for the lecturers to give effective feedback for everyone. In some instances, students could be performing well in some subjects but struggling in others, so they might need to book a consultation hour with the lecturers outside the classroom.

Additional IT lab booking issue:

Moreover, if any lecturer changes their lab class timetable or cancel any lab class, then the lecturer needs to take a replacement class, or an extra class for covering that module on time but there is no option for the lecturers to book an IT lab class in the current system. For this reason, lecturer need to go or send email to the admin people for booking an IT lab class if any lecturer need. Lecturer does not have any direct access to book the lab classes without going or sending email to admin staffs. The proposed system would be facilitating for booking an IT lab class directly from the centralized scheduling android application system which would be very helpful for the lecturers.

Modification and changing difficulties:

Maintaining time is very important for both the lecturers and the students for the academic purpose. A student or a lecturer can cancel or modify their consultation timing for some reason. There is no option of modifying consultation timing in the current system, they can only cancel the appointments. On the other hand, student who cancel or want to re-book the consultation hour again with due to have that lecturer's busy schedule it's very difficult to get that lecturer's consultation hour again. So, the proposed system would be allowing the students and the lecturers to modify the appointment timing without doing cancelation. If there is any modification or cancelation on timing an auto generated email will send to both the lecturer and student. In addition, if anyone cancel or modify the consultation timing, they need to write the valid reason of cancelation or modification, that both can be satisfied and planed accordingly for their other work which is not facilitated in the current system.

1.3 Rationale

According to the problems stated before, having a user friendly and well managed centralized scheduling system can be a solution. In present days students and lecturers both want the centralized scheduling system (lecturer's consultation hours and IT lab

booking) to be easier to access and time effective. “MScheduling” is an android mobile application which will achieve the necessities of both the students and the lecturers. The mobile application will cover the requirement of both the lecture’s consultation hour booking and IT lab booking. Student will get the benefit of booking lecturer’s consultation hour easily and this system will also help the lectures to book available IT lab instead of going or sending mail to admin. The benefits of using the application is massive.

1.4 Potential benefits

1.4.1 Tangible benefits

There are tangible benefits of this system are given below:

- Students do not need to browse website for booking the lecturer’s consultation hour.
- Students can see the lecturer’s profile and office address.
- Students would always have the access to modify the consultation timing with lecturers.
- Lecturers don’t need to visit admin for booking available IT lab.
- Reduce workload of the lecturers and the admin staffs. Admin stuffs do not need to help all the lecturers separately.

1.4.1 Intangible benefits

There are some intangible benefits of this project are given below:

- Influence on more students to come to the lecturer for consultation hour by making the process of the scheduling system easier and user friendly.
- Improve the student-lecturer relation between them and an efficient learning system.

- Reduce the complication of lab booking system and give an easy access to reduce lecturers wasting time on booking IT lab.

1.5 Target User

The target user of this proposed system are students, lecturers and admin.

1.6 Scope and objectives

1.6.1 Aims

The aim is to develop an android application and enhance the features of existing lecturer scheduling system which is used in APU by integrating IT Lab reservation, and Consultation Hour Booking.

1.6.2 Objectives

The objectives of this project are,

- To find out the problems which are faced by the lecturers and students while booking an IT lab or consultation hour and provide best solution based on the problem
- To develop an android application for centralized scheduling system which would be helping for lecturer's consultation hour booking and IT lab reservation
- To design user-friendly interface in centralized scheduling system that everyone can use it without having any issues
- To create live chat system between lecturers and students for improving the communication
- To make an option for student for giving rating and feedback about the consultation hour which will improve the study system in a better way

1.6.3 Deliverables

Centralized scheduling system is an online android mobile application which helps lecturers and students to book consultation hour and available IT lab with some additional features. After successfully making this application they no longer be suffering of facing any problem for using this application which they experienced before. An android device is required for the user to run this application. The main activities of this application are to give a connivance and easy way to book lecturer's consultation hours and IT lab booking.

Some of the functionalities of this proposed application are given below:

- To allow user log in the system (students/lecturers)
- To allow user to log out from the system (students/lecturers)
- To allow students to see the available consultation hour (students)
- To allow user to modify their consultation hour (students/lecturers)
- To allow user to cancel their consultation hour (students/lecturers)
- To allow students to give feedback on consultation hour (students)
- To allow lecturer to book available IT lab. (lecturers)
- To send email notification if there is any modification and cancellation (students/lecturers)
- To allow users to communicate among them by creating live chat system. (Students/Lecturers)
- To allow admin to setup the lab timetable (admin)
- To allow admin to communicate with the lecturers by live chat system (admin)

Besides that, the additional features of the system are given below:

- To allow user (students) to view lecturer academic prolific information that they can communicate easily with the lecturers.

- To allow user tracking of meetings and appointments, and contact lists

Apart from that, the special features of the system will be added if there is any extra time:

- To allow users to get the mobile SMS notification once the booking has been made or cancelled.
- To create an automatic email notification system for student and lecturer in the event of any changes in consultation timing that will help the user to plan accordingly

1.6.4 Nature of Challenges

It's not an easy task to make an android application for centralized scheduling system. Firstly, it's very important to select the appropriate programming language for making this android mobile application. As every programming language has their exact functionalities and usability. Secondly, it's another important thing for the developer to learn the specific language to develop a user-friendly application that the developer can ensure to the user that there is no way of facing difficulties while they will be using the system. Moving on to the next phase, the database is going to be another challenge for this project. Lastly, security maintenance is one of the most important things in this application. The developer must learn how can developer make it secure. It becomes a popular way to make an android application by using android studio where the developer can implement java language as well.

1.7 Overview of this Investigation report

Chapter 1:

For the proposed system the project has started with the introduction to the study. In this chapter the background of the project has explained. The identified problem of the Centralized Scheduling system for Lab booking and Lecturer's Consultation Hour has described in the problem context. The potential benefits of the project, which is divided into tangible and intangible benefits, has explained in chapter 1. This chapter will also have scope and objectives, which contains aims and objectives, functionalities of the proposed system and the nature of challenges.

Chapter 2:

Literature Review will be written in chapter 2. There are mainly two chapter in the literature review which are the domain and the technical research. In chapter 2 domain research will be briefly described. Domain research contains the information of the current system as well as other similar system. In the domain research part, there will be comparison between similar system and the proposed system. Finally, there will be the summary of whole chapter.

Chapter 3:

This chapter will be written based on technical research section on literature review. In the technical research part there will be the information and comparison between programming language, methodology, Database, operating system, libraries and other important sectors for the proposed system. The selection and justification of the chosen programming language, database and methodology will be included in this chapter. In the end, there will also be a summary of chapter 3.

Chapter 4:

The system development methodologies will be described in this chapter which are related to the chosen methodologies. The comparison between the methodologies and also the justification of choosing one methodology will also be there. The diagram will be provided related to the methodology in chapter 4.

Chapter 5:

The information of the research method of the project would be containing in chapter 5. In this chapter the project quality and deliverables will be explained briefly. The selection and justification of data collection method will be described in this chapter. In this chapter the process of taking the interviews, questionnaires, surveys and the proper documentation and format of the questions will be provided in this chapter.

Chapter 6:

The analysis of the data and information which have been collected from the questionnaires, surveys and interviews.

Chapter 7:

This is the last chapter of this investigation report. Chapter 7 will be based on the conclusion and reflection of the whole project plan and investigation report.

1.8 Project Plan

Gantt chart is created for project planning and attached in appendices.

CHAPTER 2: LITERATURE REVIEW

2.1: Introduction

There are many researches that have been conducted regarding the interaction and consultation between the students and the lecturers. The consultation between students and lecturers brings the positive relationship in the education environment that enables the students for having a better personalization and academic skill. It also helps student to feel safe and secure in their learning environment (Nasution, 2015).

Domain research and technical research are two focus areas in literature review that is related to centralized scheduling system for lab booking and lecturer's consultation hour booking system for furthermore understanding of the study. The system is accessible from an android device as it is going to be developed for any android devices. The student can book the lecturer's consultation hour from their android phone which will help them to reduce time and without facing any difficulties. The student can also chat with the lecturers from the system which is going to be developed is an online android application. For student who needs to contact with lecturers, LiveHelp offers real-time support through multiple means including live chat and SMS-text messaging. Messaging will be used for administrative support and to get lecturer help from student with queries. On the other hand, lecturer can manage the IT lab reservation from the application. It will save their valuable time and reduce their work. The lecturer can easily access to the database for updating their available consultation slot for the student. The system will be user-friendly so that the user can access without facing any difficulties. Besides that, the android application would be allowing users to cancel and modify the consultation hour.

2.2: Domain research

In the present APU centralized scheduling system for lab booking and lecturer's consultation hour is web-based system and only accessed through Webspace which is more complicated than the proposed android application system. Thus, almost all solutions need a light-weight design to ensure a long system life time and less manual input. In addition, users desire user-friendly interfaces, flexible and intuitive solutions, security support concerning access and data storage, and mobility support (Schmitt, et al., 2016). In this fast and modern world, devices are becoming smaller and more portable with the evolution of technologies. Recently devices are becoming more portable and smaller in this modern world with the evaluation of technologies. All the requirements will be fulfilled by the proposed "Mscheduling" android mobile application which is going to be developed for centralized scheduling system for lab booking and lecturer's consultation hour in APU.

Mobile Devices

A literature search was conducted using ScienceDirect to find out the factors that may be associated with mobile phone. According to statistics in 2009, 2.52 billion mobile applications were downloaded worldwide. In addition, e-commerce and the social network development simulates the evaluation of the mobile operating systems (Android, iOS, windows, etc.). For example, the quantity of use application in Google play store is 1.600.000 and the quantity of application in windows phone store is 340.000. Mobile technologies ended up became wide spared, users will be more inspired to use more portable device and interfacing with mobile applications. Science 2014, 3600 million of users are subscribed in mobile services (Ines, et al., 2017).

Alongside web and internet, smart phones have picked up fame because of their location awareness, accessibility, and portability. Simultaneously, the regularly expanding interest for different kind of mobile applications running on various devices has prompted an increasing demand in mobile developers and competitive mobile application markets (Genc-Nayebi & Abran, 2017).

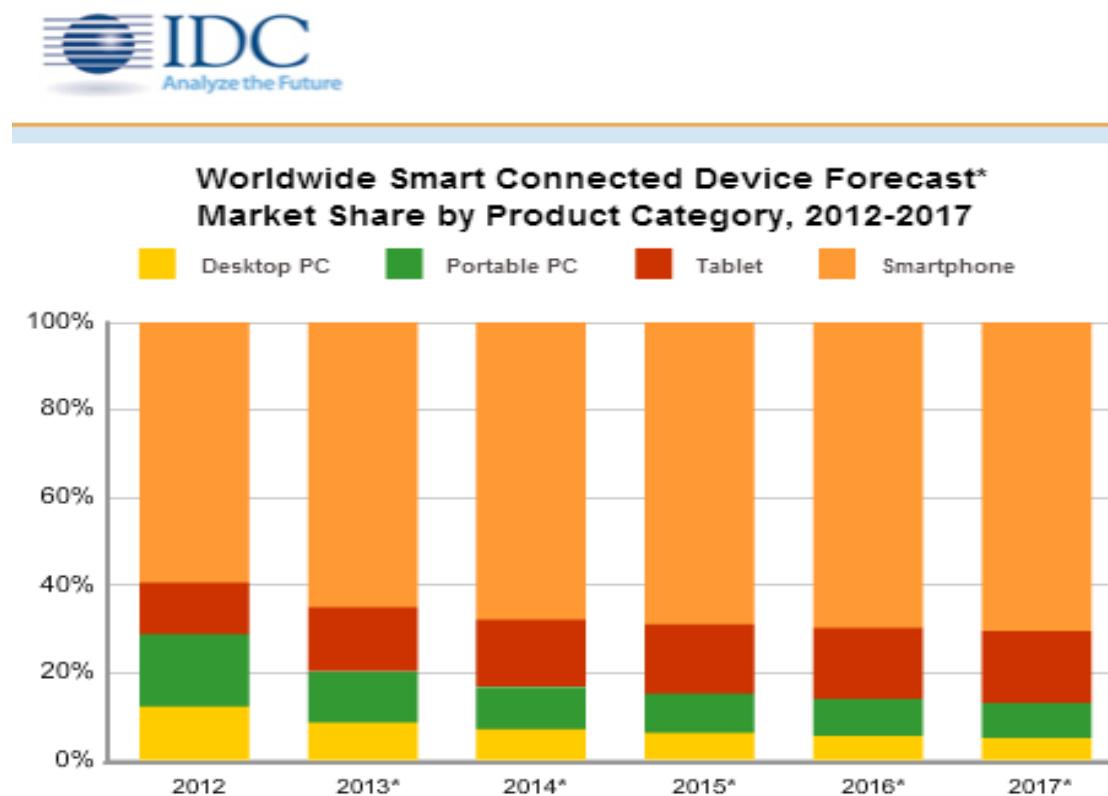


Figure 1 Worldwide smart connected device forecast (Forbes.com. 2018)

The mobile or the smartphone users are increasing rapidly all over the world. So, from the findings mobile device is very easy and convenient to use which is an important reason for developing the android mobile application for centralized scheduling system ('MScheduling').

Consultation Hour Booking

To get direct help from lecturer outside class, consultation hour is very important for the students. Net four-tier architecture to the appointment management handling in the university/college environment. A Web based appointment management system called WBAMS is designed and implemented so that students and lecturers can arrange meetings in an effective and efficient way (Ming Lu & Ab Hamid, 26 December 2007).

E-appointment is closely related to electronic booking, electronic reservation and other types of internet-mediated agreements on relations between time periods and resources in focus. Even though there is no clear-cut distinction, one could say that e-appointment emphasizes the agreement between two or more partners as social subjects while reservation and booking rather refers to physical resources (e.g. presentation room) or impersonal and/or highly standardized services (e.g. flight, secondary care treatment) (Klischewski, 2003). The system allows students and lecturers to simply gain access to the system by connecting to the Internet. It also enables students to drop any message which consists of the purpose and time of the appointment. This will enable an android application to be robust, cheap and capable of operating on various platforms. The system does not only fully automated, and perform excellently well, but also user-friendly, time effective and efficient (Ridwan, et al., 2016).

One common software that be used to achieve this is Microsoft Outlook. But still there are some drawbacks which include human involvement towards recording of appointment, cancellation, confirmation and reschedule etc. Of course, these systems possess one advantage which is the automatic reminder only. Though ICT has played a good role in appointment scheduling, still there is no automation in appointment scheduling system (Parchment1 & Sankaranarayanan , 2013)

Based on research an institution uses consultation hour booking system to get some benefits such as See upcoming consultations, book consultations, see the consultations that has already booked, cancel or make changes to the consultations hour etc. Shockingly, numerous issues happen while implementing the manual consultation system that causes the low number of students who go to their lecturers for

consultation. It has been found that rarely students meet their lecturer due to face difficulties and no idea about how to set an appointment with lecturer. Only a few student use consultations booking system that is provided by the university because they do not know how to book lecturer's consultation hour. As a new platform it is suggested by researcher to develop an android application system for lecturer's consultation hour booking which is going to be replaced the current system with an advanced system that will contribute for developing a better educational environment and improving student-lecturer relationship.

IT Lab Reservation System

The lab booking system can be designed and implemented through the investigation and analysis on the need of the management of the laboratory in Xinzhou Teachers' College. With the auxiliary of the website news model, the system has realized the operation of four functional models: registering, appointment of users, messages of users and backstage management. The realization of the system will be conducive to the modern management of laboratory (Li_min, et al., 2003)

A multilayer feed forward neural network is trained on speech examples with known reverberation times generated by a room simulator. The speech signals are preprocessed by calculating short-term rms values. A second decision-based neural network is added to improve the reliability of the predictions. In the retrieve phase, the trained neural networks extract room reverberation times from speech signals picked up in the rooms to an accuracy of 0.1 s. This provides an alternative to traditional measurement methods and facilitates the occupied measurement of room reverberation times (Darlington, et al., April 1, 2001).

From the findings, it aims to provide an efficient and convenient way of reserving rooms for all the individuals involved. By hosting the service online, the entire flow of the reservation system will not be greatly affected by the absence of important individuals. online booking system should have at least one screen where we can see the availability very quickly and clearly. By this proposed 'MScheduling' android

application it will be an easy platform for the lecturer to book available computer lab from the system which would be helping to save time and reduce work.

Live Chat

According to, (Nam Kim, et al., 2010) recently live chats have received attention due to the growing popularity of chat services and the increasing body of applications. For example, large organizations are increasingly providing support or information services through live chat. Live chat between the lecturers and students will help them to address their short issues and quires outside the class timetable through ‘LiveHelp’ option that is going to be developed in proposed (MScheduling) application.

Online chat may refer to any kind of communication over the Internet which offers an instantaneous transmission of text-based messages from sender to receiver; hence the delay for visual access to the sent message shall not hamper the flow of communications in any of the directions. Several researchers have addressed the effectiveness of e-mail as a customer support tool (Millar 2001) and (Kannan 2011). Other has discussed online (not real-time) customer support such as filling out a form or browsing help menus. But very little research was found to discuss the effectiveness of “Live Support Chat” (Lindsay 2009), although it is an important new trend in online service because it solves users’ problems and concerns instantly on the spot. LiveHelp is an affordable live chat platform that delivers instant interactivity, information and support to the student.

LiveHelp will give a proper academic way to both the lecturer and student that they can message with each other in a simple, organized dashboard. Lecturers can easily transmit class materials or point students to an online knowledge resource. Even when the lecturer is not online, students can ask course questions and request a callback through Chat, email, or text. In APU It will improve the relationship and understanding between lecturer and student in a collaborative way which is an important thing for the better educational environment. LiveHelp will be used for administrative support, and to get lecturers help from students with questions.

Client-Server Model

In the recent computing world, Client-Server system becoming so popular all over the world because it is being used virtually every now and then for different applications. Some of the standardized protocols that client and servers use to communicate with themselves include: File Transfer Protocol (FTP), Simple Mail Transfer Protocol (SMTP) and Hypertext Transfer Protocol (HTTP). Thus, Client-server system can be defined as a software architecture made up of both the client and server, whereby the clients always send requests while the server responds to the requests sent. An inter-process communication has provided by the client server because it helps to exchange of data for both the client and server and each of them functions differently (Ridwan, et al., 2016). Nevertheless, the architecture of the Web is the Client-Server model, in which accordingly the correspondence between the customer and server is the principal thing we should be concerned about

For the proposed ‘MScheduling’ system client-server architecture has been used for user login and registration purpose. The user needs to enroll with their accreditation to login into the system. The user will be enlisted in the server. Afterward, the system will approve the user email and password from the server and approve or reject the user

2.3: Similar System/s

“UniConnect” Application

UniConnect is an android application that has been found through research and it has few similarities to the proposed system. This UniConnect android application is developed by Professor Dr. Syed Akhter Hossain who currently working as a professor in Daffodil International University.

Application Functionalities

Firstly, from the google play store the application needs to be download and installed in an android device. User need to be registered to get access to log into the system. There is a login interface that the user needs to type the user name and password to log into the system. After installation the application user can log into the system and see the functionalities. In this application the different functionality has been added based on user type.

It is a platform where lecturer can-

- Make their work schedule / Class routine
- Add reminder
- Contact with student
- Create groups of students
- Make Announcement
- Create Notifications
- Answer to students' questions
- Give appointment

And student can-

- Make class routine
- Ask question to teacher
- Request for appointment
- See when his/her expected teacher is available
- Join in a group

Additional Functionalities

Students can upload their picture to the profile as identity that lecturer can easily identify the students.

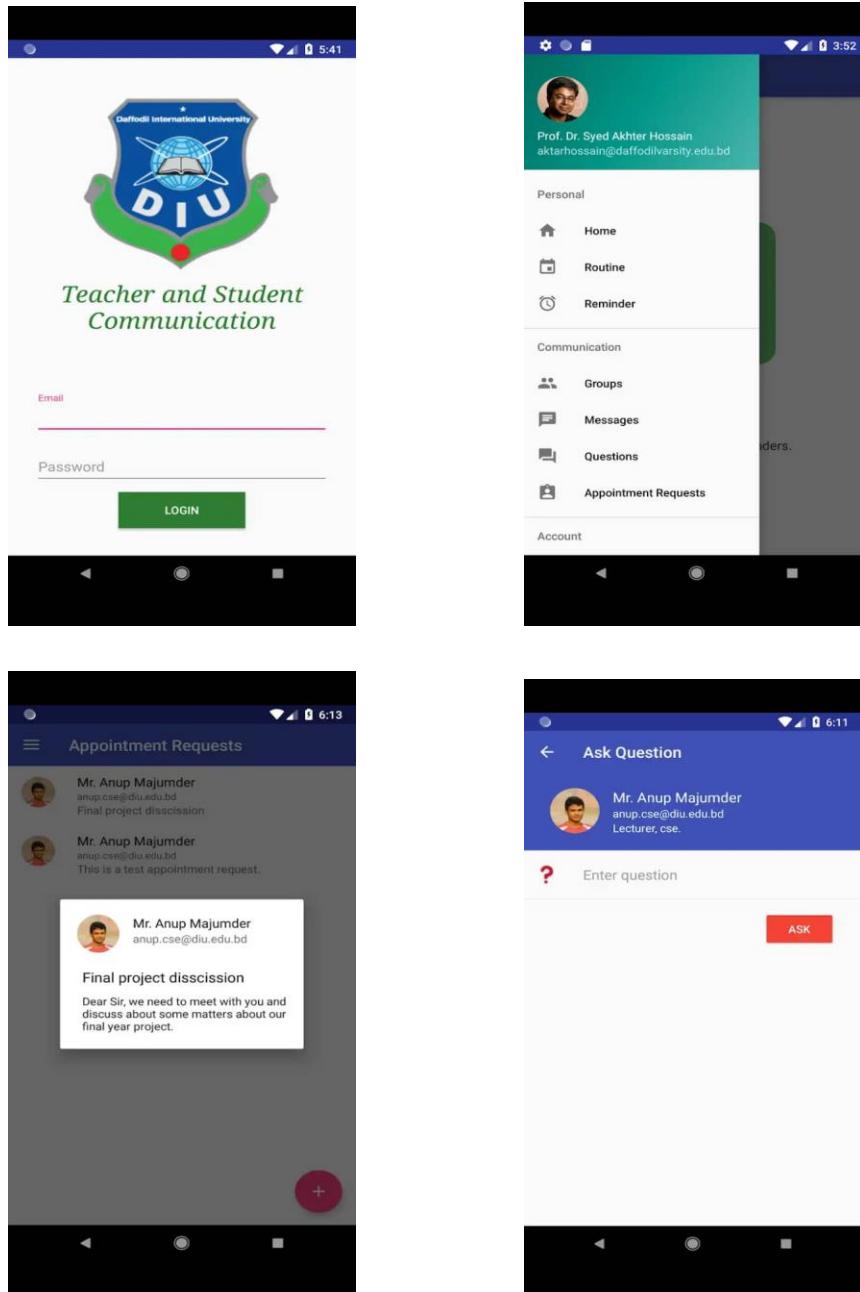


Figure 2 UniConnect application screenshot

“UMM Appointment” Application

UMM Appointment is an android application that has been found through research and it has few similarities to the proposed system. This UMM Appointment android application is found in google play store.

Application Functionalities

Appointment UMM is a mobile application that works on android platform. This application was created to facilitate the scheduling of Final guidance, or consultation with the faculty staff. This application can be used by faculty and students. With this application is expected lecturers can estimate the time and be able to estimate the density of the queue students who wish to undertake coaching or consultation. So that guidance can be carried out in accordance with the number of students who have already made an appointment and in accordance with the scheduled time.

Additional Functionalities

In this application students are allowed to provide feedback or give rating based on their consultation hour. Both the student and lecturer get a notification once the consultation hour booking has been made. In the user interface there is a login option based on the type of student.

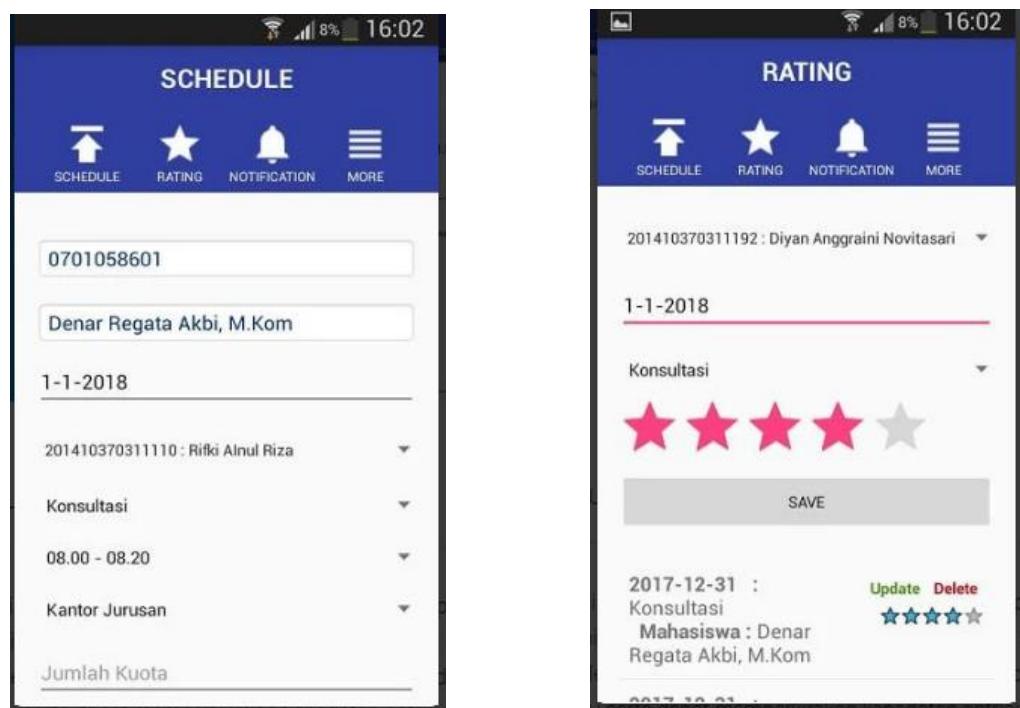


Figure 3 UMM Appointment application

Differences between the proposed system and similar systems

Functionalities	UniConnect	UMM Appointment	MScheduling
Modify or cancel consultation hour	Not available	Not available	User can modify or cancel their consultation hour.
IT lab Reservation	Not available	Not available	Lecturer can book IT lab through this system.
Live chat	There is an option for chat between the user but not in real-time.	Not available	Lecturers and students can interact with each other in a real-time online live chat system.
Rating on consultation hour	Not available	Available	Student can give the feedback on their consultation with lecturer.
Email Notification	There is no email automatic notification service once the booking has been confirmed or cancelled.	There is no email automatic notification service once the booking has been confirmed or cancelled.	User will get notification in event of consultation hour booking or cancellation.

Table 1 Differences between the proposed system and similar systems

2.4: Summary

In the domain research it is clear that the using of mobile devices are incising significantly all around the globe. The huge demand of android mobile phone is increasing massively in the market which is found by the researcher. The importance of live chat briefly discussed in the domain research and the advantage of choosing live chat into the proposed system can bring a revolutionary change in the educational environment. A Client-Server model correspondingly researched from different aspects through the domain research. In the proposed system there are many valid reasons of choosing client-server model. Throughout the domain research the reason has been clarified.

To determine the better functionalities and options for the proposed system different type of similar android application has been researched for Centralized Scheduling System for Lab Booking and Lecturer's Consultation Hour. This is to ensure that all students who has no idea about how to book consultation hour, they can use this application without having any kind of trouble.

CHAPTER 3: TECHNICAL RESEARCH

Mobile Application Development

3.1: Programming language chosen

In many respects, developing mobile applications is similar to software engineering for other embedded applications. Common issues include integration with device hardware, as well as traditional issues of security, performance, reliability, and storage limitations (Wasserman , 2010). In the major mobile platform there are some comprehensive programming environment available. For example, Android Development Tools plug-in can be used by the developers for Eclipse programming environment.

There are two type of processes are available for mobile application development in view of the immense fracture of stages and devices. Native Applications are the projects that is based on a specific stage. It very well may be Android, Windows or iOS. As Native applications are worked for a single stage, it can take almost every advantage of the most recent operating system technologies and features that has been installed just for that stage, for example, camera resolutions and the GPS.

On the other hand, A cross-platform application is a mobile app which is compatible with multiple operating systems and can therefore run on any smartphone or tablet. Cross platform application can work in several types of operating environments. Cross-platform also known as multiplatform or platform independent it means the application can work in Android, windows and iOS.

“Centralized Scheduling System for Lab booking and lecture’s consultation hour (MScheduling)” is a native mobile application. “MScheduling” can be developed in many platforms such as iOS, Windows and android application. For developing the application each platform needs identified and specific programming language. Based on increasing numbers of user a native application and the platform of android has been chosen for developing the proposed system “MScheduling”. There are basically two

kind of programming language are offered to develop an android application. Kotlin and Java are mainly focused and well known for developing android application.

The comparison between Kotlin and Java are given below:

	Kotlin	Java
Developed By	Kotlin was developed by JetBrains. Andrey Breslav was team leader of project Kotlin. First version of Kotlin was released in 2016.	Java was developed by Sun Microsystems which was later acquired by Oracle Corporation. James Gosling was the lead developer of Java. First version of Java was released in 1995.
Operating System	Multi-platform	Multi-platform
Code Size	In Kotlin we have to write 30-40% less code as compared to java	In Java we have to write more code as compared to Kotlin.
Null Safety	Kotlin does not have null pointer exception problem. Various ways are provided to deal with this exception.	Null Pointer Exception is most common problem in java that is occurred when we try to access a member having null reference.
Features	Encapsulation, inheritance, data hiding, polymorphism	Distributed, Simple, interpreted, secure, portable, architecture neutral

Checked Exception	Kotlin doesn't have the check exception feature.	Java have checked exception feature.
Use of semicolon	It is optional to write semicolon at the end of statements	In java each statement must be terminated by semicolon
Filename Extensions	.kts, .kt	.jar, .class, .java

Table 2 The comparison between Kotlin and Java

During the development of system every programming language has some advantages and disadvantages. For the Kotlin and Java programming languages the advantages and disadvantages are given below:

Kotlin

Advantages

- Increases team efficiency.
- It can be written in any command line or java IDE.
- Compiles with existing java code.
- Avoid the errors such as, null pointer exceptions.
- Easily Maintainable and less buggy.

Disadvantages

- Limited learning sources.
- Kotlin doesn't have checked exception feature.

- Kotlin doesn't have checked exception feature.
- Scarcely any Kotlin expert to hire.
- Kotlin compiles slower than java.
- It has very smaller developer society.

Java

Advantages

- Java is simple, free, distributed, object-oriented, supports multithreading and offers multimedia and network support.
- Being highly popular at embedder, networking level and enterprise, java has a large active community and support available.
- Java has powerful development tools like Eclipse SDK and NetBeans which have debugging capability and offer integrated development environment.
- Relatively seamless compatibility from one version to the next.
- Java has that function to store data and restore those data easily, which is known as stack allocation system.
- Increasing language diversity, evidence by combability with java with Scala, JRuby, Groovy and Clojure.

Disadvantages

- Java architecture code is insufficient
- Language limited latency critical tuning
- Performance is comparatively slower and takes more time
- The database is more complex
- Java takes more memory space

Justification

Java seems the most appropriate language after the analysis of disciplines, features, advantages and disadvantages of both Kotlin and Java languages. Without any doubt it can say java is more useful programing language to develop the proposed system

(“MScheduling”). Java is a secured, portable and an object-oriented programming language which will be more suitable for the proposed system. Java is most usable language with the possible functionalities and features for developing any android application though it consumes more spaces than other languages.

3.2: IDE (Interactive Development Environment) chosen

An integrated development environment (IDE) is a software suite that combines the basic tools that developers need to write and test software. Characteristically, an IDE contains a code editor, an interpreter or compiler and debugger that the developer accesses over a single graphical user interface (GUI). An IDE may be including as part of one or more existing and compatible applications or may a standalone application. Over the past five decades, desktop IDEs have become mature and are now prevalent in modern software engineering. They provide tools for working with a wide range of languages, combined with facilities for version management, issue management, and so on (Kats, et al., 2012). IDE provide valuable services in the appropriate platform such as, content assist, graphical debugging, refactoring, semantic highlighting and so on. To access of Android’s features, one needs to develop app using tools such as Android studio, which is provided by Google as a full-fledged development environment for Android development, debugging, packaging and testing (A. Allison , 2016).

As “MScheduling” is an android app it would be better to develop the app with the help and support of Android Studio and Android SDK as the IDE. For developing an android application android studio has a lot of functionalities including more additional features and Android studio is built on JetBrain’ IntelliJ IDEA software.

Android studio has huge flexibility and suitable operating system for macOS, Linax, windows. The first commercial version of android studio was released on September 23, 2008. But the version history of mobile operation system started with the release of the Android beta on November 2007.

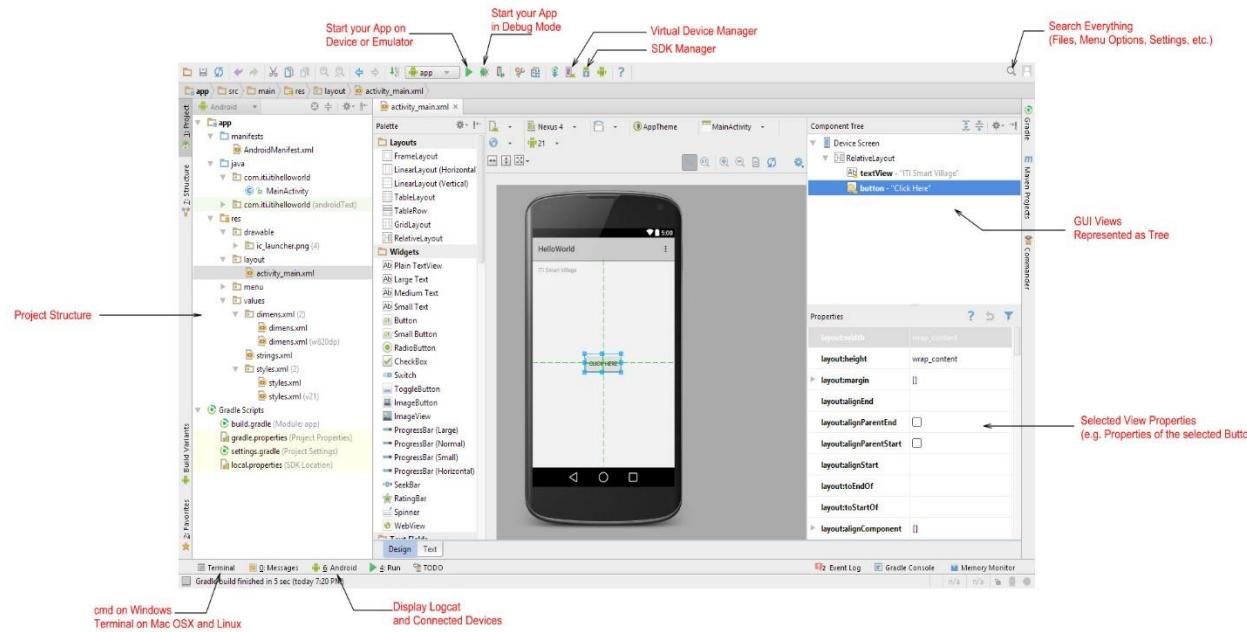


Figure 4 Interface of Android studio

Advantages of Android Studio

- In order to check the performances and compatibility developers can check one application in multiple devices with different specifications.
- Android studio support the flexible griddle-based build system.
- Free to download on multiple platform.
- Emulator allows developers to observe app behavior on simulated devices.
- Many code templates are available in android studio, which helps to build common features in application.
- Code writing for android become more easier, faster accurate and through android studio.

Disadvantages of Android Studio

- The interface has an old feel.
- Emulator can run very slow at time in windows rather than macOS and Ubuntu.
- Very little documentation and support.

Apart from these disadvantages, there are some huge advantages and more useful features in android studio that will help the developer to build and design a user-friendly application in an appropriate way. So, the developer has chosen Android studio as a platform of developing the proposed app “MScheduling”.

3.3: Database Management System chosen

To develop the proposed system “Centralized Scheduling System for Lab booking and lecturer’s consultation hour (MScheduling)” there are three types of database management system have been chosen. MySQL, SQLite and Firestore are the three chosen database management system for the proposed “MScheduling” app.

The comparison is given below among the database management systems:

	MySQL	SQLite	Cloud Firestore
Developer	Oracle Corporation	D. Richard Hipp	Andre Lee, James Tamplin
Database Size	Medium	Small	Large
Operating System	Cross-platform	Cross-platform	Cross-platform

APIs and other access methods	<ul style="list-style-type: none"> • ODBC • JDBC • ADO.NET 	<ul style="list-style-type: none"> • DB-API 	<ul style="list-style-type: none"> • IOS • Android • RESTful HTTP API • JavaScript API
Programming languages (for development of database)	C, C++	C	
Advantages	<ul style="list-style-type: none"> • Database is encrypting the password and secured • MySQL is very easy to install and use • MySQL cost effective for the developers because it is free to use 	<ul style="list-style-type: none"> • System directly reads and writes • Before using SQLite, it doesn't need any installation or setup process • Source codes are design to be accessible and readable to the developers 	<ul style="list-style-type: none"> • Very faster and richer queries • More intuitive model than SQLite and MySQL • Automatically validates data • Automatically scales the data

			<ul style="list-style-type: none"> • Easy to organize the hierarchical and complex data • Scales better than other real time
Disadvantages	<ul style="list-style-type: none"> • Development is not community driven and it has lags • There is a stability issue in MySQL • Database is not supportive for the application with large database 	<ul style="list-style-type: none"> • Very small database size • Less features than MySQL and Firestore 	<ul style="list-style-type: none"> • There are no disadvantages for Cloud Firestore until now

Table 3 The comparison among the database management systems

3.4: Operating System Chosen

Operating system chosen is one of the most important tasks of this proposed system. There are many operating system already been developed in this modern era such as, iOS, Android, Windows, Blackberry etc. Android operating system is one of the most popular operating system developed by google. Android was initially released on 23rd

September 2008. Android is an open source operating system, meaning its source code made available to the manufacturers with an Apache License 2.0 (Padhya, et al., August 2016).

The comparison between different operating system with the proposed Android operating system are given below:

Parameter	Android	iOS	Windows
Vendor	Open Handset Alliance	Apple	Microsoft
Symbol			
Developed in programming Language	C, C++, Java	C, C++, Objective-C, Swift	C#, VB.NET, F#, C++, Jscript
License	Open source	Proprietary	Proprietary
App Store	Google Play	App Store	Windows Phone Store
No. of App	1.3 million	1.2 million	500,000
Side loading	Available	Done by installing Xcode7	Available with windows phone 10, not in earlier version
Battery Demand	Highest	Less	Least
Customizability	Highest	Provide few option (allows a few selected widgets to be applied)	Allow re-sizable live tiles, various color schemes can

		on the notification panel)	be chosen in addition to background images
Security	Softest to crack	Hard to crack	Hardest to crack
Advantages	<ul style="list-style-type: none"> • Android is more customizable can change almost anything • Android offers an open platform • Cost effective • Easy access to Android App market. 	<ul style="list-style-type: none"> • Excellent UI and fluid responsive • Developers can design apps because a smaller number of models • Excellent for media entertainment • iOS is more “Intuitive” 	<ul style="list-style-type: none"> • Windows phone battery saver. • Windows phone are comparatively cheaper than other phone. • Windows phone has personal control features.
Disadvantages	<ul style="list-style-type: none"> • Usually need more code on java than objective-C. • Complex layout and animation are harder to code in android • High device fragmentation 	<ul style="list-style-type: none"> • Using iOS is costly Apps an no widget. • Battery performances is very poor on 3G. • Not flexible only support iOS devices 	<ul style="list-style-type: none"> • Screen glasses of Windows phone are not good enough. • Windows phone OS sometimes unresponsive. • Windows phone gets slower quickly than other smartphones.

Table 4 The comparison between different operating system

Justification

Every operating system has its own fractures. From the comparison it is clear to the developer that Android operating system is the best operating system for the proposed “MScheduling” application.

3.5: Summary

Centralized Scheduling System for Lab Booking and Lecturer’s Consultation Hour (MScheduling) is a mobile application which would be providing services to the student through mobile devices. Java has been chosen as programming language, Cloud Fire store would be using for database management, Android Studio would be using as a platform for developing the proposed system and Android operating system will operate the proposed “MScheduling” application.

CHAPTER 4: SYSTEM DEVELOPMENT METHODOLOGY

4.1 System Development Methodology chosen

Software development methodologies improving the management and control of software development process with the development quality and productivity. In this present world many system development methodologies are using commonly by the developers. For the proposed “MScheduling” system there are three common methodologies have been chosen for comparison and the best methodologies have been chosen to develop the proposed system.

Agile methodology, prototyping methodology and waterfall methodologies have been compared with the advantages and disadvantages of those methodologies are given below in the table.

	Agile Methodology	Prototyping Methodology	Waterfall Methodology
Model	6 stages	6 stages	8 stages
Stages	<ul style="list-style-type: none"> • Planning • Requirements analysis • Design • Implementation, coding or design • Testing • Deployment 	<ul style="list-style-type: none"> • Requirement design • Quick design • Building prototype • User evaluation • Refining prototype • Engineer product 	<ul style="list-style-type: none"> • Conception • Initiation • Analysis • Design • Code • Testing • Implementation • Maintenance

Advantages	<ul style="list-style-type: none"> • Faster and high-quality delivery. • End goal can be unknown. • Strong team interaction. • Continuous improvement. • Face-to-face communication between customers and developers which improve connection. • Accommodate and accept changes. 	<ul style="list-style-type: none"> • Errors are detected very earlier. • Give quick feedback for better solution. • Identifying missing functionality easily. • Identifies confusing and difficult function. • Users are properly involved in project. • User get a better understanding. 	<ul style="list-style-type: none"> • Uses clear structure. • Determines the end goal early. • Transfers information well. • Easy to use and understand. • Appropriate for all small projects with clear requirements. • Proceed to next phase after the full complementation of previous phase.
Disadvantages	<ul style="list-style-type: none"> • Planning can be less correct. • Team must be knowledgeable. • Active involvement 	<ul style="list-style-type: none"> • The client involvement is more. • It is a slow process. • Many changes can be disturbing 	<ul style="list-style-type: none"> • Makes changes difficult. • Excludes a client or end user. • Delays testing until after completion. • Not good for big project.

	<p>and collaboration are required.</p> <ul style="list-style-type: none"> • Need professional developer for taking sensitive decision. 	<p>the rhythm of developers.</p> <ul style="list-style-type: none"> • Lack of analysis and incomplete application can't be used. • Doesn't give fully lead to the implementation. 	<ul style="list-style-type: none"> • Very risky and uncertainty. • Inappropriate for object-oriented and complicated project.
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Table 5 Comparison between the methodologies

4.2 Justification

Developing mobile application is currently a very challenging task due to the specific demands and technical constraints of the mobile environment (Abrahamsson, et al., 2004). Agile methodology has been chosen for developing the “MScheduling” application after the research of software development models, advantages and disadvantages of three common methodologies. As “MScheduling” is mainly android application agile will be appropriate methodology for the proposed system.

The user requirements are not stable for mobile applications development until the software is fully developed. So, in mobile application development agile methodology makes a flexible process that the track of development process can be changed easily and quickly to any alternative way. The mobile software application has user interface modules which react immediately to user interactions, and since this is an environment with rapidly changing user demands, the development of such applications requires an agile approach. Among the available software development methods, agile methods are the most appropriate and potential solution for mobile application development (Kaleel & Harishankar, 2013).

4.3 Description of system development methodology chosen

Agile methodology has overwhelmed the software development world and quickly established its place as "the gold standard." It's an iterative and incremental software development process. For any software development agile methodologies are commonly used by the developers. Agile methodologies are set of IS methodologies which share some of the agile principles. Some of the popular IS methodologies under adopting to agile principle are Extreme Programming (XP), Scrum Agile Modeling Adaptive Software Development (ASD), Dynamic System Development Method (DSDM), Feature Driven Development (FDD), Lean Software Development, Dialogue-Driven Development (aka d3) and Kanban Methods. But comparatively to other methodologies, Extreme Programming (XP) will be more suitable agile method for the proposed "MScheduling" application development.

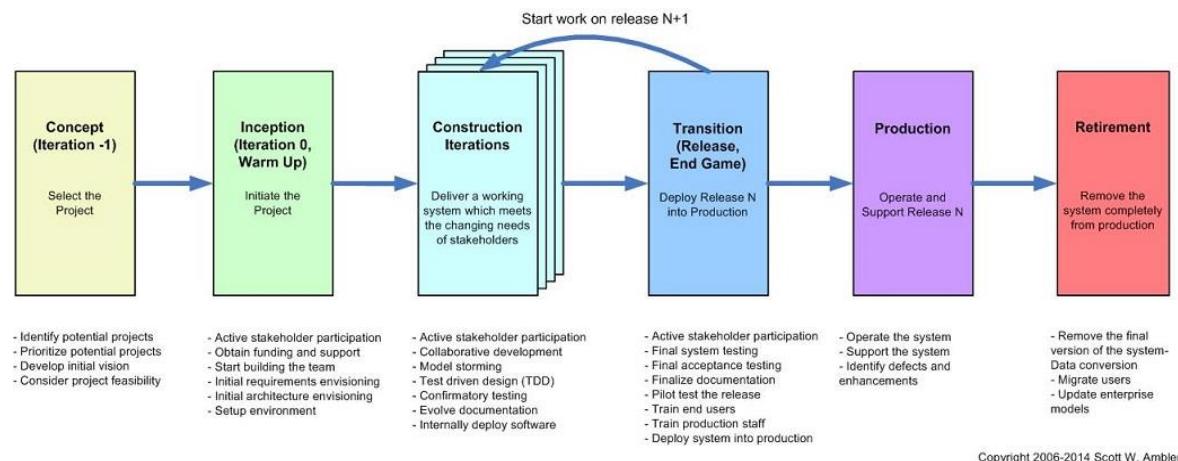


Figure 5 The agile SDLC (Ambler, 2014)

For all the Agile methodologies overall goal is to change and deliver all the software faster. Based on the definition there is an inconsequential difference between the Agile methodologies, but for all the methodologies the lifecycle is the same. According to the nature of software and situation developers select different methodologies.

The phases of Agile methodologies are briefly explained below:

Phase1: Scope out and priorities projects

The team scopes out and prioritizes projects during the first step of the agile software development life cycle. Depending on the department's organization some team may work more than one project at the same time. Developers should define the business opportunity for each concept and determine the work it will take to complete the project and the time. In the feasibility analysis of the system developers normally give a very less effort. The amount of effort depends on the type of system in feasibility analysis.

Phase2: Diagram requirements for the initial sprint

Once the project has been identified then developers need to work with stakeholders to determine requirements. Developers might want to use high-level UML diagrams or User flow diagrams to demonstrate how the new feature should function and how it will fit into the existing system. From that point, selected team members to work on the project and allocate resources. Developers also create swim lane process map in the chart or a timeline to delineate responsibilities and clearly show when certain work need to be done for the duration of the sprint.

Phase3: Construction Iteration

Once the requirements have defined by the developer's team for the initial sprint based on stakeholder feedback and requirements, the work begins. Developers and the UX designers bring work on their first iteration of the project, with the goal of having a working product to launch at the end of the sprint. The system will be tested by the user after each iteration of the project. For developer testing at the design level and for the requirements level there are many tastings involved in the project, which are agile requirements testing and confirmatory testing.

Phase4: Release the iteration into production

At this phase developer nearly release the product into the world. Finish up this software iteration with the following steps:

- Test the system
 - The system should be tested by the quality assurance team based on functionality, detect bugs, and record wins and losses.
- Address any defect.
- Finalize system and user documentation
 - Lucid chart can help to visualize the code through UML diagrams or provide user flows for everyone that they can understand how the system functions and they can build upon it further.
- Release the iteration into production

Phase5: Production and ongoing support for the software release

The focus of this phase keeps the system running among the user and productive after the deployment of the system. The production phase ends when support has ended or when the release is planned for retirement.

Phase6: Retirement

The last phase of agile method is retirement. During the retirement phase the system release will be fully removed from production when developer want to replace a system with new release when the system becomes obsolete, or contrary and redundant to the business model.

Phase of Extreme Programming (XP) Methodology

For the proposed system Extreme Programming (XP) has been chosen as it is one of the development methodology of Agile methodology. The phases involved in Extreme Programming (XP) are given below:

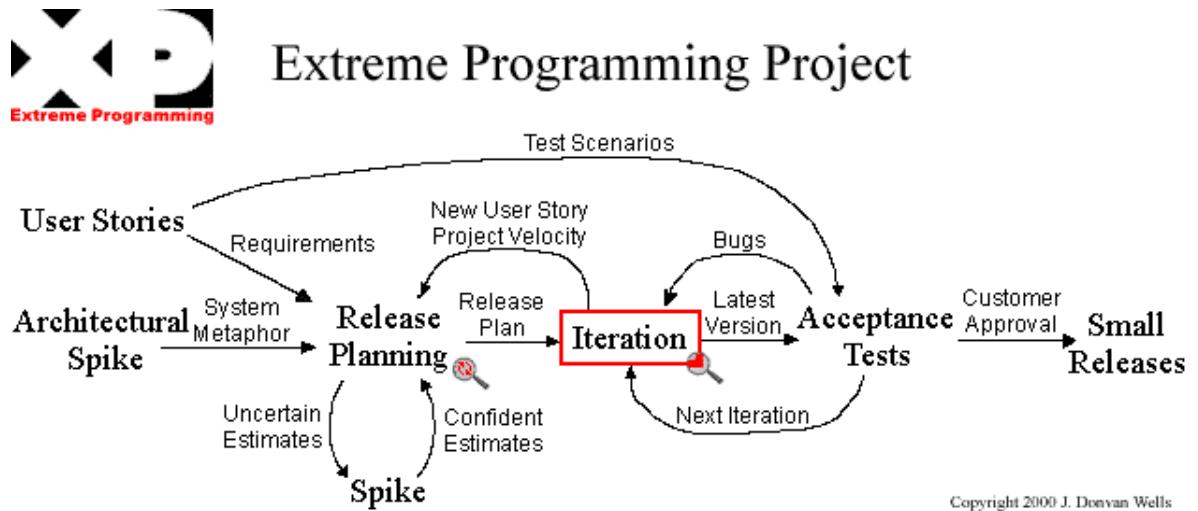


Figure 6 Extreme Programming (XP) Diagram (Wells, 2013)

Phase1: Planning phase

Planning phase is the first phase of Extreme programming (XP) life cycle. In this phase users meet the development team to create user requirement. The user stories have been converted into iterations by the development team that cover a small part of the functionality or featured required. A combination of iteration delivers the client with the concluding functional product. The development team prepares the time, plan and costs of carrying out the iteration, and separate developers sign up for the iteration.

Phase2: Designing

An iteration of XP programming begins with designing

The guidance principle of this steps are given below:

- Using systems metaphor or standards on names, methods and class name, and agreeing on uniform formats and style to ensure the compatibility among the work or different team members.

- Thrust on simplicity by stating an object only once and not addition of functionality in application.
- Creating spike solutions or simple programs that explore potential solution for a specific problem, ignoring all other concerns, to mitigate risk.
- Using software Class Responsibilities and Collaboration (CRC) Cards that allow for a departure from traditional procedural mindset and make possible object-oriented technology. Such cards allow all members of the project team to contribute ideas, and collate the best ideas into the design

Phase3: Coding

The customers availability is one of the requirements of extreme programming. Developers should include at least one or more customers in the project team. The customers will not only be a member of the team but also will help with the system requirements by communicating with the developers face-to-face on the site. User stories also written by these customers with the help of the developers. These customers should be expert in this field and make sure the future functionalities are covered by the user stories. the formation of the coding must be standard so that other developers can understand and easily refactor it if necessary (Wells, 2013).

Standard related to coding include:

- Pair of developing code by two programmers working together on a single machine, aimed at producing higher quality code at the same or less cost.
- Frequent integration of the code to the dedicated repository, with one pair integration at a time to prevent conflicts, and optimization at the end.
- Developing the code based on the agreed metaphors and standards and adopting a policy of collective ownership.

Phase4: Testing

Unit test must be created for all the codes of the system. During this phase, unit tests will be released with the codes. If it does not appear during testing, then the developers have to create the unit testing at that time and the codes must pass the unit tests before releasing. If any bug is found during testing in the system, then an acceptance test will be created to protect against it. Acceptance tests are created from user stories. These are the black box system tests and each test represents the expected results from the system. During the testing phase the acceptance tests are run, and the score is published (Wells, 2013).

Phase5: Listening

During the development phase the basic extreme programming is a continuous mechanism of customer involvement through feedback. Apart from the customer, the developers also receive feedback from the project manager. The basis of feedback is the customer acceptance test. If the customers are satisfied with the test results the iteration ends there, and the design for new iteration starts which again follows the design-coding-listening cycle.

CHAPTER 5: RESEARCH METHODS

5.1: Introduction

Research methods is a comprehensive term. While methods of data collection and data analysis represent the core of research methods, you must address a range of extra elements within the scope of your investigation (Dudovskiy, 2018). The methodology may include any publication research, questionnaire, interviews, surveys, other investigation techniques and could contain both present and historical information. So, in this project, the developer has chosen questionnaire and interview techniques to collect data and information. This technique will allow the developer to get opinion and gather information straight from users for the system.

Questionnaire is another important technique of primary research method. It is a process of collecting data from the targeted respondents which consists of a series of questions. This method can be classified in both quantitative and qualitative approach based on the type of questions. The questionnaire method has been chosen for this project, because it is an easy way to collect data from a large group of students in a short period of time. The attitudes, priorities, perspectives, behaviors and the expectations of the students from a library management system can be found out by this process (Anon., n.d.).

One of the most important quantitative primary research methods for data gathering is interview. To collect data which is related to the research this is a method of a conversation between two people. To know the lack of current system developer can directly answer to the participants. For fixing the requirements by deliberating from both sides about the proposed system this technique will also help both the developers and the users.

5.2 Design

Designing of questions for the interview

Name of Interviewee: _____

Position: _____

Time from: _____ To: _____

Name of University: _____ Date of Interview: ___/___/___

Type of Interview: _____

1. How Do you book Lecturer's consultation Hour?

Answer:

2. How do you manage the IT lab reservation?

Answer:

3. Who controls the current lab reservation system?

Answer:

4. Is current system convenient to use? If ‘No’, then explain the reason.

Answer:

5. Did any student ask you before to help them by booking lecturer’s consultation hour? If ‘Yes’, Then how did you manage that?

Answer:

6. Have you found any student who asked you to show the lecturer’s consultation booking system and procedure? If ‘yes’, Then explain how did you do that?

Answer:

7. Do you think in the new android application there should be an option to modify and cancel the consultation hour? If ‘yes’, then explain the reason why?

Answer:

8. Is the current system convenient to use? If ‘No’, please explain the reason why?

Answer:

9. If there are any new system being developed for IT lab reservation and lecturer's consultation booking will you try to use? If 'yes', please explain the reason why?

Answer:

10. Do you think a live chat option will help to improve communication between the lecturer and student? If 'yes' then How?

Answer:

5.2.1 Questionnaire

Survey Cover Letter



Dear Participants,

My name is Md Easir Arafat. I am a student in Asia pacific university of technology and innovation. I am doing a research for my final year project for the fulfillment of a degree of international business management. You are kindly invited to participate in this research entitled “Centralized Scheduling system for Lab Booking and lecturer’s Consultation Hour”. The purpose of this research is to develop an android application and enhance the features of existing lecturer scheduling system which is used in APU by integrating IT Lab reservation, and Consultation Hour Booking.

Your corporation to fill out the questions in an utmost honesty, truthfully and faithfully will be highly appreciated. The questionnaires will only take around 5-10 minutes of your time to be completed. Please be informed that there are no consequences or known risk in participating in this survey. Your participation is voluntary, and this research is only conducted for academic purpose and that your response will be strictly confidential. If you have problems or concerns regarding this research, please feel free to contact the researcher through the number or send an email as provided below.

Thank you for your corporation.

Sincerely,

Md Easir Arafat,

TP039768

easirarafat07@gmail.com

Questionnaires

Section A

In this section the question is prepared to collect general information of the participant

1. What is your Occupation?

- Lecturer
- Admin Staff
- Student
- Other (please specify)

(Objective: To verify the user type, who will use this application)

2. What is your gender?

- Male
- Female

(Objective: To identify and measuring the activities of the user based on their gender)

3. What is your study level?

- Foundation
- Diploma
- Degree
- Master's degree
- Doctorate degree

(Objective: To identify the user based on their education level)

Section B

In this section the question is prepared for collecting the information regarding the final year project

4. What operating system are you using in your smart phone?

- Android
- iOS
- Other

(**Objective:** To identify the type of smart phone user and operating system that is mostly used)

5. How often do you use your mobile phone in a week to play online games, browsing and others?

- 1-3 times in a week
- 4-6 times in a week
- 7-9 times in a week
- More than 9 times in a week

(**Objectives:** To identify user's availability and spending time on mobile phone that will help to find out possible user)

6. Have you ever booked lecturer's consultation hour?

- YES
- NO

(**Objective:** To find out the user who would be using this application)

7. How do you book lecturer's consultation hour?

- From website
- Sending Email
- Both of above
- Other

(Objective: To identify the current system user and their response about using the system)

8. Have you faced anyone who asked you to help them for booking lecturer's consultation hours?

- Yes
- No

(Objective: To identify the user who faced difficulties while booking lecturer's consultation hour)

9. How often do you book lecturer's consultation hour?

- 1-5 times in a semester
- 6-10 times in a semester
- 11-15 times in a semester
- More than 15 times

(Objective: To verify the average time of lecturer's consultation booking)

10. Do you think android mobile application will help you to do IT lab reservation?

- Yes
- No

(Objective: To identify lecturer's necessity of having mobile application which would be helping them to save their valuable time and book IT lab class)

11. Do you think mobile application would be an easier platform to book lecturer's consultation hour?

- YES
- NO
- Maybe

(Objective: To identify student's necessity of this project that would be helping them for booking lecturer's consultation hour easily)

12. Do you prepare live chat system in proposed lecturer's scheduling system application?

- Yes
- No

(Objective: To find out the importance of communication system among users that will help them keep in touch with each other outside class time)

13. Do you prepare to be notified in event of any changes on consultation timing from the system?

- YES
- NO

(Objective: To determine the importance of notification system that should be facilitate user to get the update in real time)

14. How would you rate your current lecturer's scheduling and consultation booking system?

1 2 3 4 5

Very Poor

Very Good

(Objective: To identify the user's satisfaction for the current lecturer's scheduling and consultation booking system)

15. Do you agree an android application will help you to book lecturer's consultation hour?

1 2 3 4 5

Strongly Disagree

Strongly Agree

(Objective: To find out the importance of developing this centralized scheduling system for lab booking and lecturer's consultation hour in an android application)

5.3 Summary

This interview and questionnaire are part of the method that would be helping the developer to gather exact information regarding the proposed system and to identify user's knowledge with proposed system. and, to know user's involvement for example, to identify whether the user like the system or not? So, this method benefits the developer a lot for the proposed android application. From this section, the developer also gathers data for example, what are the things that should be applied in this system, how to progress the system, etc.

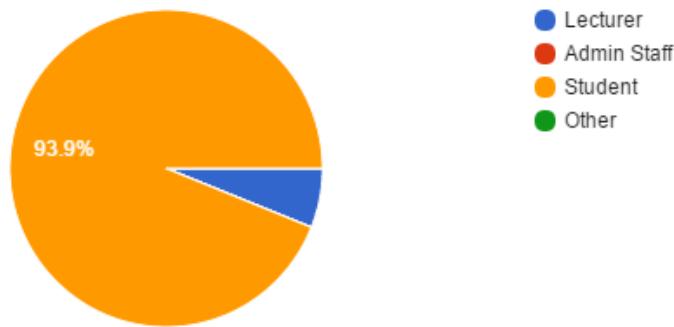
CHAPTER 6: REQUIREMENTS VALIDATION

6.1 Analysis of Data

Analysis of data collected through questionnaire

1. What is your Occupation?

33 responses



Result

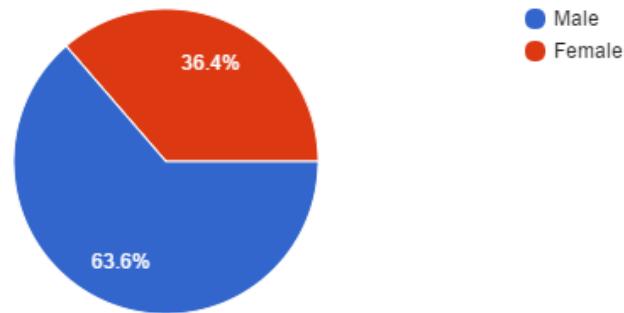
Result shows that there are a huge number of responses from student. From the diagram it can see 93.9% of students have attended and rest of the number are lecturers among 33 participants.

Analysis:

Result shows that the question has been answered by the students and lecturers.

2. What is your gender?

33 responses



Result

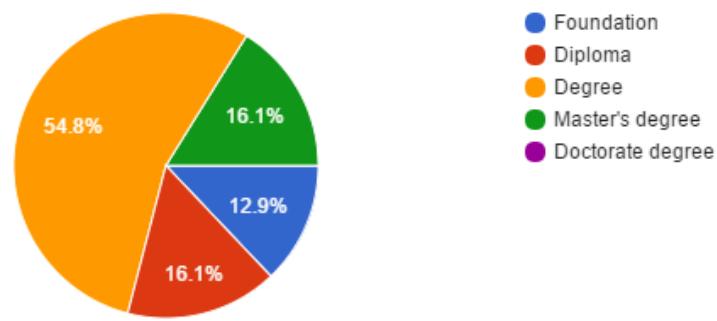
There are total 33 participants responded to this question, 63.6% male and 36.4% female.

Analysis

The diagram shows that the question has been answer by both the male and female participant.

3. What is your study level?

31 responses



Results

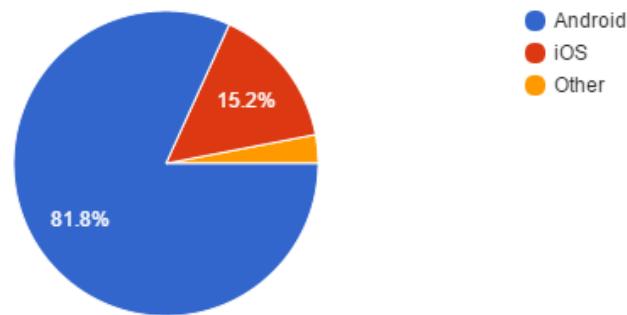
There are 31 participant total and 54.8% students are currently studying in degree level, 16.1% are studying in both diploma and master's degree and rest of 12.9% are studying foundation.

Analysis

The diagram shows that the height number of participants are from degree level so that they knowledge about the technology and mobile application.

4. What operating system are you using in your smart phone?

33 responses

**Result:**

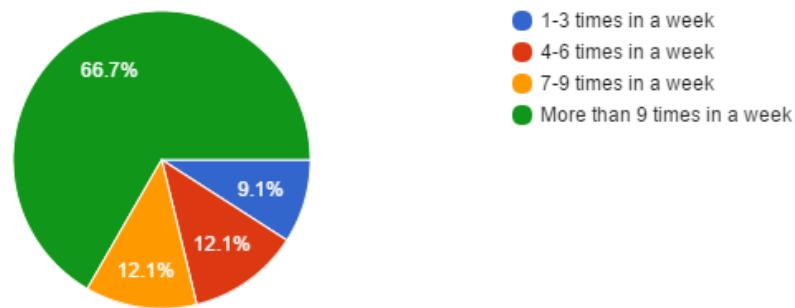
The results showing that among 33 participants there are 81.8% people are using android mobile phone, 15.2% are using iOS mobile phone and only a few numbers of people are using other phone.

Analysis

The demand of android mobile phone is higher than any other operating system phone. So, the demand and popularity of android operating system is higher than other operating systems.

5. How often do you use your mobile phone in a week to play online games, browsing and others?

33 responses



Result

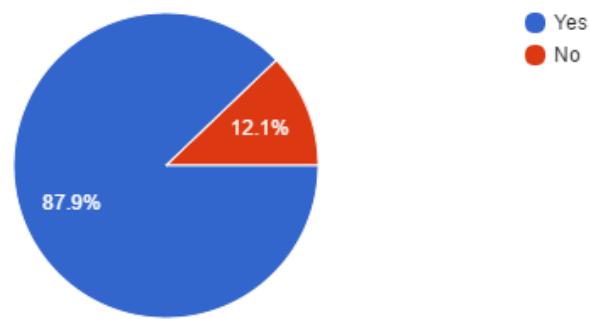
33 participants involved to this question. The height number of participants 66.7% spend on playing online game more than 9 hours. 9.9% spend 1-3 times in a week, 12.1% spend 4-6 times in a week and 12.15 spend 7-9 times in a week.

Analysis

From Result it is clear that, the height number of people are engaging with mobile phone for playing online games is more than 9 times in a week. So, the result explains the high usage of mobile phone among the users.

6. Have you ever booked lecturer's consultation hour?

33 responses

**Results**

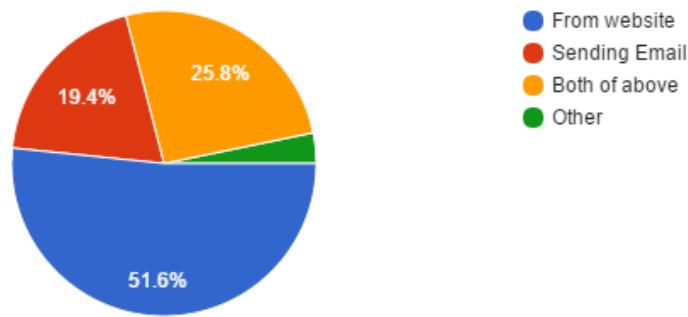
Among 33 participants 87.9% answered yes and 12.1% answered no. So, the height number of people are booking lecturer's consultation hour.

Analysis

The result show that height number of participants are booking lecturer's consultation hour. There is a huge importance of lecturer's consultation hour currently.

7. How do you book lecturer's consultation hour?

31 responses



Result

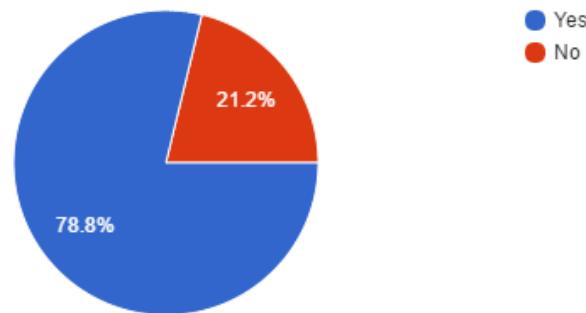
The number of participants in this question are 31. Among them 51.6% participants book consultation hour by using university website, 25.8% book lecturer's consultation through email. 25.8% people use both website and the email for booking the consultation hour. Only a few using other.

Analysis

From the chart it is clear that the greatest number of participants are suing university website for booking lecturer's consultation hour.

8. Have you faced anyone who asked you to help them for booking lecturer's consultation hours?

33 responses



Result

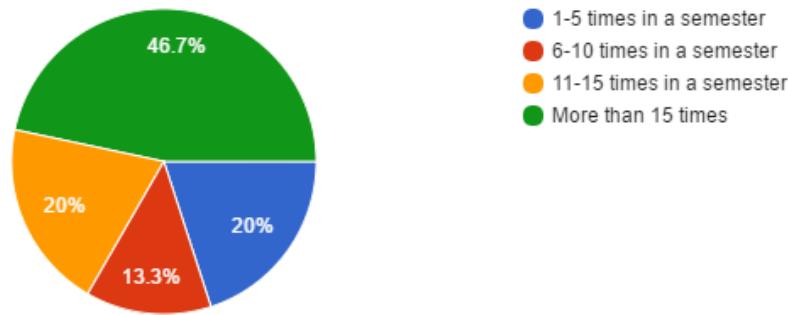
In this question 33 participants have involved and among them 78.8% people are facing the problem of booking lecturer's consultation hour. Only 21.2% participants can do it by themselves.

Analysis

From the chart it can see a frustrating number of participants have no idea how to book lecturer's consultation hour.

9. How often do you book lecturer's consultation hour?

30 responses

**Result**

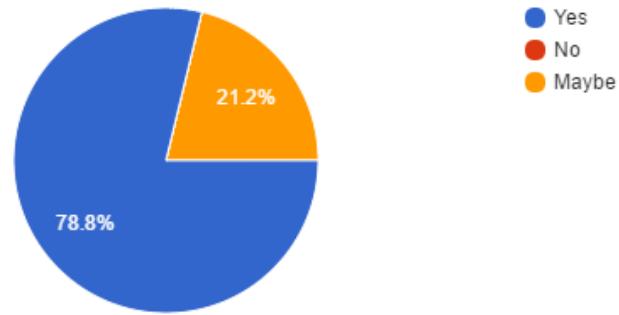
In this question 30 participant have involved and 46.7% people are booking lecturer's consultation hour very often. More than 15 times the consultation hour is booking by the height number of participants in a semester where the other 20% are booking 11-15 times in a semester, 13.3% are booking 6-10 times in and rest of 20% are booking 1-5 times in a semester.

Analysis

From the diagram it has been found that the height number of participants are booking lecturer's consultation hour more than 15 times in a semester.

10. Do you think an Android mobile application will help to do IT lab reservation for the lecturer?

33 responses



Results

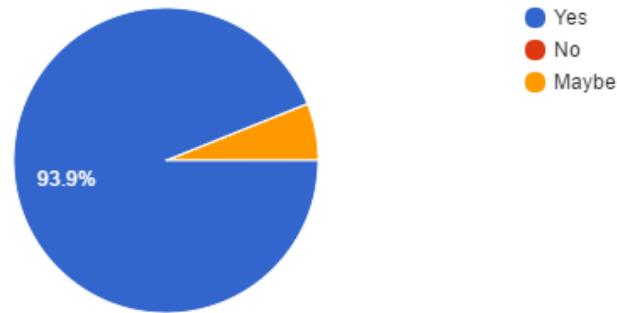
78.8% participants think among all 33 participants that, an android application will help lecturers to book the available computer lab. On the other hand, only 21.2% think It can be helpful for the lectures.

Analysis

A height number of participants think the lecturers can get the benefit from the proposed application regarding their available IT lab reservation.

11. Do you think mobile application would be an easier platform to book lecturer's consultation hour?

33 responses



Result

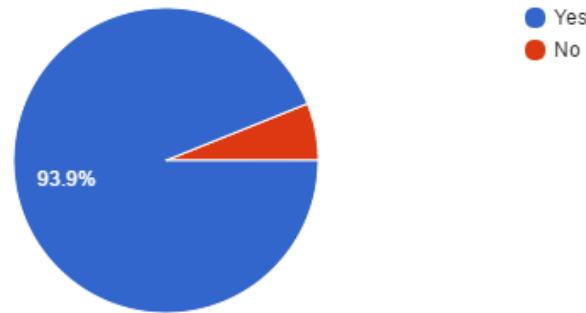
Total number of participants of this question are 33. Among all the participants 93.9% answered “YES” and only a very smaller number of participants answered “NO”.

Analysis

In this diagram it can easily say that the height number of participants prefer android application for booking lecturer's consultation hour.

12. Do you prepare live chat option in proposed lecturer's scheduling system application?

33 responses



Result

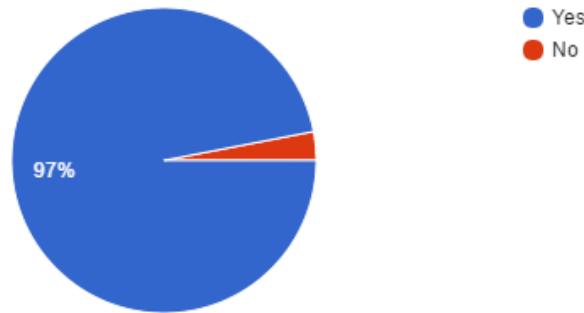
93.9% participants prefer live chat option among all the participants where only rest of 6.1% answered “NO” among 33 participants.

Analysis

From the diagram it can see that the height number of participants want live chat option the proposed “MScheduling” application.

13. Do you prepare to be notified in event of any changes on consultation timing from the system?

33 responses



Results

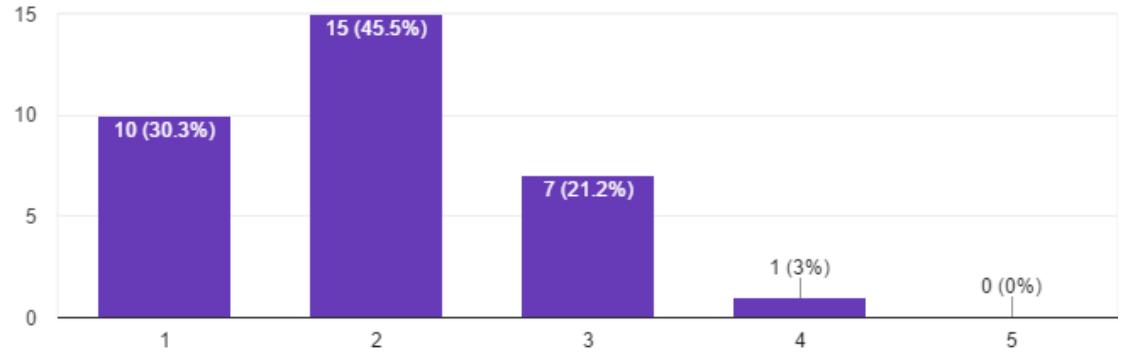
In this question there are 33 participants have involved and among the 97% answered “YES” and only 3% answered “NO.”

Analysis

So, this is clear from the diagram that the height number of participants prefer to be notified in event of any changes on consultation timing where only 3% participants do want that feature among all the participants.

14. How would you rate your current lecturer's scheduling and consultation booking system?

33 responses



Result

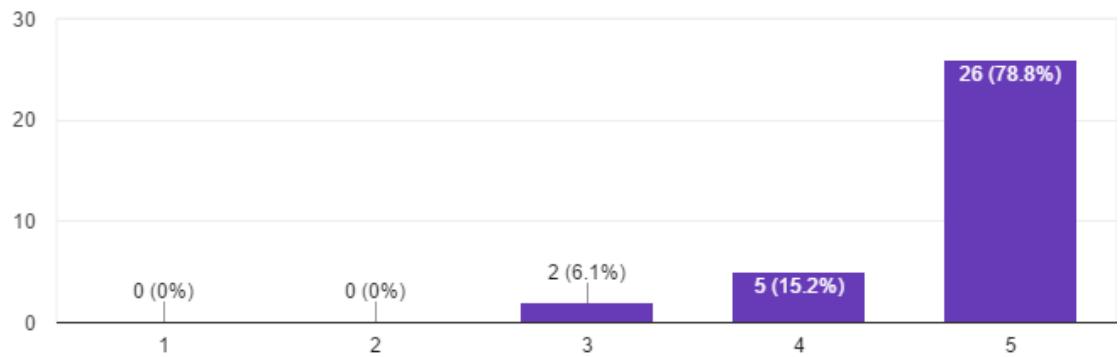
From this bar chart it is easy to predict the current consultation booking system's performances among the 33 participants. 10 participants only giving 1 as their rating on current system, 15 participants given 2, and very few 7 participants given 3 rating on the current system.

Analysis

From the above diagram this is clear that people don't like the current system as the height number of participants given very low rating on the current system.

15. Do you agree an android application will help you to book lecturer's consultation hour?

33 responses



Result

From the above stated bar chart total participant were 33 for this question and 78.8% people strongly agreed that android application will help them to book the lecturer's consultation hour. 15.2% agreed and 6.1% moderately agreed among all the participants.

Analysis

Among 33 participants the height number of participants strongly agreed that an android application will help them to book the lecturer's consultation hour.

6.2 Analysis of data collected through interview

Name of Interviewee: _____ Md Showmik Rahman _____

Position: _____ Student _____

Time from: _____ 2 pm _____ To: _____ 3 pm _____

Name of University: Asia Pacific University Date of Interview: 25 /08 /2018

Type of Interview: Face-to-Face

1. How Do you book Lecturer's consultation Hour?

Answer: I usually visit university website and book my lecturer's consultation, Once or twice I did it through directly sending email to the lecturer.

2. How do you manage the IT lab reservation? (Lecturer)

Answer: N/A (Not applicable for the student only lecturer can answer this specific question)

3. Who controls the current lab reservation system?

Answer: N/A (Not applicable for the student only lecturer can answer this specific question)

4. Is current system convenient to use? If 'No', then explain the reason.

Answer: No. because in the current system I need to visit the university website which is a bit more difficult. It's time effective and if I need a consultation hour urgently I can't book it in a faster way.

5. Did any student ask you before to help them by booking lecturer's consultation hour? If 'Yes', Then how did you manage that?

Answer: Yes, every now and then I am facing this type of problem. Even few my classmates don't know how to book lecturer's consultation hour. I guided them to visit through university website when they asked me how to do it.

6. Have you found any student who asked you to show the lecturer's consultation booking system and procedure? If 'yes', Then explain how did you do that?

Answer: I usually face this type of problem. I met a junior who is currently studying in diploma. He asked me the procedure of booking lecturer's consultation hour. I thought him how to do it from university website.

7. Do you think in the new android application there should be an option to modify and cancel the consultation hour? If 'yes', then explain the reason why?

Answer: Yes, in case of emergency or sickness students are unable to go and meet their lecturers and if there will be any option to modify or cancel it before a certain time then both can plan accordingly.

8. Is the current system convenient to use? If 'No', please explain the reason why?

Answer: No, the current system is not convenient to use because it's time effective and interface is not user-friendly.

9. If there are any new android system being developed for IT lab reservation and lecturer's consultation booking will you try to use? If 'yes', please explain the reason why?

Answer: Yes, because it's easy to understand and I can track my appointment with lecturer's any time I need. I don't need to visit the university web site which is bit difficult.

10. Do you think a live chat option will help to improve communication between the lecturer and student? If 'yes' then How?

Answer: Yes, if there will be any chat option in your proposed system it will help a lot to both lecturers and students. Sometimes a student can face any little problem regarding to their lessons, if they want to address those little issues, they need to book consultation hour that is complicated for both the lecturer and students.

6.2 Summary

The interview was done successfully with an APU student. From the interview information it is clear that the current system is not effective for the student. Most of the student are using the university for booking the lecturer's consultation hour. They are demanding a user friendly and portable application from where can easily book the lecturer's consultation hour.

Therefor the proposed "MScheduling application will help them to book the lecturer's consultation hour in a convenient way.

CHAPTER 7: SYSTEM ARCHITECTURE

7.1 Introduction

System architecture is the conceptual model that defines the structure, behavior, and more views of a system. The designs help in delivering and fulfilling the requirements of the users and system. It presents the overview of the systems. “MScheduling” also have the diagrams specifying the overall design of the system which have been used for the development of system. The modules, interfaces, data and also other components are defined in system designs. There are use case diagram, class diagram, sequence diagram, system architecture diagram, entity relationship diagram which are included in the proposed system design.

7.2 Abstract Architecture

7.2.1 System Design

Use Case Diagram

Use case is a list of actions or event steps, typically defining the interactions between a role (an actor) and a system, to achieve a goal. The actor can be a human, an external system, or time. It represents the missions or stakeholder goals. It represents the actions which the system can perform according to the users. the current system “MScheduling” has three different types of users, such as, the students, lecturers and the admin. The diagram for the system has given below:

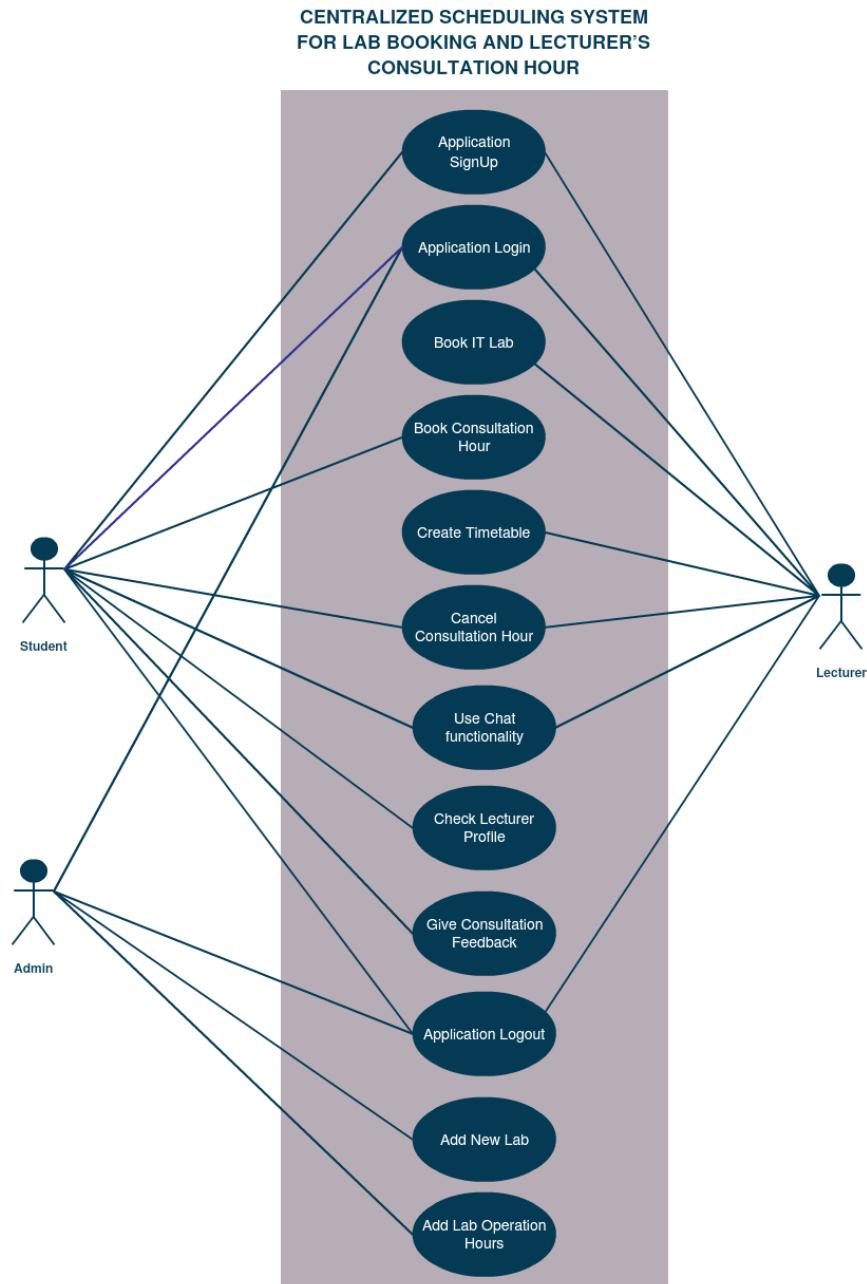


Figure 7 Use Case Diagram

Actor Specification

Actors	Details
Students	Students are one of the main actors of “MScheduling” application.
Lecturers	Lecturers are one of the main actors of “MScheduling” application.
Admin	Admin adds the new labs to the list of labs available for classes.

Table 6 Actors Specification

Use Case Specification

SIGN UP

Use Case Name	Sign Up
Summary	Users must sign up the application before using it. After the sign up, the system validates the credentials and saves it into the database.
Actors	Students , Lecturers
Precondition	Users must open the application downloaded from play store and must have internet access in the device.
Use Case Flow	<ol style="list-style-type: none"> 1. Sign Up <ol style="list-style-type: none"> a) Users enter their valid name, password and email address. b) Then, user chooses whether it is student or lecturer. c) Users clicks the “SIGN UP” button.

	<p>d) Application validate the name, email address and password.</p> <p>e) Application saves the information in the database.</p>
Post Condition	Application creates new account and give access to the account after the successful verification process.

Table 7 Users Specification (Sign Up)

View Lecturer List

View Lecturer List (Student) Use Case Name	View Lecturer
Summary	System shows the list of available lecturers along with their email. When a particular lecturer is clicked, application moves to the page that shows his/her consultation hours.
Actors	Students
Precondition	Users have to open and login to the application.
Use Case Flow	<p>1. View Lecturer List</p> <p>a) Users click the “Lecturer List” option in the side bar.</p> <p>b) System shows the available lecturers in a list.</p>
Post Condition	System displays the lecturer consultation hour.

Table 8 Users Specification (View Lecturer List)

View Lecturer Time-table

View Lecturer Time Table (Lecturer) Use Case Name	View Lecturer Timetable
Summary	System shows the timetable to the lecturer where he can decide which timeslot is free for him to put available for consultation.
Actors	Lecturers
Precondition	Users have to open and login to the application.
Use Case Flow	<p>1. View Lecturer Timetable</p> <p>a) In the homepage, user can select “Timetable”.</p> <p>b) System shows the lecturer timetable and lecturer can choose slots for consultation and click “save” button to save</p>
Post Condition	System displays those free slot hours when student books the consultation.

Table 9Users Specification (View Lecturer Timetable)

Book Lab

Book Lab (Lecturer) Use Case Name	Book Lab
Summary	System shows the list of available labs that can be booked by lecturer. From where user select the particular lab, which redirects it to the page that shows the dates and available hours on a specific date.

Actors	Lecturers
Precondition	Users have to open and login to the application.
Use Case Flow	<p>1. View List Of Labs</p> <ul style="list-style-type: none"> a) In the homepage, user can select “Lab List option”. b) System redirects to the page that shows the list of labs available. c) User selects the particular lab and system directs it to the lab booking page. <p>2. Book lab</p> <ul style="list-style-type: none"> a) System provides the month calendar with highlighted dates, when lab is available. b) User click on a particular date and the available timing is displayed. c) User click on the timing and clicks “Book” button. d) Then, it moves to the page that shows the booked lab details and has a “Cancel” button that can be used to cancel booking
Post Condition	The lab is booked under the particular lecturer.

Table 10 Users Specification (Book Lab)

Book Consultation Time

Book Consultation Time(Student) Use Case Name	View Lecturer Timetable
Summary	System shows the list of available lecturers for consultation. From where user selects lecturer, which redirects it to the page that shows the dates and available consultation hours on a specific date.
Actors	Lecturers
Precondition	Users must open and login to the application.
Use Case Flow	<p>1. View Lecturer List</p> <ul style="list-style-type: none"> a) Users click the “Lecturer List” option in the side bar. b) System shows the available lecturers in a list. After clicking the lecturer, application redirects it to the page to book consultation under a particular lecturer. <p>2. Book Consultation Time</p> <ul style="list-style-type: none"> a) System provides the month calendar with highlighted dates, when consultation is available. b) User click on a particular date and the available timing is displayed. c) User click on the timing and clicks “Book” button.
Post Condition	System books the consultation timing of student in the lecturer.

Table 11Users Specification (Book Consultation Time)

Add New Lab

Add New Lab (Admin) Use Case Name	Add new lab
Summary	System provides the option to add new lab for admin user. The admin enters the name and assign the time slot for when the lab will be available for booking.
Actors	admin
Precondition	Users have to open and login to the application.
Use Case Flow	<p>1. Add New Lab</p> <ul style="list-style-type: none"> a) User chooses the “Add New Lab” option from the side bar menu. b) Then , it is redirected to the page where user enter the name of lab and assigns the timeslots to it, when it is going to be available. c) The user clicks the “Submit” button.
Post Condition	System saves the new lab to the list of labs.

Table 12 Users Specification (Add New Lab)

Live Chat Functionality

Use Case Name	Add new lab
Summary	System provides the option to chat among the users.
Actors	Admin, Students, Lecturers
Precondition	Users have to open and login to the application.
Use Case Flow	<p>1. Chat Functionality</p> <ul style="list-style-type: none"> a) User select the “Message” option. b) System open the chat functionality. c) User type the messages and click the send button.
Post Condition	System send the messages to the particular user.

Table 13 Users Specification (Live Chat Functionality)

Class Diagram

Class diagram represents a static structure diagram by defining the classes, methods and attributes of the “MScheduling” system. the class diagram also defines the relationship among the objects of the classes. The class diagram of the current system is given below:

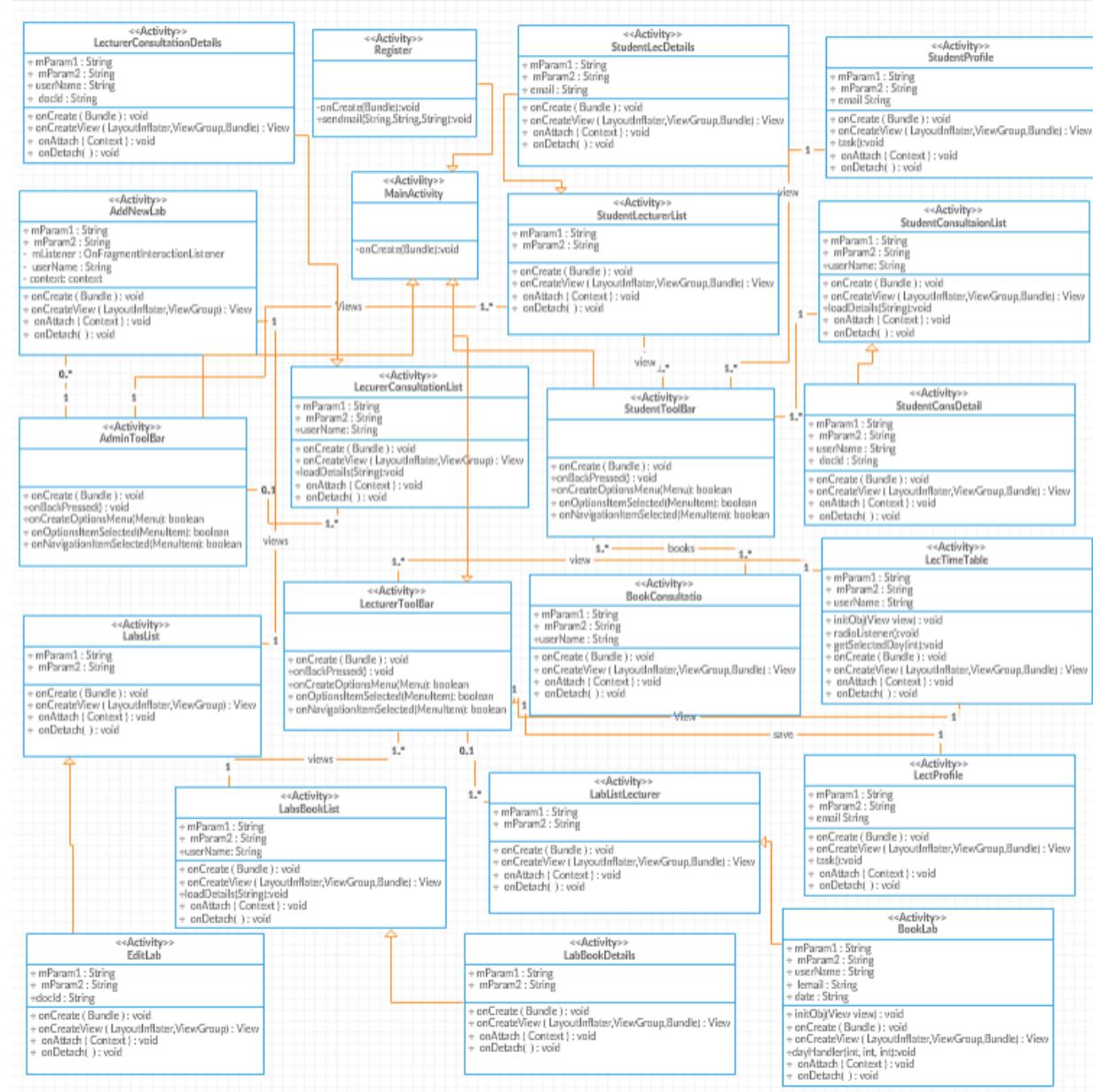


Figure 8 Class Diagram

Sequence Diagram

The sequence diagram is also a part of Unified Modelling Language (UML). It identifies the logics, functions and interactions between the objects and the external actors of a selected scenario from the use case diagram in a sequence.

Register

Users have to register themselves before using the “MScheduling” system. They have to input the valid email address and password for successful registration. Users will be accessed in the system after the registration.

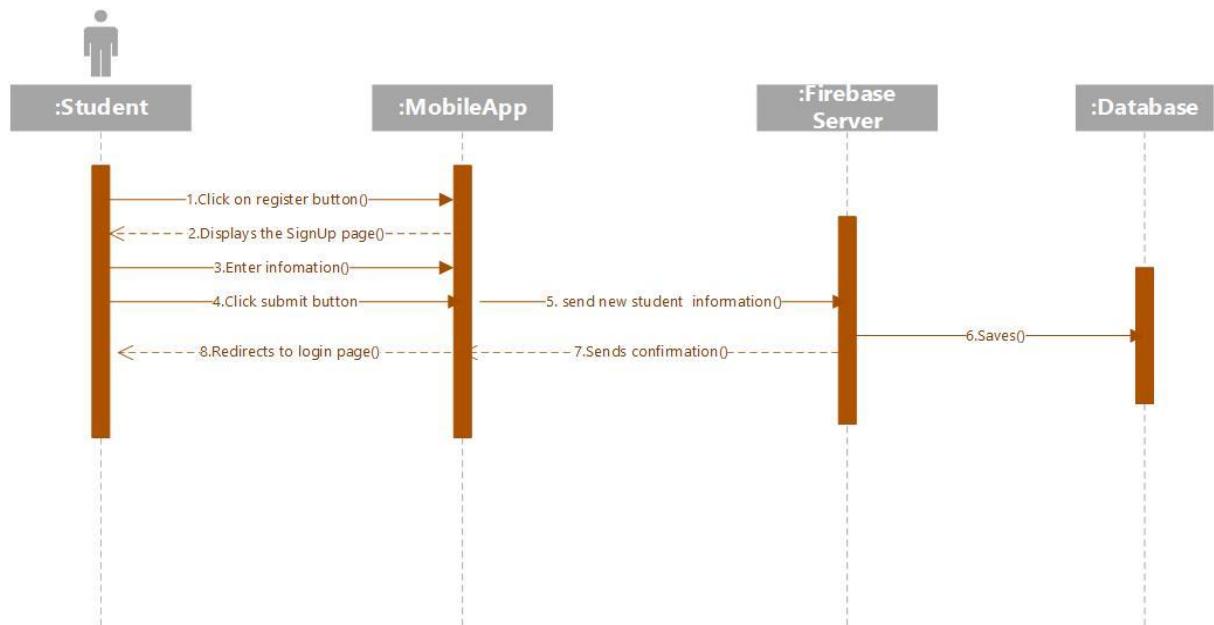


Figure 9 Sequence diagram(student register)

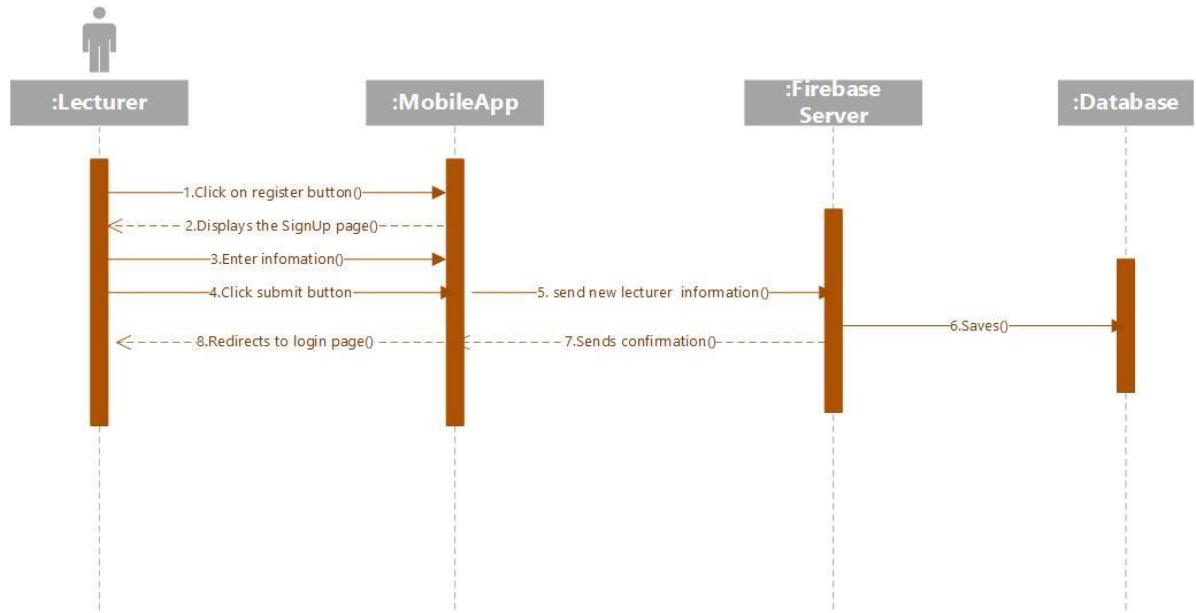


Figure 10 Sequence diagram(lecturer register)

Login

Users have to login with the registered email address and password. They have to login for once after registration. Later, the system will redirect to the home page directly after the first login until the users log out their account from the system.

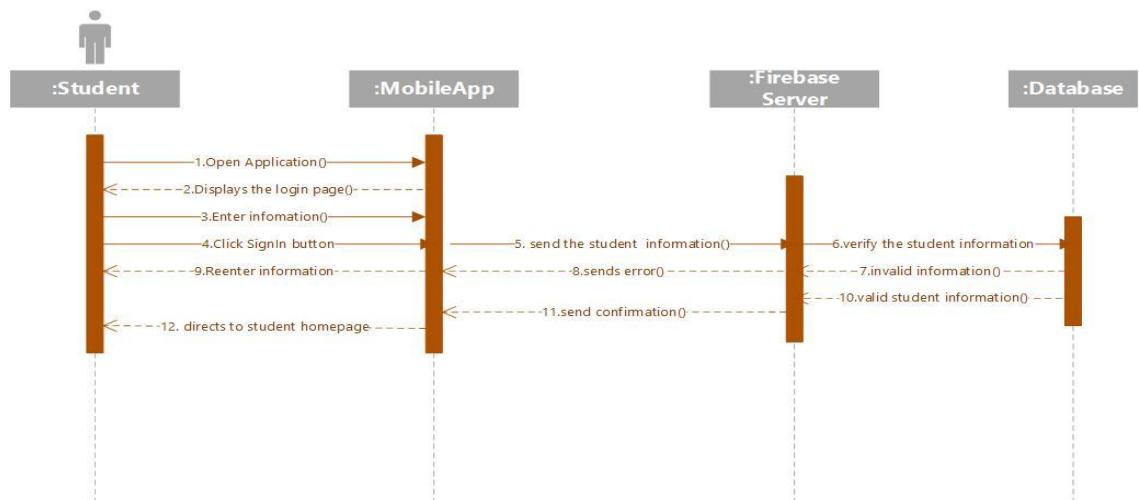


Figure 11 Sequence diagram (student login)

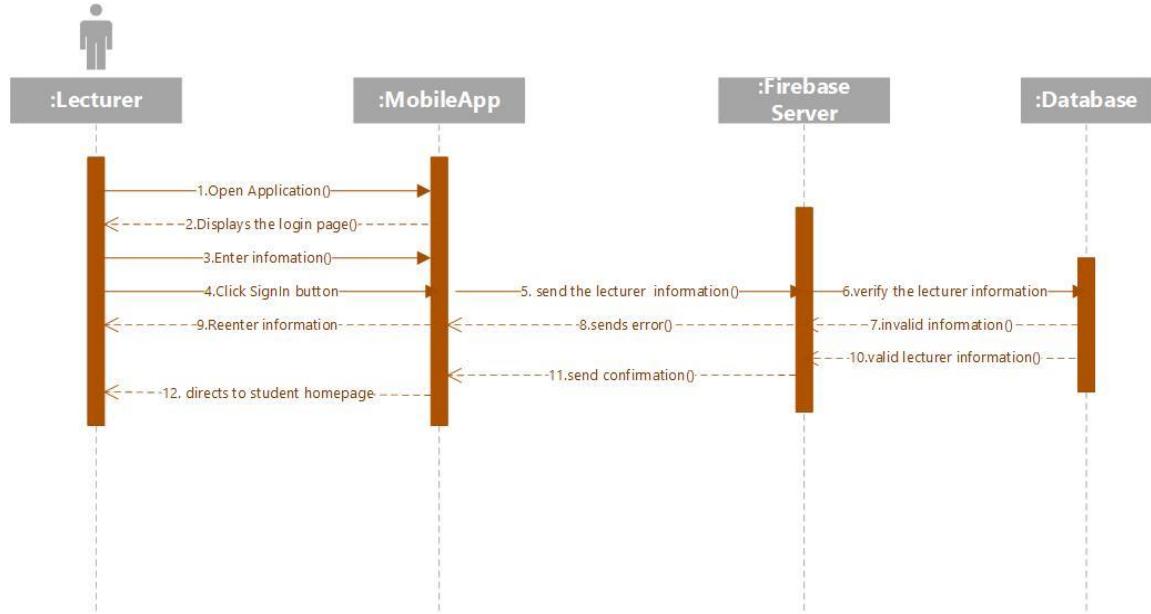


Figure 12 Sequence diagram(lecturer login)

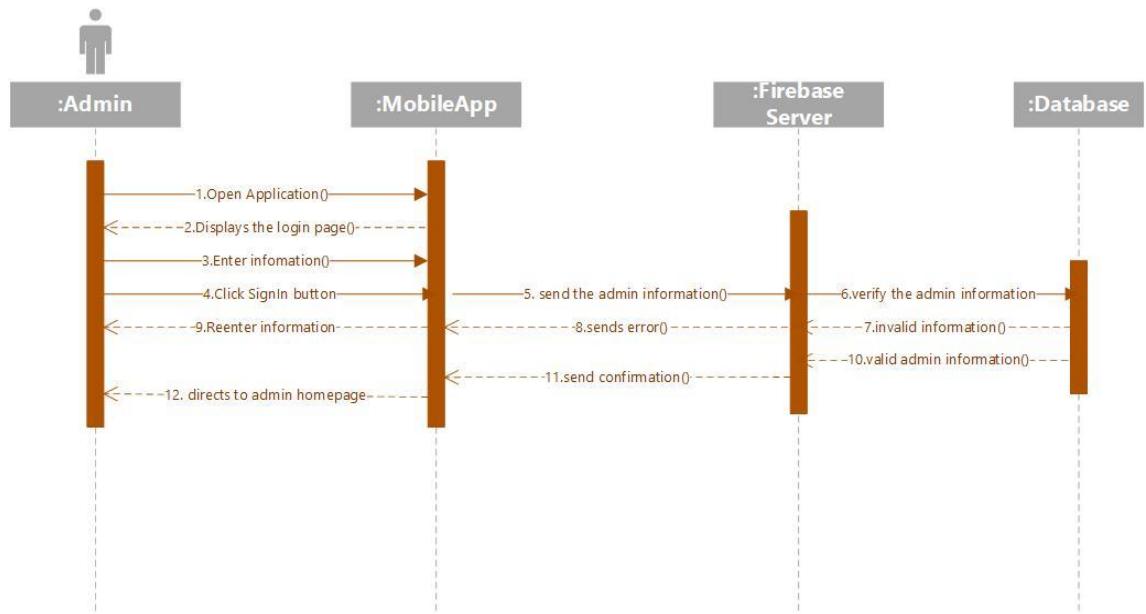


Figure 13 Sequence diagram(Admin login)

Add New Lab

When admin logs in, he can add a new lab to the list of labs available for booking by clicking on “Add New Lab” option in navigation menu, then is directed to the page where user can put lab information and click “submit” button, the new lab will be added to the list of labs.

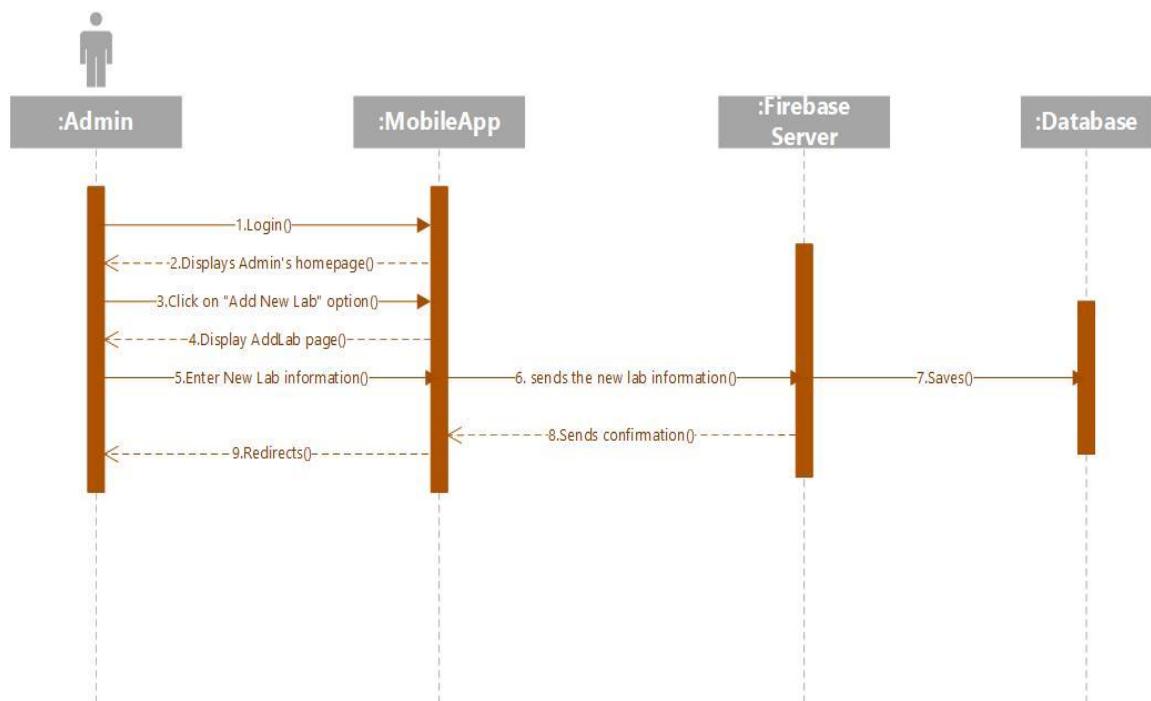


Figure 14 Sequence diagram(Add New Lab)

Lecturer Timetable

When lecturer logs in, he can set his timetable to put time slots for consultation by clicking on “consultation timetable” option in navigation menu, then is directed to the page where timetable is displayed, and the lecturer chooses the timeslots and click “save” button.

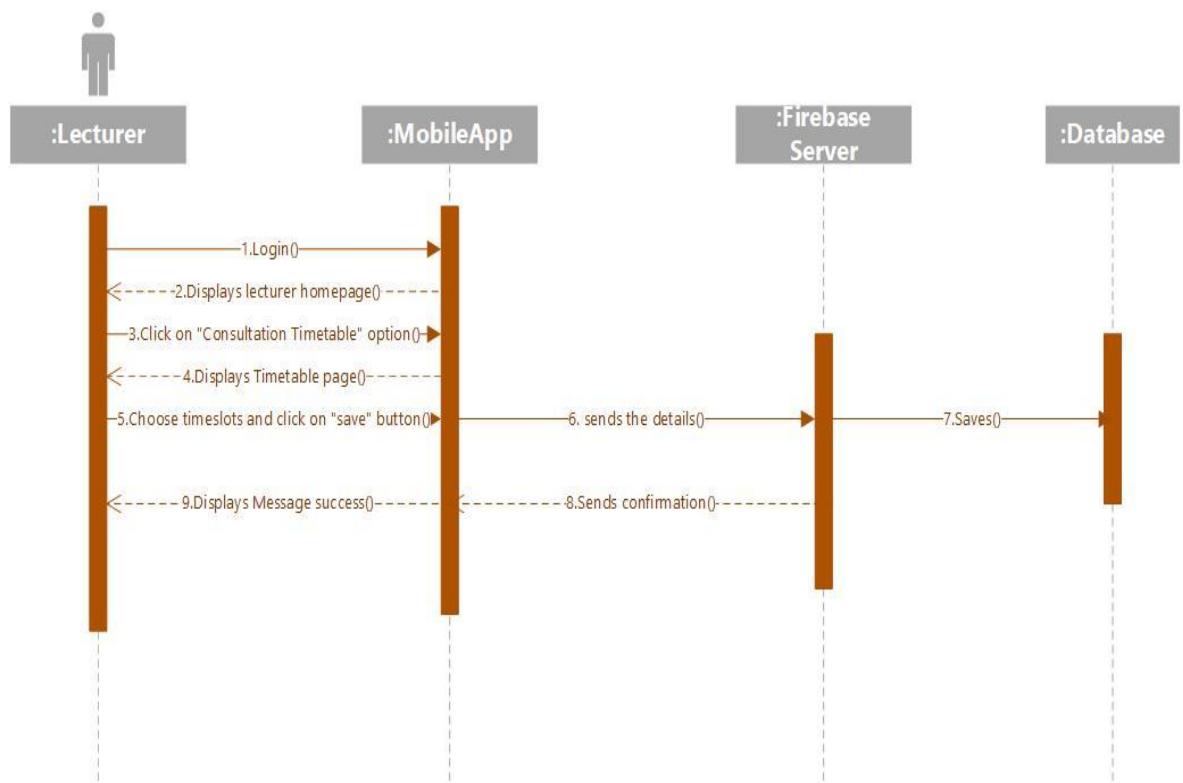


Figure 15 Sequence diagram(Lecturer Timetable)

Book Lab

When lecturer logs in, he can book lab by clicking on “Lab Reservation” option in navigation menu, then is directed to the page where list of labs is displayed. The lecturer clicks on any of the lab, “book lab” page is displayed, then the lecturer can select booking information and click “Book” button. The lab will be booked.

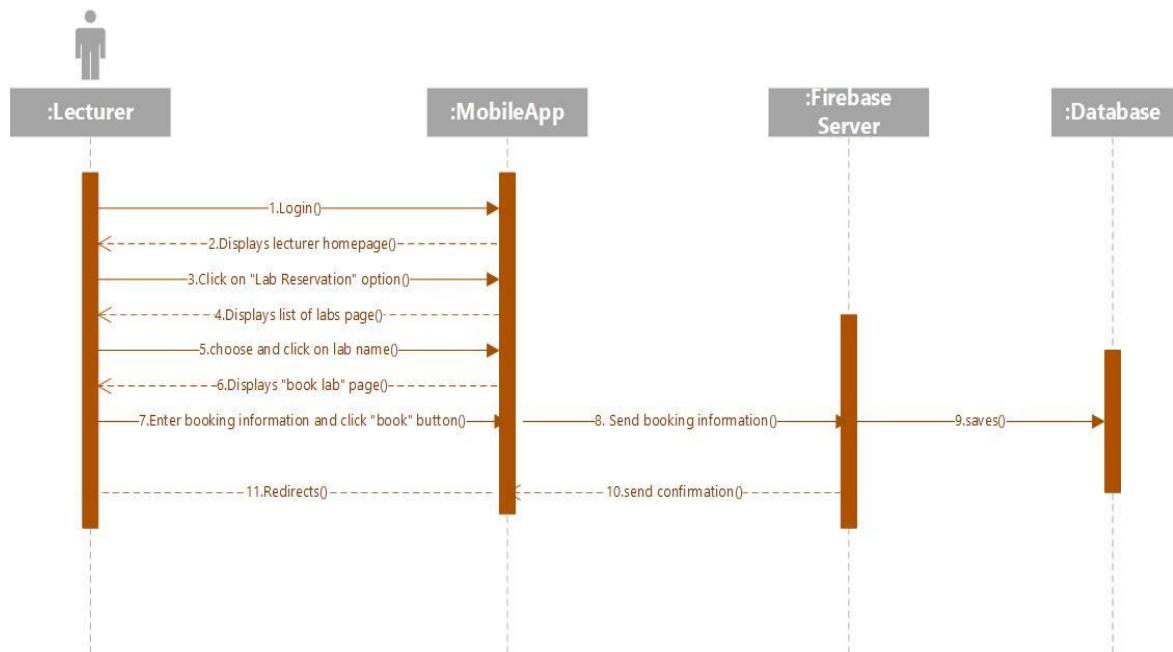


Figure 16 Sequence diagram(Book Lab)

Lecturer List and Information(student)

When student logs in, he can check lecturer details by clicking on “Lecturers List” option in navigation menu, then is directed to the page where list of lecturers is displayed. The student clicks on any lecturer in the list, then the app is directed to the page where lecturer details are displayed.

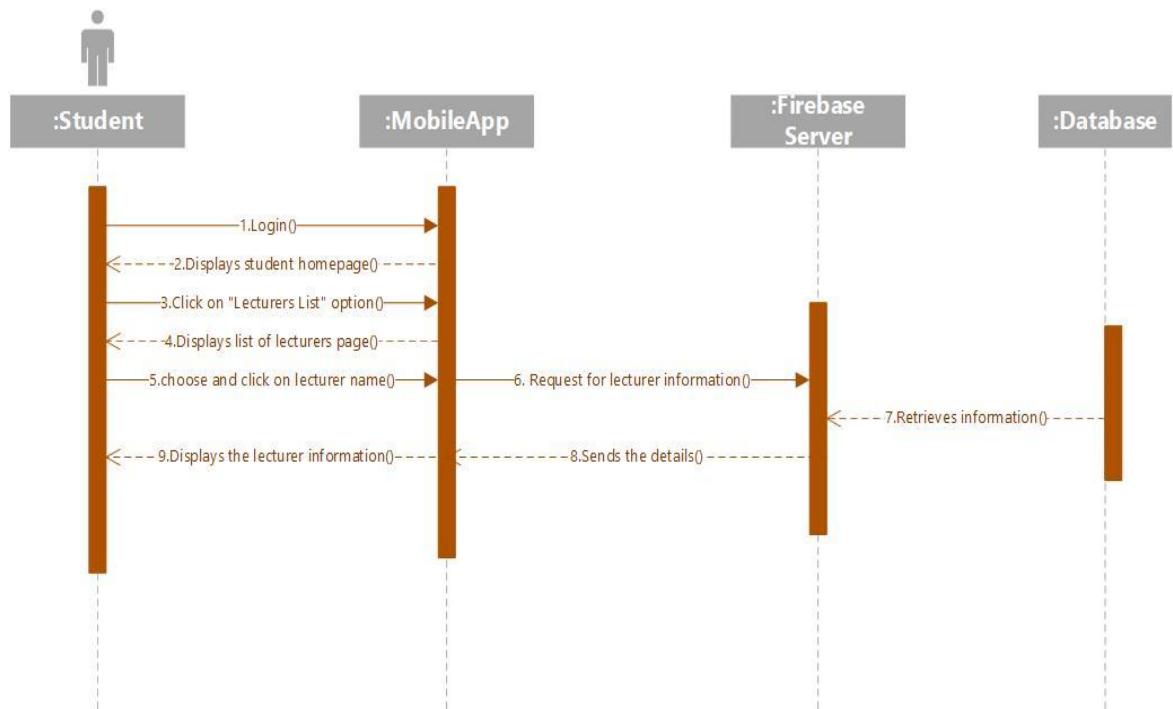


Figure 17 Sequence diagram(Lecturer details)

Book Consultation

When student logs in, he can book consultation by clicking on “Book Consultation” option in navigation menu, then is directed to the page where list of lecturers is displayed. The student clicks on any of the lecturer name, “book consultation” page is displayed, then the lecturer can select booking information and click “Book” button. The consultation will be booked.

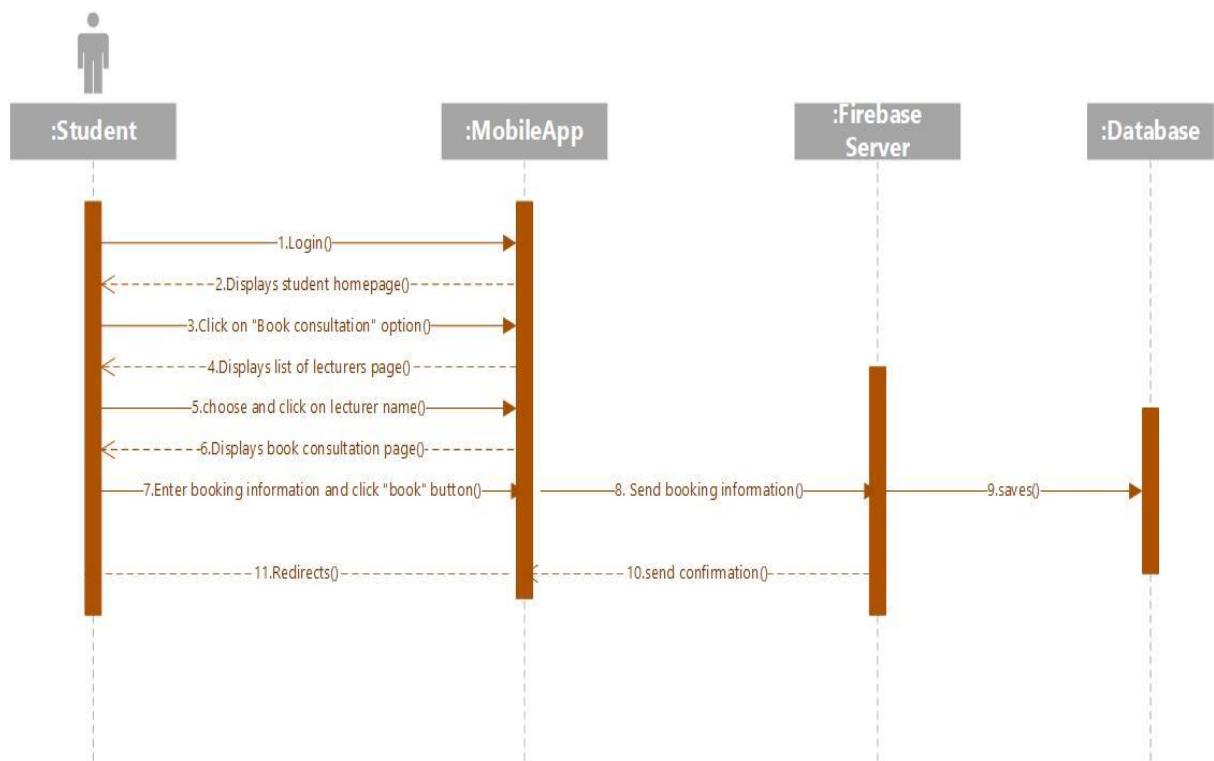


Figure 18 Sequence diagram(Book consultation)

Consultation Feedback

When the user logs in, he can view consultation details and provide feedback by clicking on “Consultations” option in navigation menu, then is directed to the page where list of consultations is displayed .The user clicks on any of the consultation, “consultation details” page is displayed, then the user can check details and provide feedback and click “save” button to save the details.

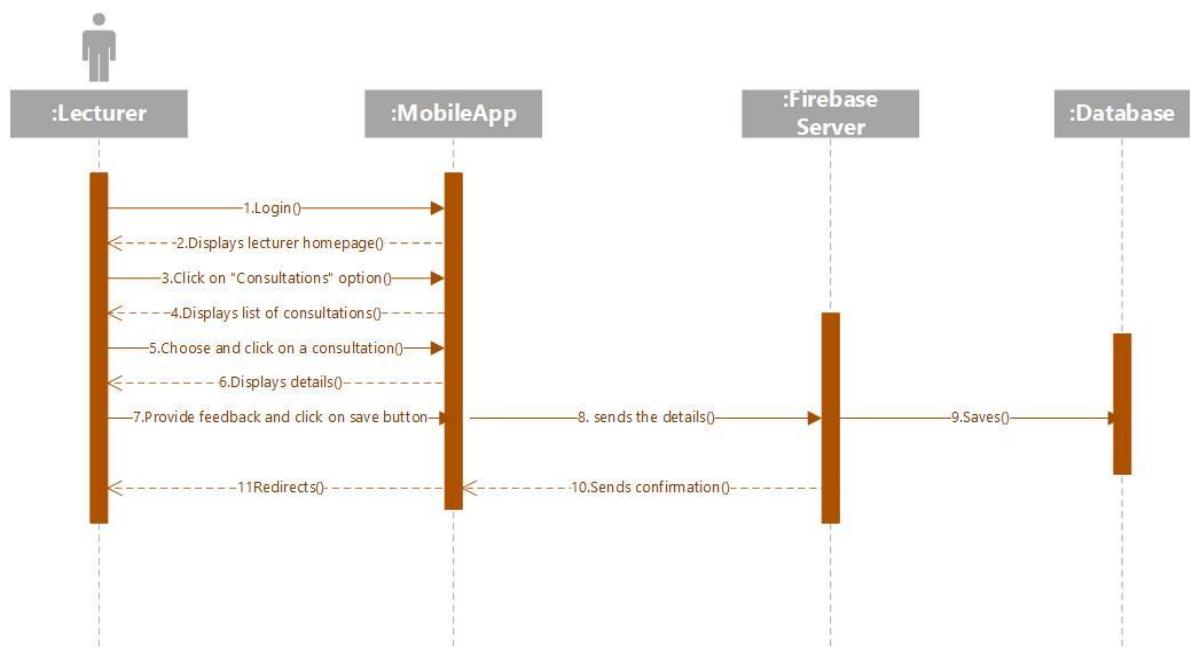


Figure 19 Sequence diagram (lecturer feedback)

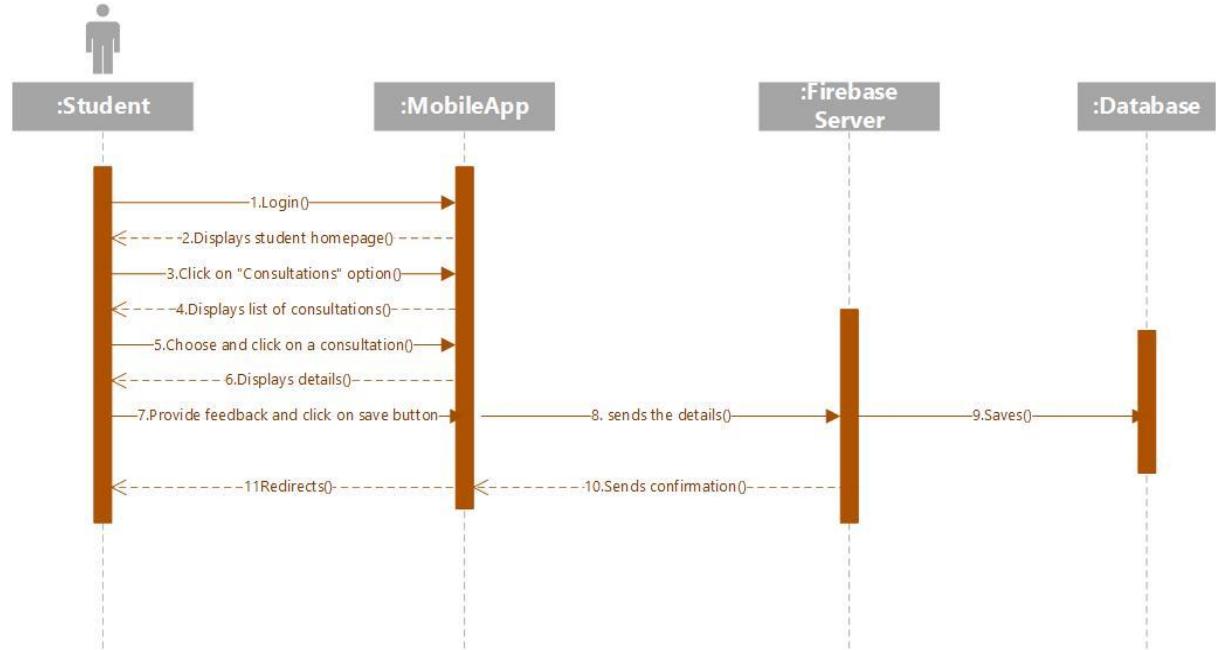


Figure 20 Sequence diagram(student feedback)

System Architecture Diagram

For system developers, they need system architecture diagrams to understand, clarify, and communicate ideas about the system structure and the user requirements that the system must support. It's a basic framework can be used at the system planning phase helping partners understand the architecture, discuss changes, and communicate intentions clearly. This diagram mainly extends and separates the system or application into multiple functional layers. The architecture diagram for the current system “MScheduling” has been separated into 5 layers, which are – Data Storage Layer, Functional Layer, Communication Layer, Internet Layer and User Interface Layer. The system architecture diagram is given below:

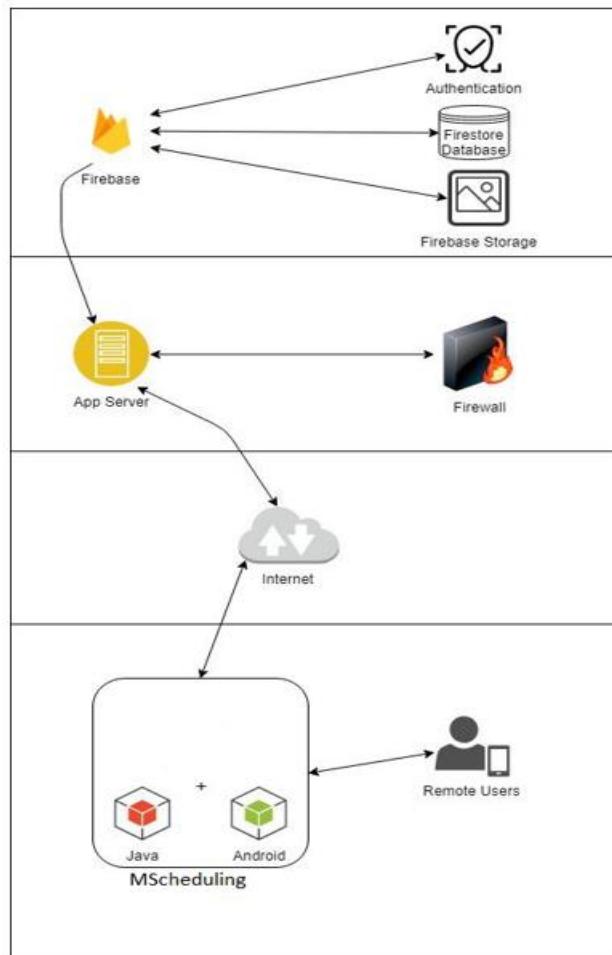


Figure 21 system architecture design

7.2.2 Database Design

7.2.2.1 Entity Relationship Diagram

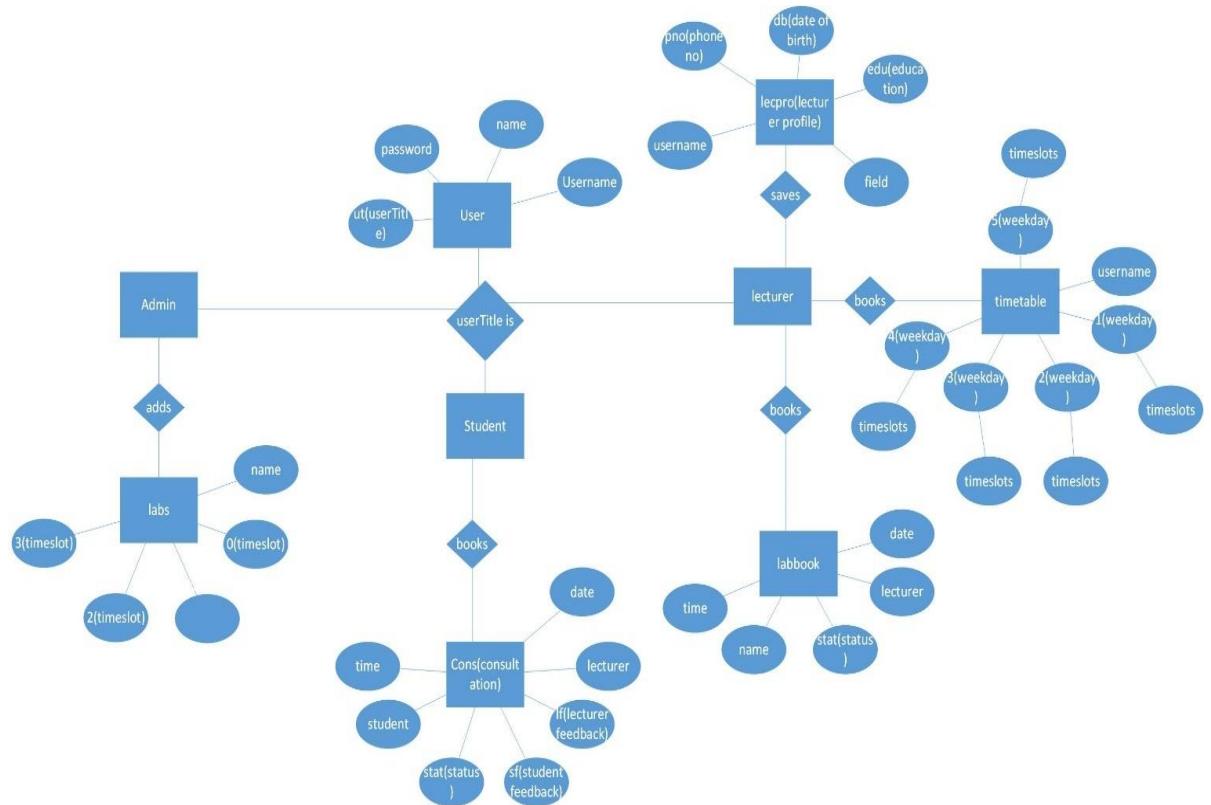


Figure 22 Entity Relationship Diagram

7.2.2.2 Database Table Structure

User Database:

The screenshot shows the MongoDB Compass interface with the following details:

- Project:** msschedule-e6462
- Collection:** users
- Document ID:** dpYX4ZYQr3Qjkxu017y5
- Fields:**
 - name: "Md Easir Arafat"
 - password: "1234"
 - username: "easirarafat1994@gmail.com"
 - ut: "student"

The screenshot shows the MongoDB Compass interface with the following details:

- Project:** msschedule-e6462
- Collection:** users
- Document ID:** E91VyeRo0gnfaZGMw9B5
- Fields:**
 - name: "Lecturer"
 - password: "1234"
 - username: "lecturer@gmail.com"
 - ut: "lecturer"

msschedule-e6462	users	dl9vdkni5FbYaR...	⋮
+ Add collection	+ Add document	+ Add collection	⋮
cons	E91VyeRo0gnfaZGMw9B5	+ Add field	
labbook	dl9vdkni5FbYaR2TDsgs >	name: "admin"	
labs	dpYX4ZYQr3Qjkxu017y5	password: "admin"	
timetable		username: "admin"	
users >		ut: "admin"	

Table 14 User database

Lecturer Timetable Database:

msschedule-e6462	timetable	qKP7LuY8l...	⋮
+ Add collection	+ Add document	+ Add collection	⋮
cons	qKP7LuY8l...	+ Add field	
labbook	>	5: {0: false, 1: false, 2: true}	
labs		username: "lecturer@gmail.com"	
timetable >			
users			

Table 15 Lecturer timetable database

Lab Booking Database:

The screenshot shows the MongoDB interface with the database 'msschedule-e6462'. The 'labbook' collection is selected. A document with the ID 'pu1WTn5nYlhxyMYuZa2c' is expanded, showing the following fields and their values:

- date: "2019-1-1"
- lecturer: "lecturer@gmail.com"
- name: "IT LAB"
- stat: "canceled"
- time: 1

Table 16 Lab booking database

Lab List Database:

The screenshot shows the MongoDB interface with the database 'msschedule-e6462'. The 'labs' collection is selected. A document with the ID '0cYEkXEP1yCpLcC0oJY8' is expanded, showing the following fields and their values:

- 0: false
- 1: false
- 2: false
- 3: false
- name: "IT LAB"

Table 17 Lab list database

Lecturer Profile Database:

+ Add collection	+ Add document	+ Add collection
cons	NM14rxZyZfrm86CfmxG2	
labbook	xLmoPjkNe2aKQ7tz5etq	
labs		
lecpro		+ Add field
timetable		db: "02/08/1988"
		edu: "bacholar"
		field: "software engineer"
		pno: "1835273741"

Table 18 Lecturer profile database

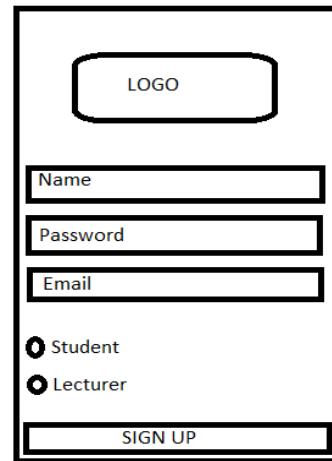
Consultation Booking Database:

msschedule-e6462	cons	sl9qdJt7rnuCH...
+ Add collection	+ Add document	+ Add collection
cons	GPNVX8VRqANCX9LvmpA8	
labbook	iasRI6ByZ4Mw8xhGuBYW	
labs	sl9qdJt7rnuCHf1HDQP	+ Add field
timetable		date: "2019-1-18"
users		lecturer: "lecturer@gmail.com"
		sf: "Had a good consultation hour."
		stat: "canceled"
		student: "easirarafat1994@gmail.com"
		time: 6

Table 19 consultation booking database

7.2.3 Interface Design

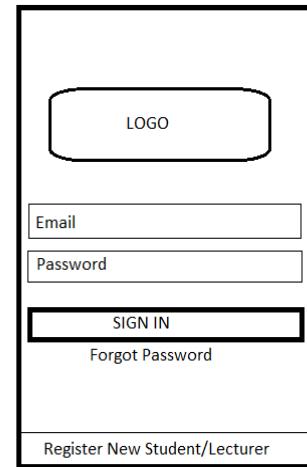
Sign Up



A wireframe diagram of a sign-up interface. At the top is a logo placeholder. Below it are three input fields labeled "Name", "Password", and "Email". Underneath these fields are two radio buttons: one for "Student" and one for "Lecturer". At the bottom is a large, prominent "SIGN UP" button.

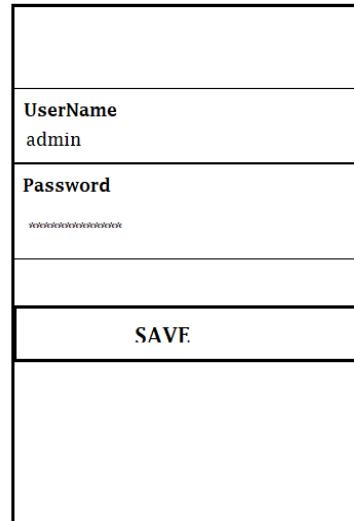
Figure 23 sign up (interface)

Sign In



A wireframe diagram of a sign-in interface. At the top is a logo placeholder. Below it are two input fields labeled "Email" and "Password". Underneath these fields are two buttons: a large "SIGN IN" button and a smaller "Forgot Password" link. At the very bottom is a link labeled "Register New Student/Lecturer".

Figure 24 sign in (interface)

Admin Sign-in

The diagram illustrates the Admin sign-in interface. It consists of a vertical stack of rectangular fields. At the top is a large empty field. Below it is a field labeled "UserName" containing the value "admin". Further down is a field labeled "Password" with a series of dots representing the password. At the bottom of the stack is a button labeled "SAVE".

Figure 25 Admin sign in (interface)

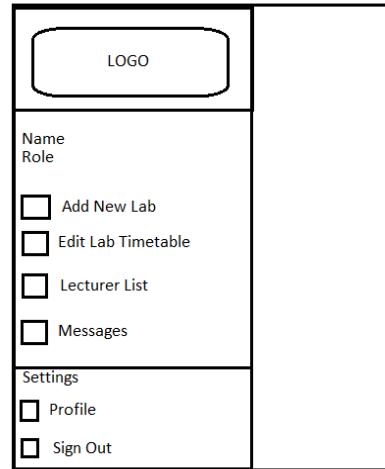
Menu (Admin)

Figure 26 Main menu (interface)

Add New Lab (Admin)

NEW LAB	
LAB 1	
8:30-10:30	10:30-12:30
13:30-15:30	15:30-17:30
SUBMIT	

Figure 27 Add new lab (interface)

Lecturer List(student)

Lecturer List
Choose Lecturer
John Walder
Prof. Dumbledore
Dr. Morgan

Figure 28 Lecturer list (interface)

Lecturer Profile (student)

PROFILE	
Name	Harry Potter
Email	harry@gmail.com
Education	bachlors
Field	software
DOB	23/11/1995
SEND MESSAGE	

*Figure 29 Lecturer profile (interface)***Lecturer chat (student)**

CHATS	
HARRY POTTER / harry@gmail.com	

Figure 30 Lecturer chat (interface)

View Lab List (Lecturer)

LABS LIST
Lab1
Lab2
Lab3

*Figure 31 Lab list (interface)***Book Lab (lecturer)**

BOOK LAB						
lab2						
S	M	T	W	Th	F	S
25	26	27	28	29	30	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

8:30	9:00
9:30	10:00

 BOOK |*Figure 32 Book Lab (interface)*

View Timetable (Lecturer)

TIMETABLE			
Monday	Tuesday	Wednesday	
Thursday		Friday	
8:30	9:00	9:30	10:00
10:30	11:00	11:30	12:00
12:30	13:00	13:30	14:00
14:30	15:00	15:30	16:00

*Figure 33 Timetable(interface)***Lecturer Profile (Lecturer)**

PROFILE	
UserName	Harry Potter
Password	*****
Education	Bachlors
Field	Software Engineering
Date of Birth	23/11/1995
Phone Number	01128898876
SAVE	

Figure 34 Lecturer Profile(interface)

Book Consultation (Student)

BOOK CONSULTATION							
HARRY POTTER software engineer				harry@gmail.com 01178786543			
December 2018							
S	M	T	W	Th	F	S	S
25	26	27	28	29	30	1	
2	3	4	5	6	7	8	
9	10	11	12	13	14	15	
16	17	18	19	20	21	22	
23	24	25	26	27	28	29	
30	31	1	2	3	4	5	
8:30		9:00		9:30		10:00	
10:30		11:00		11:30		12:00	
13:30		14:00		14:30		15:00	
15:30		16:00		16:30		17:00	
BOOK							

*Figure 35 Book consultation (interface)***Consultation Feedback(Lecturer/student)**

DETAILS	
2019-01-01	16:30
Mike Box	CANCELED
<u>Lecturer comment/Feedback</u>	
<u>Student comment/Feedback</u>	
SAVE	
CANCEL	

Figure 36 Consultation feedback (interface)

Consultation details (student/lecturer)

CONSULTATIONS	
Upcoming	
	2019-01-25 / 16:30
History	
	2018-12-11 / 09:00

Figure 37 Consultation details(interface)

CHAPTER 8: PROJECT PLAN

8.1 Features for “MScheduling” Application

Feature ID	Feature	Description
1	Register Students /Lecturers	System validates the email address and password and then store the information in the database(firebase).
2	Login (Students/lecturers)	System retrieves the students'/lecturers' information from the database to check whether it is registered or not.
3	Login (Admin)	System allows admin to login with the admin credentials.
4	Add new Lab	System allows admin to add new lab to the list of labs available to lecturers.
5	Show lecturer list	Shows the list of lecturers available for consultation.
6	Show lab list	Shows the list of labs to lecturers for them to book.
7	View Timetable	Shows the lecturer timetable to lecturer, making easy for him to manage timetable and assign consultations.

8	Book lab	System lets lecturer book lab by choosing the available time slot of lab.
9	Book consultation	System lets student book the consultation by choosing the time slots made available by the lecturer.
10	View Lecturer profile	System lets the student view the profile details of the lecturer.
11	Edit profile details	System lets the lecturer edit his profile details
12	chat	System lets the student chat with lecturer
13	Consultation check	System lets the user know of the upcoming consultations and history of the past consultations.
14	Consultation feedback	System lets the students and lecturer both provide the feedback of the attended consultation.

Table 20 Features for "MScheduling" Application

8.2 Release Plan for “MScheduling” Application

Version Number	Version Content(s)	Release Week
1.0	The version 1.0 consists of the function for the student, lecturer and admin to log in. This function allows to login with specific username and password.	The version 1.0 will be released on 1 st week of January
2.0	The version consists of the development of interface and implementation of firebase for backend.	The version 2.0 will be released on 3rd week of February
2.1	The version consists of the development chat functionality with all other features.	The version 2.1 will be released on 4th week of March

Table 21 Release Plan for "MScheduling" Application

8.3 Test Plan

8.3.1 Test Plan for Unit Testing

Unit testing is a level of software testing where individual units/ components of a software are tested. The purpose is to validate that each unit of the software performs as designed. A unit is the smallest testable part of any software. It usually has one or a few inputs and usually a single output. Unit testing is the first phase of software testing. The smallest parts of the system are called the units. These units are tested to check whether these are working as planned or not. As example, a unit may have one or few inputs and only one output. The test plan for unit testing for the “MScheduling” system has given below in a table:

Test Unit: Sign Up

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Email Format	Validation must show when the email address will not have the correct format.			
2	Password must have at least 6 characters	Validation must show when the password has less than 6 characters			
3	Empty Field	Validation will show when any field will be empty			
4	Trigger Sign-up Button	User credentials should be saved			

Table 22 Unit Testing Plan (Sign Up)

Test Unit: Login(Students/lecturers)

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Incorrect email address and password	Validation must show when the email address or password is not correct.			
2	Validate correct Email Address and password from the database.	Prompt user to the home activity if the email address and password is correct.			
3	Empty Field	Validation will show when any field will be empty			
4	Trigger Sign In Button	Prompt user to the home activity and shows “Logged in Successfully”			
5	Trigger Register Button	Prompt user to the register activity.			

Table 23 Unit Testing Plan for Login (Student, Lecturer)

Test Unit: Login(Admin)

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Incorrect email address and password	Validation must show when the email address or password is not correct.			
2	Validate correct Email Address and password from the database.	Prompt user to the home activity if the email address and password is correct.			
3	Empty Field	Validation will show when any field will be empty			
4	Trigger Sign In Button	Prompt user to the home activity and shows “Logged in Successfully”			

Table 24 Unit Testing Plan for Login (Admin)

Test Unit: Add New Lab

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty			
2	Trigger Submit Button	The information of the new lab must be stored in database, after clicking the “Submit” button.			
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

*Table 25 Unit Testing Plan (Add New Lab)***Test Unit: Lecturers List**

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the lecturers in a list	All of the lecturers must be able to retrieve from the database, show it in a list in the system.			

2	Search lecturers	Those lecturers according to the similarity between their name and entered name based on the alphabets must be shown in a list.			
3	Trigger lecturer name.	Prompt user to the lecturer profile			
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

*Table 26 Unit Testing Plan (Lecturers List)***Test Unit: Lecturer Profile**

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Trigger “Send Message” Button	Should prompt user to the chat thread between lecturer and user(student).			

Table 27 Unit Testing Plan (Lecturer profile)

Test Unit: Book Consultation Timetable

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the week days and timing under it	All the weekdays should be displayed along with time slots			
2	Trigger weekday	Prompts the user to choose desired timeslots under it			
3	Trigger Save Button	The information of the consultation must be stored in database with confirmation message.			
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

Table 28 Unit Testing Plan (Book Consultation Timetable)

Test Unit: Lab list

No	Test Case	Expected Result	Actual Result	Pass	Fail
.					
1	Show all the labs available in a list	All of the available labs must be retrieving from the			

		database show it in a list in the system.			
2	Trigger any of the lab name	Redirects the user to the Book lab page.			
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

Table 29 Unit Testing Plan (Lab List)

Test Unit: Book Lab

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the dates and available time slots under it	A month date calendar should be displayed and timeslots.			
2	Trigger any date	Displays the time slots under it			
3	Trigger “Book” Button	The information of the booking must be stored in database with confirmation message.			

4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			
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*Table 30 Unit Testing Plan (Book Lab)***Test Unit: Book Consultation**

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the dates and available time slots under it	A month date calendar should be displayed and timeslots.			
2	Trigger any date	Displays the time slots under it			
3	Trigger “Book” Button	The information of the booking must be stored in database with confirmation message.			
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

Table 31 Unit Testing Plan (Book Consultation)

Test Unit: Edit lecturer profile

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty			
2	Trigger Save Button	The information of the consultation must be stored in database with confirmation message.			
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

Table 32 Unit Testing Plan (Edit Lecturer Profile)

Test Unit: Consultation details

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty			
2	Trigger Save Button	The information of the consultation must be stored in database with confirmation message.			

3	Trigger “cancel” Button	Should return to the home page.			
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu			

Table 33Unit Testing Plan (Consultation Details)

8.3.2 Test Plan for Integration Testing

Integration testing is the second part of software testing. All the units of the system are combined for testing in a group. The integration testing is mainly used for check and expose the defects in the connection between the integrated components of the system.

The test plan for integration testing for the “MScheduling” system has given below in a table:

Testing Function	Test Description	Test Case	Expected Result	Actual Result
Register	Store the email address and password in the database.	Input email address and password and click “Sign-up” button.		
Login(student/lecturer)	Validates email address and	Input email address and password and		

	password from the database.	click “Sign In” button		
Login (Admin)	Checks the username and password from the system.	Input username and password and click “Sign In” button		
Add New Lab	Store the information of new lab in the database	Input all the information of the new lab and click the “Submit” button		
Lecturers List	Retrieve all the list of lecturers available from the database.	Click on a selected lecturer from the list.		
Lecturer Profile	Store the information of the lecturer profile in the database	Input all the lecturer information as a lecturer and click the “Save” button		
Book Consultation Timetable	Store the information of the lecturer consultation in the database.	Select all the information for consultation timing and click		

		the “Save” button.		
Lab list	Retrieve all the list of labs available from the database.	Click on a selected lab from the list.		
Book Lab	Store the information of the lab booking in the database.	Select all the information for lab booking and click the “Book” button		
Book Consultation(student)	Store the information of student consultation booking in the database.	Select all the information for consultation booking and click the “Book” button		
Edit lecturer profile	Store the information of the lecturer profile in the database	Input all the lecturer information as a lecturer and click the “Save” button		
Consultation details	Store the information of lecturer and	Input the feedback and		

	student feedback in database	click the “Save” button.		
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Table 34 The test plan for integration testing for the “MScheduling”

8.3.3 Test Plan for User Acceptance Testing

User acceptance testing is actually the testing of the overall and fully functional system in the real world. The current system “MScheduling” will be performed by three types of users. They are the students, lecturers and admin. Basically, four users will be performed the testing. One of them will be the admin, one will be lecturer and other two others will be students of Asia Pacific University. The fully functional system of “MScheduling” will be given to the users. The admin will test the admin functionality of the system, lecturer will test the lecturer functionality of the system and the students will test the student functionality of the system. After they finish their testing, they will be given a feedback form each person which consists of 4 questions. There are 3 yes/no questions and one optional feedback question. The yes/no questions have been chosen rather than normal questions because the students might not provide the accurate answer.

The questions are given below:

1. Do you think the application makes students life easier?
 - Yes
 - No

2. Do you think the interface for the “MScheduling” application is user-friendly?
 - Yes
 - No

3. Do you think the functions of the system will be enough to fulfil the requirements of the users?

Yes

No

4. Do you think the developed system is better than the current web-based system?

Yes

No

5. Any suggestions or opinions for improving the current system will be highly appreciated.

CHAPTER 9: IMPLEMENTATION

9.1 Screenshots

9.1.1 Screenshots for Register Activity

9.1.1.1 Description

The users have to register with their valid email address, name and password to get access through the system “MScheduling”. After entering the required information, they must click the “Sign-up” button.

9.1.1.2 Screenshot

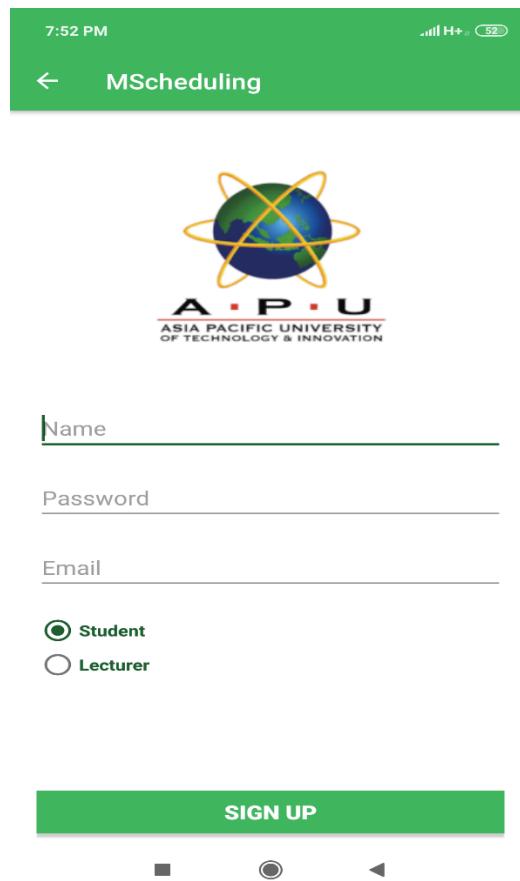


Figure 38 Sign-Up Activity

9.1.2 Screenshots for Login Activity

9.1.2.1 Description

The user must enter the valid username and password and then has to click the “Sign In Button” to get access. The “Forgot Password” text when click moves to reset password page and “Register New Student/Lecturer account” redirects to register page.

9.1.2.2 Screenshot

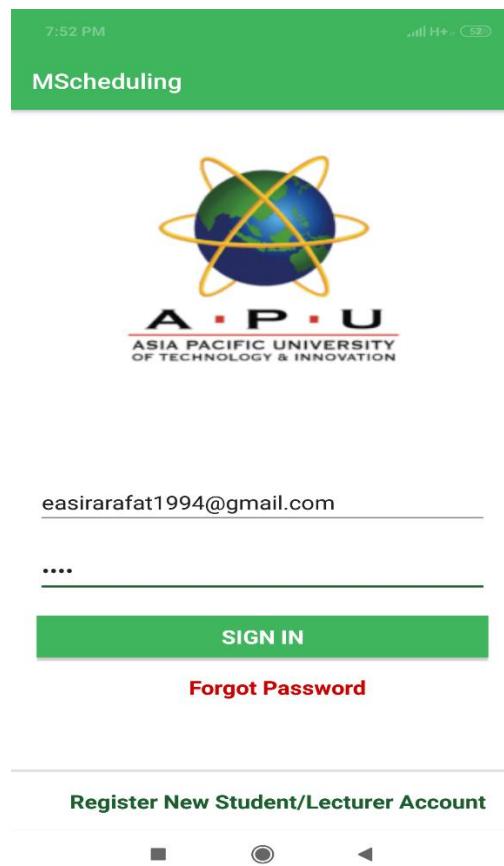


Figure 39 Login (Students) Activity

9.1.3 Screenshots for Main Menu Activity (Admin)

9.1.3.1 Description

This main menu displays the user name, timetable, lecturer list, add new lab for admin, messaging the lecturer, profile and sign-out functionality. Admin and lecturers both can chat between them.

9.1.3.2 Screenshot

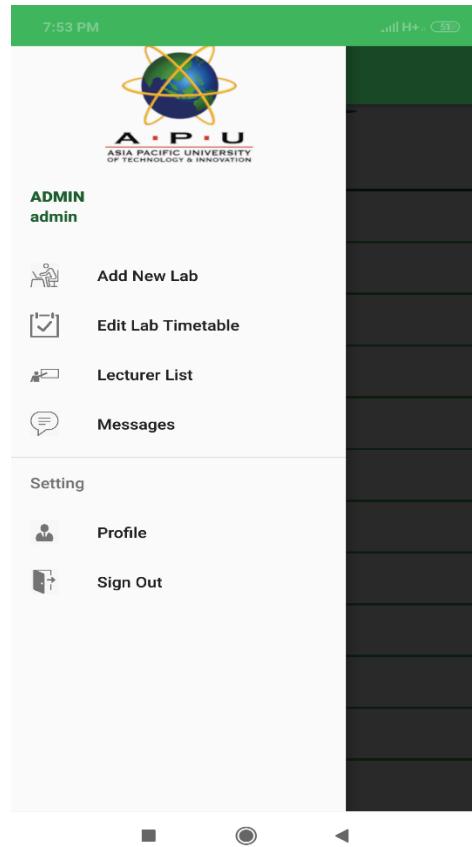


Figure 40 Login (Admin) Activity

9.1.4 Screenshots for Main Menu Activity (Student)

9.1.4.1 Description

In the student account the navigation drawer menu displays the user name, consultations, book consultations, lecturers list, messages, profile and Sign Out.

9.1.4.2 Screenshot

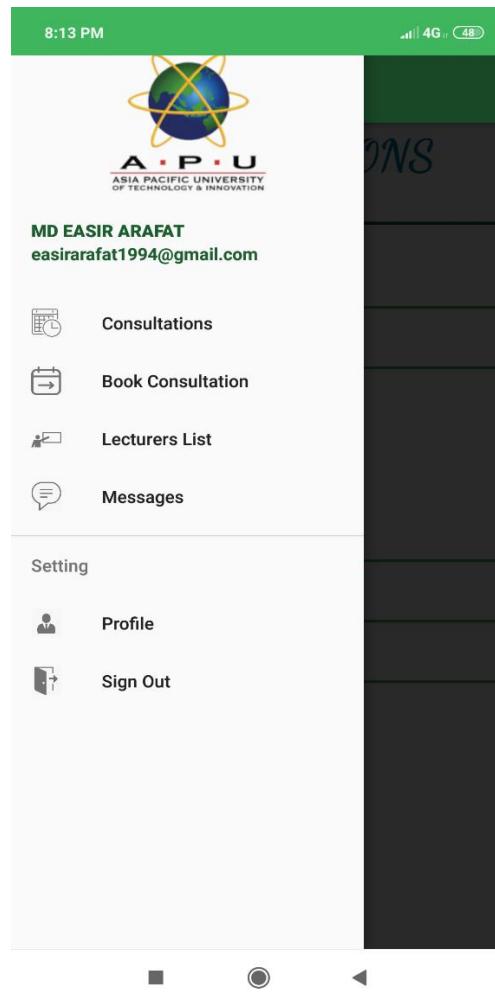


Figure 41 Login (Student) Activity

9.1.5 Screenshots for Main Menu Activity (Lecturer)

9.1.5.1 Description

In the Lecturer account the navigation drawer menu displays the user name, upcoming consultations, consultation timetable, lab reservation, messages, profile and Sign Out.

9.1.5.2 Screenshot

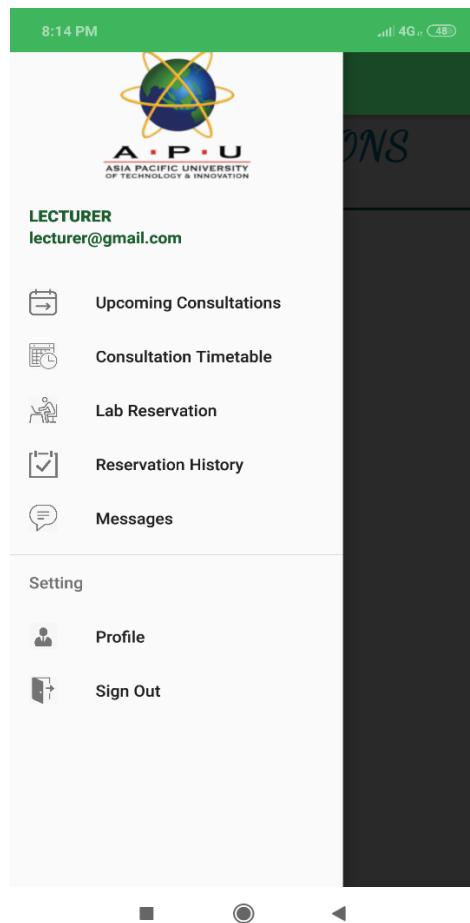


Figure 42 Login (Lecturer) Activity

9.1.6 Screenshots for Add New Lab

9.1.6.1 Description

This is the layout for adding new lab by providing the lab name, choosing the timeslots and clicking “submit” button.

9.1.6.2 Screenshot

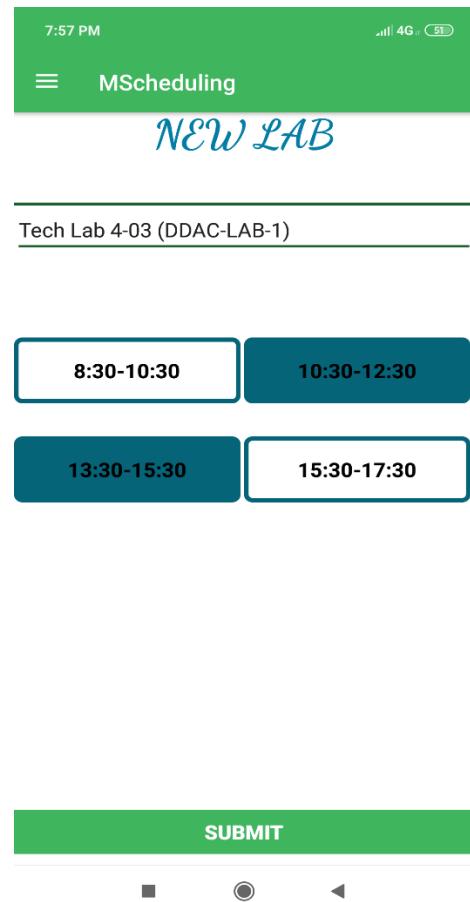


Figure 43 Add New Lab (Admin) Activity

9.1.7 Screenshots for Labs list Activity

9.1.7.1 Description

The “Labslist” activity is available in the panel of lecturers and admin. The user can view the available labs in the list and by clicking on any of the name, it takes it to the page for booking the lab

9.1.7.2 Screenshot

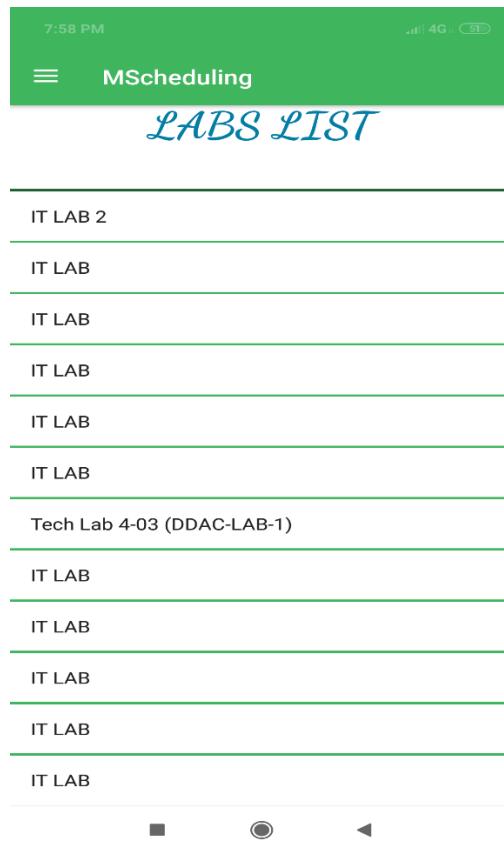


Figure 44 Labs List (Admin) Activity

9.1.8 Screenshots for Book lab Activity

9.1.8.1 Description

In this activity, lecturer can book the lab by choosing the dates and timeslots provided under it and then clicking the book button.

9.1.8.2 Screenshot

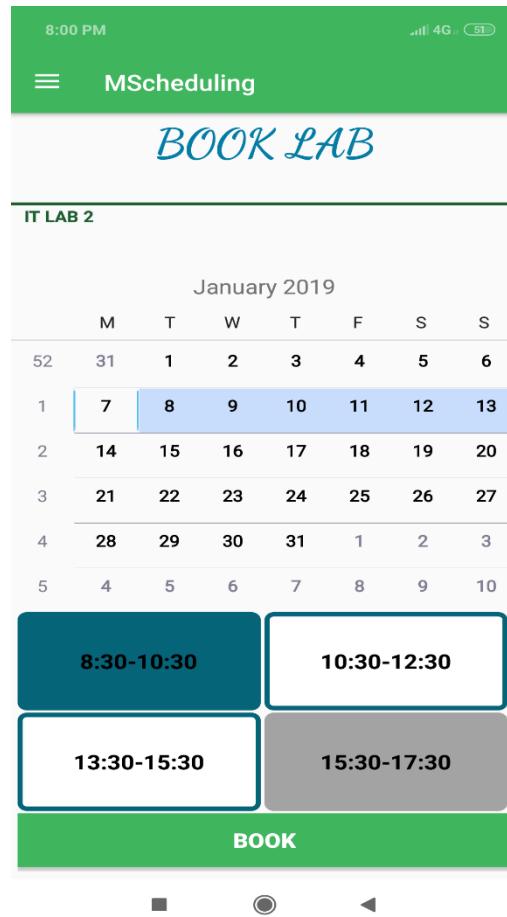


Figure 45 Book Lab (Lecturer) Activity

9.1.9 Screenshots for LecTimetable Activity

9.1.9.1 Description

In this activity, lecturer saves the timetable and puts up timeslots for consultation.

9.1.9.2 Screenshot

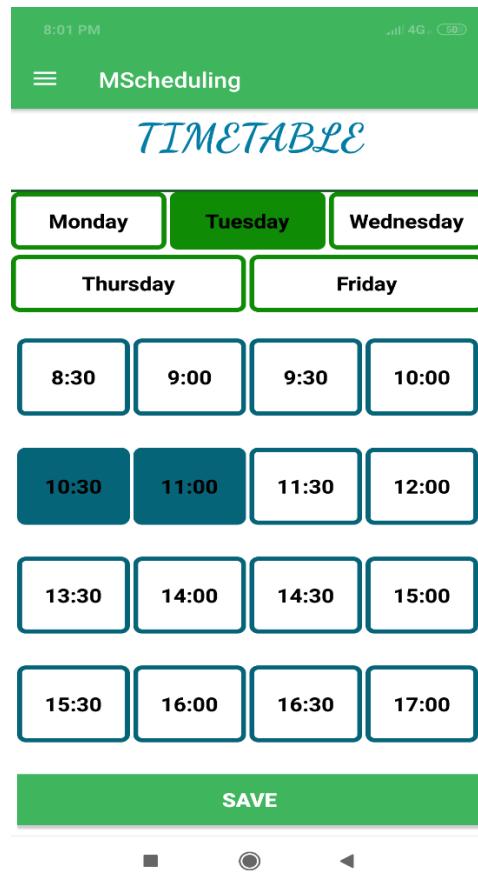


Figure 46 Lecturer Consultation Timetable (Lecturer) Activity

9.1.10 Screenshots for LecProfile Activity

9.1.10.1 Description

In this activity, lecturer saves the profile details by filling in the information and clicking “save” button.

9.1.10.2 Screenshot

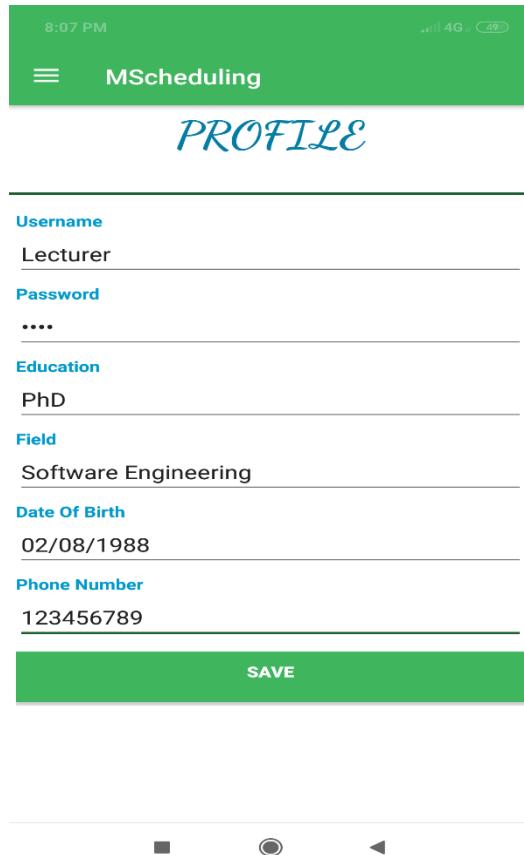


Figure 47 Lecturer's Profile (Lecturer) Activity

9.1.11 Screenshots for LabBookDetails Activity

9.1.11.1 Description

In this activity, details of the lab booking are displayed for lecturer and can click the “cancel” button to cancel booking.

9.1.11.2 Screenshot

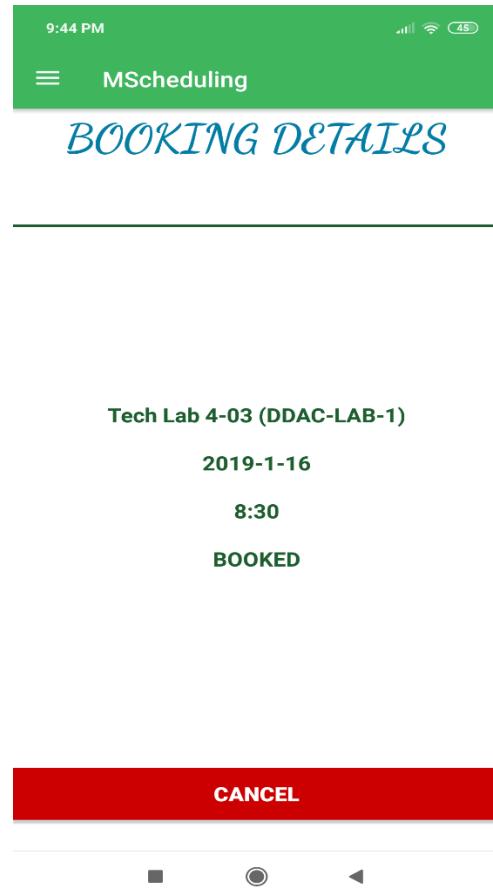


Figure 48 Lab Booking Details (Lecturer) Activity

9.1.12 Screenshots for Consultation List

9.1.12.1 Description

In this activity, details of the upcoming and already attended consultations are displayed.

9.1.12.2 Screenshot

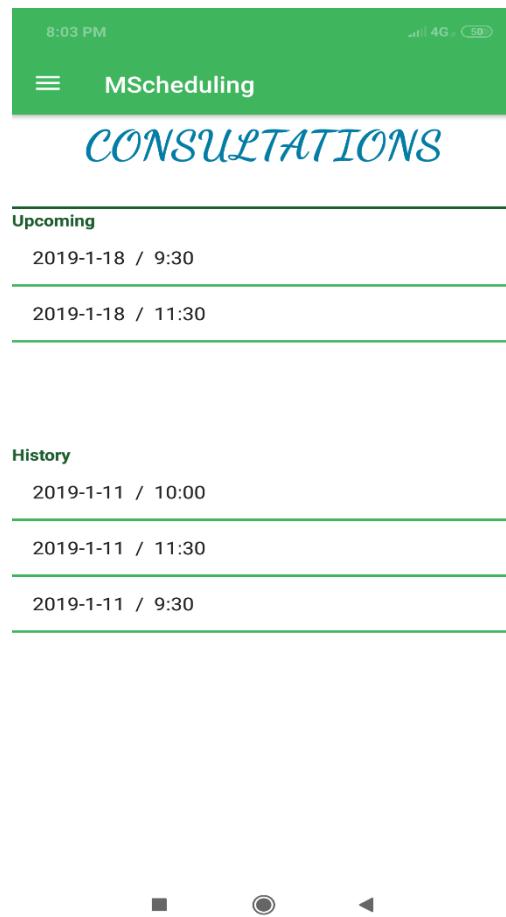


Figure 49 Consultation List (Lecturer/Student) Activity

9.1.13 Screenshots for Consultation details

9.1.13.1 Description

In this activity, details of the consultation are displayed, and both lecturer and student can provide feedback and save it using “save” button and cancel the appointment using “cancel” button.

9.1.13.2 Screenshot

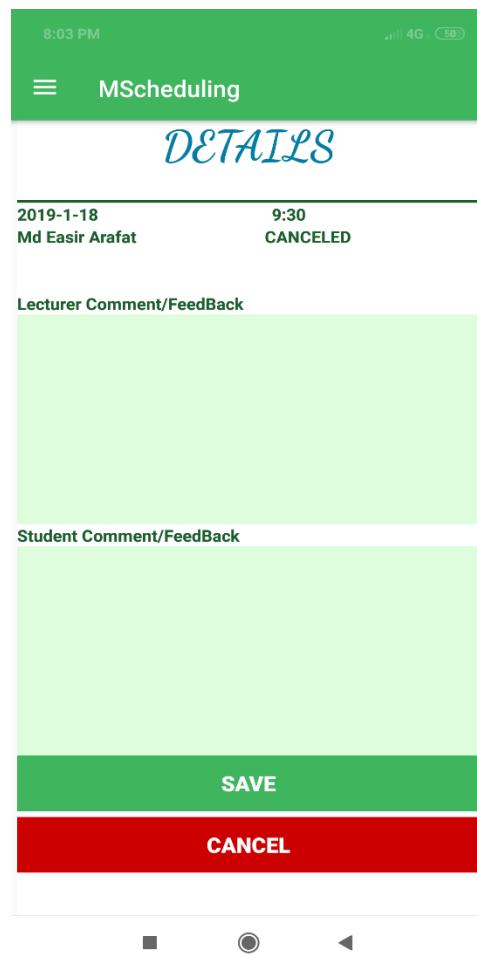


Figure 50 Consultation Details (Lecturer/Student) Activity

9.1.14 Screenshots for Consultation Booking

9.1.14.1 Description

In this activity, dates and timing of the consultation are shown for student and student can choose the date and timeslots under it and click “Book” button for booking.

9.1.14.2 Screenshot

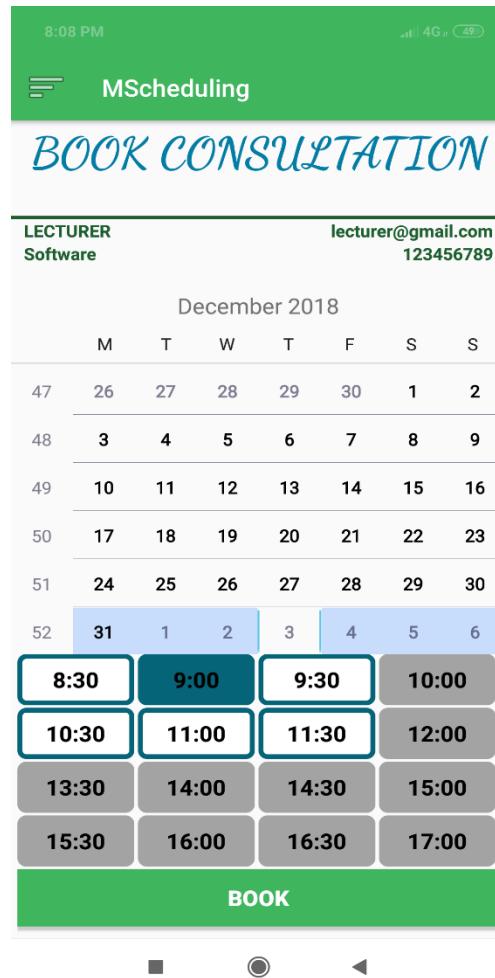


Figure 51 Book Consultation (Student) Activity

9.1.15 Screenshots for Lecturer List

9.1.15.1 Description

In this activity, lecturer list is displayed. Student can search in the search bar with the name alphabet also.

9.1.15.2 Screenshot

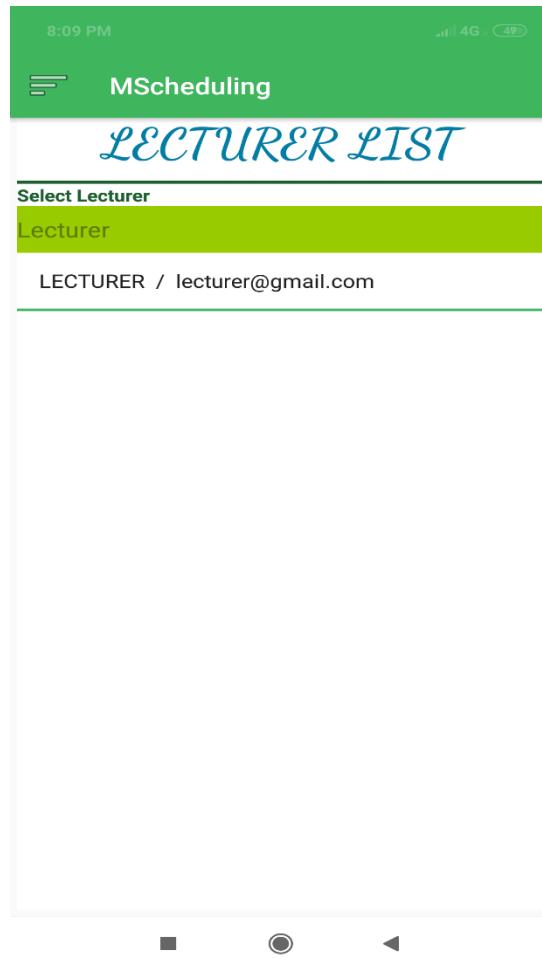


Figure 52 Lecturer's List (Student) Activity

9.1.16 Screenshots for Lecturer Profile details(student)

9.1.16.1 Description

In this activity, the selected lecturer details are displayed, and the student can click on the “Send Message” button to send message to the lecturer.

9.1.16.2 Screenshot

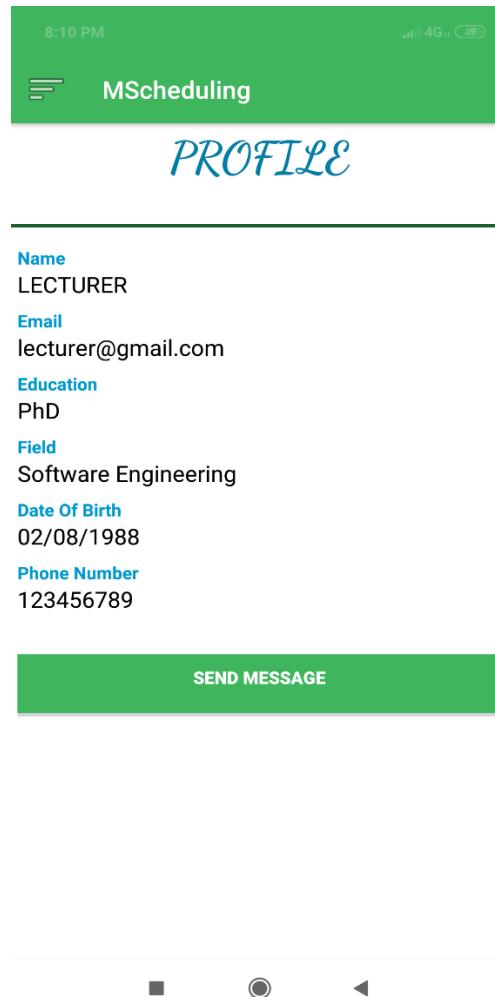


Figure 53 Lecturer's Profile Details (Student) Activity

9.1.17 Screenshots for Lecturer chat list (student)

9.1.17.1 Description

In this activity, the lecturer chat list is displayed.

9.1.17.2 Screenshot

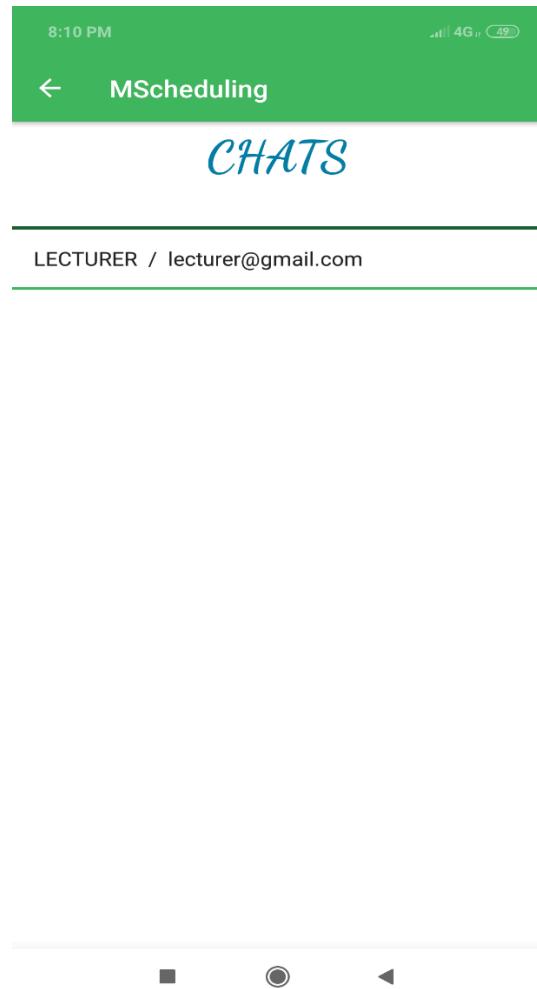


Figure 54 Lecturer's Chat List (Student) Activity

9.1.18 Screenshots for Lecturer and student chat (student)

9.1.18.1 Description

In this activity, lecturer student chat thread is displayed and can chat in this interface by entering message in the bottom and sending.

9.1.18.2 Screenshot

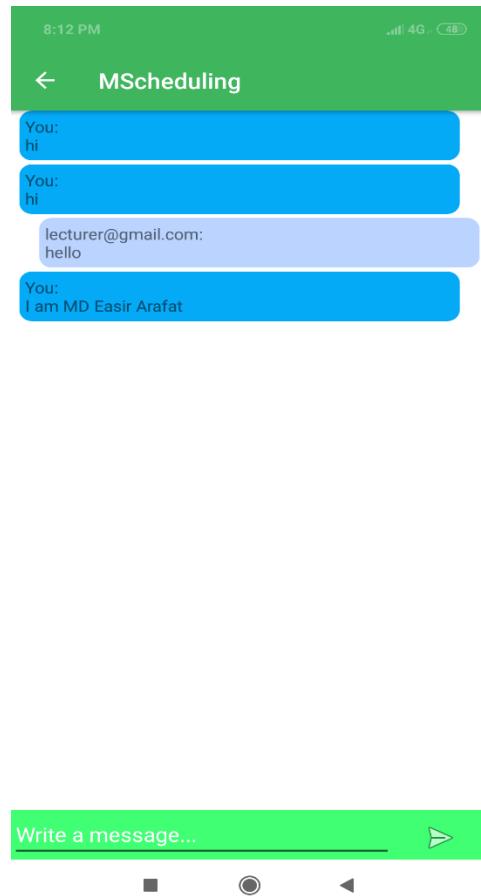


Figure 55 Lecturer and student Chat (Student) Activity

9.2 Sample Codes

The current system “MScheduling” is implemented mainly for the mobile devices. In this section, the main functionalities of the current system have been explained with the screenshots of the sample codes.

The developer did not make the interface design that much high because the size also matters in terms of usability and flexibility of the system. Simpler design makes it easier for the users to use and also takes less memory in the phone storage.

As the system is mainly developed for the android devices, so Java programming language has been used for developing the functionalities and the XML has been used for making the interface design. The firebase database has been also used by the developer to store all the information of the users and the bookings in the system. Some of the main functions have been explained below with sample codes:

9.2.1 Register and Login

In order to register and store the information of the users, the system needs to be connected to the Firebase database. The dependencies for connecting the database and the system are given below:

```
implementation 'com.google.firebase:firebase-core:16.0.1'  
implementation 'com.android.support.constraint:constraint-layout:1.1.2'  
implementation 'com.google.firebaseio:firebase-database:16.0.1'  
implementation 'com.google.firebaseio:firebase-messaging:17.3.0'  
implementation 'com.google.firebaseio:firebase-firebase:17.1.0'  
implementation 'com.google.firebaseio:firebase-core:16.0.3'  
implementation 'com.firebaseio:firebase-client-android:2.5.2+'  
implementation 'com.google.firebase:firebase-messaging:17.3.0'
```

The code for registering the users is given below:

```

bSignUp.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        final FirebaseFirestore db = FirebaseFirestore.getInstance();
        final String Email=fEmail.getText().toString();
        final String password=fPassword.getText().toString();
        final String Name=fName.getText().toString();
        String userType="student";
        final boolean[] check = {false};
        if(rLecturer.isChecked())
            userType="lecturer";
        if(Name.length()<1 || Email.length()<1 || password.length()<1)
        {
            new AlertDialog.Builder(activity)
                .setTitle("Failed!")
                .setMessage("Please fill all the field.")
                .setPositiveButton("OK", null).show();
            return;
        }
        final String finalUserType = userType;
        db.collection("users")
            .get()
            .addOnCompleteListener(new OnCompleteListener<QuerySnapshot>() {
        @Override
        public void onComplete(@NonNull Task<QuerySnapshot> task) {
            if (task.isSuccessful()) {
                check[0]=false;
                for (QueryDocumentSnapshot document : task.getResult()) {

                    if(document.getString("username").toString().equals(Email))
                        check[0]=true;
                    break;
                }
            }
            if(check[0]==true)
            {
                new AlertDialog.Builder(activity)
                    .setTitle("Failed!")
                    .setMessage("The email is already exists.")
                    .setPositiveButton("OK", null).show();
            }
            else
            {
                Map<String, Object> docData = new HashMap<>();
                docData.put("name",Name);
                docData.put("username",Email);
                docData.put("password",password);
                docData.put("ut", finalUserType);
                db.collection("users").add(docData)
                    .addOnSuccessListener(new OnSuccessListener<DocumentReference>() {
                @Override
                public void onSuccess(DocumentReference documentReference) {
                    new AlertDialog.Builder(activity)

```

```
.setTitle("Success!")
.setMessage("The new account has been created successfully..")
.setPositiveButton("OK", null).show();
Thread thread = new Thread(new Runnable() {
public void run() {
try {

sendmail(Email,password,Name);

activity.finish();
}
catch (Exception e)
e.printStackTrace();
}
}
);
thread.start();
}
});
}
}
else {
Log.w("aba", "Error getting documents.", task.getException()
}
}
}
);
}
}
});
```

The users have to register with their valid email address, name and password. After entering the necessary information, they must click the “SignUp” button.

The sample code for login is given below:

```
bSignIn.setOnClickListener(new View.OnClickListener() {
    public void onClick(View v) {
        // your handler code here
        final String userName=fUserName.getText().toString();
        final String password=fPassword.getText().toString();
        final boolean[] check = {false};
        FirebaseFirestore db = FirebaseFirestore.getInstance();
        db.collection("users")
            .get()
            .addOnCompleteListener(new
OnCompleteListener<QuerySnapshot>() {
    @Override
    public void onComplete(@NonNull Task<QuerySnapshot> task) {
        if (task.isSuccessful()) {
            check[0] =true;
            int userType=0;
```

```
for (QueryDocumentSnapshot document : task.getResult()) {  
  
    if(document.getString("username").toString().equals(userName) &&  
        document.getString("password").toString().equals(password))  
        if (document.getString("ut").toString().equals("admin")) {  
            userType = 1;  
            Intent adIntent = new Intent(activity, AdminToolBar.class);  
            prefs.edit().putString("username", userName).apply();  
            activity.startActivity(adIntent);  
        }  
        else if (document.getString("ut").toString().equals("student")) {  
            userType = 2;  
            Intent adIntent = new Intent(activity, StudentToolBar.class);  
            prefs.edit().putString("username", userName).apply();  
            prefs.edit().putString("name", document.getString("name")).apply();  
            activity.startActivity(adIntent);  
        }  
        else if (document.getString("ut").toString().equals("lecturer")) {  
            Intent adIntent = new Intent(activity, LecturerToolBar.class);  
            prefs.edit().putString("username", userName).apply();  
            prefs.edit().putString("name", document.getString("name")).apply();  
            activity.startActivity(adIntent);  
            userType = 3;  
        }  
        break;  
    }  
    if(userType==0)  
    {  
        new AlertDialog.Builder(activity)  
        .setTitle("Failed!")  
        .setMessage("Wrong username or password.")  
        .setPositiveButton("OK", null).show();  
    }  
  
} else {  
Log.w("aba", "Error getting documents.", task.getException());  
}  
});  
}  
});  
});
```

When the students click the login button, the system read the information from the database to search for the given email address and password. If the email address and password are correct, then redirects to the menu activity otherwise the system shows “Login Failed”.

9.2.2 Add New Lab

The sample code for Adding new lab by admin is given below:

```

bSubmit.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        final boolean[] check = {false};
        final String name=tName.getText().toString();
        final Boolean T0=c83.isChecked();
        final Boolean T1=c83.isChecked();
        final Boolean T2=c83.isChecked();
        final Boolean T3=c83.isChecked();
        if(name.length()<2)
        {
            new AlertDialog.Builder(context)
                .setTitle("Failed!")
                .setMessage("Please enter the lab name.")
                .setPositiveButton("OK", null).show();
            return;
        }

        db.collection("labs")
            .get()
            .addOnCompleteListener(new OnCompleteListener<QuerySnapshot>()
    @Override
    public void onComplete(@NonNull Task<QuerySnapshot> task) {
        if (task.isSuccessful()) {

            check[0]=false;
            for (QueryDocumentSnapshot document : task.getResult()) {

                if(document.getString("name").toString().equals(name)) {
                    check[0]=true;
                    break;
                }
            }
            if(check[0]==true)
            {
                new AlertDialog.Builder(context)
                    .setTitle("Failed!")
                    .setMessage("The lab is already exists.")
                    .setPositiveButton("OK", null).show();
            }
        else
        {
            Map<String, Object> docData = new HashMap<>();
            docData.put("name", name);
            docData.put("0", T0);
            docData.put("1", T1);
            docData.put("2", T2);
            docData.put("3", T3);
            db.collection("labs").add(docData)
                .addOnSuccessListener(new OnSuccessListener<DocumentReference>() {
    @Override

```

```
public void onSuccess(DocumentReference documentReference) {  
    new AlertDialog.Builder(context)  
        .setTitle("Success!")  
        .setMessage("The new account has been created successfully.")  
  
        .setPositiveButton("OK", null).show();  
    }  
});  
  
}  
  
} else {  
    Log.w("aba", "Error getting documents.", task.getException());  
}  
}  
});  
}  
});  
});  
});
```

The admin adds new lab by providing the lab name, choosing the timeslots and clicking “submit” button.

9.2.3 Book Lab

The sample code for Booking lab by lecturer is given below:

```
bSubmit.setOnClickListener(new View.OnClickListener() {  
    @Override  
    public void onClick(View v) {  
        int selectedTime=-1;  
        if(c83.isChecked()) selectedTime=0;  
        if(c103.isChecked()) selectedTime=1;  
        if(c133.isChecked()) selectedTime=2;  
        if(c153.isChecked()) selectedTime=3;  
        if(selectedTime==-1)  
        {  
            new AlertDialog.Builder(context)  
                .setTitle("Success!")  
                .setMessage("Please Select Date.")  
                .setPositiveButton("OK", null).show();  
            return;  
        }  
        String stat="booked";  
        Map<String, Object> data = new HashMap<>();  
        data.put("name",lab);  
        data.put("lecturer",userName);  
        data.put("date",date);  
        data.put("time",selectedTime);  
        data.put("stat",stat);  
        db.collection("labbook").add(data)
```

```

    .addOnSuccessListener (new OnSuccessListener<DocumentReference>() {
        @Override
        public void onSuccess(DocumentReference documentReference) {
            new AlertDialog.Builder(context)
                .setTitle("Success!")
                .setMessage("The lab has been booked.")
                .setPositiveButton("OK", null).show();
        }
    });

Class fragmentClass = LabListLecturer.class;
android.support.v4.app.Fragment fragment = null;
try {
    fragment = (android.support.v4.app.Fragment)
    fragmentClass.newInstance();
}
catch (Exception e) {
    e.printStackTrace();
}
FragmentManager fragmentManager = getActivity()
    .getSupportFragmentManager();
final int commit = fragmentManager.beginTransaction()
    .replace(R.id.navmain, fragment).commit();

}
});

```

The lecturer can book the lab by choosing the dates and timeslots provided under it and then clicking the book button.

9.2.4 Lecturer Timetable

The sample code for lecturer timetable setup is given below:

```

bSubmit.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        int day=1;
        if(rTue.isChecked()) day=2;
        if(rWed.isChecked()) day=3;
        if(rThu.isChecked()) day=4;
        if(rFri.isChecked()) day=5;

final boolean[] array = new boolean[16];

array[0]=c83.isChecked();
array[1]=c90.isChecked();
array[2]=c93.isChecked();
array[3]=c10.isChecked();
array[4]=c103.isChecked();
array[5]=c11.isChecked();
array[6]=c113.isChecked();

```

```
array[7]=c12.isChecked();
array[8]=c133.isChecked();
array[9]=c14.isChecked();
array[10]=c143.isChecked();
array[11]=c15.isChecked();
array[12]=c153.isChecked();
array[13]=c16.isChecked();
array[14]=c163.isChecked();
array[15]=c17.isChecked();

Map<String, Object> data = new HashMap<>();
data.put("username",userName);
Map<String, Object> dTime=new HashMap<>();
for(int i=0;i<16;i++)
{
    dTime.put(String.valueOf(i),array[i]);
}
data.put(String.valueOf(day),dTime);
if(docId[0].length()>2)
db.collection("timetable").document(docId[0]).set(data, SetOptions.merge())
addOnSuccessListener(new OnSuccessListener<Void>() {
@Override
public void onSuccess(Void aVoid) {
new AlertDialog.Builder(context)
.setTitle("Success!")
.setMessage("The timetable has been updated.")
.setPositiveButton("OK", null).show();
}
});
}
else
{
db.collection("timetable").add(data)
.addOnSuccessListener(new OnSuccessListener<DocumentReference>() {
@Override
public void onSuccess(DocumentReference documentReference) {
new AlertDialog.Builder(context)
.setTitle("Success!")
.setMessage("The timetable has been updated.")
.setPositiveButton("OK", null).show();
}
});
}
}
});
```

The lecturer saves the timetable and puts up timeslots for consultation using “submit” button.

9.2.5 Consultation Booking

The sample code for Booking consultation is given below:

```

bSubmit.setOnClickListener(new View.OnClickListener() {
    @Override
    public void onClick(View v) {
        int selectedTime=-1;
        if(c83.isChecked()) selectedTime=0;
        if(c90.isChecked()) selectedTime=1;
        if(c93.isChecked()) selectedTime=2;
        if(c10.isChecked()) selectedTime=3;
        if(c103.isChecked()) selectedTime=4;
        if(c11.isChecked()) selectedTime=5;
        if(c113.isChecked()) selectedTime=6;
        if(c12.isChecked()) selectedTime=7;
        if(c133.isChecked()) selectedTime=8;
        if(c14.isChecked()) selectedTime=9;
        if(c143.isChecked()) selectedTime=10;
        if(c15.isChecked()) selectedTime=11;
        if(c153.isChecked()) selectedTime=12;
        if(c16.isChecked()) selectedTime=13;
        if(c163.isChecked()) selectedTime=14;
        if(c17.isChecked()) selectedTime=15;
        if(selectedTime== -1)
        {
            new AlertDialog.Builder(context)
                .setTitle("Success!")
                .setMessage("Please Select Consultation Date.")
                .setPositiveButton("OK", null).show();
            return;
        }
        String stat="booked";
        Map<String, Object> data = new HashMap<>();
        data.put("student",userName);
        data.put("lecturer",lemail);
        data.put("date",date);
        data.put("time",selectedTime);
        data.put("stat",stat);
        db.collection("cons").add(data)
            .addOnSuccessListener(new
OnSuccessListener<DocumentReference>() {
    @Override
    public void onSuccess(DocumentReference documentReference) {
        new AlertDialog.Builder(context)
            .setTitle("Success!")
            .setMessage("The consultation has been booked.")
            .setPositiveButton("OK", null).show();

        }
    });
    Class fragmentClass = BookConsultatio.class;
    android.support.v4.app.Fragment fragment = null;
    try {
        fragment = (android.support.v4.app.Fragment) fragmentClass.newInstance();
    }
    catch (Exception e) {
        e.printStackTrace();
    }
    FragmentManager fragmentManager = getActivity()
        .getSupportFragmentManager();
    final int commit = fragmentManager.beginTransaction()

```

```

.replace(R.id.navmain, fragment).commit();

}
});

```

The dates and timing of the consultation are shown for student and student can choose the date and timeslots under it and click “Book” button for booking.

9.2.6 Lecturer List for students

The sample code for lecturer list is given below:

```

db = FirebaseFirestore.getInstance();
db.collection("users")
    .get()
    .addOnCompleteListener(new OnCompleteListener<QuerySnapshot>() {
@Override
public void onComplete(@NonNull Task<QuerySnapshot> task) {
if (task.isSuccessful()) {
int userType=0;
List<String> lecturer_list = new ArrayList<String>();

for (QueryDocumentSnapshot document : task.getResult()) {
if(document.getString("ut").equals("lecturer")) {

lecturer_list.add(document.getString("name").toString().toUpperCase() + " / "
+document.getString("username").toString());
}
}

final ArrayAdapter<String> arrayAdapter = new ArrayAdapter<String>

(context, android.R.layout.simple_list_item_1, lecturer_list);

lv.setAdapter(arrayAdapter);
eSearch.addTextChangedListener(new TextWatcher() {
@Override

public void beforeTextChanged(CharSequence s, int start, int count, int
after) {

}

@Override

public void onTextChanged(CharSequence s, int start, int before, int count)

{
@Override

```

```
public void afterTextChanged(Editable s) {
String sText=eSearch.getText().toString();

arrayAdapter.getFilter().filter(sText);
}
});

} else {

Log.w("aba", "Error getting documents.", task.getException());
}
}
});
lv.setOnItemClickListener(new AdapterView.OnItemClickListener() {
@Override
public void onItemClick(AdapterView<?> parent, View view, int position, long id) {
int p = lv.getCheckedItemPosition();
if(p!=ListView.INVALID_POSITION) {
int tindex=lv.getFirstVisiblePosition();
TextView textView = (TextView) lv.getAdapter().getView(p, null, lv);
final String text=textView.getText().toString();
final String userName=text.substring(text.indexOf(" / ")+4).trim();
final SharedPreferences prefs = context.getSharedPreferences(
"pref", Context.MODE_PRIVATE);
prefs.edit().putString("lec", userName).apply();
prefs.edit().putString("lecname", text.substring(0,text.indexOf(" /
"))).trim()).apply();
}

Class fragmentClass = StudentLecDetails.class;
android.support.v4.app.Fragment fragment = null;
try {
fragment = (android.support.v4.app.Fragment) fragmentClass.newInstance();
}

catch (Exception e) {
e.printStackTrace();
}

FragmentManager fragmentManager = getActivity().getSupportFragmentManager();
final int commit = fragmentManager.beginTransaction()

.replace(R.id.navmain, fragment).commit();
}

else{
Toast.makeText(context, "Nothing Selected..", Toast.LENGTH_LONG).show();
}
});
});
```

All the list of lecturers is retrieved from the database and displayed in the list view.

CHAPTER 10: SYSTEM VALIDATION

10.1 Unit Testing

Unit testing is the first phase of software testing. The smallest parts of the system are called the units. These units are tested to check whether these are working as planned or not. As example, a unit may have one or few inputs and only one output. The test plan for unit testing for the “MScheduling” system has given below in a table:

10.1.1 Sign Up

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Email Format	Validation must show when the email address will not have the correct format.	Validation shows after clicking the “SignUp” button with the email address which does not have the correct format.	<input checked="" type="checkbox"/>	
2	Password must have at least 6 characters	Validation must show when the password has less than 6 characters	Validation shows after clicking the “SignUp” button with the password which has less than 6 characters.	<input checked="" type="checkbox"/>	
3	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “SignUp” button with empty fields.	<input checked="" type="checkbox"/>	

4	Trigger SignUp Button	User credentials should be saved	User information are stored in the database successfully.	✓	
----------	--------------------------	----------------------------------	---	---	--

Table 35 Unit Testing Result (Sign Up)

10.1.2 Login (Students/Lecturers)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Incorrect email address and password	Validation must show when the email address or password is not correct.	Validation shows when the email and password or any of them is incorrect after clicking the “SignIn” button.	✓	
2	Validate correct Email Address and password from the database.	Prompt user to the home activity if the email address and password is correct.	System redirects to home activity.	✓	
3	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “SignIn” button with empty fields.	✓	

4	Trigger Sign In Button	Prompt user to the home activity and shows “Logged in Successfully”	User is prompted to the home activity and shows “Logged in Successfully”	<input checked="" type="checkbox"/>	
5	Trigger Register Button	Prompt user to the register activity.	User is prompted to the register activity.	<input checked="" type="checkbox"/>	

Table 36 Unit Testing Result (Login (Students/Lecturers))

10.1.2 Login(Admin)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Incorrect email address and password	Validation must show when the email address or password is not correct.	Validation shows when the email and password or any of them is incorrect after clicking the “SignIn” button.	<input checked="" type="checkbox"/>	
2	Validate correct Email Address and password from the database.	Prompt user to the home activity if the email address and password is correct.	System redirects to home activity.	<input checked="" type="checkbox"/>	
3	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “SignIn”	<input checked="" type="checkbox"/>	

			button with empty fields.		
4	Trigger Sign In Button	Prompt user to the home activity and shows “Logged in Successfully”	User is prompted to the home activity and shows “Logged in Successfully”	✓	

Table 37 Unit Testing Result (Login (Admin))

10.1.3 Add New Lab(Admin)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “Submit” button with empty fields.	✓	
2	Trigger Submit Button	The information of the new lab must be stored in db, after clicking the “Submit” button.	User information are stored in the database successfully.	✓	
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 38 Unit Testing Result (Add New Lab(Admin))

10.1.4 Lecturers List(Student)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the lecturers in a list	All of the lecturers must be retrieved from the database show it in a list in the system.	All the lecturers are displayed in the list in the system.	✓	
2	Search lecturers	Those lecturers according to the similarity between their name and entered name based on the alphabets must be shown in a list.	When start entering the lecturer name in the search bar, the lecturer names start appearing in the list.	✓	
3	Trigger lecturer name.	Should prompt user to the lecturer profile	The user is redirected to the lecturer profile	✓	
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 39 Unit Testing Result (Lecturers List(Student))

10.1.5 Lecturer Profile(Student)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Trigger “Send Message” Button	Should prompt user to the chat thread between lecturer and user(student).	The chat thread is opened.	✓	

Table 40 Unit Testing Result (Lecturer Profile(Student))

10.1.6 Book Consultation Timetable(Lecturer)

No	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the week days and timing under it	All the weekdays should be displayed along with time slots	All the weekdays are displayed along with time slots	✓	
2	Trigger weekday	Prompts the user to choose desired timeslots under it	The user is able to choose desired the timeslots under it.	✓	
3	Trigger Save Button	The information of the consultation must be stored in database with confirmation message.	The information of the consultation is stored in database and confirmation message is displayed.	✓	
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

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Table 41 Unit Testing Result (Book Consultation Timetable(Lecturer))

10.1.7 Lab List(Lecturer)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the labs available in a list	All of the available labs must be retrieving from the database show it in a list in the system.	All the available labs are shown in the list in the system.	✓	
2	Trigger any of the lab name	Redirects the user to the Book lab page.	The user is redirected to the Book lab page.	✓	
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 42 Unit Testing Result (Lab List(Lecturer))

10.1.8 Book Lab(Lecturer)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the dates and available time slots under it	A month date calendar should be displayed and timeslots.	A month date calendar is displayed along with timeslots.	✓	
2	Trigger any date	Should display the time slots under it	Displays the time slots under it	✓	
3	Trigger “Book” Button	The information of the booking must be stored in database with confirmation message.	The information of the booking is stored in database and confirmation message is prompted.	✓	
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 43 Unit Testing Result (Book Lab(Lecturer))

10.1.9 Book Consultation(Student)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Show all the dates and available time slots under it	A month date calendar should be displayed and timeslots.	A month date calendar is displayed along with timeslots.	✓	
2	Trigger any date	Should display the time slots under it	Displays the time slots under it	✓	
3	Trigger “Book” Button	The information of the booking must be stored in database with confirmation message.	The information of the booking is stored in database and confirmation message is prompted.	✓	
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 44 Unit Testing Result (Book Consultation(Student))

10.1.10 Edit Lecturer Profile(Lecturer)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “Save” button with empty fields.	✓	
2	Trigger Save Button	The information of the lecturer must be stored in database with confirmation message.	The information of the lecturer is stored in database and confirmation message is prompted.	✓	
3	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 45 Unit Testing Result (Edit Lecturer Profile(Lecturer))

10.1.11 Consultation details(Lecturer/student)

No .	Test Case	Expected Result	Actual Result	Pass	Fail
1	Empty Field	Validation will show when any field will be empty	Validation shows after clicking the “Save” button with empty fields.	✓	
2	Trigger Save Button	The information of the consultation must be stored in database with confirmation message.	The information of the consultation is stored in database and confirmation message is prompted.	✓	
3	Trigger “cancel” Button	Should return to the home page.	The user is returned to the home page.	✓	
4	Trigger navigation drawer menu Button	Must prompt navigation drawer menu	The navigation drawer menu is displayed.	✓	

Table 46 Unit Testing Result (Consultation details(Lecturer/student))

10.2 Integration Testing

The result for integration testing for the “MScheduling” system has given below in a table:

Testing Function	Test Description	Test Case	Expected Result	Actual Result
Register	Store the email address and password in the database.	Input email address and password and click “SignUp” button.	System will validate and check the pattern of the email address and the password and it will save the information in the database.	System validates the email address and password and store the information in the database.
Login(student/lecturer)	Validates email address and password from the database.	Input email address and password and click “Sign In” button	System will process and validate the entered email address and password from the database to check whether this email address is registered or not.	System validates the entered email address and password and if it is registered, then redirects to the next page.

Login (Admin)	Checks the username and password from the system.	Input username and password and click “Sign-In” button	System will check the username and password whether it matches with the operated username and password or not. If it does not match, then system will show “Login Failed”.	System checks the username and password and when it matches with the operated email address and password then redirects to the next page.
Add New Lab	Store the information of new lab in the database	Input all the information of the new lab and click the “Submit” button	The information of the new lab must be stored in database, after clicking the “Submit” button.	User information are stored in the database successfully.
Lecturers List	Retrieve all the list of lecturers available from the database.	Click on a selected lecturer from the list.	The user should be redirected to the lecturer profile	The user is redirected to the lecturer profile
Lecturer Profile	Retrieves the lecturer	Click on the “Send message”	The chat thread should open	The chat thread is opened.

	information and displays in the profile	button to chat with the lecturer	between user and lecturer when click “Send message” button	
Book Consultation Timetable	Store the information of the lecturer consultation in the database.	Select all the information for consultation timing and click the “Save” button.	The information of the consultation must be stored in database with confirmation message.	The information of the consultation is stored in database.
Lab list	Retrieve all the list of labs available from the database.	Click on a selected lab from the list.	Redirects the user to the “Book lab” page.	The user is redirected to “Book lab” page.
Book Lab	Store the information of the lab booking in the database.	Select all the information for lab booking and click the “Book” button	The information of the booking must be stored in database with confirmation message.	The information of the booking is stored in database.
Book Consultation(student)	Store the information of student consultation booking in the database.	Select all the information for consultation booking and click the “Book” button	The information of the consultation must be stored in database with confirmation message.	The information of the consultation is stored in database.

Edit lecturer profile	Store the information of the lecturer profile in the database	Input all the lecturer information as a lecturer and click the “Save” button	The information of the lecturer must be updated in database with confirmation message.	The information of the lecturer is updated in database.
Consultation details	Store the information of lecturer and student feedback in database	Input the feedback and click the “Save” button.	The information of lecturer and student feedback must be stored in database	The information of lecturer and student feedback are stored in the database.

Table 47 Integration Testing

10.3 User Acceptance Testing

User Acceptance Analysis

In the questionnaire for user acceptance testing, there are overall four questions. First three questions are bound with yes and no answer and the last question is free to answer, and it is optional so that the admin, lecturer and the students can answer openly and can give opinions and suggestions in order to improve the system.

First question is whether the application makes the life of lecturers and students easier. This question will help to put more focus on improving the features. As a feedback, all two students and a lecturer answered yes which means that the application has given them the platform they were looking for.

Second question is about the interface of the system whether it is user-friendly or not. The two students and a lecturer answered yes for this question. So, the students' panel is user-friendly. But the admin who another tester for the system is answered no for

this question. This feedback of the tester will encourage the developers to overcome the lacks and to improve the interface of the system.

The third question is about the functionalities of the system. The admin and one student answered no for this question. So, it can be said that the system does not have enough functionalities which will allow the system fulfils all the requirements of all the users. The fourth question is about the comparison between the current system and the previous system whether the current system fulfils all the requirements or not. All the four testers answered yes and agreed with this question.

The last question is free and optional for the testers. This question will help the developers to gather the requirements and the expectations of the users from the system. Among four testers, the admin and two students answered the fourth question.

10.4 Summary

Software testing is obvious process for all the fully functional system whether it can be web, windows, mobile or any type of application. Because the software testing is such a process which is performed though a system to find out any faults or bugs. The testing process also finds out whether the system or application is meeting all the requirements and demands of the users or not. If any of them is found out by the testers, then it will be returned to the developers with notifying the faults so that the developers can fix those before sending the system to the actual users.

The current system “MScheduling” has three types of users, such as – the admin, lecturers and the students. So, for the user acceptance testing, all of users has been performed properly and has gone through a questionnaire process. According to the result, the current system has some lacks which needs to be solved before delivering it to the actual users

The system will be a great companion for the lecturers and students. The result of the user acceptance testing helps to find out the hidden lacks and mistakes which the

developer must remove, develop and also encourages to develop more features and functionalities for the current system in order to make it more user-friendly and to increase the usability.

During the unit testing, every unit of all the functions in the system have been tested properly and the actual results were similar with the expected results. The results for all core functionalities in the integration testing works and gives the actual result as similar with the expected result. So, it can be said that the overall system is working properly and will support all types of users in every phase.

The current system has passed all the testing process and the users are also happy with the system. So, the system can be handed over to the actual users in order to use it.

CHAPTER 11: CONCLUSION AND REFLECTION

11.1 Critical Evaluation

The critical evaluation of the current system will be done by the developer. This section will be done by evaluating the degree of success, limitations and future enhancement of the system and the problems which have been faced by the developers during the development of the system.

11.1.1 Degree of Success

The degree of success mainly represents the output of the system and the feedback of the users for the system. The potential benefits which are the tangible and intangible benefits have been explained by the developers are also included in this section. It also includes the result of the objectives and deliverables which have been documented before, whether these are fulfilled by the system or not. One of the main objectives of this current system was providing live chat functionality to its users.

The system provides the platform for the students and lecturers to coordinate and communicate very easily. The current web-based scheduling system doesn't provide lecturer timetable and available consultation hour in a single web-based system. It doesn't synchronize with the system. So, lecturer need to open multiple tab for setting their available consultation timetable for the student where they need more time to do it. This helps the lecturer to check very easily the available time and put it up for consultation. It also helps them to book the labs very easily.

For the students, they can easily log into the system, check the available consultation timing and book in no time, otherwise earlier, they had to chase the lecturer and most of the time would find difficult to catch the lecturer and which could sometimes have serious consequences.

It saves the energy of all the users. This application saves a lot time for students and can focus on more productive work instead of wasting time chasing the lecturers.

In the testing section, the result of user acceptance testing which is inside the testing section will allow the developer to know how much convincing the current system to the developers will be. Overall, “MScheduling” system fulfils all the requirements of the users including the chat functionalities which successfully completes the objectives which was documented by the developer in the early stage.

11.1.2 System Limitations

There are no applications or systems that can be developed without any bugs or faults in the system. It is an obvious matter that any application which have been developed must have some bugs at the first time. Some faults can be fixed after a short period of testing. But it needs a long period of time to make a proper application which will be gone through a long and proper software testing. “MScheduling” system also has some limitations because of the lack of developing time resources. The limitations are given below:

- a. The admin’s panel also needs to be developed as a web application. According to the admin’s feedback in the user acceptance testing, the system would be more flexible and easier to use in a web application. But to implement this function, the developer needs more time as there will be two different applications to be developed and tested for a long time. Because of the lack of enough time, the developer did not develop the web application for the librarian.
- b. When the admin will add new lab in the system or lab timing is updated. The lecturer must be notified by the system. This lets him know he has more flexibility in choosing the labs and adjust his timetable. But because of the shortage of time, the developer could not develop it.

c. The students should have the functionality to select the lecturers, they want to get notification from when they publish their consultation timings. This will help students to know earlier and book as soon as possible.

Though, there are some limitations in the developed system, but it completed every objective and is fulfilling all the requirements of the users. The developer implemented all the core functions in the system. So, the system is fully ready to deliver to its actual users. Later, the system can be updated with the functions and features which are left.

11.1.3 Future Enhancement

The developer could implement and apply a lot of sub-functions and features in the system. But for the lack of time the developer could not do it. The future enhancement for the current system is given below:

- a. Develop web-based panel for admin.
- b. Include push notification for the students' panel to notify them about new consolation timings published by lecturer
- c. Include push notification for the lecturers' panel to notify them about new lab added and the new timings of the availability of labs.

11.1.4 Problems Faced

The first problem which has been faced by the developer is the Firebase database. Cloud firebase database is a NoSQL database which supports IOS, android and web applications. But the developer could not find enough documentation for this database so that connect and implement it in the system. So, the developer had to give a lot of time and effort to learn the implementation of this database. The developer also took suggestions for more documentation from the other developers. After a lot of research and effort, the developer finally able to develop the system with the cloud firebase as database.

The second problem was the integration of the chat functionality in the system. The developer didn't know how to add chat functionality to the system, so he had to do a lot of research but finally he managed to do it.

The developer also faced some other minor problems during the development of the system. One of them is the confliction of the version between firebase database and Android Studio. The version of the android IDE constantly being updated. And then the firebase version gets conflicted with the new version of the IDE. The developers still stuck in many parts of the development which is normal most of the developers. But he managed to cover those problems by his own.

11.1.5 Challenges

The first and main challenge for the developer was the programming languages for developing the system. As the developer was new to android development, first he had to learn the java and the functionalities of IDE properly before starting the implementation of the system. But still as a developer of a new programming language, he had to face many challenges during the development in terms of implementing new functionalities.

The interface design was another challenge for the developer. Since, the developed system is a mobile application, it has lesser resources for designing the features. So, the developer had to analyse and find new ways to design the interface in a way.

11.1.6 Learning Outcomes

The developer has learnt a lot of new things during the development of the system. Problems, bugs, faults may be being the negative words. But for a software developer it is considered as both negative and positive words. Because, the developer can experience and learn from different types of problems. Without facing and solving any error in a system means that the developer didn't learn anything during that development. So, the developer took those errors as a chance of learning and solving his mistakes.

Moreover, the developer also had to learn java language and the functionalities of Android studio as well as the Firestore Database. The developer also learnt the core function of the system which is the development chat functionality and successfully incorporated in the system.

11.2 Conclusion

The main purpose of developing the system “MScheduling” is to lessen the problems and sufferings of the students as well as the lecturers. The previous system was a web application and the lecturers had to go through many links and pages just to see their timetable. The admin office also had to suffer by helping lecturers manage the labs for consultation.

“MScheduling” allows the students to chat directly with the lecturers. Students can view the lecturer details. They can also choose or cancel the consultations as per preferences. So, now they do not have to go to the lecturer office for seeing him or chasing him. It will save time for the lecturers, students as well as admin office. The developer also did the research and analysed the problems and made the idea for the new application for the users. The potential benefits, problems, objectives, domain and technical research and other valuable sections of the research had been done by the developer in order to make the system to fulfil all the users’ requirements and to solve the problems of them.

After the development of the system, it had been tested by the tester so that the users do not face any difficulties, bugs and errors in the system. The system passed all the tests successfully and the users are also happy with the system according to the result of user acceptance testing. So finally, the system is fully ready to deliver to the students and lecturers.

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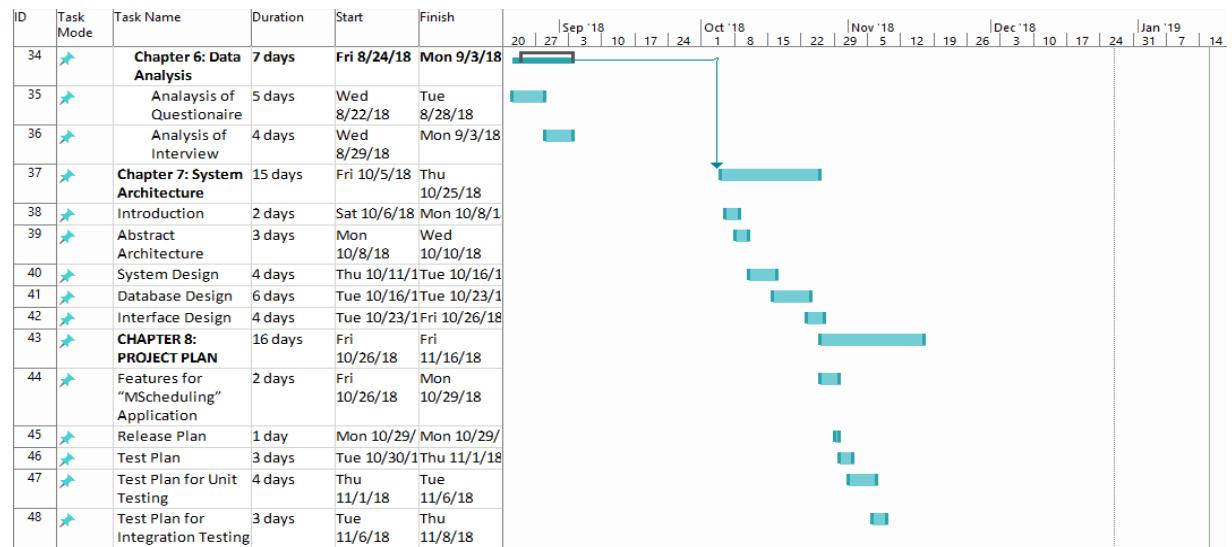
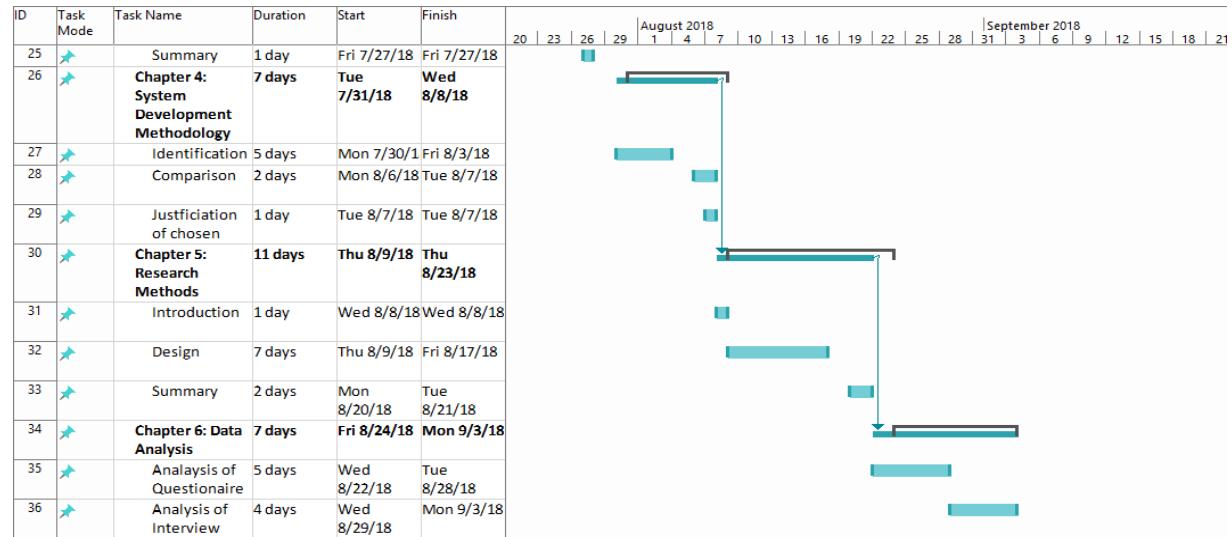
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APPENDICES

Gantt Chart

ID	Task Mode	Task Name	Duration	Start	Finish	Timeline
1	★	FYP Project Plan	148 days	Mon 6/4/18	Wed 12/26/18	23 May '18 30 7 14 21 28 Jun '18 4 11 18 25 Jul '18 2 9 16 23 Aug '18 30 6 13 20 27 Sep '18 3 10 17
2	★	Chapter 1: Introduction to the Study	9 days	Tue 6/5/18	Mon 6/18/18	
3	★	Background to the Project	2 days	Tue 6/5/18	Wed 6/6/18	
4	★	Problem Context	3 days	Tue 6/5/18	Thu 6/7/18	
5	★	Rationale	1 day	Fri 6/8/18	Fri 6/8/18	
6	★	Potential Benefits	2 days	Mon 6/11/18	Tue 6/12/18	
7	★	Target Users	1 day	Wed 6/13/18	Wed 6/13/18	
8	★	Scope and Objectives	5 days	Tue 6/12/18	Sun 6/17/18	
9	★	Aims	1 day	Mon 6/11/18	Mon 6/11/18	
10	★	Objectives	1 day	Mon 6/11/18	Mon 6/11/18	
11	★	Deliverable	3 days	Mon 6/11/18	Wed 6/13/18	
12	★	Nature of Challenges	1 day	Thu 6/14/18	Thu 6/14/18	
13	☛	IR Overview	1 day	Fri 6/15/18	Fri 6/15/18	
14	★	Project Plan	1 day	Fri 6/15/18	Fri 6/15/18	
15	★	Chapter 2: Literature Review	15 days	Tue 6/19/18	Mon 7/9/18	
16	★	Introduction	1 day	Mon 6/18/18	Mon 6/18/18	

ID	Task Mode	Task Name	Duration	Start	Finish	Timeline
13	☛	IR Overview	1 day	Fri 6/15/18	Fri 6/15/18	11 14 17 20 23 26 29 July 2018 2 5 8 11 14 17 20 23 26 29 August 1 4 7 10 13
14	★	Project Plan	1 day	Fri 6/15/18	Fri 6/15/18	
15	★	Chapter 2: Literature Review	15 days	Tue 6/19/18	Mon 7/9/18	
16	★	Introduction	1 day	Mon 6/18/18	Mon 6/18/18	
17	★	Domain Research	7 days	Mon 6/18/18	Tue 6/26/18	
18	★	Similar Systems	7 days	Wed 6/27/18	Thu 7/5/18	
19	★	Summary	1 day	Fri 7/6/18	Fri 7/6/18	
20	★	Chapter 3: Technical Research	15 days	Mon 7/9/18	Fri 7/27/18	
21	★	Programming Language Chosen	5 days	Mon 7/9/18	Fri 7/13/18	
22	★	IDE Chosen	3 days	Mon 7/16/18	Wed 7/18/18	
23	★	Database Chosen	3 days	Thu 7/19/18	Mon 7/23/18	
24	★	Web Server Chosen	3 days	Tue 7/24/18	Thu 7/26/18	
25	★	Summary	1 day	Fri 7/27/18	Fri 7/27/18	
26	★	Chapter 4: System Development Methodology	7 days	Tue 7/31/18	Wed 8/8/18	



ID	Task Mode	Task Name	Duration	Start	Finish	Timeline
52	★	Sample Codes	1 day	Fri 11/16/18	Fri 11/16/18	November 2018 5 8 11 14 17 20 23 26 29 December 2018 2 5 8 11 14 17 20 23 26 29 January 2019 1 4 7
53	★	CHAPTER 10: SYSTEM VALIDATION	15 days	Sat 11/17/18	Thu 12/6/18	
54	★	Unit Testing	4 days	Sat 11/17/18	Wed 11/21/18	
55	★	Integration Testing	3 days	Thu 11/22/18	Mon 11/26/18	
56	★	User Acceptance Testing	5 days	Tue 11/27/18	Mon 12/3/18	
57	★	User Acceptance Analysis	2 days	Tue 12/4/18	Wed 12/5/18	
58	★	Summary	1 day	Thu 12/6/18	Thu 12/6/18	
59	★	CHAPTER 11: CONCLUSION AND REFLECTION	10 days	Fri 12/7/18	Thu 12/20/18	
60	★	Critical Evaluation	1 day	Fri 12/7/18	Fri 12/7/18	
61	★	Degree of Success	1 day	Sat 12/8/18	Sat 12/8/18	
62	★	System Limitations	2 days	Sun 12/9/18	Mon 12/10/18	
63	★	Future Enhancement	1 day	Mon 12/10/18	Mon 12/10/18	
64	★	Problems Faced	1 day	Wed 12/12/18	Wed 12/12/18	
65	★	Challenges	2 days	Thu 12/13/18	Fri 12/14/18	
66	★	Learning Outcomes	1 day	Thu 12/20/18	Thu 12/20/18	
67	★	Conclusion	1 day	Wed 12/26/18	Wed 12/26/18	

Project Proposal Form (PPF)

FYP Title:

Centralized Scheduling system for Lab Booking and lecturer's Consultation Hour**Introduction:**

Scheduling time for lecturers and lab booking system is one of the most important administrative activities that take place in all academic institutions such as APU. The centralized scheduling system is an online based system that allows student to book consultation hour with lecturer to solve their problems and queries outside the class timetable. This centralized scheduling system will also help lecturer to book available computer lab and availability of their consultation hour with the student in an android application. In this system access is provided to both staff and student.

The centralized scheduling is an online android application system that allows student to book consultation hour with the lecturer to solve their problems and queries outside the class timetable and for the lecturer this centralized lecturer scheduling system will help them for booking available computer lab, showing the timetable of the class and availability of their consultation hour for the student in an android application. Access is provided to both staff and student in the system.

This android system considered more user-friendly than current web-based system. Security and integrity are well maintained within centralized scheduling system. This system will facilitate both the student and the lecturer. In this system Students can book their consultation hour with the lecturer and lecturers are able to book available computer lab for any additional classes or any changes of lab class. There is an auto generated email processing system in this centralized scheduling android application. Lecturer and student both will get an auto generated email once the booking has been confirmed or canceled.

Current lecturer scheduling system doesn't provide lecturer timetable and available consultation hour in a single web-based system. It doesn't synchronize with the system. So, lecturer need to open multiple tab for setting their available consultation timetable for the student where they need more time to do it.

On the other hand, the proposed system will show the class timetable to the lecturer in an android application system that they can easily set their available consultation hour for the student. Moreover, this system will help the student to see lecturer's profile, their email address and office address as well.

The main purpose of the project is to develop an android application for centralized scheduling system to provide convenience in scheduling lecture time-table, available computer lab booking, lecturer's consultation hour booking. This application will make the students life easier when they will book the consolation hour with the lecturer and on the other hand it will also help lecturers to reduce time to set their available consultation hour and available computer lab booking.

Problem Statement:

This centralized scheduling system would be the perfect platform of booking lecturer's consultation hour and lab booking for any additional or replacement classes. Currently at Asia Pacific University (APU) consultation hour booking system is called 'staff consultation hours system' in the webspace. There are some features need to be enhanced for this project in an android application system to make it more user-friendly. In the webspace if lecturers want to set their available consultation hours, they need to open multiple tab for seeing their timetable and their available consultation hours which is very complicated and time effective. Everyday a lot of student book consultation hours with the lecturers at Asia Pacific University (APU). So, it is very important to maintain the lecturer's consultation hour booking system in a well-managed and user-friendly way.

High number of students:

Due to the high number of lecturers to student ratio and with the limited time and lecture scope, it is not possible for the students to address all their queries in the classroom. Therefore, they require additional consultations with lecturers to address their issues. It becomes almost impossible for the lecturers to give effective feedback for everyone. In some instances, students could be performing well in some subjects but struggling in others, so they might need to book a consultation hour with the lecturers outside the classroom.

Additional IT lab booking issue:

Moreover, if any lecturer changes their lab class timetable or cancel any lab class, then the lecturer needs to take a replacement class, or an extra class for covering that module on time but there is no option for the lecturers to book an IT lab class in the current system. For this reason, lecturer need to go or send email to the admin people for booking an IT lab class if any lecturer need. Lecturer does not have any direct access to book the lab classes without going or sending email to admin staffs. The proposed system would be facilitating for booking an IT lab class directly from the centralized scheduling android application system which would be very helpful for the lecturers.

Modification and changing difficulties:

Maintaining time is very important for both the lecturers and the students for the academic purpose. A student or a lecturer can cancel or modify their consultation timing for some reason. There is no option of modifying consultation timing in the current system, they can only cancel the appointments. On the other hand, student who cancel or want to re-book the consultation hour again with due to have that lecturer's busy schedule it's very difficult to get that lecturer's consultation hour again. So, the proposed system would be allowing the students and the lecturers to modify the

appointment timing without doing cancelation. If there is any modification or cancelation on timing an auto generated email will send to both the lecturer and student. In addition, if anyone cancel or modify the consultation timing, they need to write the valid reason of cancelation or modification, that both can be satisfied and planed accordingly for their other work which is not facilitated in the current system.

1.3 Rationale

According to the problems stated before, having a user friendly and well managed centralized scheduling system can be a solution. In present days students and lecturers both want the centralized scheduling system (lecturer's consultation hours and IT lab booking) to be easier to access and time effective. "MScheduling" is an android mobile application which will achieve the necessities of both the students and the lecturers. The mobile application will cover the requirement of both the lecture's consultation hour booking and IT lab booking. Student will get the benefit of booking lecturer's consultation hour easily and this system will also help the lectures to book available IT lab instead of going or sending mail to admin. The benefits of using the application is massive.

Project Aims:

The aim is to develop an android application and enhance the features of existing lecturer scheduling system which is used in APU by integrating IT Lab reservation, and Consultation Hour Booking.

Project Objectives

The objectives of this project are,

The objectives of this project are,

- To find out the problems which are faced by the lecturers and students while booking an IT lab or consultation hour and provide best solution based on the problem
- To develop an android application for centralized scheduling system which would be helping for lecturer's consultation hour booking and IT lab reservation
- To design user-friendly interface in centralized scheduling system that everyone can use it without having any issues
- To create live chat system between lecturers and students for improving the communication
- To make an option for student for giving rating and feedback about the consultation hour which will improve the study system in a better way

Literature Review

SCHEDULING SYSTEM

In most educational institutions, the timetabling activity assumes considerable importance. First, as a result of this task, a set of attributions determining the entire daily activity of all the human resources involved, from students and teachers to employees, is drawn up. Secondly, alongside, a pattern of the use of the institutions physical resources is defined. (P. Carrasco & V. Pato, 05 September 2001). [Abramson & Abela 91] used some algorithms to pre-combine a class, teacher and room combination into a tuple and treat the tuple as an inseparable unit later. (Fang, 1994)

Educational timetabling problems need to be solved in schools, colleges and universities regularly. There are some similarities between these problems, for example, teacher/lecturers can only teach one group of students at a time and rooms have size limitations. However, there are also some key differences. Overall different educational timetabling problems can be divided into two mains categories: A timetabling problem is a problem with four parameters: T, a finite set of times R, a

finite set of resources M, a finite set of meetings and C, a finite set of constraints. The problem is to assign times and resources to the meetings so as to satisfy the constraints as much as possible. (MirHassani & Habibi, February 2013).

During the last thirty years, starting with (Gotlieb 1963), many papers related to automated timetabling have been published in conferences proceedings and journals. In addition, several applications have been developed and employed with a good success. (Schaerf, April 1999)

The object behind making this web-based system is to make a user-friendly web-based system for the lecturer and students who can access easily. It will reduce the time and easy to maintain the class scheduling for lecturers. The goal is to minimize student clashes in a multi-disciplined scholastic environment, optimize the use of teaching facilities, and provide practical solution to better use resources and manage timetable constraints.

CONSULTATION HOUR BOOKING:

Net four-tier architecture to the appointment management handling in the university/college environment. A Web based appointment management system called WBAMS is designed and implemented so that students and lecturers can arrange meetings in an effective and efficient way. (Ming Lu & Ab Hamid, 26 December 2007).

E-appointment is closely related to electronic booking, electronic reservation and other types of internet-mediated agreements on relations between time periods and resources in focus. Even though there is no clear-cut distinction, one could say that e-appointment emphasizes the agreement between two or more partners as social subjects while reservation and booking rather refers to physical resources (e.g. presentation room) or impersonal and/or highly standardized services (e.g. flight, secondary care treatment) (Klischewski, 2003). The system allows students and lecturers to simply gain access to the system by connecting to the Internet. It also enables students to any message which

consists of the purpose and time of the appointment. The system was developed using Hypertext Markup Language (HTML5), Hypertext Pre-processor (PHP) as scripting language, Bootstrap framework and My Structured Query Language (MySQL) as database. This will enable the web application to be robust, cheap and capable of operating on various platforms. The system does not only fully automated, and perform excellently well, but also user-friendly, time effective and efficient. (Ridwan, et al., 2016)

One common software that be used to achieve this is Microsoft Outlook. But still there are some drawbacks which include human involvement towards recording of appointment, cancellation, confirmation and reschedule etc. Of course, these systems possess one advantage which is the automatic reminder only. Though ICT has played a good role in appointment scheduling, still there is no automation in appointment scheduling system. (Parchment1, Sankaranarayanan 2013)

Based on literature review an institution use consultation hour booking system to get some benefits such as See upcoming consultations, book consultations, see the consultations that has already booked, cancel or make changes to the current consultations etc. To give direct help to students, consolation hour is very important for the lecturers.

LAB RESERVATION SYSTEM:

The lab booking system can be designed and implemented through the investigation and analysis on the need of the management of the laboratory in Xinzhou Teachers' College. With the auxiliary of the website news model, the system has realized the operation of four functional models: registering, appointment of users, messages of users and backstage management. The realization of the system will be conducive to the modern management of laboratory. (Li_min, et al., 2003)

A multi-layer feed forward neural network is trained on speech examples with known reverberation times generated by a room simulator. The speech signals are

prepossessed by calculating short-term rms values. A second decision-based neural network is added to improve the reliability of the predictions. In the retrieve phase, the trained neural networks extract room reverberation times from speech signals picked up in the rooms to an accuracy of 0.1 s. This provides an alternative to traditional measurement methods and facilitates the occupied measurement of room reverberation times. (Darlington, et al., April 1, 2001).

From the findings, it aims to provide an efficient and convenient way of reserving rooms for all the individuals involved. By hosting the service online, the entire flow of the reservation system will not be greatly affected by the absence of important individuals. online booking system should have at least one screen where we can see the availability very quickly and clearly.

Deliverables:

Target users:

- Students
- Staffs/Admin

Allowance of the students to the system:

- To log in to the system
- To log out from the system
- To see the lecturer's available consultation hours
- To book/cancel the consultation hour
- To see the lecturer's timetable
- To see the lecturer's profile

Allowance of the staffs/Admin to the system:

- To log in to the system
- To log out from the system
- To their available consultation hour
- To manage the additional lab booking if required
- To cancel the consultation hour.
- To modify the consultation hour

Propose the name of your supervisor:

1. Dr Vazeeruddin Abdul Hameed
2. Umapathy Eaganathan
3. Dr. Sumaira Muhammad Hayat Khan

Project Specification Form (PSF)

STUDENT ID : TP039768
INTAKE ID : UC3F1805SE
STUDENT NAME : MD EASIR ARAFAT

Project Title:

Centralized Scheduling system for Lab Booking and lecturer's Consultation Hour

B: Brief description on project background. (i.e. problem context, rationale, description of problem area, nature of challenge) (Word limit: 1000)

Project Background

This centralized scheduling system would be the perfect platform of booking lecturer's consultation hour and lab booking for any additional or replacement classes. Currently at Asia Pacific University (APU) consultation hour booking system is called 'staff consultation hours system' in the webspace. There are some features need to be enhanced for this project in an android application system to make it more user-friendly. In the webspace if lecturers want to set their available consultation hours, they need to open multiple tab for seeing their timetable and their available consultation hours which is very complicated and time effective. Everyday a lot of student book consultation hours with the lecturers at Asia Pacific University (APU). So, it is very important to maintain the lecturer's consultation hour booking system in a well-managed and user-friendly way.

High number of students:

Due to the high number of lecturers to student ratio and with the limited time and lecture scope, it is not possible for the students to address all their queries in the classroom. Therefore, they require additional consultations with lecturers to address their issues. It becomes almost impossible for the lecturers to give effective feedback for everyone. In some instances, students could be performing well in some subjects but struggling in others, so they might need to book a consultation hour with the lecturers outside the classroom.

Additional IT lab booking issue:

Moreover, if any lecturer changes their lab class timetable or cancel any lab class, then the lecturer needs to take a replacement class, or an extra class for covering that module on time but there is no option for the lecturers to book an IT lab class in the current system. For this reason, lecturer need to go or send email to the admin people for booking an IT lab class if any lecturer need. Lecturer does not have any direct access to book the lab classes without going or sending email to admin staffs. The proposed system would be facilitating for booking an IT lab class directly from the centralized scheduling android application system which would be very helpful for the lecturers.

Modification and changing difficulties:

Maintaining time is very important for both the lecturers and the students for the academic purpose. A student or a lecturer can cancel or modify their consultation timing for some reason. There is no option of modifying consultation timing in the current system, they can only cancel the appointments. On the other hand, student who

cancel or want to re-book the consultation hour again with due to have that lecturer's busy schedule it's very difficult to get that lecturer's consultation hour again. So, the proposed system would be allowing the students and the lecturers to modify the appointment timing without doing cancelation. If there is any modification or cancelation on timing an auto generated email will send to both the lecturer and student. In addition, if anyone cancel or modify the consultation timing, they need to write the valid reason of cancelation or modification, that both can be satisfied and planed accordingly for their other work which is not facilitated in the current system.

Rationale:

According to the problems stated before, having a user friendly and well managed centralized scheduling system can be a solution. In present days students and lecturers both want the centralized scheduling system (lecturer's consultation hours and IT lab booking) to be easier to access and time effective. "MScheduling" is an android mobile application which will achieve the necessities of both the students and the lecturers. The mobile application will cover the requirement of both the lecture's consultation hour booking and IT lab booking. Student will get the benefit of booking lecturer's consultation hour easily and this system will also help the lectures to book available IT lab instead of going or sending mail to admin. The benefits of using the application is massive.

There will be two types of benefits from the application are given bellow:

Tangible Benefits:

- Students do not need to browse website for booking the lecturer's consultation hour.
- Students can see the lecturer's profile and office address.
- Students would always have the access to modify the consultation timing with lecturers.
- Lecturers don't need to visit admin for booking available IT lab.

- Reduce workload of the lecturers and the admin staffs. Admin stuffs do not need to help all the lecturers separately.

Intangible Benefits:

- Influence on more students to come to the lecturer for consultation hour by making the process of the scheduling system easier and user friendly.
- Improve the student-lecturer relation between them and efficient learning system.
- Reduce the complication of lab booking system and give an easy access to reduce lecturers wasting time on booking IT lab.

Nature of Challenge:

It's not an easy task to make an android application for centralized scheduling system. Firstly, it's very important to select the appropriate programming language for making this android mobile application. As every programming language has their exact functionalities and usability. Secondly, it's another important thing for me to learn the specific language to develop a user-friendly application that I can ensure to the user that there is no way of facing difficulties while they will be using the system. Moving on to the next phase, the database is going to be another challenge for this project. Lastly, security maintenance is one of the most important things in this application. I must learn how can I make it secure. It becomes a popular way to make an android application by using android studio where I can implement java language as well.

C: Brief description of project objectives. (i.e. scope of proposal and deliverables) (Word limit: 1000)

Project Objectives:

- To find out the problems which are faced by the lecturers and students while booking an IT lab or consultation hour and provide best solution based on the problem
- To develop an android application for centralized scheduling system which would be helping for lecturer's consultation hour booking and IT lab reservation
- To design user-friendly interface in centralized scheduling system that everyone can use it without having any issues
- To create live chat system between lecturers and students for improving the communication
- To make an option for student for giving rating and feedback about the consultation hour which will improve the study system in a better way

Deliverables

Centralized scheduling system is an online android mobile application which helps lecturers and students to book consultation hour and available IT lab with some additional features. After successfully making this application they no longer be suffering of facing any problem for using this application which they experienced before. An android device is required for the user to run this application. The main activities of this application are to give a connivance and easy way to book lecturer's consultation hours and IT lab booking.

Some of the functionalities of this application are given below:

- To log in the system (students/lecturers)
- To log out from the system (students/lecturers)
- To show students the available consultation hour (students)
- Allow user to modify their consultation hour (students/lecturers)
- Allow user to cancel their consultation hour (students/lecturers)
- Allow students to give feedback on consultation hour (students)

- Allow lecturer to book available IT lab. (lecturers)
- An email notification will send if there is any modification and cancellation (students/lecturers)

Besides that, the additional features of the system are given below:

- Allow user (students) to view lecturer academic prolific information that they can communicate easily with the lecturers.
- Apart from that, the special features of the system will be added if there is any extra time:
- Allow users to get the mobile or email SMS notification once the booking has been made or cancelled.

D: Brief description of the resources needed by the proposal (i.e. hardware, software, access to information / expertise, user involvement etc.) (Word limit: 1000)

Basically, there are two types of hardware which will be desired for developing and testing this mobile application. Computer and the Smart Phone are that two hardware. The least requirements for both hardware is given below:

Smart Phone:

- Android OS 2.3
- Camera
- Touchscreen
- 3G, 4G or Wi-Fi Network

Computer:

- Monitor
- Keyboard
- Mouse

- Wi-Fi
- Intel Core 2 Duo Processor – 2.6 GHz
- 200GB Hard Drive
- Min 1GB RAM

Software:

For developing this android mobile application there are two types of software are required. And The data database management is essential, and a software is required for coding.

The minimum requirements for software are given underneath:

Coding and Developing:

- Android Studio 3.0.1
- Visual Studio 2013 Professional

Database Management System (DBMS):

- Cloud Firestore

Project Planning:

- Microsoft Word 2016
- Microsoft Project 2016 Software Documentation

Access to information / expertise

To build this project successfully, proper consultation from the IT expert will be needed. Consultation from supervisors and lecturer's guidance are very much important for developing this centralized scheduling system android application. Apart

from that, internet is a source of gathering huge knowledge of developing an android application.

User Involvement

The people who will be involving with this application are the lecturers and the students. Discussion need to be conducted with experts, students and the lecturers to acquire knowledge on troubleshooting. For testing this application there will be few more people involved.

E: Academic research being carried out and other information, techniques being learned (i.e. what are the names of books you are going to read / data sets you are going to use) (Word limit: 1000)

In order to carry out the deliverables, the preliminary list of books and websites that the developers will follow for the research are as follows:

Books:

- Name: Android Application Development for Dummies
 - Author: Donn Felker & Micheal Burton
 - Publisher: John Wiley & Sons, Inc
-
- Name: Sams Teach Yourself Android Application Development in 24 Hours
 - Author: Lauren Darcey
 - Publisher: Sams Pub., 2010

- Name: Java SE7 Programming Essentials
- Author: Micheal Emest
- Publisher: John Wiley & Sons, Inc

Online Resources:

- raywenderlich, 2018. raywenderlich. [Online]
Available at: <https://www.raywenderlich.com/category/android> [Accessed 2018].
- Developers, A., n.d. Android Developers. [Online]
Available at:
<https://developer.android.com/training/basics/firstapp/creating-project.html>

F: Brief description of the development plan for the proposed project. (i.e. which software methodology and why, the major areas of functions to be developed and the order in which developed) (Word limit: 1000)

There are few types of methodology like SCRUM, RAD, waterfall, Agile, etc. can be used for developing and testing this mobile android application. From my point of view Agile is most suitable methodology for developing this android application. A style of project management that focuses on early delivery of business value, continues improvement of the project's product and process, scope flexibility, team input and delivering well tested products that reflect customer needs (Layton, 2012).

It very easy to control and planning the process of development by following Agile methodology. Agile methodology helps to decrease the wasting of time on unnecessary processes. It is also time and cost effective. Agile methodology also supports to build a solid connection among the developer and the clients because of the regular testing of the application.

G: Brief description of the evaluation and test plan for the proposed project. (i.e. what is the success criteria and how will be evaluated & implementation will be tested, indicate the estimated size of the demonstration/test database) (Word limit: 1000)

Evaluation and test plan for the proposed project

Success Criteria

The main goal of this project is to make an easy consultation system and lab booking system for improving the study environment. The success of this system would rely on the number of people involve of it in the academic environment. To make sure assumed features are working accurately and running well, the application will be used by the APU lecturers and students.

Few lecturers and students would use this application first to bring out succeeding testing methods and feedback from them will be improved the application before its final deployment.

Unit Testing:

During unit testing the whole application will be tested separately into small testable component. All these units essential to go through a testing stage before integrated into a component. Unit testing involves only those characteristics that are vital to the performance of the unit under test. Once all the units in a program have been found to be working in the most efficient and error-free manner possible, larger components of the program can be evaluated by means of integration testing. (Rouse, 2008)

Integration Testing:

Integration testing is an approach where modules are developed, and testing of modules always starts at the finest level of the programming hierarchy and continues towards the lower levels. It's the extension to unit testing. Integration testing takes smaller unit of unit testing and tests their behavior as the whole (Guruswamy, 2015). The object of this level of testing is to find any faults in the communication between these integrated units. during integration testing, there are two tested units will be integrated into a component. For instance, when the lecturers and students will cancel or modify the consultation timing hours from the back-end, from the system new data will be stored into the database.

Usability Testing:

The goal is to find any usability difficulties, gather qualitative and quantitative data and control the participant's satisfaction with the product. After building the prototype of the system the method is usually taken. The user gratification level needs to be carried out in usability testing. People who are involved in this testing would essentially run the program and they will get the real impression of an accomplished project

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Fast-track ethical approval form

Office Record	Receipt
Date Received: Received by whom:	Student name: Student number: Received by: Date:

ACADEMIC RESEARCH ETHICS DISCLAIMER

Declaration about ethical issues and
implications of research proposals to be
included on project application forms

Project Title: Centralized Scheduling System for Lab Booking and
lecturer's consultation

The following declaration should be made in cases where research project applicants for a particular project and the supervisor(s) for that project conclude that it is not necessary to apply for ethical approval for a research project.

We confirm that the University's guidelines for ethical approval have been consulted and that all ethical issues and implications in relation to the above project have been considered. We confirm that ethical approval need not be sought.

Md Farid Arafat
Name of Research Project Applicant

Arafat 15/08/18
Signature Date

S. H. S.
Name of Research Project Supervisor / 2nd
Marker Seumaria _____
Signature Date

	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Office Record</td> <td style="width: 50%;">Receipt – Fast-Track Ethical Approval</td> </tr> <tr> <td>Date Received:</td> <td>Student name:</td> </tr> <tr> <td></td> <td>Student number:</td> </tr> <tr> <td></td> <td>Received by:</td> </tr> <tr> <td></td> <td>Date:</td> </tr> </table>	Office Record	Receipt – Fast-Track Ethical Approval	Date Received:	Student name:		Student number:		Received by:		Date:																																			
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APU FAST-TRACK ETHICAL APPROVAL FORM (STUDENTS)																																														
<p>Tick one box: <input type="checkbox"/> TAUGHT POSTGRADUATE project <input checked="" type="checkbox"/> UNDERGRADUATE project</p> <p><input type="checkbox"/> TAUGHT POSTGRADUATE MODULE assignment</p> <p><input type="checkbox"/> TAUGHT UNDERGRADUATE MODULE assignment</p> <p>Title of Specialism on which enrolled ... B.Sc. in Software Engineering</p> <p>Tick one box: Full-Time Study <input checked="" type="checkbox"/> or Part-Time Study <input type="checkbox"/></p> <p>Title of project ... Centralized lecture scheduling system for lab looking lecturer's consultation and hour</p> <p>Name of student researcher ... M.d. Easir Arzafat</p> <p>Name of supervisor/ ... Dr. Sumaita Muhammad Hayat Khan</p>																																														
<p>Student Researchers- please note that certain professional organisations have ethical guidelines that you may need to consult when completing this form.</p> <p>Supervisors/Module Tutors - please seek guidance from the Chair of the APU Research Ethics Committee if you are uncertain about any ethical issue arising from this application.</p>																																														
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 80%;"></th> <th style="width: 10%;">YES</th> <th style="width: 10%;">NO</th> <th style="width: 10%;">N/A</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Will you describe the main procedures to participants in advance, so that they are informed about what to expect?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>Will you tell participants that their participation is voluntary?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>3</td> <td>Will you obtain written consent for participation?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>4</td> <td>If the research is observational, will you ask participants for their consent to being observed?</td> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td>5</td> <td>Will you tell participants that they may withdraw from the research at any time and for any reason?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>6</td> <td>With questionnaires and interviews will you give participants the option of omitting questions they do not want to answer?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>7</td> <td>Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> <tr> <td>8</td> <td>Will you give participants the opportunity to be debriefed i.e. to find out more about the study and its results?</td> <td style="text-align: center;">✓</td> <td></td> <td></td> </tr> </tbody> </table>				YES	NO	N/A	1	Will you describe the main procedures to participants in advance, so that they are informed about what to expect?	✓			2	Will you tell participants that their participation is voluntary?	✓			3	Will you obtain written consent for participation?	✓			4	If the research is observational, will you ask participants for their consent to being observed?			✓	5	Will you tell participants that they may withdraw from the research at any time and for any reason?	✓			6	With questionnaires and interviews will you give participants the option of omitting questions they do not want to answer?	✓			7	Will you tell participants that their data will be treated with full confidentiality and that, if published, it will not be identifiable as theirs?	✓			8	Will you give participants the opportunity to be debriefed i.e. to find out more about the study and its results?	✓		
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<p>If you have ticked Yes to 9, 10 or 11 you should complete the full Ethics Approval Form. In relation to question 10 this should include details of what you will tell participants to do if they should experience any problems (e.g. who they can contact for help). You may also need to consider risk assessment issues.</p>																																														

		YES	NO	N/A
12	Does your project involve work with animals?		✓	
13	<p>Do participants fall into any of the following special groups?</p> <p>Note that you may also need to obtain satisfactory Criminal Records Bureau clearance (or equivalent)</p>	<p>Children (under 18 years of age) People with communication or learning difficulties Patients People in custody People who could be regarded as vulnerable People engaged in illegal activities (eg drug taking)</p>	✓	
14	Does the project involve external funding or external collaboration where the funding body or external collaborative partner requires the University to provide evidence that the project had been subject to ethical scrutiny?		✓	

If you have ticked Yes to 12, 13 or 14 you should complete the full Ethics Approval Form. There is an obligation on student and supervisor to bring to the attention of the APU Research Ethics Committee any issues with ethical implications not clearly covered by the above checklist.

STUDENT RESEARCHER

Provide in the boxes below (plus any other appended details) information required in support of your application.
THEN SIGN THE FORM.

Please Tick Boxes

I consider that this project has no significant ethical implications requiring a full ethics submission to the APU Research Ethics Committee.	✓
Give a brief description of participants and procedure (methods, tests used etc) in up to 150 words.	
<p>Participant will include Lecturers and the students, Method of data collection will be questionnary and interviews.</p>	
I also confirm that: ii) All key documents e.g. consent form, information sheet, questionnaire/interview are appended to this application.	
Or ii) Any key documents e.g. consent form, information sheet, questionnaire/interview schedules which need to be finalised following initial investigations will be submitted for approval by the project supervisor/module leader before they are used in primary data collection.	✓

Signed... *Anafat* ... Print Name... Md. Easir Anafat Date... 15/08/18
(Student Researcher)

Please note that any variation to that contained within this document that in any way affects ethical issues of the stated research requires the appending of new ethical details. New ethical consent may need to be sought.

The completed form (and any attachments) should be submitted for consideration by your Supervisor/Module Tutor

**SUPERVISOR/MODULE TUTOR
PLEASE CONFIRM THE FOLLOWING:**

Please Tick Box

I consider that this project has no significant ethical implications requiring a full ethics submission to the APU Research Ethics Committee	<input type="checkbox"/>
i) I have checked and approved the key documents required for this proposal (e.g. consent form, information sheet, questionnaire, interview schedule)	<input type="checkbox"/>
Or	
ii) I have checked and approved draft documents required for this proposal which provide a basis for the preliminary investigations which will inform the main research study. I have informed the student researcher that finalised and additional documents (e.g. consent form, information sheet, questionnaire, interview schedule) must be submitted for approval by me before they are used for primary data collection:	<input type="checkbox"/>

SUPERVISOR AND SECOND ACADEMIC SIGNATORY

STATEMENT OF ETHICAL APPROVAL (please delete as appropriate)

1) THIS PROJECT HAS BEEN CONSIDERED USING AGREED APIIT/SU PROCEDURES AND IS NOW APPROVED

2) THIS PROJECT HAS BEEN APPROVED IN PRINCIPLE AS INVOLVING NO SIGNIFICANT ETHICAL IMPLICATIONS, BUT FINAL APPROVAL FOR DATA COLLECTION IS SUBJECT TO THE SUBMISSION OF KEY DOCUMENTS FOR APPROVAL BY SUPERVISOR (see Appendix A)

Signed...  Print Name... Dr. Sumainia M. Khan Date... 15/08/18
(Supervisor/2nd Marker)

Signed... Print Name... Date...
(Second Academic Signatory)

Office Record	Receipt – Appendix A (Fast-Track Ethics Form)
Date Received:	Student name:
Received by whom:	Student number:
	Received by:
	Date:

APPENDIX A
AUTHORISATION FOR USE OF KEY DOCUMENTS

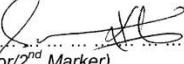
Completion of Appendix A is required when for good reasons key documents are not available when a fast track application is approved by the supervisor/module leader and second academic signatory.

I have now checked and approved all the key documents associated with this proposal e.g. consent form, information sheet, questionnaire, interview schedule

Title of project Centralized Scheduling System for Lab Booking and Lecturer's consultation hour.

Name of student researcher Md. Easir Arzafat

Student ID: TP039768 Intake: UC3F1805 SE

Signed...  ... Print Name Dr. Sumaiya R. Muhammed Date 15/08/18
 (Supervisor/2nd Marker)

Project Log Sheet – Supervisory Session



APU: 74472
PLS V1.0

Project Log Sheet – Supervisory Session

Notes on use of the project log sheet:

1. This log sheet is designed for meetings of more than 15 minutes duration, of which there must be at minimum SIX (6) during the course of the project (SIX mandatory supervisory sessions).
2. The student should prepare for the supervisory sessions by deciding which question(s) he or she needs to ask the supervisor and what progress has been made (if any) since the last session, and noting these in the relevant sections of the form, effectively forming an agenda for the session.
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6. It is recommended that students bring along log sheets of previous meetings together with the project file during each supervisory session.
7. The log sheet is an important deliverable for the project and an important record of a student's organisation and learning experience. The student **must** hand in the log sheets as an appendix of the final year documentation, with sheets dated and numbered consecutively.

Student's name: Md. Fazlul Arrafat Date: 17/06 Meeting No: 1

Project title: Centralized Scheduling system for Lab booking and Intake: *lectureres consultation hour*

Entry logged into PAGOL

Supervisor's name: Dr. Sumaiter Muhammad. Supervisor's signature: *[Signature]*

Items for discussion (noted by student before mandatory supervisory meeting):

1. Showing the PDF
- 2.
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

1. Changes on objectives.
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

1. Proceed with PSD
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet

Student Copy



APU : 74471

PLS V1.0

Project Log Sheet – Supervisory Session

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Student's name: ...Md. Farid Arif... **Date:** 11/07/2018 **Meeting No:** ..2....

Project title: Centralized Scheduling System for Lab Booking and lecturer's consultation
lecturer's consultation intake:..... Wasr

Entry logged into PAGOL

Supervisor's name: Dr. Sumaira Muhammad

Supervisor's signature:

Items for discussion (noted by student before mandatory supervisory meeting):

1. Showing the PSF
2. Discussion on Literature Review .
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

1. Problem context need to be extended .
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

1. Processed to I.R .
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet**Student Copy**



APU : 74470

PLS V1.0

Project Log Sheet – Supervisory Session

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Student's name: Md. Farzir Arrafat **Date:** 20/03/2018 **Meeting No:** ...3....

Project title: Centralized Scheduling System for Lab booking and Intake: UC3F1805SE
Lecturer's name: Dr. Sumanica Muhammad **Intake:** UC3F1805SE

Entry logged into PAGOL

Supervisor's name: Dr. Sumanica Muhammad **Supervisor's signature:**

Items for discussion (noted by student before mandatory supervisory meeting):

1. Showing the IR progression.
2. Get the sign for Ethics form
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

1. Table of content and the element of IR.
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

1. Proceed with FR.
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet

Student Copy



APU : 74469

PLS V1.0

Project Log Sheet – Supervisory Session

Notes on use of the project log sheet:

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7. The log sheet is an important deliverable for the project and an important record of a student's organisation and learning experience. The student **must** hand in the log sheets as an appendix of the final year documentation, with sheets dated and numbered consecutively.

Student's name: Md. Faridc. Arcafat **Date:** 21/02/2018 **Meeting No:** 4.....

Project title: Centralized scheduling System for Lab booking and Lecturer's Intake: JC3F1805SE

Entry logged into PAGOL

Supervisor's name: Dr. Sumairia Muhammad

Supervisor's signature:

Items for discussion (noted by student before mandatory supervisory meeting):

1. Overall discussion about Investigation Report.
2. Discussion on System development methodology
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

1. Need to write the system development methodology base
2. On development phase.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

1. Finish IR on time
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet

Student Copy



41137

PLS V1.0

Project Log Sheet – Supervisory Session

Notes on use of the project log sheet:

1. This log sheet is designed for meetings of more than 15 minutes duration, of which there must be at minimum SIX (6) during the course of the project (SIX mandatory supervisory sessions: 3 sessions per semester).
2. The student should prepare for the supervisory sessions by deciding which question(s) he or she needs to ask the supervisor and what progress has been made (if any) since the last session, and noting these in the relevant sections of the form, effectively forming an agenda for the session.
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6. It is recommended that students bring along log sheets of previous meetings together with the project file during each supervisory session.
7. The log sheet is an important deliverable for the project and an important record of a student's organisation and learning experience. The student should hand in the log sheets as an appendix of the final year documentation, with sheets dated and numbered consecutively.

Student's name: Md. Fariz Arrafat..... Date: 12/01/2019..... Meeting No: Q5.....

Project title: Centralized scheduling system for lab Booking and Lecturer's consultation hour..... Intake: UC3F1805SE

Entry logged into FYPBaNK

Supervisor's name: Dr. Sumaira Muhammad

Supervisor's signature:

Items for discussion (noted by student before mandatory supervisory meeting):

1. FYP Project.
- 2.
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

- 1.
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

- 1.
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet

Student Copy



41136

PLS V1.0

Project Log Sheet – Supervisory Session

Notes on use of the project log sheet:

1. This log sheet is designed for meetings of more than 15 minutes duration, of which there must be at minimum SIX (6) during the course of the project (SIX mandatory supervisory sessions: 3 sessions per semester).
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The supervisor will record each session into <http://fypbank.apiiit.edu.my/>
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7. The log sheet is an important deliverable for the project and an important record of a student's organisation and learning experience. The student should hand in the log sheets as an appendix of the final year documentation, with sheets dated and numbered consecutively.

Student's name: Md. Farid Arrafat Date: 13/01/2019 Meeting No: 06

Project title: Centralized Scheduling system for lab Booking and Lecturer's consultation hour..... Intake: UC3F1805SE

Entry logged into FYPBaNK

Supervisor's name: Dr. Sumaira Muhammad

Supervisor's signature:

Items for discussion (noted by student before mandatory supervisory meeting):

1. FYP Documentation
- 2.
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

- 1.
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

- 1.
- 2.
- 3.

Note: A student should make an appointment to meet his or her supervisor (via the consultation system) at least ONE (1) week prior to a mandatory supervisor session – please see document on project timelines. In the event a supervisor could not be booked for consultation, the project manager should be informed ONE (1) week prior to the session so that a meeting can be subsequently arranged.

Project Log Sheet

Student Copy


Project Log Sheet – Supervisory Session
Notes on use of the project log sheet:

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7. The log sheet is an important deliverable for the project and an important record of a student's organisation and learning experience. The student **must** hand in the log sheets as an appendix of the final year documentation, with sheets dated and numbered consecutively.

Student's name: ..Md.. Farzad.. Afrasat..... **Date:** 14/01/2019 **Meeting No:** 07....

Project title: Centralized Scheduling System for Lab Booking and Lecturer's Consultation Home..... **Intake:** UC3F1805SE

Entry logged into PAGOL

Supervisor's name: Dr. Sumaira Muhammad. **Supervisor's signature:**

Items for discussion (noted by student before mandatory supervisory meeting):

1. FYP project
- 2.
- 3.
- 4.

Record of discussion (noted by student during mandatory supervisory meeting):

- 1.
- 2.
- 3.
- 4.

Action List (to be attempted or completed by student by the next mandatory supervisory meeting):

- 1.
- 2.
- 3.

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Project Log Sheet

Student Copy