Monitoring Class Attendance
Via
Mobile Application

By

Por Hong Yang

16148

FINAL PROJECT REPORT

Submitted to the Department of Electrical & Electronic Engineering

in Partial Fulfilment of the Requirements for the Degree

Bachelor of Engineering (Hons) (Electrical & Electronic Engineering)

Universiti Teknologi PETRONAS

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CERTIFICATION OF APPROVAL

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(ELECTRICAL AND ELECTRONIC)

JANUARY 2016

Approved by,

_____

(Dr. Hanita Daud)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

January 2016

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

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Por Hong Yang

ABSTRACT

Attendance taking has become a huge problems for institutions to keep track and record the number and other necessary details of the attendees. Traditional ways of taking attendance has been widely used which is mostly based on paper. Paper-based attendance taking is a heartache for institutions as this system is unreliable and difficult to keep track. This system allows attendance fabrication and do not have a systematic way of keeping the record indefinitely. Over the years, lots of innovative ideas to improve attendance taking systems have been developed to counter this problem. However, each of them has its own limitations and weaknesses. As a result, studies have been carried out to develop a more systematic and reliable way to improve current attendance taking system. There are three objectives to be achieved; To implement well-organized attendance monitoring and tracking system by developing an Android mobile application that helps lecturers to monitor attendance in the cloud; To prevent fabrication of students' attendance; To save time in taking attendances.

ACKNOWLEDGEMENTS

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Her guidance and assistance are valuable to motivate me to complete my project. Special thanks to the our Electrical & Electronic Engineering Department Final Year Project Committees for their effort in making this course valuable to our career.

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Chapter 1: Introduction

1.1 Background Study

A student mobile application to record their respective attendances for particular classes. Taking attendance for classes using this mobile application is fast and easy. This helps to save time and hassles. This application is paperless and cloud-based which means all the recorded data will be stored in the cloud service instead of papers. There will only be one mobile application developed for both lecturers and students. A QR code will be printed out by lecturer for a particular class. Students only need to scan the QR code to sign in for that particular class. Once successfully sign in, his/her record will be updated in the database.

Firstly, the students needs to download the application from the Google PlayStore. They will then be asked to register their IDs for the application. Upon successful registration, the mobile application will contain the details of the particular student for taking attendance purpose.However, there are some additional features for the lecturers which are restricted for the students. Lecturers will be able to access the database to monitor the recorded attendance of students. The main component of the mobile application is the QR code scanner that is required to work with the smartphone's camera. The scanner will scan the printed-out QR code and register the students for that particular session. His/her ID, name and timestamp will be stored in the cloud for the lecturers to monitor.

At present, UTP is using the paper-based attendance system which is unreliable and time-consuming. This is because, the method of paper-based allows student to fabricate other students' signature to register for the attendance. Lecturers will be having a difficult time to track and monitor the attendance of students if they opt for this approach. Attendance sheets are easily lost and are very difficult to organize. With the mobile application, it will be very difficult for students to take attendance on behalf of his/her friends. As for both parties, this mobile application data is permanently stored and organized neatly in the cloud as proof.

1.2 Problem Statement

Tracking and monitoring attendances using paper-based method is difficult to organize. This is because papers are easily lost or destroyed. With this application, attendance records are well-organized in the cloud database with correct date and time.

Fabrication of attendance is a menace to UTP. This encourages students to be absent from classes as they could ask from their friends to do them a favor in helping to record attendances. This mobile application aims to prevent this scenario from happening.

Paper-based attendance system is time-consuming. Attendance sheets are slowly passed from one student to another. Sometimes, students are not able to register their attendances before the end of a short lecture.

1.3 Objectives

To implement well-organized attendance monitoring and tracking system by developing an Android mobile application that helps lecturers to monitor attendance in the cloud.

To prevent fabrication of students' attendance.

To save time in taking attendances.

1.4. SCOPE OF PROJECT

Before the implementation and start of this project. Studies and surveys are being done to identify and analyze the current attendance taking systems currently being available. Each system weakness is being listed out and ideas are gathered to improve the each weakness. Journals, conference paper and Internet articles are great sources to find out the current attendance taking systems.

After that, studies are then being carried out on Android SDK to know about the application development flow. Several libraries and Application Public Interface (API) are explored in order to use in the application development. The APIs being studied are QR Code.

The QR Code Scanner API allows mobile application to access to the mobile's camera. The captured image will then be processed by the QR Code Scanner.

Chapter 2: Literature Review

2.1 RFID

RFID has been deployed for a long time. RFID tag contains specific information which is stored in the microchip. The information stored is encoded in hexadecimal which is known as Electronic Product Code (EPC). The information of a RFID tag can only be read by a RFID reader. The medium of transmission of data of between a RFID tag and RFID reader is through radio waves. The transmission can be of long distance or short distance. After successful transmission, the data will be synthesized and processed by the reader. Examples of RFID tags being used in the industries are:

Supermarkets – Products have embedded RFID tags to prevent thefts.

Credit Card – Visa and MasterCard are implementing a smart card that has RFID chips to ease transaction process.

Marathon Competition – RFID tags are being attached to the participants so that their timings and positions can be tracked.

Qaiser and Khan [1] who proposed an indigenous way of RFID tag being tracked and detected by interrogation field in their Automation of Time and Attendance using RFID Systems. By using this system the authors suggested that RFID tags data can be tracked an detected in a long distance which is known as a significant disadvantage of all RFID applications in real world. The long distance tracking is contributed by the use of'Active' RFID. This system is able to monitor and record multiple information of the users of RFID tags at the same time. They suggest that this system is very effective and efficient which does not need human intervention and is totally autonomously processed by the RFID readers.
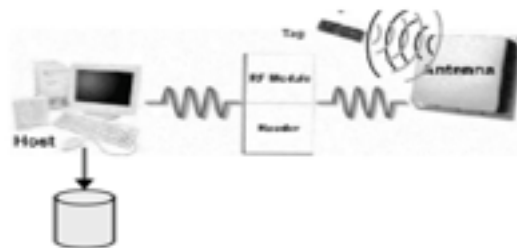

Figure 1 RFID Method

There is another RFID tags method proposed by Singhal and Gujral [2] in their system which is known Anytime Anywhere- Remote Monitoring of Attendance System based on RFID using GSM Network. Their system requires student to scan their respective RFID tags with the reader

in order to register their attendances for a class. In this system they incorporate RFID data transmission and reading technique with a database that can be used to store the scanned information. The database can be considered as a monitoring platform which contains important information like timestamp of an incoming student. The multi-functional database is deployed by using Microsoft Visual Basic 6.0 and its associate Microsoft Access. This system is then be further enhanced with the ability to inform the administrators regarding the records of incoming students in the class using Short Message Service (SMS).
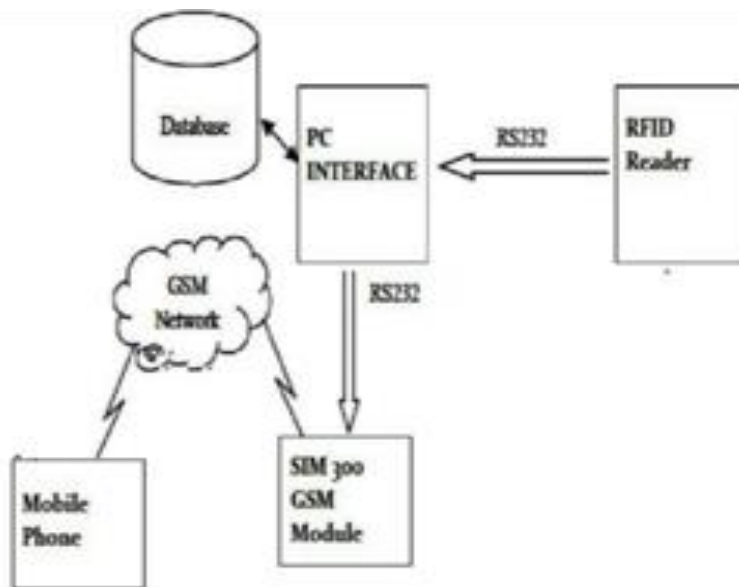

Figure 2 Flow of RFID Method
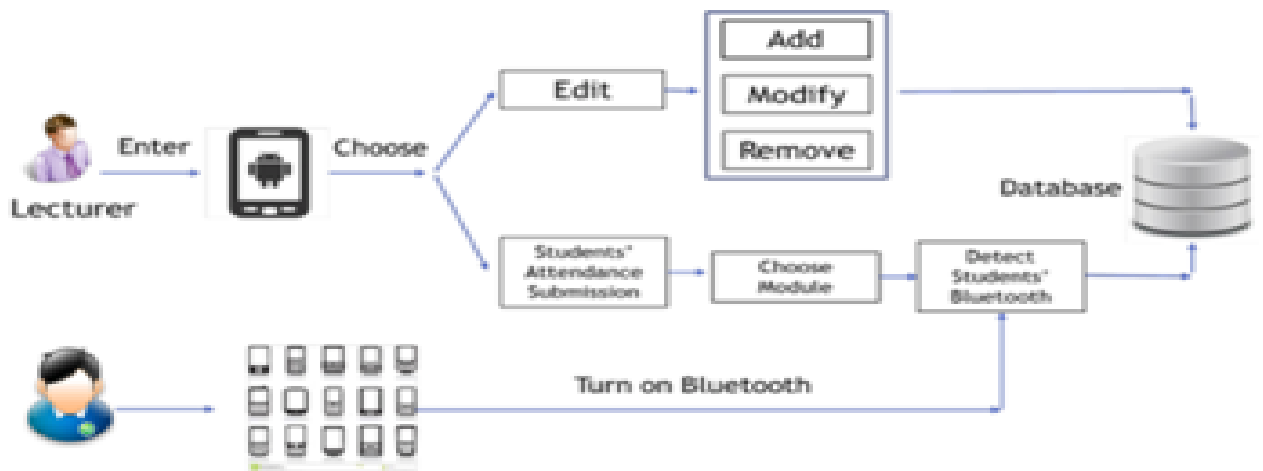
2.2 Bluetooth

Figure 3 Bluetooth Method

Another method of registering attendance of student is by using Bluetooth transmission technology. This technology allows data exchange between two mediums wirelessly through personal area networks (PANs). Akmal (2013) [3] states in his paper that this technology can be implemented with Android smartphones. Firstly, the Android application needs to include frameworks that have the ability to allow wireless connections between two bluetooth devices. In this case, Android Bluetooth API. Two smartphones will have their own functionality. For a student, his/her smartphone will send bluetooth data to the lecture's smartphone to be read. The data will then be recorded and stored in the application. Firstly, the Android application needs to include frameworks that have the ability to allow wireless connections between two bluetooth devices. In this case, Android Bluetooth API is chosen. The Android Bluetooth API allows multiple devices to be detected and is able to transfer data to multiple devices at the same time.

The specifications are listed as follow:

	Bluetooth
Frequency	2.4 GHz
Cost	Low
Security	It is less secure
Primary Devices	Mobile phones, mouse, keyboards
Hardware Requirements	Bluetooth adaptor on all devices connecting with each other
Range	5-30 meters
Power Consumption	Low
Ease of Use	Simple to use. Can be used to connect up to seven devices at a time

Figure 4 Bluetooth Specification

2.3 Biometric System

Biometric system is an advanced technique that can be used to identify a person or identity based on his/her physical features. The features include DNA, fingerprint, palm and face. These biological features are exclusive to oneself and distinct. The biological data will then be analyzed and used to identify a person using biometric technology.

In a proposed project, "Development of Attendance Management System using Biometrics " by Shoewu and Idowu [4]. The authors utilize the system of fingerprint scanner in classes for taking attendances. Their system is built by a combination of fingerprint scanner company's SDK, with their own implemented C# code and Microsoft SQL as database. Students will have to scan their finger with the fingerprint sensor at the class. The scanner will then identify the students' identities. If the identity of a student successfully matches his/her own feature that are stored in the database, then the student's attendance will be recorded and updated in the database. They propose that this method is very secured and efficient compared to using other biometric features.
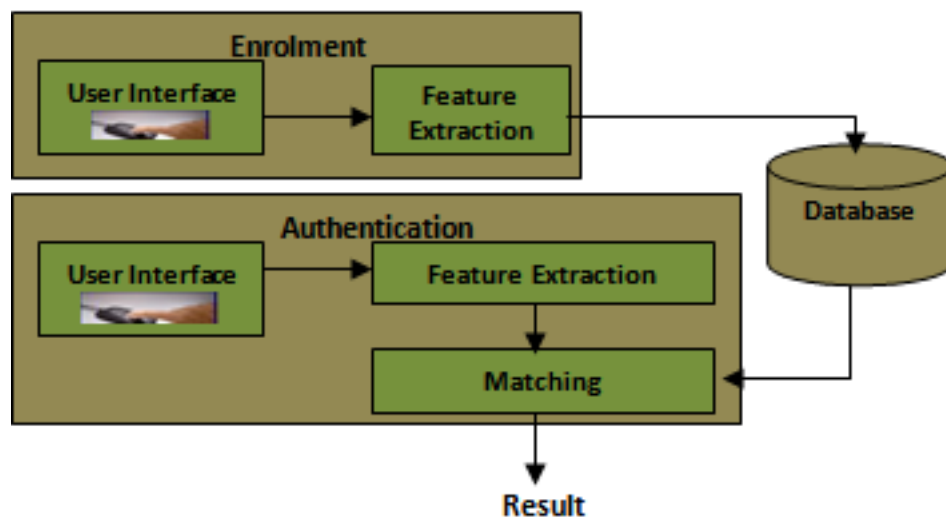

Figure 5 Flow of Biometric System

2.4 QR Code

A company called "TimeStation" [5] created a mobile application called "Time Station" that can be used to track attendance system by mobile phones or tablets. This application is offered in both Android & iOS platforms.

The application utilizes Fast-Scan technology that enables employees or students to register their attendances quickly. The attendance will then be uploaded to the administrators' TimeStation account in the cloud. From there, admins can monitor the attendances. Furthermore, this application also incorporate GPS within the application.

Firstly, the students or employees will have their own printed-out QR codes. The QR codes will then be used for the registration at a particular venue which is equipped with this smartphone application. The QR codes will then be scanned and details about the attendees will be uploaded to the cloud drive.
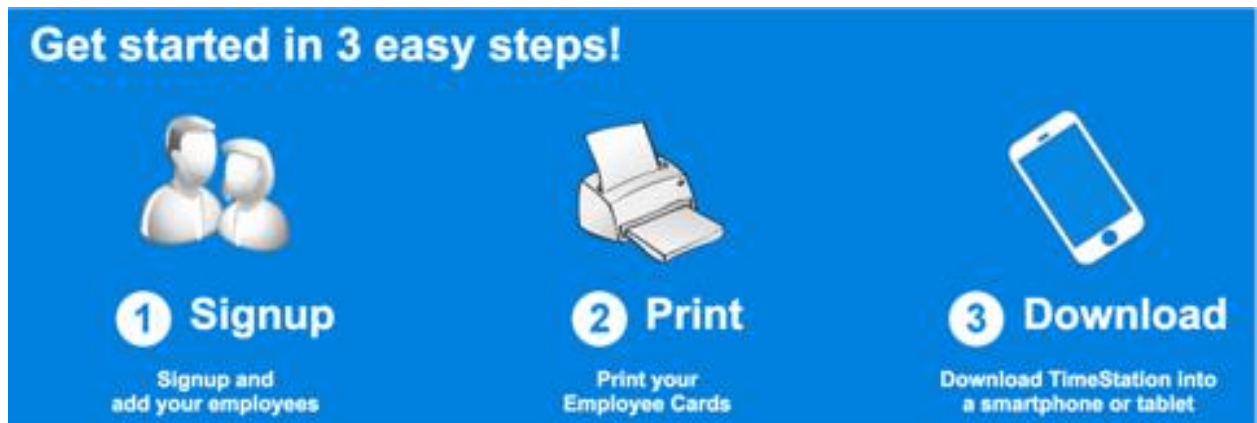

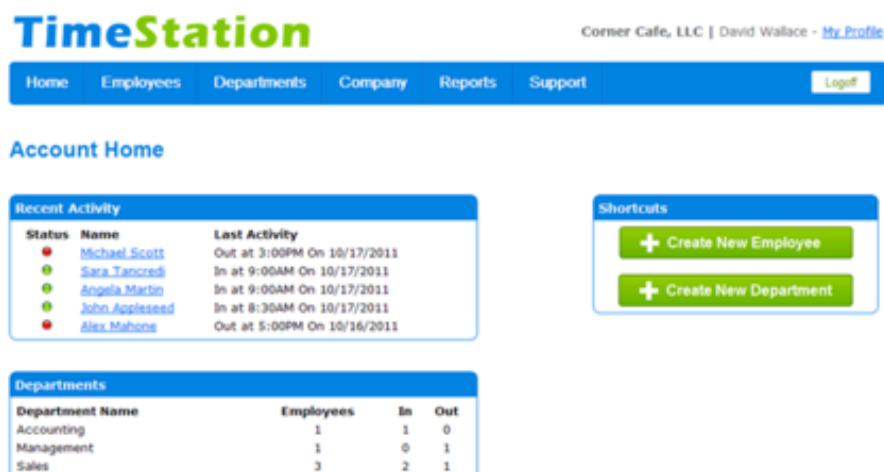Figure 6 TimeStation QR Code Attendance System

Figure 7 TimeStation Database

2.5 Advantages & Impact of Mobile Application

Nowadays, mobile application plays an essential role in human life by acting as a convenient platform for effective and efficient communication tools. With the evolvement of technology, remote servers like wireless communication further facilitates the usage of mobile application. Mobile application deploys cloud computing to store data online. With this integration, mobile application provides a convenient way for users to retrieve data from anywhere and at anytime without the hassle of carrying bulky physical storage devices such as thumb drive, DVD, external hard disk and etc. [6]

Furthermore, in the modern age of IT, people are inclined to utilize mobile devices for their daily activities. This is because mobile devices are well-equipped with applications that can help them in performing their daily tasks. This has caused mobile application to become a rapidly growing sector in this world. A lot has been said about the impacts of mobile application in daily life whether it would bring positive and negative effects to the lives of users. Obviously, there is a slew of positive impacts of mobile application. These include keeping in touch with the loved ones, browsing contents online, file content management and etc. [7]

Chapter 3: Methodology

3.1 Research Methodology

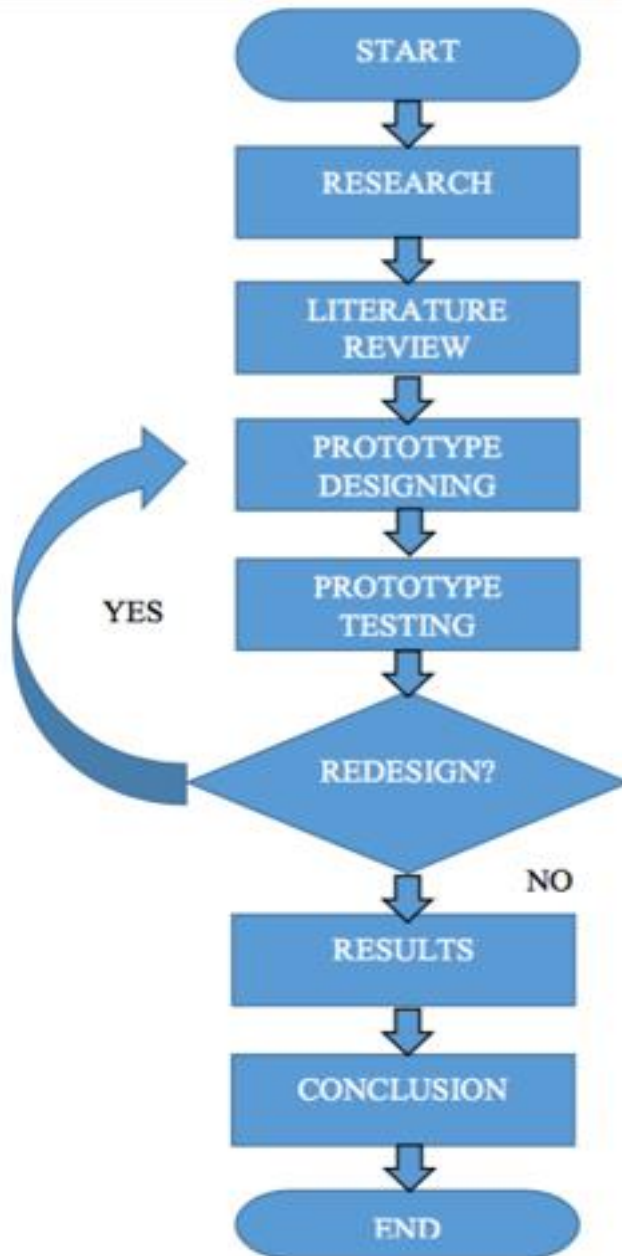The figure below shows the how several steps are involved in the research methodology.

Figure 8 Research Methodology 1

3.2 Project Work

Research
- Research on current existing attendance taking system from journals, papers, articles and websites.

Literature Review
- Identify the objectives and problem statements
- Examine the scope of study of the project
- Outline a plan on how to achieve the objectives

Prototype Designing
- Design the User Interface of the mobile application
- Choose the correct APIs and frameworks for the application development
- Identify the best tools to implement this project like laptop, smartphone and software

Prototype Testing
- Make sure that all the frameworks and APIs work correctly with the mobile application.

Redesign
- If there are errors or bugs present within the application, debugging process will be carried out

Result
- The final prototype should be working with outcomes that meet the objectives of this project.
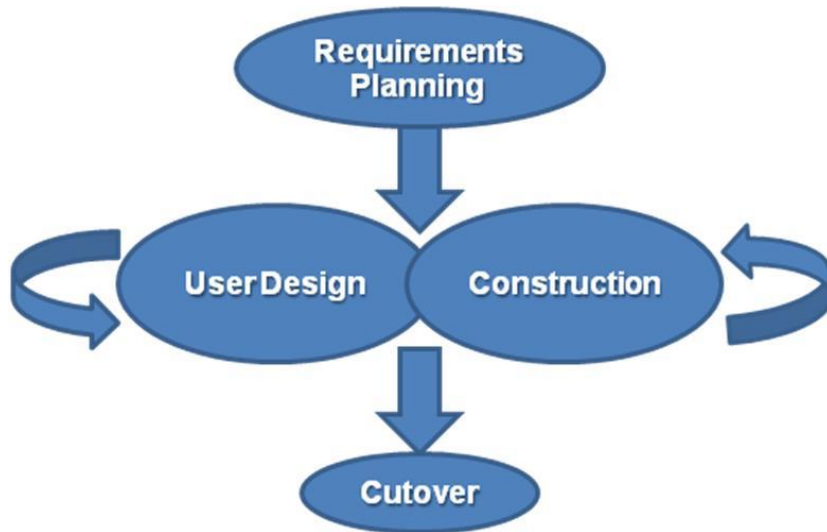
3.3 Development Methodology

Figure 9 Research Methodology 2

Rapid Application Development (RAD) concept is applied for this project. There are four major steps involved:

Requirements Planning: During this step, researches have been done to understand the major system architecture of this attendance application. Other understandings like APIs and frameworks in Android are other major prior requirements.

User Design: At this step, user-interface and user-experience are being studied. The studies will then map the all the designing ideas of user-interface into story-boards. Data and internal processes algorithm will then put into thoughts in conjunction with the design of user-interface.

Construction: Codes and story-boards are linked together to produce a working application.

Cutover: Deliver the working application to end-users. This step also includes testing of the system and educating users on how to use the applications.
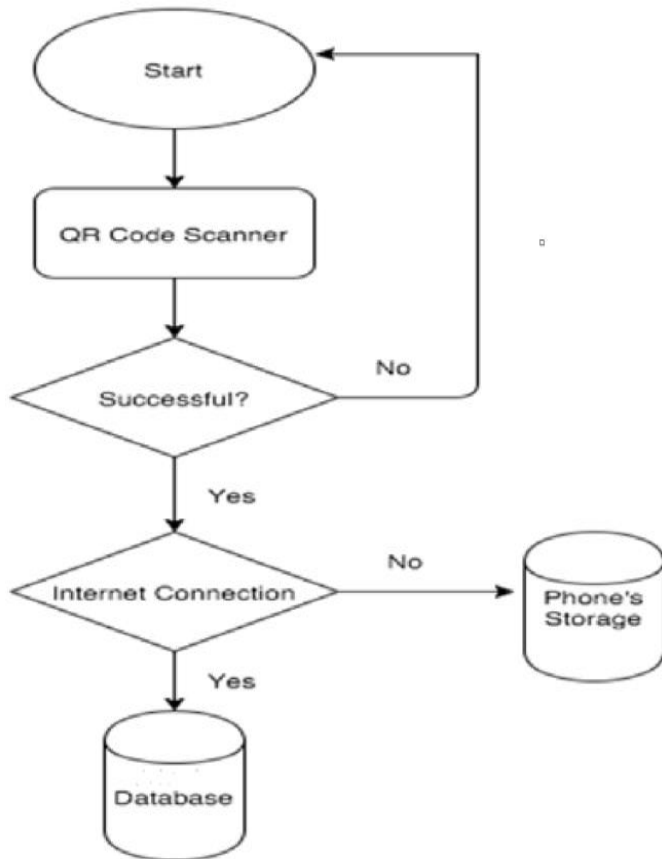
3.4 System Architecture Design

Figure 10 Flow of Process

Figure 9 shows the flow of process of the application. Lecturer will hand out a printed-out QR code to the students at a lecture. Students will then launch the application to scan the QR code. If he successfully sign up for the attendance with Internet connection. His attendance record will be updated in the dedicated website. However, if there is no internet connection at the moment, his record will be updated later when internet connection is available.
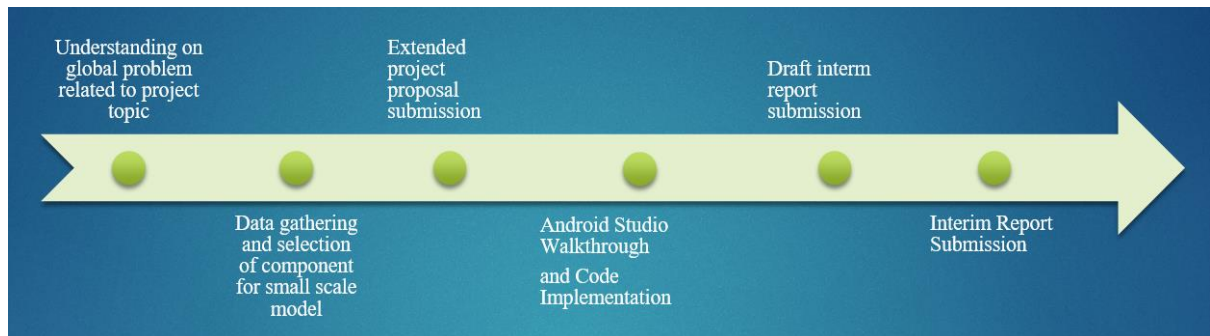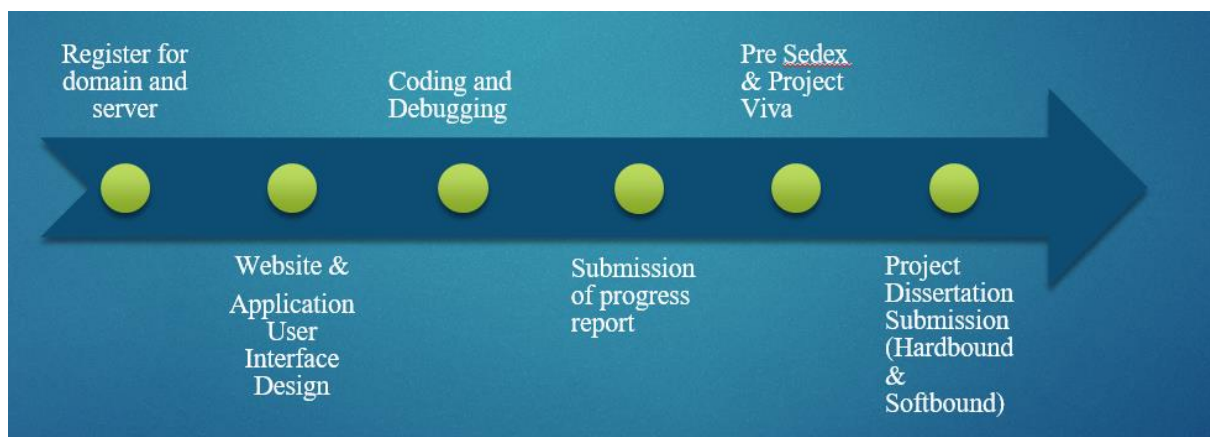
3.5 Key Milestone

Understanding on global problem related to project topic

Extended project proposal submission

Draft interm report submission

Data gathering and selection of component for small scale model

Android Studio Walkthrough and Code Implementation

Interim Report Submission

Figure 11 Key Milestone FYP 1

Register for domain and server

Coding and Debugging

Pre Sedex & Project Viva

Website & Application User Interface Design

Submission of progress report

Project Dissertation Submission (Hardbound & Softbound)

Figure 12 Key Milestone FYP 2

3.6 Grant Chart

No	Detail /Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Understanding the topic and problem related	■	■	■											
2	Data gathering and component selection				■	■	■								
3	Extended proposal submission						■								
4	Android Studio Walkthrough							■	■	■	■	■	■	■	■
5	Proposal defence									■					
6	Draft report submission													■	
7	Submission of final report														■

Figure 13 Grantt Chart FYP 1

No	Detail /Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Register for domain and server	■	■												
2	Website & Application User Interface Design			■											
3	Coding & Debugging	■	■	■	■	■	■	■	■	■	■				
4	Submission of progress report								■						
5	Pre Sedex & Project Viva										■				
6	Submission of final report											■			
7	Project Dissertation Submission (Hardbound & Softbound												■	■	■

Figure 14 Grantt Chart FYP 2

3.7 Tools

3.5.1. Software

Android application development – Android Studio [8]

- Android Studio is a free firmware released by Google in 2013. This firmware is the official IDE for developers to create Android mobile applications.

QR code scanner– Zxing [9] Scanner

- Zxing is an open source project that enables Android devices' cameras to scan 1-D or 2-D "Graphic Barcodes".

Database – MySQL

- MySQL database is used to store the data of registered students for tracking and recording purposes.

3.5.2. Hardware

Android smart phone
Windows PC

Chapter 4: Result & Discussion

4.1 Mobile Application

The user interface of the android application is designed by using Android Studio For Mac although some functionalities are limited on Mac version.
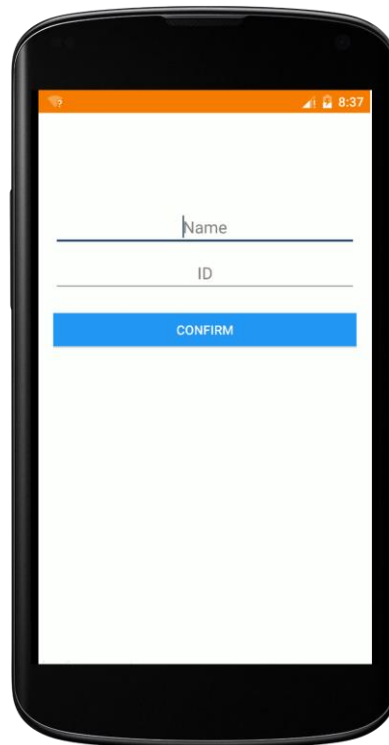
Figure 15 Activate Activity

The main activity of the Android application is to register users with their IDs. The IDs of students will be registered with the application. The ID text field is designed for the student to key in their respective IDs.

Once the ID is entered, student can click the ACTIVATE button to activate their IDs and register to the mobile application.
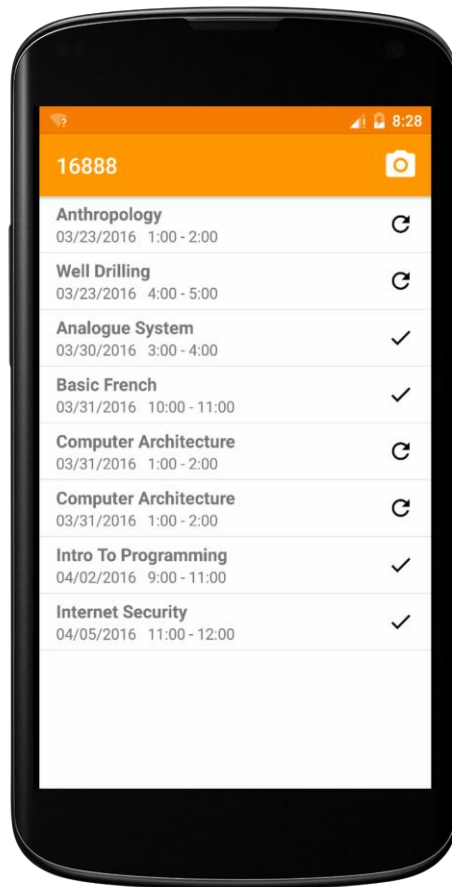
Figure 16 Take Attendance

After the student's ID has been activated with the mobile application. He/ She is able to proceed to taking attendance with the mobile application. By pressing the camera button, users will be able to scan the QR Code with the mobile application by using the mobile phone's camera.
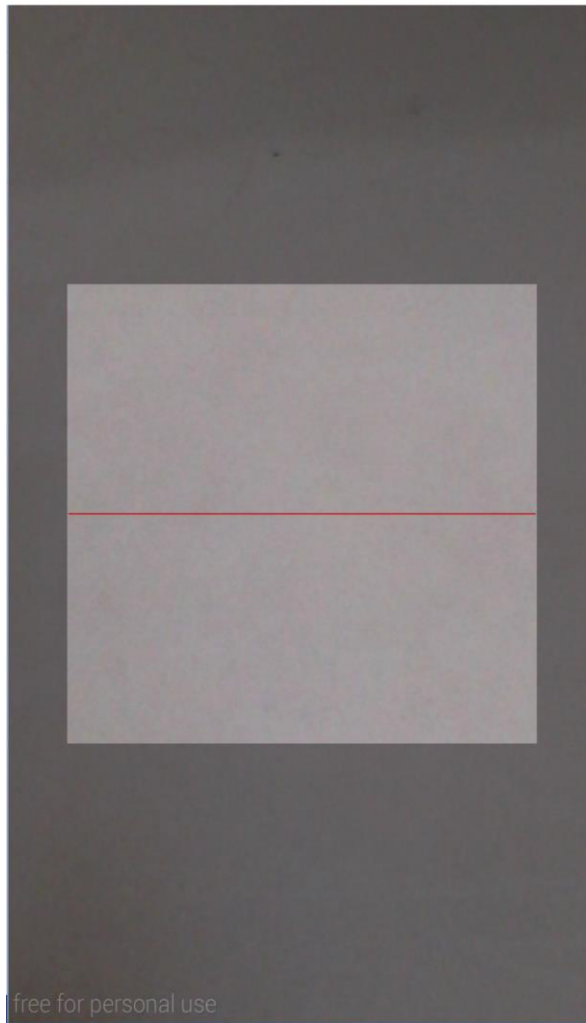
Figure 17 Scanner Activity

After user enter the ID for activation. The Scanner Activity will be fired up to scan the QR Code using the phone's camera.
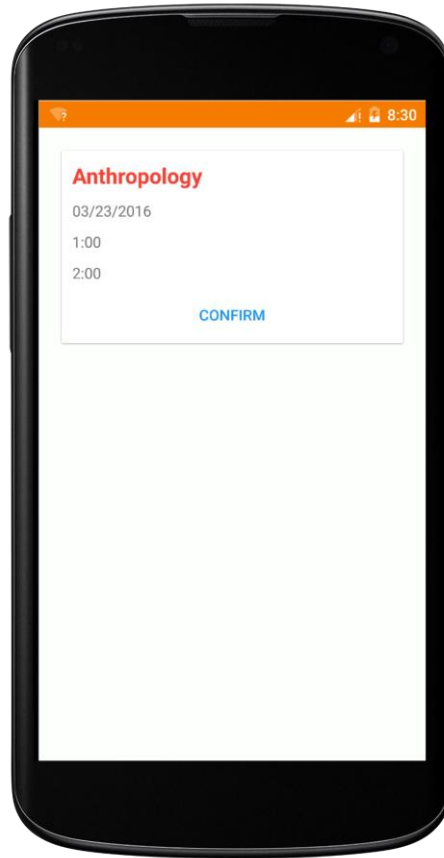
Figure 18 Insert Activity

The insert activity indicates that the QR code has been successfully verified by Zxing. The info that will be recorded are Time, Date, Class and Lecturer. Once the 'Confirm Button' is clicked the data will be uploaded to the MySQL server. After that users will be redirected back to the Main Activity.

Figure 19 Attendance Pending For Update

Figure 20 Attendance Successfully Updated

4.2 MySQL Server

MySQL server is utilized to store the users' logged data.

	NO	ID	DateTime
☐ 🖉 Edit ⬛ Copy ⊖ Delete	1	11223	2016-03-08 01:44:22
☐ 🖉 Edit ⬛ Copy ⊖ Delete	2	11223	2016-03-08 01:49:11
☐ 🖉 Edit ⬛ Copy ⊖ Delete	3	11223	2016-03-08 01:49:12
☐ 🖉 Edit ⬛ Copy ⊖ Delete	4	11223	2016-03-08 01:50:54

Figure 21 MySQL

4.3 QR Code Generator Website
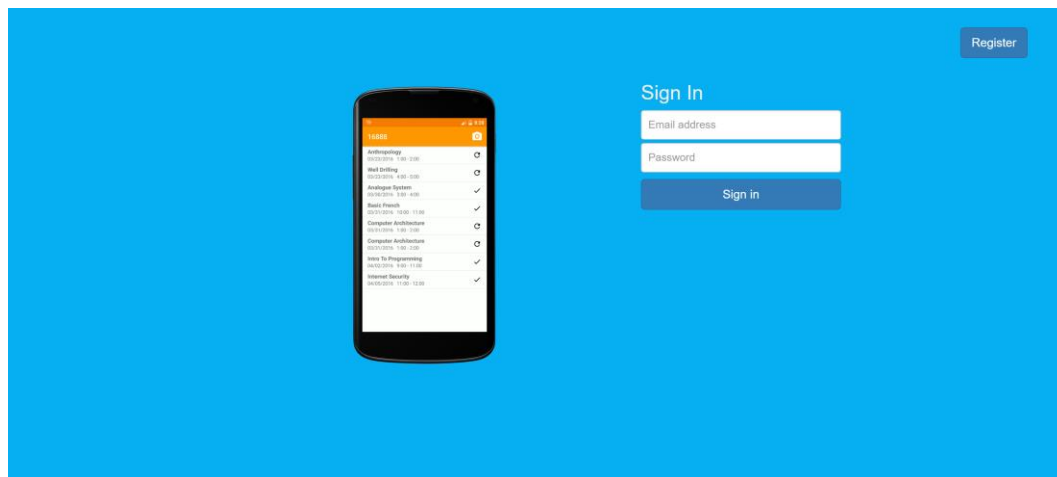

Figure 22 QR Code Generator Website Login Page

Registered instructors will able to login into the website to generate the QR Code for their respective classes.

Figure 23 QR Code Generator Website Generation Page

Instructors can fill in the following fields to generate an unique QR Code for their class.

Figure 24 Generated QR Code

Generated QR Code.
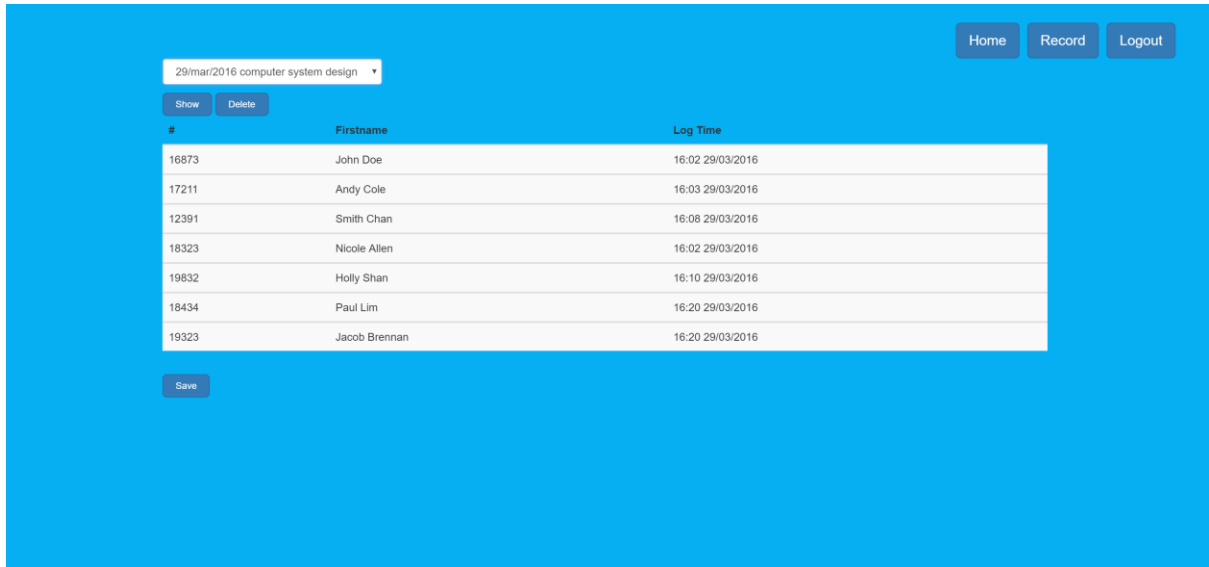
Figure 25 Track Students Attendance Page

Instructors can track the attendance records of all classes by visiting the website either by using ID or Class search fields. Instructors can save the records in a PDF file for future reference.

Anthropology

#	Firstname	Log Time
12458	Danny	02:31 11/04/2016
12458	Danny	02:31 11/04/2016
12458	Danny	02:31 11/04/2016

Figure 26 PDF File

Chapter 5: Conclusion & Recommendation

5.1 Conclusion

QR Code Attendance system will be very beneficial in the approach to further enhance the traditional attendance taking system at university. This is because this system is reliable, organized and efficient in many aspects. The objective of this system is to assist the administrators to keep systematic and organized records of attendance for a particular class. Records that are kept in the spreadsheet will be permanent and well-organized. This system will also discourage students to fabricate other students' attendance thus will help to cultivate a sense of discipline among themselves.

5.2 Recommendation

There are fews recommendations to point out so as to enhance the performance of the mobile application. Firstly, the mobile application source code can be updated from time to time, code cleaning and bug-fixing are two major aspects in this process. This will ensure that the application can run smoother and attendance can be taken quickly. In this case, there will be several versions of this application updated from time to time. Secondly, the local database of mobile phone can be updated from time to time to the MySQL database online for persistent storage. The interface of the website will have to conform to the design of the mobile application. Finally, the UI designs of website and mobile application have to improve for visual purposes.

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