Automation of College Attendance System using Quick Response code

A major project report submitted in partial fulfilment of the requirement for the award of degree of

Bachelor of Technology

in

Computer Science & Engineering / Information Technology

Submitted by

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CERTIFICATE

This is to certify that the work which is being presented in the project report titled "Automation of College Attendance System using QR code" in partial fulfilment of the requirements for the award of the degree of B.Tech in Computer Science & Engineering and Information Technology and submitted to the Department of Computer Science & Engineering, Jaypee University of Information Technology, Waknaghat is an authentic record of work carried out by "Aarhan Ali Khan, 201221" and "Advik Kumar Singh, 201530" during the period from August 2023 to May 2024 under the supervision of Dr. Nishant Sharma, Department of Computer Science and Engineering, Jaypee University of Information Technology, Waknaghat.

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CANDIDATE'S DECLARATION

We hereby declare that the work presented in this report entitled **'Automation of College Attendance System using Quick Response(QR) code'** in partial fulfilment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science & Engineering / Information Technology** submitted in the Department of Computer Science & Engineering and Information Technology, Jaypee University of Information Technology, Waknaghat is an authentic record of my own work carried out over a period from August 2023 to May 2024 under the supervision of **Dr. Nishant Sharma**(Assistant Professor(SG), Department of Computer Science & Engineering and Information Technology).

The matter embodied in the report has not been submitted for the award of any other degree or diploma.

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This is to certify that the above statement made by the candidate is true to the best of my knowledge.

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CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

QR	Quick Response
URL	Uniform Resource Locator
SQL	Structured Query Language
CSV	Comma Separated Value
CSS	Cascading Style Sheets
JS	JavaScript
SIS	System Information System
API	Application Programming Interface

ABSTRACT

Attendance is an important factor for every academic activity. There are different traditional methods like roll calls, attendance sheet either paper or excel for attendance management. All the methods have some disadvantage in maintaining the attendance. As we know smartphones are an important part of our daily lives in the current technological era. Most problems today can be swiftly and easily solved using smartphones. With many social apps, business apps, apps for solving problems, apps for marketing and education, etc., it has made everyone's life simpler and easier.

This project intends a method that would deal with a challenge for keeping track of attendance after the technology. The solution that is being proposed consists of two platforms: one that creates a QR Code and a second one that scans and records attendance. The attendance record is in CSV or XLS format.

The purpose of the smart phone-based attendance system is to computerize the traditional way of recording attendance and provide an easiest and smart way to track attendance in institutions.

CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

In today's era where there is a crucial need of technology for doing any kind of work, educational institutions are looking for some innovative methods to improve the administrative as well as academic processes. One such area is the management of attendance where QR code technology has come out as a promising solution. QR code is a type of two-dimensional barcode made up of black and white modules that can be easily scanned by electronic devices like mobile phones, digital scanners, etc[13]. Data capacity of QR code is up to 7089 characters. They can encode URL links and any type of data[15].

It is very necessary to monitor the attendance of students which are mostly taken manually. Traditional methods like roll calls, attendance sheets, punch cards, etc. of taking attendance are inefficient nowadays as there are lot of chances of human errors. This method is time consuming, prone to errors and lacks data analysis capabilities. So, there is a need of an automated attendance system to track the attendance process.
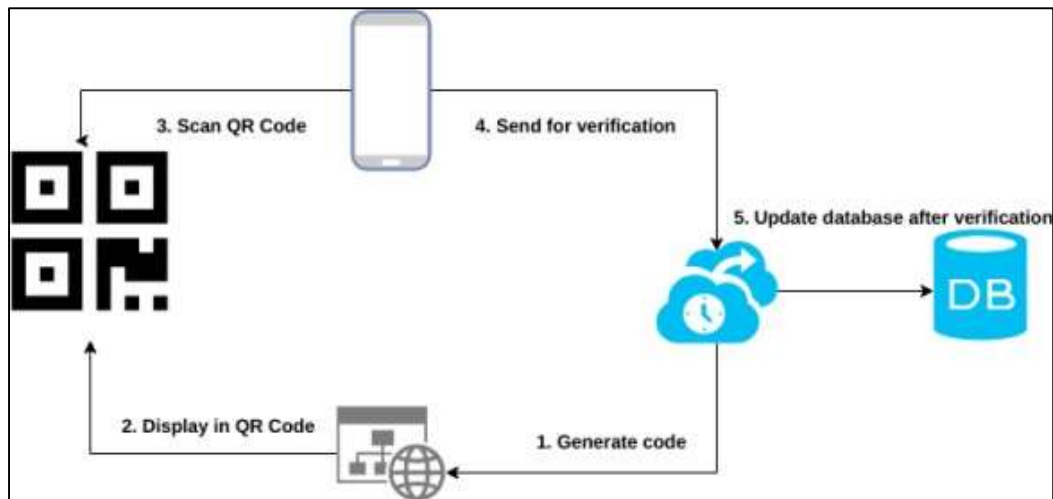
Figure 1.1 : Proposed Solution Overview

The above diagram shows a solution to all the problems faced in traditional methods of marking attendance and i.e. Attendance System using QR code. In this a QR code will be generated by the teacher and it will be scanned by the students using an android device and the data will be stored in the form of an excel file that can be downloaded.

The benefits of QR based attendance system are implementation is easy, accuracy is improved, data analysis become easy and many more. Some of the important aspects that have been taken into consideration in this project are privacy, security and accessibility. It enables immediate access to attendance data allowing instructors to see who is present and who is absent during an ongoing class. It eliminates delays and potential errors associated with manual attendance sheets. QR codes prevent unauthorized attendance marking. Suitable for various settings like workplaces, events, classrooms, etc.

Some drawbacks of the system are scanner malfunctions, network connectivity problems and the most important is the effectiveness depends on the students remembering to scan the QR code[18].

In our project, we propose a QR code-based system in which one platform is designed to create a QR code and the other device like smart phone, scan the QR codes. Students use cellphones to scan QR codes that are displayed by the teacher. When students scan this QR code, their attendance is immediately recorded based on their user id. We develop QR codes through Reed Solomon Algorithm and then enhance its appearance through module or pixel-based techniques[22]. The success of this project will be evaluated on reduction in manual effort and time spent on attendance marking.

1.2 PROBLEM STATEMENT

Traditional attendance system faces a lot of problem that effects the efficiency, accuracy, attendance monitoring and overall effectiveness.

1. Prone to Human Errors : In manual process there can be many errors such as names are misread, some entries may be skipped and many more. This cause inaccurate records which make it very difficult to track the attendance of students and thus effects the overall efficiency.

2. Time Consuming and Inefficient : A lot of time is waste in calling out the names of the students and managing the attendance book log. This makes the whole process inefficient so, there must be a solution for this and the saved time can be used for teaching or other academic activities.

3. Lack Attendance Monitoring and Data Analysis : In traditional method of taking attendance, monitoring process come out as a problem which make it very difficult to find patterns in attendance record. Because of this absentee's section that must be

taken into consideration can be ignored. As a result, this will impact the academic performance of the students.

4. Prone to Proxy Attendance and Fraud : In traditional process proxy attendance is a common problem where students mark the attendance of their friends through unfair means. This effect the integrity of attendance records and damage the actual attendance records.

Automation of college attendance system is a promising solution to overcome the limitations of traditional process. This innovative approach will improve the accuracy and efficiency of the attendance marking process and it will also improve the academic performance of the students.

1.3 OBJECTIVES

'Automation of College Attendance System using QR code' is a web application that is used for attendance management on daily basis in college. Every academic staff and students will have this application for the complete attendance process. Some of the objectives are -

1. Error reduction and Accuracy : It reduce the possibility of human errors related to manual attendance marking and storing them. It will not only improve the integrity of data but also remove the work of correcting attendance issues from the administrative staff.

2. Efficiency is improved : This system helps the student to quickly mark their attendance and also reduce the burden of taking attendance from teaching staff thus saving time and effort. This time can be used for teaching and other academic activities.

3. Data Analysis and Attendance Monitoring : This system help the teaching staff to analyze and monitor the attendance data which will help in finding patterns related to student academic work, issues related to absentees and many more. This helps the student to improve their academic performance .

4. Data Protection : Some security measures like strong passwords during login time, expiration time for QR codes, etc. are a part of this system that will protect the personal information of student from unauthorized access which ensures the integrity of data and will not violate their privacy.

5. Easy Accessibility : This system is designed in such a way so that it can be easily accessible to all students regardless of their technological literacy as the only requirement for this system is a mobile phone.

Automation of College Attendance System using QR code offers a range of benefits that improve the attendance of students, their academic performance and overall success of the institution.

1.4 SIGNIFICANCE AND MOTIVATION

1.4.1 SIGNIFICANCE :

This system has a lot of significance value and that's why it is a promising solution to the problems of traditional method of taking attendance. Some of it are –

1. Proxy attendance is prevented and security is improved : This system will prevent the unauthorized access of the system thus ensuring the integrity of the attendance records. It also prevents the proxy attendance from taking place as the QR code will change every 10 seconds.
2. Improves the accuracy and make records more reliable : This system removes the human errors associated with the traditional method which will make the records more accurate and reliable.
3. Maintainability : The system would be maintainable to a good extent since there are not too much of the hardware devices like projectors, white screen for display, mobile phones and computer system . The system is solely based on internet connectivity and the database has to be maintained against attacks and has to be dynamic in nature, where they can be modified.
4. Reduce the academic burden from teachers : This system will reduce the workload of marking attendance from the teachers and they can use this time for teaching and other academic activities.
5. Portability : The system is completely portable since the only requirement is internet connectivity. Also, the web page is responsive and works well with mobile, desktop PCs.

The below diagram shows that first, the lecturer will login himself on the web platform and then create a lecture for a particular topic, after that generate a QR code for the students in order to mark the attendance. Beside the students will login themselves on

the app and scan the QR code. If the scanning process completes properly attendance will be marked and gets stored in the form of an excel file that can be downloaded after the process.
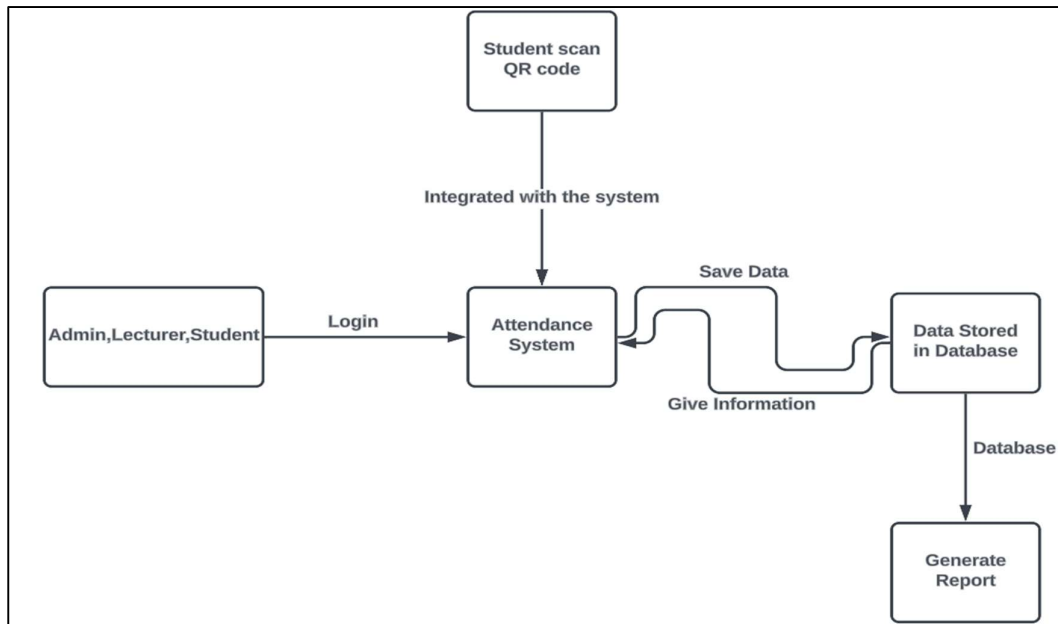
Figure 1.2 : Working of Proposed System

1.4.2 MOTIVATION :

1. Traditional methods are prone to human errors and as a result efficiency of the process is reduced. This system eliminates the errors caused by human such as misreading names, skipping of some entries and many more. This improves the accuracy of the attendance marking process and also the integrity of data. As a result, it ensures a reliable attendance data.

2. Roll calls and attendance sheets have a common problem of proxy attendances. This system removes the problem of proxy attendance and as a result the integrity of attendance data is maintained and the actual attendance record is not distorted. Some security features are added to this system so that only authorized one can access the system and no breaching of data can be done.

3. Taking attendance is an important work of the teaching staff but it is also a burden for them. This attendance system reduces the workload of marking attendance from teaching staff. As they don't have to mark attendance on a paper or excel sheet, they have to just open the app follow some steps and the whole process will be done within a minute thus, saving energy and time.

4. Attendance monitoring is an important work of teachers in order to know which students are regular to class but it becomes very difficult in traditional process as the whole data is distributed and it is not easy to analyze them. Through this system the teachers can easily monitor the regularity of students as it will provide them stats regarding the absentees' students and the students who came regularly to their classes.

5. In traditional method attendance was marked either through roll calls or through attendance sheets and due to this a lot of time was wasted but through this system the whole process can be done within few minutes thus saving time and improving the overall efficiency of the process. The saved time can be used for teaching or other academic purpose.

6. In traditional methods a lot of time is waste in taking attendance and during that time students are engaged in other activities thus the whole teaching environment gets disrupt. Through this system a better teaching environment can be developed as less time will be required to complete the process and the students cannot engage themselves in other activities.

1.5 ORGANIZATION OF PROJECT REPORT

CHAPTER 1 : INTRODUCTION

This chapter aims to present an overview of the project developed on 'Automation of College Attendance System using QR code'. In our project, we develop a system in which QR code is used to mark the attendance and it have different features that manages the attendance process. We will create an app that marks the attendance of students for a particular subject and also create a web platform where the lecturers can have the attendance. We develop QR codes through Reed Solomon Algorithm that will change every 10 seconds[21] in order to prevent proxy attendances and then beautify it through module or pixel-based techniques. This chapter explain the problem statement, objectives, significance and motivation of the project.

CHAPTER 2 : LITERATURE REVIEW

This chapter aims to present various literature survey of existing research on college attendance system using quick response code. Some of the useful content from different papers are used for different purposes like how to create a QR code using Reed Solomon

Algorithm and then modify it through module or pixel-based techniques, about the features of QR code, their advantages, structures and different techniques to enhance their appearance like Direct Superimposition and Blended type techniques.This section also contain the key gaps of the literature survey discussed here like missing of some security measures like some necessary authentication process, device malfunction, lack of training which results in the difficult adaptation for the system, decoding speed and accuracy are affected due to the beautification process, etc.

CHAPTER 3 : SYSTEM DEVELOPMENT

This chapter explains the step-by-step methodology used in the development of college attendance system using QR code. This section consists of the tools(Git, ReactJS, SQL, Spring Boot, etc.), requirements(hardware, functional, non-functional), project design and architecture, target users, etc. In this first we develop an app for attendance marking using QR code using ReactJS and Spring Boot. Then we develop a QR code through Reed-Solomon algorithm because it balances the amount of data stored and level of correction required. Finally, we enhance the appearance of the QR code through module or pixel techniques for branding and promotion.

CHAPTER 4 : TESTING

This chapter presents a depth analysis of the test results obtained during testing. In testing the lecturer will login himself on the web platform, after that he/she will create a subject followed by a lecture on a particular topic. Lecturer will generate a QR code that will change every 10 seconds automatically for the students to scan the QR code in order to mark the attendance. The students will login themself on the mobile platform and then scan the QR code which is shown on the projector. If the scanning process executes properly then the attendance will be marked and vice-versa.

CHAPTER 5 : RESULTS & EVALUATION

This chapter provides a detailed evaluation of the system for marking attendance through QR code. In this how a student register itself for a subject, stats of student's attendance as well as of the whole class can be seen, how a QR code appears and changes every 10 seconds to prevent any type of fraud and many more. Like chances of human error is reduced, manual load is reduced, attendance monitoring becomes easier, technology is cheap as compared to other ways as minimum hardware and software are required, etc.

CHAPTER 6 : CONCLUSION

The final chapter summarizes the project's outcomes, suggesting potential improvements and future work. It emphasizes the system's potential impact on improving the attendance system. This system is both feasible and beneficial and promises to improve the operational efficiency, data accuracy and experiences of students and faculty. However, successful deployment requires planning, financial investment and privacy measures. With proper preparation this system can significantly contribute to the educational institution's administrative effectiveness and academic environment.

CHAPTER 2

LITERATURE SURVEY

2.1 OVERRVIEW OF RELEVANT LITERATURE

A Manori et al. [1] proposed a variant of QR code. It is a two-layer structure that shows two alternative messages when scanned from two different directions. The also demonstrate the robustness of their method for both synthetic and fabricated examples. This two-layer structure has a top layer and a bottom layer. Each layer is a matrix of modules. The bottom layer modules are black and white, while the top layer modules may be transparent, allowing the code to appear differently when view from different directions.

A Manori et al. [2] proposed a system that uses QR codes and geolocation in marking the attendance. The system is a combination of two android applications that is used for the management process. Each staff will be given the application for attendance management. The main objective of the system is to automate the traditional way of recording attendance. Some of it benefits are enhanced accuracy and reliability, improved efficiency and time-saving, real-time attendance monitoring and many more.

T. Lee et al. [3] proposed a two-stage approach to generate QR code with high quality visual content. In the first stage, a QR code with reliable and fast decode ability but poor visual quality is synthesized based on the Reed Solomon procedure. In the second stage, a rendering mechanism is used to improve the visual quality without affecting the decode ability of the QR. The results show that the proposed method enhances the appearance of the QR code and the processing complexity is not increased.

B. Dinesh et al. [4] proposed a system named that uses an android app which scans the QR code that acts like a user ID, for verification either fingerprint or voice recognition is used. In this paper, the fingerprints of every employee are stored in the server. At the same time the employee must record all the 26 alphabets for the recognition process that is stored in the database. During authentication, a random 5 alphabets will be listed and the employee should read it. When the voice frequency gets matched with stored one, it is verified that employee is a part of organization.

D. Sharma et al. [5] proposed a review on QR code structure for encryption and decryption process. The research paper focus on the development and understanding the structure of QR

code in today's world, a deep understanding on the structure of QR code(each and every part of it) and how it can be useful in various applications like marketing, medical, finance and information about various products which containing less space in QR Codes. QR code capability of storing various types of information beyond numbers include URL links, email and many more.

2.2 KEY GAPS IN THE LITERATURE

A Manori et al. propose an innovative approach for attendance management but there are several key gaps that can be seen in this report. Some of them are training and support for students, teachers and administrative staff in order to have an   easy adaptation for the system and also to teach them about technical challenges, device malfunctions or internet connectivity issues that can cause disruptions during the process and many more.

B. Dinesh et al. give a promising solution for automating employee attendance management but there are some key gaps that need to be addressed. Some of the security measures like missing of authentication process that need to be a part of the system are missing that can affect the sensitive information of employees as well as the attendance data and as a result this can impact the integrity of the data, cost effectiveness for large organizations with many employees and many more.

S. Grewal et al. propose different techniques such as Direct Superimposition, Blended type, etc. to enhance the QR code appearance but there exist some key gaps that require attention and some of them are there should be a balance between appearance enhancements and QR code readability, QR codes should be enhanced in such a way so that it can please the user, during enhancements there are chances where security can be compromised and this can impact the integrity of data.

T. Lee et al.[6] suggest some ways how to develop a QR code and then beautify it with different techniques. There are some key gaps that need to be addressed and some of them are algorithm used to develop a QR code is complex and decoding process for larger codewords are a little bit slow, during beautification process decoding speed and accuracy can be affected and lack of some security measures during enhancement.

CHAPTER 3
SYSTEM DEVELOPMENT

3.1 REQUIREMENTS AND ANALYSIS

3.1.1 HARDWARE REQUIREMENTS

- Laptop/Projector Screen : Dynamic QR codes are generated for each class session and displayed for the students to scan.
- Android OS 4.2+ (Mobile)
- Server to host the website
- Android smartphone with camera and fingerprint scanner : Students use their smartphones or dedicated scanning devices to scan the QR code during the attendance session.
- Reliable network

3.1.2 SOFTWARE REQUIREMENTS

- Integration with Institutional Systems(Webkiosk): The system must integrate with existing student information systems (SIS) for data synchronization. If the college has an API (Application Programming Interface) for student, your attendance system's backend can connect and exchange data securely using the API.
- Data Export/Import: Alternatively, the attendance system might allow exporting attendance data in a specific format (e.g., CSV) that can be imported into the institutional system.
  Admin needed to manage the software
- Technical Support: Ongoing technical support for system maintenance, updates, and troubleshooting.
  1. Server outages or downtime affecting system functionality.
  2. Database errors leading to inaccurate attendance records.
  3. Difficulties integrating the QR code system with existing student databases.
  4. Data synchronization problems between the attendance system and other platforms.
  5. Users reporting suspicious activity or potential security breaches.

6. Clear user manuals and training materials should be available for both teachers and students on using the QR code attendance system effectively.

7. Having access to technical support staff who can troubleshoot any issues with the system is crucial. This could be through a phone support or online chat.

3.1.3 TOOLS

- Git[7] : It is a distributed version control system. It has many applications like software development, to keeptrack of the programme files in order to verify that the latest changes in it do not alter the software. Even if it happens then we can revert to the previous files.

- Programming Languages :

  ReactJS[11] : It is a well-known JavaScript library for creating user interfaces that emphasises the concept of reusable components. It makes use of a virtual DOM to efficiently refresh the user interface and has a declarative programming language that makes it simple to reason about the application's state.

  React Native[10] : It is a mobile application development framework that uses JavaScript and ReactJS. It enables developers to create code once and deliver iton both iOS and Android, resulting in a quick and efficient mobile app development process.

  Spring Boot[9] : It is a popular Java-based web application framework that streamlines the process of developing stand-alone, production-grade apps. It has many capabilities, like as auto-configuration and embedded servers, that make it simple to get started with Spring development and reduce the amount of boilerplate code required.

  SQL[12] : It is a computer language that is commonly used to manage and modify relational databases. It includes a collection of instructions for creating, editing, and querying databases and associated tables, allowing developers to swiftly and effectively store, retrieve, and analyse data.

3.1.4 FUNCTIONAL REQUIREMENTS

It outlines the specific tasks and functionalities that the system should perform.

LECTURES :

1. The website shall be able to generate QR code

2. The most important work of the site is to manage attendance records which include -

   - To view records

   - To update them from time to time in order to get a reliable data

3.Other work of the site is to manage classes like -

   - To create classes of different subjects

   - To update them due to any reason like increase in class strength

   - To delete them if some wrong information is added like subject name

STUDENTS :

1. The app shall be able to scan QR code to record attendance

2. It must also check attendance records for all classes

3. Other work the app must perform -

   - To view students' attendance percentage

   - To view class details with time and venue

3.1.5   NON- FUNCTIONAL REQUIREMENTS

It outlines specific features that ensures the effectiveness and usability of the system. The system must have different features like -

1. To prevent cheating attendance by verifying the request.

2. To prevent unauthorised login on user accounts.

3. The most important feature of system is it must be fast and responsive.

3.2 PROJECT DESIGN AND ARCHITECTURE

3.2.1   Methodology

To achieve the discussed objectives, a step-by-step methodology has been followed. The details of methodology are given below:

- Create an app that takes attendance of a particular subject and produce an attendance sheet based on attendance records.

- Develop a QR code through Reed Solomon Algorithm in the android app.

- Create a web gateway where the teacher can select the lesson and view the QR code.

3.2.2 Proposed Approach

The methodology that is proposed is of type Throwaway Prototyping Methodology[8].
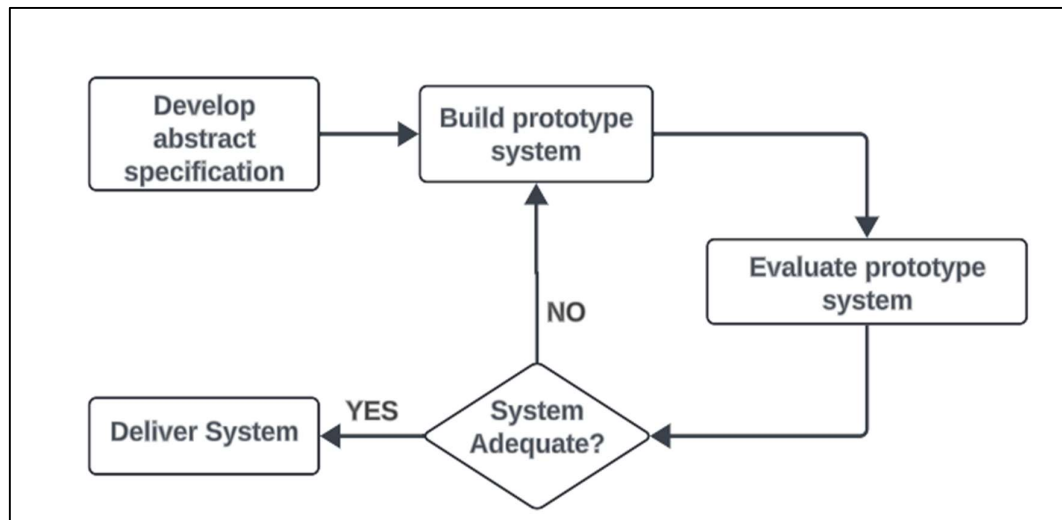
Figure 3.1 : Model of System Prototype

Users feedback is important during development stage of the prototype model. Based on their feedback, this can lead to a better knowledge of requirements. Errors may be discovered early on and as a result missing modules are identified. Attendance system must be dependable and easy to use. As a result, involving users in the development stage is beneficial.

3.2.3 TARGET USERS

1. JUIT Students

   - To record their attendance for every class

2. JUIT Lecturers

   - To show QR Code to students so that they can scan them

   - To view and manage attendance records

3. JUIT Administrator Staffs

- To manage different works like timetable, classes and users (students and lecturers).

3.2.4 PLATFORM

The system consists of 2 platforms :

- Web Platform

- Mobile Platform

The web platform of the system is used by the lecturers and mobile platform will be used by the students.

3.2.5 MODULES

1. Mobile Module

- To record attendance by scanning QR Code.

- To view whether attendance is marked or not.

- A notification is generated if students' attendance is below a certain percentage.

2. Web Module

- To view, add and modify classes.

- To view and update attendance records.

- To analyze overall attendance records in charts.

- Display QR Code for each class.

3. Backend Service Module

- Prevent registration of unauthorized students for the attendance process.

- Provides authentication in login process from both mobile and web.

4. Modules not covered

- Tutorials on how-to-use the system on both mobile and web platform.

- Module for administrators to manage user pools and timetable data.

3.2.6 INPUT/OUTPUT

1. Input data : QR code

2. Output data : XLS and CSV sheet

3. Database used : SQL

3.2.7 FEASIBILITY

1. **Economic Feasibility** : The developed system is efficient as less time is required to complete the process because attendance is marked automatically. It is also cost effective because no paper is used during this process.

2. **Technical Feasibility** : The system does not use any other additional Hardware and software.

3. **Behavioral Feasibility** : The system is user friendly and interactive.

4. **Financial Feasibility :**
   Initial Investment :-
   - Hardware and software acquisition or development costs.
     Suppose, in a college for teaching purpose there are 18 classrooms and each classroom require a projector and a screen(the main components).
     According to my research approximately,
     1 projector = Rs 7000
     1 screen = Rs 2000
     So, total initial investment will be around Rs 160000.
     The most important thing is both the components will not be used only for attendance marking they will be also used for other educational purposes.

Once implemented, scaling the system for larger student populations is relatively cost- efficient.

If we talk about traditional marking system i.e. through pen paper mode the cost will be-

In a B. Tech course for there are 20 batches in one 1 year approx... so for all the 4 years there will be 80 batches.

Each batch consist of around 25 students and for their attendance a 30 pages notebook will be required that cost around Rs 20.

So total cost per annum will be Rs 25000.

Infrastructure upgrades, if necessary to support system requirements.

Training for faculty and administrative staff on system use.

- Ongoing Costs :-
    1. Software license renewals or subscription fees.
    2. Technical support and system maintenance.
    3. Periodic hardware upgrades or replacements.

3.2.8 USE CASE DIAGRAM

The various members of the system are described in the figure below :
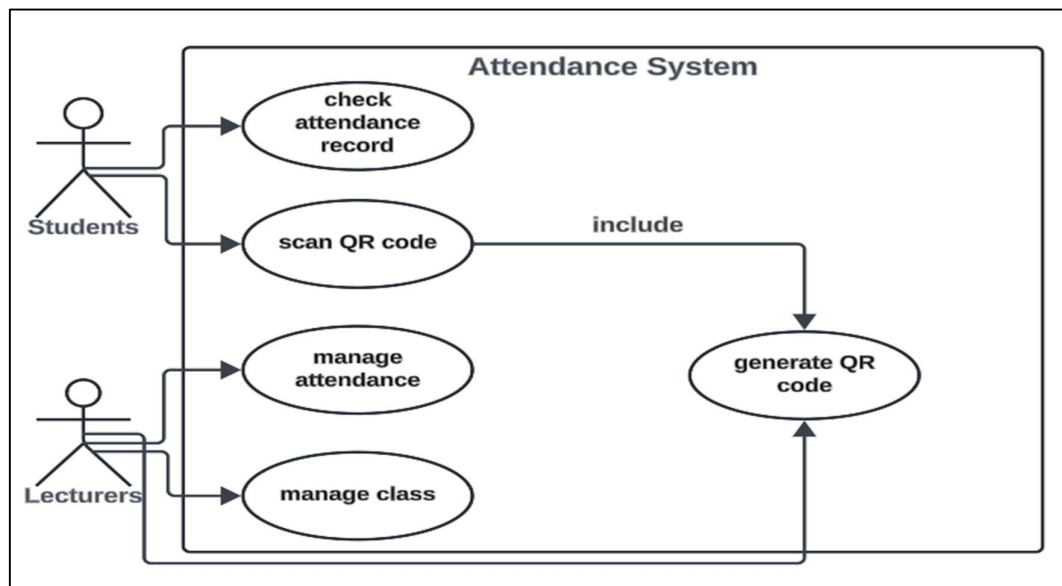

Figure 3.2 : Use case diagram

The above diagram shows the work of each member in the system i.e. students and teachers, The lecturers have to create a subject, generate a QR code for the students to marks their attendance and manage the data the received in the form of an excel file. Students have to

scan the QR code for their attendance to be marked and check their attendance record on regular basis.

3.2.9 FLOWCHART DIAGRAM
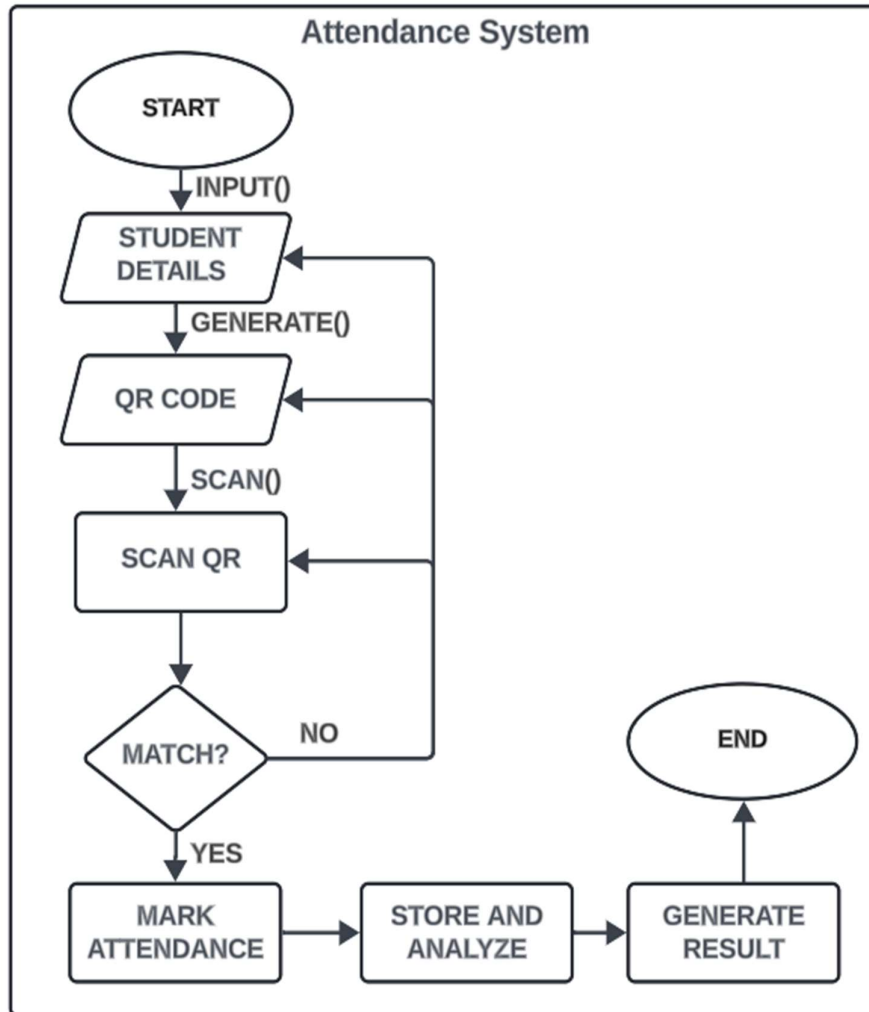
Figure 3.3 : Flowchart of Application System[20]

The above diagram illustrates the flowchart of the Automated Attendance System using QR code. The proposed solution involves taking attendance with a QR code. Students can validate their attendance by scanning a QR code with the mobile module. The request for attendance is then sent to the backend service module for verification. Once the request has been validated, the module will update the database of attendance records. The entire taking procedure should take less than 2 minutes.
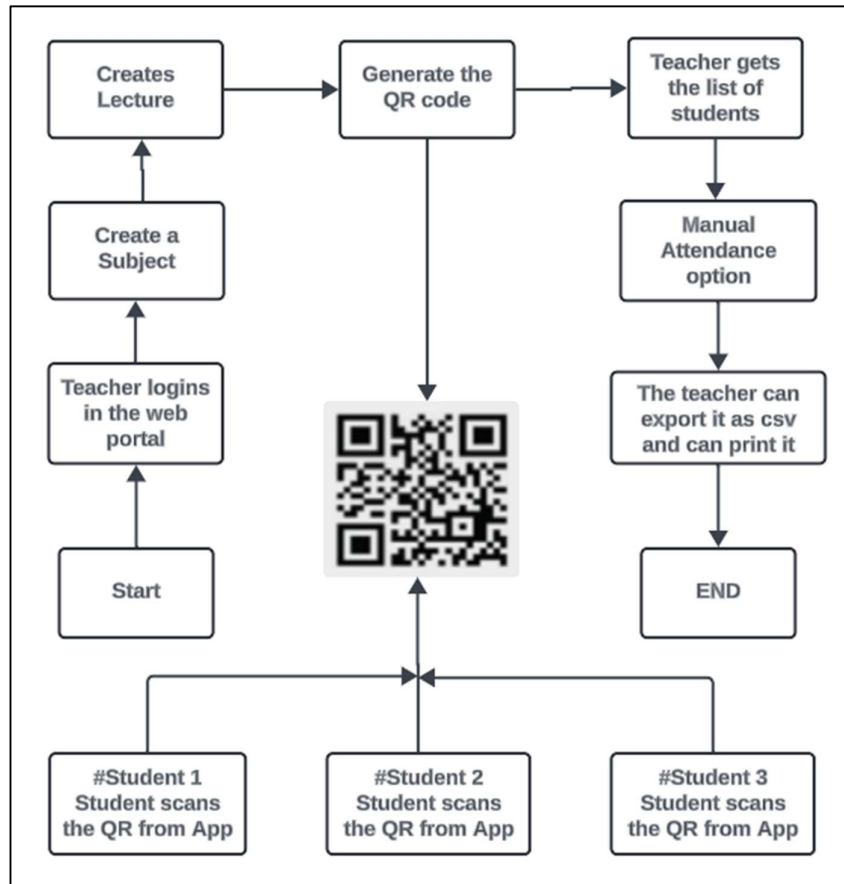
3.2.10 DATA FLOW DIAGRAM

Figure 3.4 : Data flow diagram of Attendance System
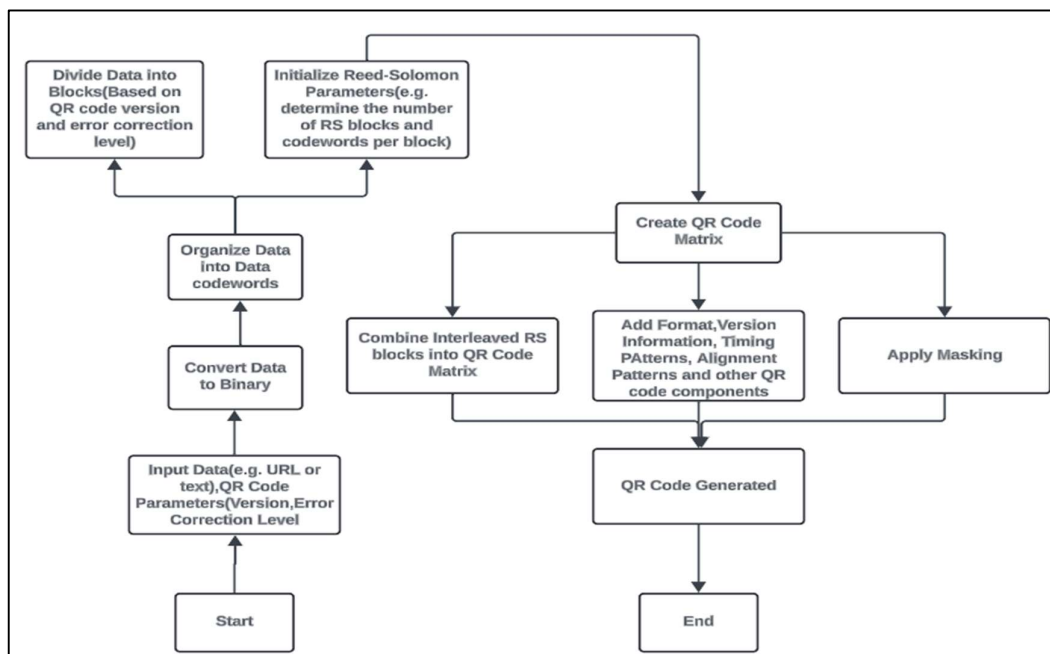
3.2.11 REED SOLOMON ALGORITHM & QR CODE

Figure 3.5 : Data flow diagram for QR code generation[19]

This algorithm is used for QR code generation. We use Reed Solomon code to make QR code because it balances and manages the amount of data stored and error correction level. Due to this feature, QR codes are suitable for a wide range of applications. It also allows QR codes to remain readable when a portion of QR is damaged[16]. During generation of QR code one very important process is used and i.e., Masking. It is used to avoid features like misleading shapes in the code that might confuse a scanner to scan properly. Masking simply means to alter the module color of QR code. This makes the scanning process easier for a scanner.
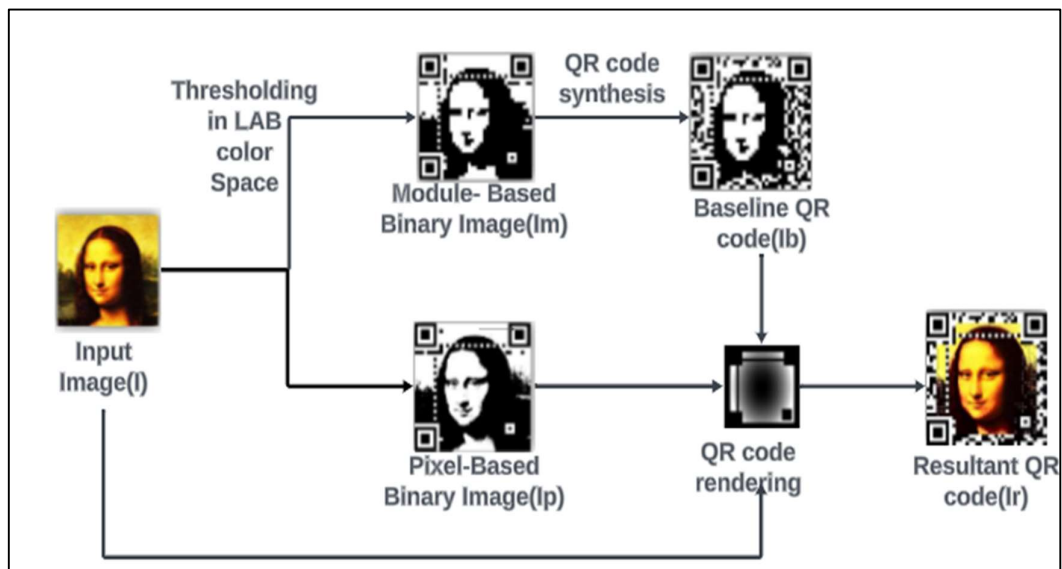

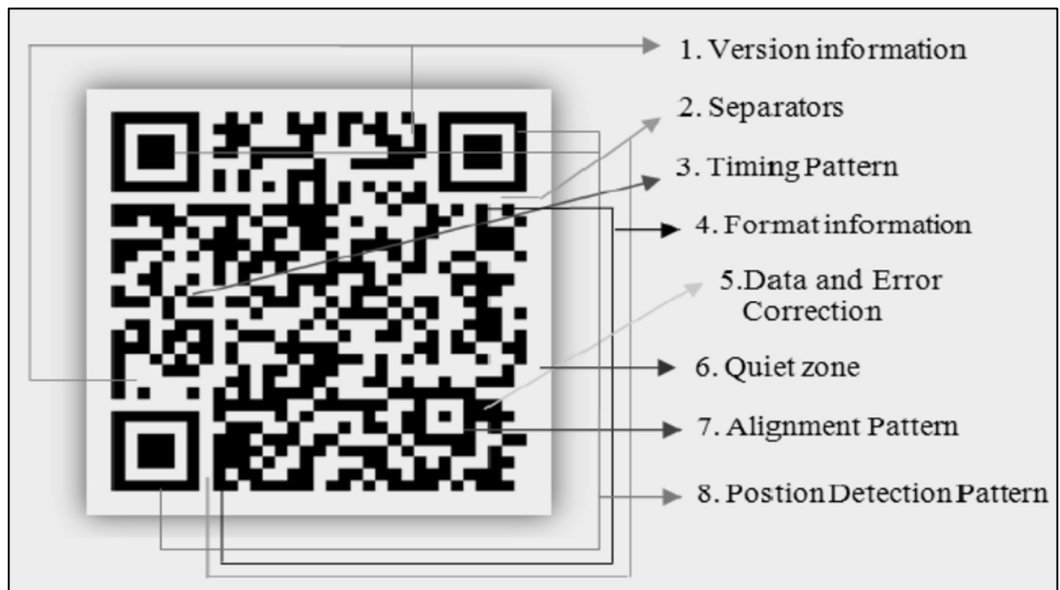**Figure 3.6 : Data flow diagram of QR code beautifier**

**Figure 3.7 : Structure of QR code[14]**

There are 40 versions of QR code and each version has 4 correction levels. These are L(low), M(medium), Q(quartile) and H(high) having a correction capacity of 7%, 15%, 25% and 30%.

Algorithm/Pseudo Code of Reed Solomon Algorithm[17] :

1: Begin

2: Take input- message length , choose error correction level and version

3: Encoding - Input texts are encoded into codewords

4: Polynomial Representation – Encoded message is treated as co-efficient of polynomial

5: RS algorithm generate error correction codewords base on representation

6: Algorithm also generate parity bits

7: Codewords and bits are appended to the final encoded message

8: Padding bits are adopted if codewords can't completely fill message length

9: Final encoded message combines with necessary information

10: XOR operation is performed

11: QR code is generated

12: End

3.3   IMPLEMENTATION

4.3.1   SYSTEM FLOW
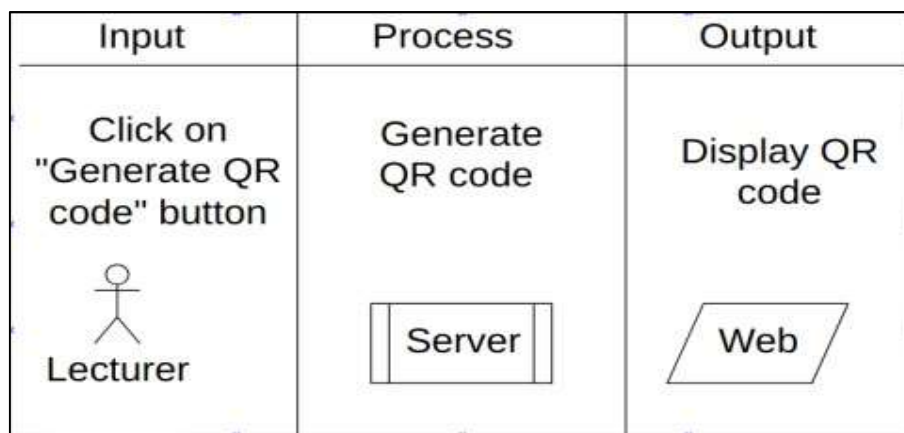
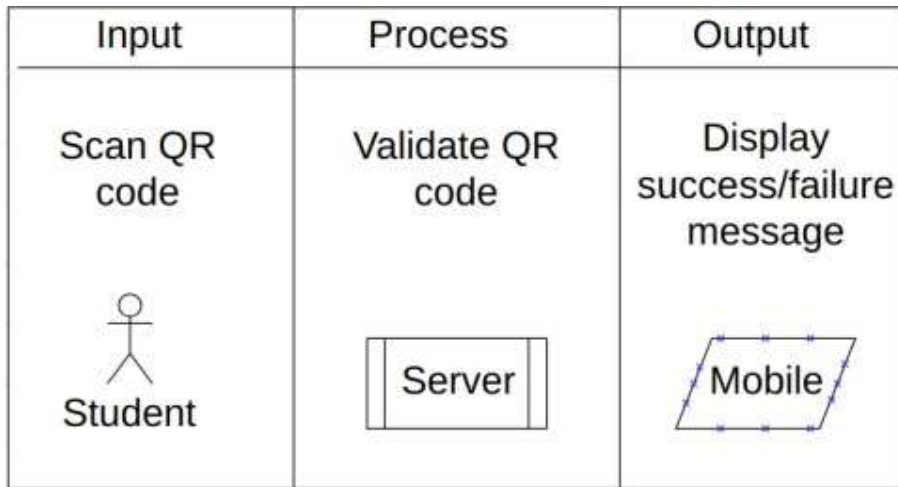**Figure 3.8 : IPO diagram of generating QR code**

Figure 3.9 : IPO diagram of scanning QR code

3.3.4 DATABASE

The database is managed using SQL. It stores name of subjects, student's , subject codes, and attendance record. The database table is shown in below:
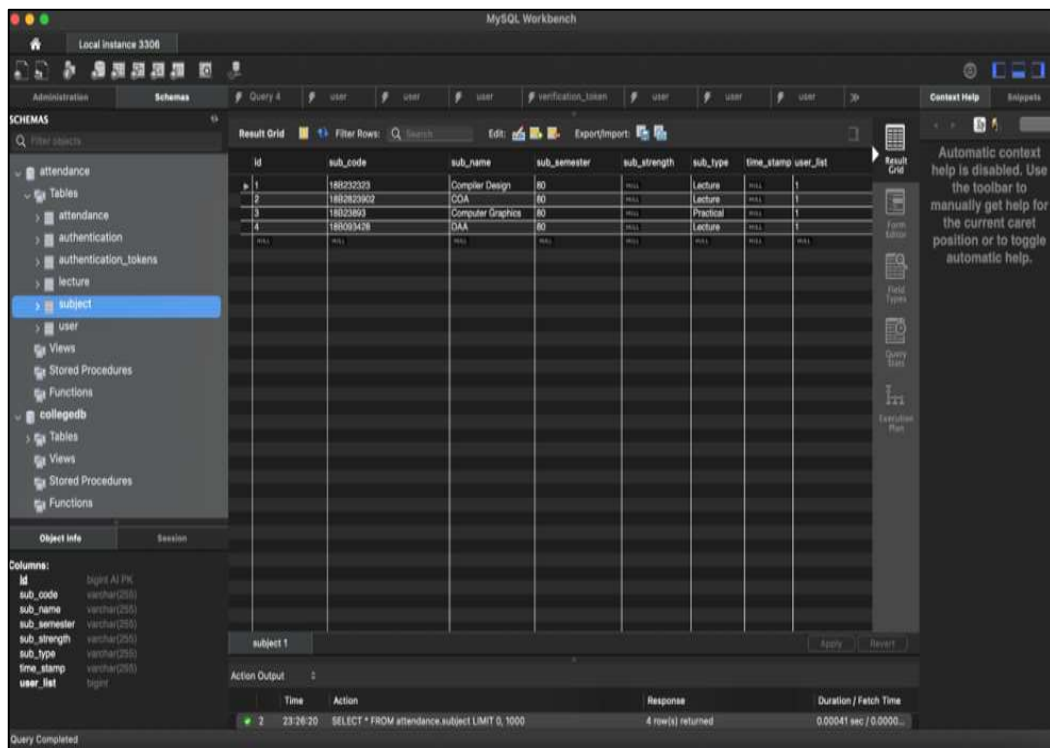

Figure 3.10 : Database of Subject

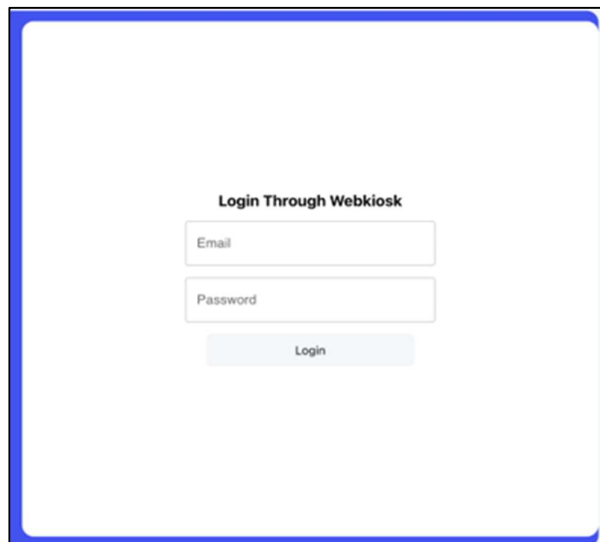### 3.3.3 WEB PLATFORM

Figure 3.11 : Homepage of System

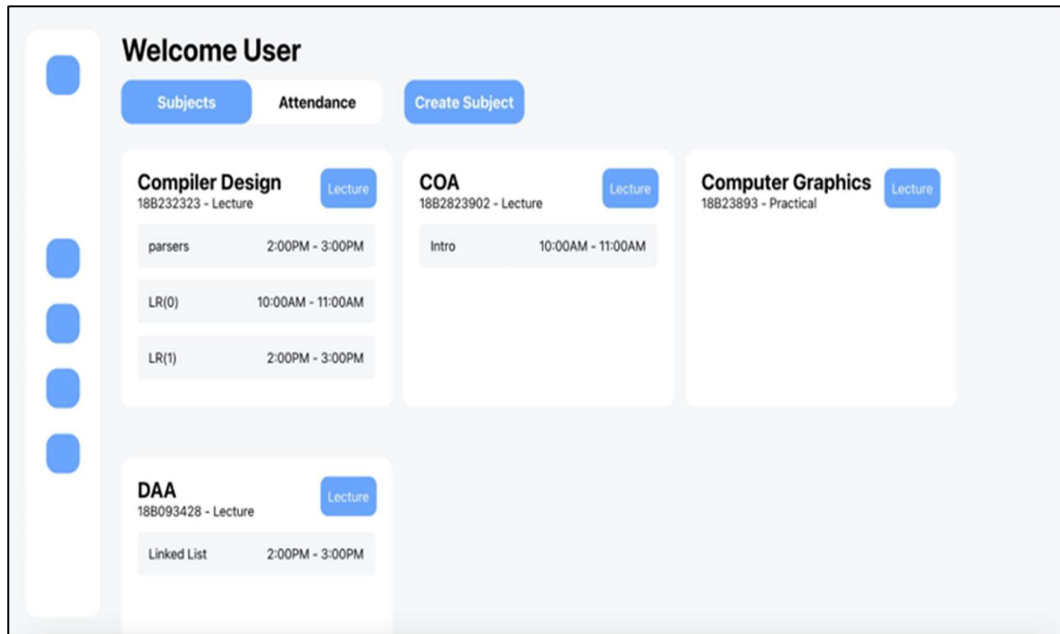**Figure 3.12 : Login portion of system**

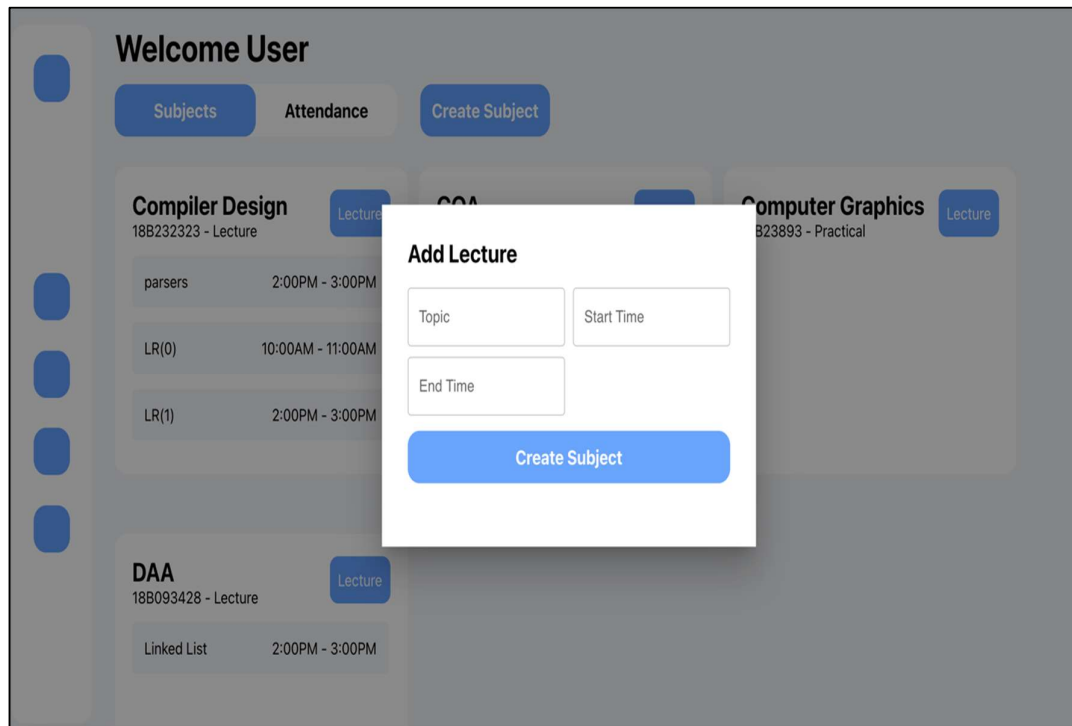**Figure 3.13 : Dashboard of system**
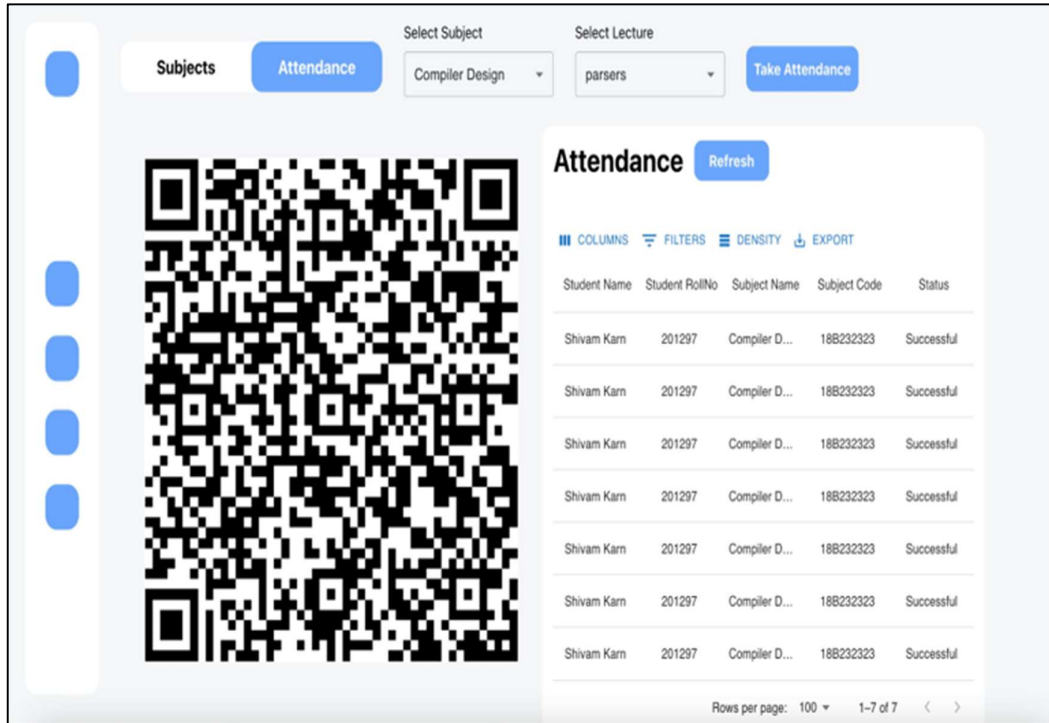

Figure 3.14 : Create subject portion

Figure 3.15 : QR code generation page
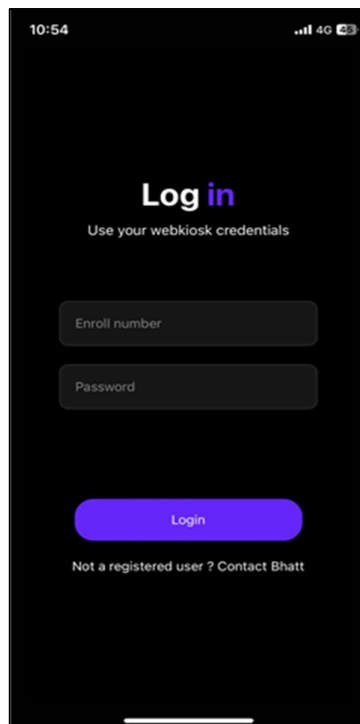
3.3.4 MOBILE APPLICATION PLATFORM
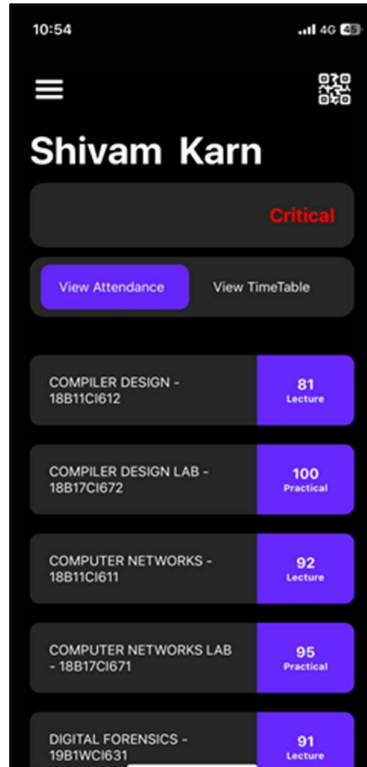

Figure 3.16 : Login Page of Android App

Figure 3.17 : Dashboard of Android App
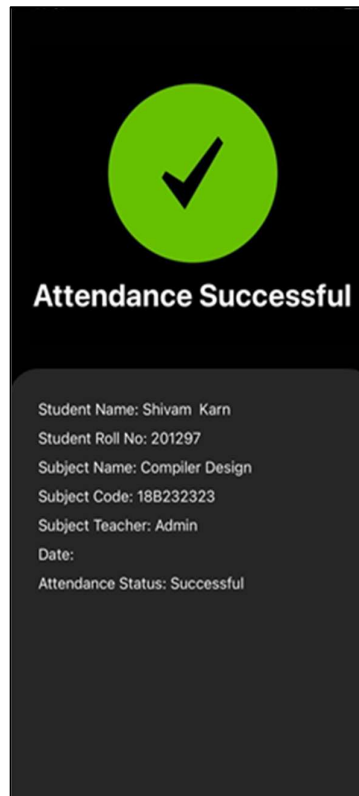

Figure 3.18 : Attendance Status of Android App

3.3.5 CODE SNIPPETS

```css
1   *{
2       padding: 0px;
3       margin: 0px;
4   }
5   .login-main{
6       display: flex;
7       flex-direction: column;
8       justify-content: center;
9       background-color: ▢#f4f6f8;
10      padding: 2vw;
11      height: 92vh;
12      max-width: 100%;
13      min-height: 100%;
14  }
15  .login-image-container{
16      display: flex;
17      flex-direction: column;
18
19      border-radius: 1vw;
20      /* background-color: #ffff; */
21      width:50%;
22  }
23  .login-main-container{
24      display: flex;
25      flex-direction: row;
26      border-radius: 1vw;
27
28      background-color: ■#4153ef;
29
30      height: 100%;
31  }
32  .login-button {
33      display: flex;
34      flex-direction: column;
35      background-color: ▢#f4f6f8;
36      text-align: center;
37      justify-content: center;
38      align-items: center;
39      cursor: pointer;
40      border-radius: 0.5vw;
41      height: 40px;
42      width: 250px;
43  }
44  .login-box{
45      display: flex;
```

Figure 3.19 : CSS of login page

```
1    import React, { useEffect, useState } from 'react';
2    import './Login.css'
3    import TextField from '@mui/material/TextField';
4    import qr from './qr.gif'
5    import { useHistory } from 'react-router-dom'
6    export default function Login() {
7        const [temp, setTemp] = useState("");
8        const [word, setWord] = useState("");
9        const [result1,setResult1] = useState();
10       const [size, setSize] = useState(250);
11       const [bgColor, setBgColor] = useState("ffffff");
12       const [qrCode, setQrCode] = useState("");
13       const [email,setEmail] = useState("");
14       const [password,setPassword] = useState("")
15       const [loading,setLoading] = useState(false)
16       const history = useHistory();
17     if(localStorage.getItem('credentials')){
18       history.push('/dashboard');
19       window.location.reload();
20   }
21       const login = async () => {
22           setLoading(true);
23           const payload = JSON.stringify({
24               "email":email,
25               "password":password
26           });
27           var myHeaders = new Headers();
28           myHeaders.append("Content-Type", "application/json");
29           var requestOptions = {
30             method: 'POST',
31             headers: myHeaders,
32             body: payload,
33           };
34
35           fetch("https://juit-attendance2-6640b71cefbe.herokuapp.com/user/authorize", requestOptions)
36             .then(response => response.text())
37             .then(async result => {
38
39               var final = JSON.parse(result);
40               localStorage.setItem("credentials",JSON.stringify(final));
41               setLoading(false);
42               history.push('/dashboard')
43
44           })
45             .catch(error => {
```

Figure 3.20 : JS of login page

```css
1    .dashboard{
2        height: 100vh;
3
4        max-height: 100%;
5        max-width: 100%;
6        background-color: ☐#f4f6f8;
7        padding: 2vw;
8    }
9    .dashboard-container{
10
11
12       height: 93%;
13       width: 100%;
14       border-radius: 1vw;
15   }
16
17   .main-dashboard{
18       height: 100%;
19       width: 100%;
20       padding-left: 2vw;
21
22       display: flex;
23       flex-direction: column;
24       justify-content: flex-start;
25       gap:1vw;
26
27   }
28   .row{
29       display: flex;
30       flex-direction: row;
31       gap:1vw;
32       width: 100%;
33
34   }
35   .column{
36       display: flex;
37       flex-direction: column;
38       gap:2vw;
39
40   }
```

Figure 3.21 : CSS of Dashboard

```
1    import { useState } from 'react';
2    import './App.css';
3    import { BrowserRouter as Router, Switch, Route } from "react-router-dom";
4    import Login from './screens/login/Login';
5    import Dashboard from './screens/dashboard/Dashboard'
6    function App() {
7      // const [userid, setUserID] = useState("");
8      // const [userpass, setUserPass] = useState("");
9      // const [allEntry, setAllEntry] = useState([]);
10
11
12     // let navigate = useNavigate();
13
14     return (
15       <Router>
16       <Switch>
17         <Route path="/dashboard">
18           <Dashboard/>
19         </Route>
20         <Route path="/login">
21           <Login/>
22         </Route>
23         <Route path="/">
24           <Login/>
25         </Route>
26       </Switch>
27     </Router>
28       // <div className="container mt-5 shadow p-3 mb-5 bg-white rounded">
29       //   <Form className="login-form">
30       //     <h1 className='font-weight-bold text-center mt-5'>Login</h1>
31       //       <div className="mt-5">
32       //         <FormGroup>
33       //           <Label>User ID</Label>
34       //           <Input type="ID" placeholder="User ID" name="userid" value={userid}
35       //         </FormGroup>
36
37       //         <FormGroup>
38       //           <Label>Password</Label>
39       //           <Input type="password" placeholder="Password" name="userpass" value=
40       //         </FormGroup>
41
42       //         <div className="mybutton">
43       //           <Button block color="primary" size="md" onClick={() => {
44       //             navigate("/qr_code");
45       //           }}>Login</Button>
```

Figure 3.22 : JS of Android App

```
 1      .login-form {
 2        width: 100%;
 3        max-width: 330px;
 4        padding: 15px;
 5        margin: auto;
 6        height: 100%;
 7      }
 8
 9      .container {
10        width: 40vw;
11        height: 80vh;
12        background-color: black;
13        border-radius: 50px;
14      }
15
16      .mybutton {
17        display: flex;
18        justify-content: space-evenly;
19      }
```

Figure 3.23 : CSS of Android App

```
 1    body {
 2      margin: 0;
 3      font-family: -apple-system, BlinkMacSystemFont, 'Segoe UI', 'Roboto', 'Oxygen',
 4        'Ubuntu', 'Cantarell', 'Fira Sans', 'Droid Sans', 'Helvetica Neue',
 5        sans-serif;
 6      -webkit-font-smoothing: antialiased;
 7      -moz-osx-font-smoothing: grayscale;
 8    }
 9
10    code {
11      font-family: source-code-pro, Menlo, Monaco, Consolas, 'Courier New',
12        monospace;
13    }
```

Figure 3.24 : CSS of index

```
1     import React from 'react';

2     import ReactDOM from 'react-dom';

3     import './index.css';

4     import App from './App';

5     import QR from './qr_code';

6     import { BrowserRouter, Routes, Route } from "react-router-dom";

7

8     ReactDOM.render(

9       <App/>,

10      document.getElementById('root')

11    );
```

Figure 3.25 : JS of index

```
1     .QR {
2       text-align: center;
3     }
4     .QR-logo {
5       height: 40vmin;
6       pointer-events: none;
7     }
8
9     @media (prefers-reduced-motion: no-preference) {
10      .QR-logo {
11        animation: App-logo-spin infinite 20s linear;
12      }
13    }
14    .QR-header {
15      background-color: ■#282c34;
16      min-height: 100vh;
17      display: flex;
18      flex-direction: column;
19      align-items: center;
20      justify-content: center;
21      font-size: calc(10px + 2vmin);
22      color: □white;
23    }
24
25    .QR-link {
26      color: □#61dafb;
27    }
28
29    @keyframes QR-logo-spin {
30      from {
31        transform: rotate(0deg);
32      }
33      to {
34        transform: rotate(360deg);
35      }
36    }
37
38    body {
39      background-color: □white;
40    }
41
42    #heading{
43      font-size: 3em;
44      font-weight: 900;
45      padding: 0.5em;
```

Figure 3.26 CSS of QR code

```
1   import React, { useEffect, useState } from 'react';
2   import './qr.css';
3   function QR() {
4       const [temp, setTemp] = useState("");
5       const [word, setWord] = useState("");
6       const [result1,setResult1] = useState();
7       const [size, setSize] = useState(400);
8       const [bgColor, setBgColor] = useState("ffffff");
9       const [qrCode, setQrCode] = useState("");
10
11      useEffect(() => {
12          setQrCode
13              (`http://api.qrserver.com/v1/create-qr-code/?data=${word}&size=${size}
14      }, [word, size, bgColor]);
15      function handleClick() {
16          setWord(temp);
17      }
18      const delay = ms => new Promise(
19          resolve => setTimeout(resolve, ms)
20      );
21      async function setQr() {
22          var myHeaders = new Headers();
23  myHeaders.append("Content-Type", "application/json");
24
25  var raw = JSON.stringify({
26    "id": 1
27  });
28
29  var requestOptions = {
30    method: 'POST',
31    headers: myHeaders,
32    body: raw,
33    redirect: 'follow'
34  };
35
36  fetch("http://localhost:8086/lecture/generateTokens", requestOptions)
37    .then(response => response.text())
38    .then(async result => {
39
40      var final = JSON.parse(result);
41      console.log(final.tokens);
42      for(var i=0;i<final?.tokens.length;i++){
43          setWord(final?.tokens[i]);
44          console.log(final?.tokens[i]);
45          await delay(5000);
```

Figure 3.27 JS of QR code

4.4 KEY CHALLENGES

The difficulties that occur when developing the project are listed as follows:

1. A lot of self-learning was required for different works such as to pick up libraries, frameworks and cloud services.

2. To efficiently generate QR code without compromising the accuracy and decoding speed of it. During beautification decoding process was affected.

3. To provide training to different users on how to use the system.

4. The lecturer web app lacks HTTPS connection and because of this the services which the app provides are not secured.

CHAPTER 4

TESTING

4.1 TESTING STRATEGY

The proposed solution involves taking attendance with a QR code. According to 37.5% of respondents, this approach is both efficient and reliable. Taking attendance utilizing the resources that every student possesses, smartphones. The web module displays the QR code created by the backend service module. To avoid cheating, it changes every 10 seconds. Students can mark their attendance by scanning a QR code with the mobile module. The request for attendance is then sent to the backend service module for verification process. Once the process has been validated, the module will update the records in database. The entire attendance is faster than traditional processes. Students can check their attendance records for a particular subject which can improve their openness for the system. If the attendance % falls below a given threshold, the system sends a message. Furthermore, professors can manage students' records through a web module. Lecturers can alter students' attendance records if they have legitimate reasons to miss class and can also manage classes like can change or eliminate existing classes. In the event of a class replacement, a new class can be formed. Lecturers Web modules allow administrators to manage users. They have the ability to add new professors or students, amend their information and delete existing users.
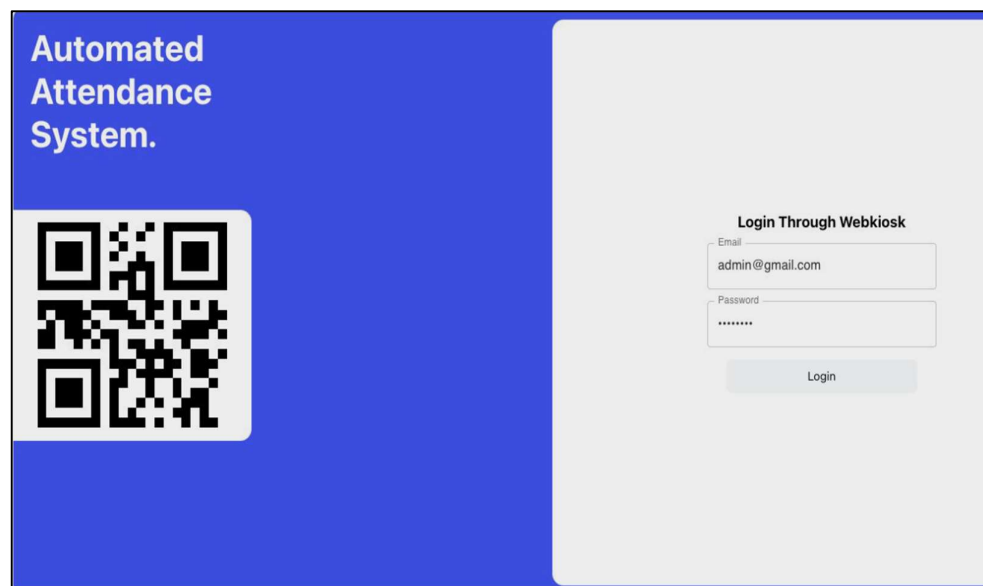
4.2 TEST CASES AND OUTCOMES
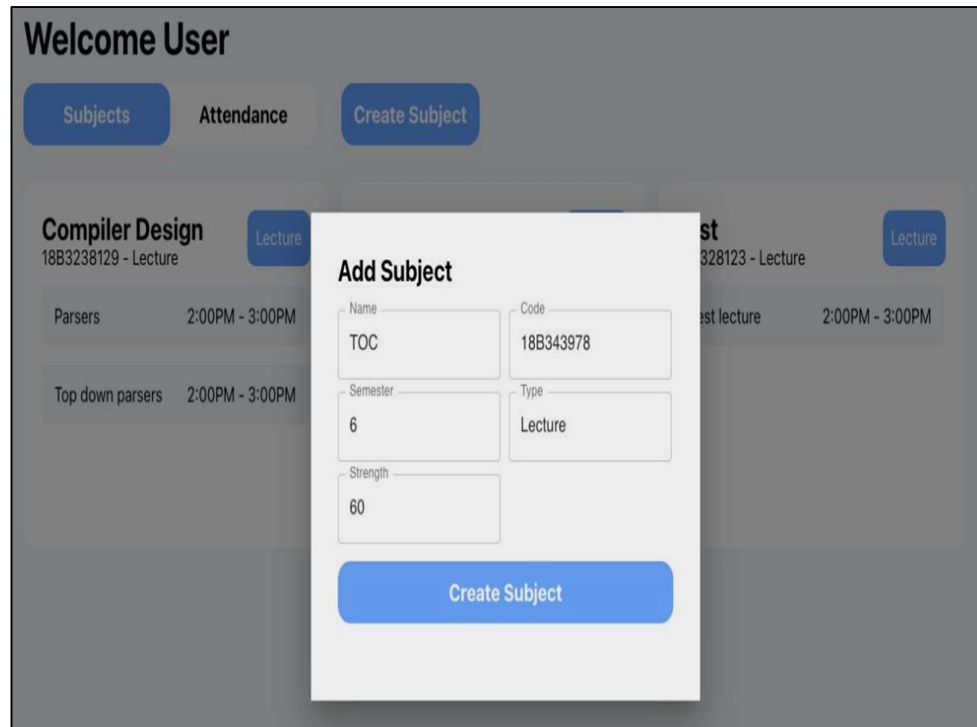

Figure 4.1 : Login testing
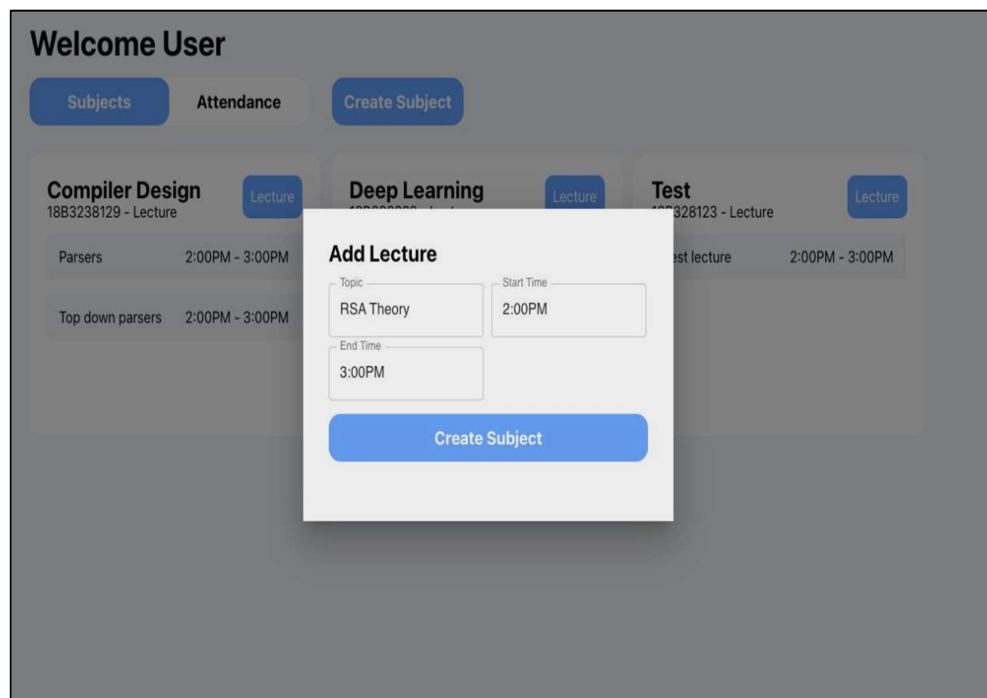
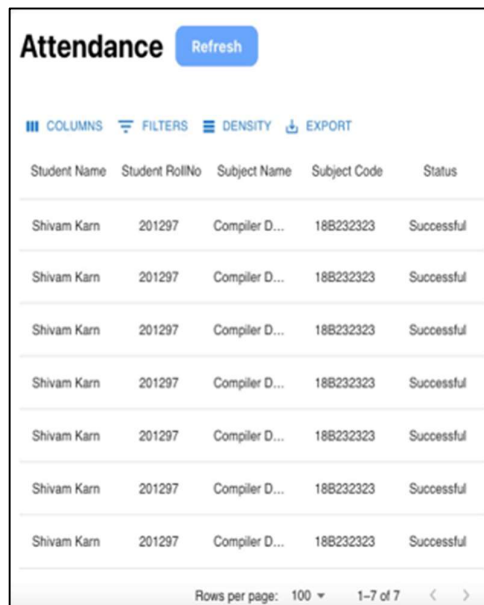**Figure 4.2 : Subject Testing**

Figure 4.3 : Add Lecture Testing

CHAPTER 5
RESULTS AND EVALUATION

5.1 RESULTS

Some of the key results of Automation of College Attendance System using QR code are :

1. Manual work is reduced and attendance recording becomes easier and this saves a lot of time that can be used in some other useful activities.

2. The whole process of taking attendance becomes quicker through this system thus improving the efficiency of the process.

3. Human error is reduced like skipping some of the entries, misspelling names of the students and many more and as a result more reliable and accurate data can be achieved thus maintaining the integrity of the data.

4. Attendance monitoring becomes easier as statistics and graphs of attendance data will be present in a particular section of the system and through this teacher can easily came to know which students are regularly present and which are not.

5. This technology is inexpensive as compared to the other technologies used for attendance management process and it also need minimum hardware and software requirements.

6. This system can be easily used by the users without any need of deep technical knowledge and training.
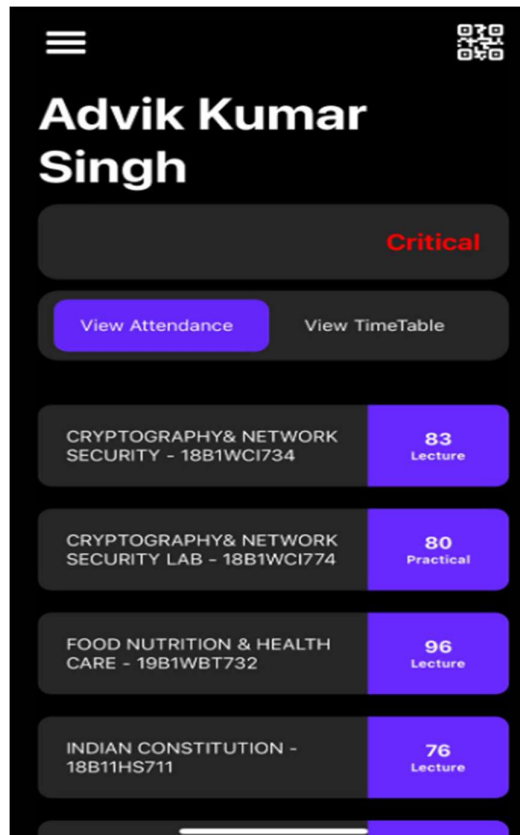

Figure 5.1 : Attendance Record of Student

Figure 5.2 : Attendance of different subjects

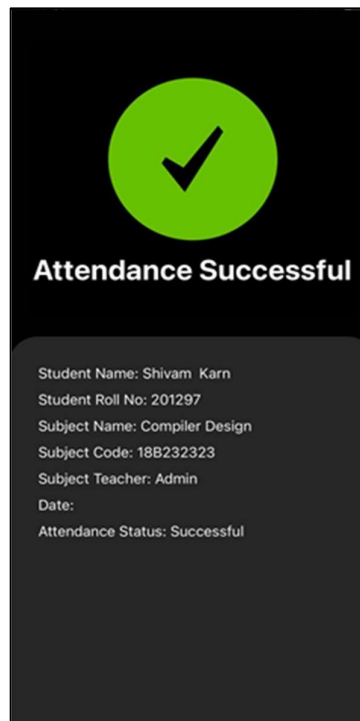**Figure 5.3 : Attendance Status of Lecture**

CHAPTER 6
CONCLUSIONS AND FUTURE SCOPE

6.1 CONCLUSION

Finally, among all of the methods taking attendance with a QR code is the most promising solution to handle the limitations of the traditional method of marking attendance. It is the most affordable and versatile one to do this process. It does not necessitate any changes to the infrastructure.

Proxy attendances has become even more difficult with automatically refreshing QR code every 10 seconds and fingerprint authentication. Through this system attendance monitoring becomes easy and it helps the teacher to know which students are regular and which are not. Analyzing data with the help of charts that are developed through this system helps in decision making. Security features like fingerprint authentication allows only authorized users to access the system thus prevents breaching of sensitive data. The application can be easily used by both the users i.e. teachers as well as students after attending few training sessions. This user-friendly interface improves the experience of the app. The system doesn't require any extra hardware or software, just a good internet service and smart phones. It is available anytime, completely portable and can be easily maintained. Human errors are also reduced as there are no chances of skipping entries and misspelled names thus improving the efficiency of the process. Data is more accurate and reliable thus maintaining the integrity of the data. Furthermore, it saves a lot of time of professors that can be used in teaching or other academic activities.

With the proliferation of smartphones and having so many advantages over the traditional methods, it has the potential to be widely employed in colleges, offices and other large organizations.

6.2 FUTURE SCOPE

Further efforts will focus on making class topics that are missed and make them available to students. The teacher has complete control with more secure and upgraded alternatives. To improve the administrator, view for managing timetables, users and viewing consumed resources. To create an in-depth data analysis feature to study students' attendance records

further. To enhance the security feature in the system Fingerprint authentication[25] will be used. Finally, we conclude that if we combine this monitoring system with face recognition capability for iOS devices, then majority of students will be able to use it.

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APPENDIX

- **AVAILABILITY**

The system will be available 24x7, as it will be a web-based portal.

- **MAINTAINABILITY**

The system would be maintainable to a good extent since there are not too much of the hardware devices. The system is solely based on internet connectivity, and the database has to be maintained against attacks and has to be dynamic in nature, where they can be modified.

- **PORTABILITY**

The system is completely portable since the only requirement is an internet connectivity and devices like tablets, mobile phones, etc.

- **RECOMMENDATIONS**

  1. Pilot Testing: It refers to a small-scale trial run of something before a complete launch. Begin with this section to assess the system's performance and address any technical or operational issues.[24]

  2. Infrastructure Assessment: Conduct a thorough review of existing infrastructure and technology to find out any necessary requirements like smart devices, projector, etc.

  3. Privacy Policy Development: Establish clear policies for data collection, storage and usage of that data.

  4. Stakeholder Engagement: Engage students and faculty early in the process to ensure buy-in and address any concerns.

- **RETURN ON INVESTMENT (ROI)**

  1. Reduction in resources required and time spent on manual attendance tracking.

  2. Improved accuracy of attendance records, potentially leading to better academic performance .

  3. Enhanced student and faculty experience.

- **PRIVACY AND SECURITY CONSIDERATIONS**

1. Data Collection: When a student scans the QR code, their unique identifier (linked to the QR code) and timestamp are captured. Optionally, additional information like location data (if using a GPS-enabled app) can also be collected.[23]

2. Data Storage: Security measures are crucial to protect sensitive attendance data. This may involve:

   Encryption: Encrypting data at rest and in transit makes it unreadable in case of a security breach.

   Access Controls: Only authorized users (instructors, administrators) should be able to access and manage attendance data.

   Compliance: Students and attendees should be informed about what data is collected, how it's used, and who has access to it. Their consent should be obtained according to relevant data privacy regulations.

PLAGARISM CERTIFICATE is attached to the next page.

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