# SMART CR: AN ANDROID APPLICATION FOR CLASS MANAGEMENT

**BY**

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

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# APPROVAL

This Project/internship titled **"Smart CR: An Android Application for Class Management"**, submitted by **Md. Albin Hossain**, ID No: **191-15-12926** to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfilment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on *02/02/2023*.

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# DECLARATION

We hereby declare that this project has been done by us under the supervision of **Ms. TANZINA AFROZ RIMI, Lecturer, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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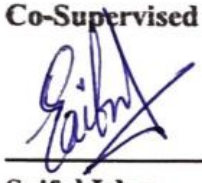

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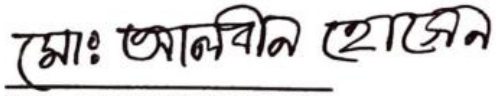

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# ABSTRACT

Smart CR is an Android application that aims to support the education system by providing a platform for sharing important information and resources among students and class representatives (CRs). The app enables users to access updates from teachers and CRs, important notices, class routines, exam routines, necessary study resources, and faculty information. It also allows students to manage their studies more effectively by storing and presenting important dates, quiz presentations, and other resources. This report presents an overview of the development and design of the Smart CR app. It begins with a discussion of the motivations and objectives of the project, and then presents a review of the related work in the field of mobile learning. Next, the report provides a description of the business process modeling, requirement collection and analysis, and use case modeling for the app. It then presents the logical data model, front-end design, and back-end design for the app, as well as the interaction design and user experience (UX) considerations. The report then discusses the implementation requirements and the testing of the app, including the use of Firebase and Android Jetpack Compose for the front-end design, and the use of Android testing systems and Jetpack for testing. Finally, the report discusses the potential impact of the app on society, the environment, and sustainability, and addresses the ethical aspects of the project. The report concludes with a discussion of the appendices and references used in the project.

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# CHAPTER 1
# INTRODUCTION

## 1.1 Introduction

Smart CR is an innovative Android application designed to help students manage their studies and stay organized. With Smart CR, students can access a range of resources and information related to their class and studies, including updates from teachers and class representatives (CRs), important announcements, class routines, exam schedules, study resources, class notes and information about their classmates and teachers.

One of the key features of Smart CR is its ability to keep everything synced and shared with every classmate. This means that students can access the same materials and information and collaborate with each other to support their studies. This can be especially helpful for students who may have missed a class or need additional support with their coursework.

In addition to providing students with a range of resources and information, Smart CR also helps students stay organized by storing important dates and deadlines, quiz presentations, and other materials in one place. This makes it easier for students to keep track of their progress and stay on top of their studies. Smart CR app provides a discussion forum where students can discuss about their confusion and share their ideas too.

Overall, Smart CR is a valuable tool for students looking to improve their productivity and focus on their studies. By providing a range of resources and information in one place, and enabling students to collaborate with their classmates, Smart CR helps students stay organized and manage their studies effectively.

## 1.2 Motivation

There are several motivations for the development of the Smart CR app project. Some of the reasons for creating this app include: To provide students with a more convenient way to access information and resources related to their studies. By consolidating this information in one place, students can more easily find what they need without having

to search through multiple sources. To help students stay organized and manage their studies more effectively. With Smart CR, students can store important dates and deadlines, class routines, exam routines, and other materials in one place, which can help them stay on top of their coursework.

To enable students to collaborate and support each other in their studies. By allowing students to share resources and information with their classmates, Smart CR can help create a sense of community and provide a platform for students to work together. To improve communication between students and teachers or class representatives (CRs). With Smart CR, students can easily receive updates and important notices from their teachers or CRs, which can help them stay informed about their studies and class activities.

To provide a tool that can be customized to the needs of different schools or classrooms. Smart CR could be tailored to the specific needs of a particular school or class, making it a more useful and relevant resource for students. To provide students with a more convenient way to access course materials, lectures, and other resources. By making these materials available on a mobile device, students can more easily review and study at their own pace, from any location.

To enable students to participate in online discussions and get feedback from their professors or classmates. This can help to create a sense of community and support among students and allow them to ask questions and get help with their coursework. To offer students the opportunity to learn at their own pace, allowing them to review material as needed or skip ahead if they are already familiar with a topic. This can be especially helpful for students who may have missed a class or need additional support with their coursework. To provide a platform for students to connect and collaborate with each other, facilitating peer-to-peer learning and support.

## 1.3 Objectives

The objectives for the Smart CR app are to provide students with a range of resources and information related to their studies, including updates from teachers and class representatives (CRs), important notices, class routines, exam routines, study resources, and faculty information.

It wants to enable students to store and organize their materials, including important dates and deadlines, quiz presentations, and other resources, in one place allowing students to share resources and information with their classmates, facilitating collaboration and supporting each other in their studies.

To improve communication between students and teachers or CRs, by providing an easy way for students to receive updates and important notices. We want to tailor the app to the specific needs of different schools or classrooms, making it a more relevant and useful resource for students helping students stay organized and manage their studies more effectively, improving their productivity and focus offering a user-friendly interface that is easy for students to navigate and use.

Like any educational application this app wants to provide students with a way to access course materials, lectures, and other resources at any time, from any location. To offer students the opportunity to learn at their own pace, allowing them to review material as needed or skip ahead if they are already familiar with a topic. To provide a platform for students to connect and collaborate with each other, facilitating peer-to-peer learning and support.

## 1.4 Expected Outcomes

The expected outcomes of the Smart CR project include Improved organization and productivity for students: By providing a range of resources and information in one place, and enabling students to store and organize their materials, the app may help students stay better organized and manage their studies more effectively.

Enhanced communication and collaboration among students: The ability to share resources and information with classmates may foster a sense of community and encourage students to work together and support each other in their studies.

Increased engagement and motivation for students: By providing access to multimedia resources, such as videos and interactive simulations, the app may help to engage and motivate students in their studies. Improved performance and academic success for students: By helping students stay organized, stay up to date on important notices and

deadlines, and access a range of resources and information, the app may ultimately contribute to improved performance and academic success for students.

Greater convenience and flexibility for students: By making resources and information available on a mobile device, the app may provide students with greater convenience and flexibility in their studies, allowing them to review and study at their own pace, from any location.

## 1.5 Project Management and Finance

Table 1.5.1: Stakeholders

| Stakeholder | Role | Responsibility |
|---|---|---|
| Students | Primary users of the app | Use the app to access class information, study resources, and other relevant materials |
| Teachers | Providers of class information and resources | Use the app to share updates, assignments, and other information with students |
| Class representatives (CRs) | Liaisons between students and teachers | Use the app to communicate with students and teachers, and to pass along important announcements and updates |
| School administration | Sponsors and overseers of the app | Monitor the usage and effectiveness of the app, and provide feedback and support as needed |
| IT department | Technical support for the app | Troubleshoot any technical issues with the app, and maintain the servers and databases that support it |

Effective project management is essential for the successful development of the Smart CR app. Here are some key considerations we want to keep in mind for managing the project:

Define clear goals and objectives: It is important to establish clear and measurable goals and objectives for the project, so that it is possible to track progress and measure success. Create a project plan: A project plan outlines the activities and tasks that need to be completed to achieve the project's goals, along with estimates of the time and resources required.

Assign roles and responsibilities: It is important to clearly define the roles and responsibilities of each team member, and to ensure that everyone has the resources and support they need to complete their tasks.

Communicate effectively: Regular communication with all stakeholders, including team members, clients, and other stakeholders, is essential for keeping the project on track and addressing any issues that may arise.

Manage risks: It is important to identify and assess potential risks to the project, and to develop contingency plans to mitigate those risks. Monitor and control progress: Regular monitoring and control of the project's progress is essential for ensuring that it stays on track and meets its goals. Adjust the project plan as needed: The project plan should be flexible and able to adapt to changing circumstances or requirements.

Overall, effective project management is critical for the success of the Smart CR app, and will involve a combination of careful planning, effective communication, and proactive risk management.

Table 1.5.2: Project Planning

| Activity | Start Date | End Date | Resources | Dependencies |
|---|---|---|---|---|
| Requirement gathering and analysis | Sept 1 | Oct 1 | Md. Albin Hossain | N/A |
| Design and prototyping | Oct 1 | Oct 15 | Md. Albin Hossain | Requirements |
| Development | Oct 15 | Dec 1 | Md. Albin Hossain | Design |
| Testing | Dec 1 | Jan 1 | Md. Albin Hossain, testers | Development |
| Deployment | Jan 31 | Feb 1 | Md. Albin Hossain | Testing |
| Maintenance and support | Feb 1 | Ongoing | Md. Albin Hossain | Deployment |

## 1.6 Report Layout

Here is the layout for a project report for the Smart CR app:

Title page: This includes the title of the report, the name of our project team members including the supervisors and the date of submission.

Abstract: This provides a brief overview of the project, including its motivations, objectives, and main findings or conclusions.

Introduction: This provides a more detailed background and context for the project, including its motivations and objectives, and a summary of the related work in the field.

Business process modeling: This describes the business process modeling techniques used to identify and analyze the key activities and stakeholders involved in the app.

Requirement collection and analysis: This describes the techniques used to gather and analyze the requirements for the app, including user needs and preferences, technical constraints, and business goals.

Use case modeling and description: This provides a detailed description of the use cases for the app, including the user actions and system responses.

Logical data model: This describes the logical data model for the app, including the entity types, attributes, and relationships.

Front-end design: This provides a detailed description of the design of the app's user interface, including the layout, navigation, and visual design.

Back-end design: This provides a detailed description of the design of the app's back-end systems, including the databases, servers, and APIs.

Interaction design: This describes the design of the interactions between the user and the app, including the input and output mechanisms.

User experience (UX): This describes the considerations taken into account to ensure a positive and effective user experience for the app.

Implementation requirements: This describes the technical requirements for implementing the app, including the hardware, software, and tools used.

Testing: This describes the testing approaches and methods used to validate the app's functionality and reliability.

Impact on society, environment, and sustainability: This discusses the potential impact of the app on society, the environment, and sustainability.

Ethical aspects: This addresses any ethical considerations that arose during the development of the app.

Appendices: This includes any supplementary materials that support the findings or conclusions of the report, such as code samples, user testing materials, or design mock-ups.

References: This includes a list of the sources cited in the report, including books, articles, websites, and other materials.

# CHAPTER 2
# BACKGROUND

## 2.1 Preliminaries/Terminologies

Here are the preliminaries/terminologies for the Smart CR project:

**Class Representative (CR)**: A student who represents the interests of their classmates and serves as a liaison between the students and the teacher or school administration.

**Class Routine**: A schedule of classes and activities for a particular course or semester.

**Exam Routine**: A schedule of exams and other assessments for a particular course or semester.

**Study Resources**: Materials that are provided to students to help them learn and prepare for exams, such as textbooks, lectures, and online resources.

**Faculty Information**: Information about the teachers or professors who are responsible for a particular course or program of study.

**Important Notices**: Announcements or updates that are relevant to students and their studies, such as changes to class schedules or deadlines for assignments.

**Quiz Presentations:** Slides or other materials used to present information or test students' knowledge of a particular subject.

**Mobile Device**: A handheld device, such as a smartphone or tablet, that is capable of running applications and accessing the internet.

**Android**: A mobile operating system developed by Google, used on a wide range of devices including smartphones and tablets.

## 2.2 Related Works

There are some projects or applications that are similar to the Smart CR project in that they are designed to help students manage their studies and stay organized. Some of the similar projects could include:

ClassDojo: A communication platform that connects teachers, students, and parents, and allows them to share updates, photos, and resources.

MyHomework: A student planner app that helps students keep track of assignments, tests, and other important dates and deadlines.

StudyBlue: A study tool that provides students with access to millions of study materials and helps them create and share flashcards, notes, and other resources.

ClassCloud: A cloud-based platform that allows teachers to create and share lesson plans, assignments, and other resources with their students.

Schoology: A learning management system that allows teachers to create and share course materials, assignments, and assessments with their students.

Edmodo: A learning management system that connects teachers, students, and parents, and allows them to communicate and share resources with each other.

Moodle: An open-source learning management system that allows teachers to create and share course materials, assignments, and assessments with their students.

Blackboard: A learning management system that provides teachers with a range of tools to create and share course materials, assignments, and assessments with their students.

## 2.3 Comparative Analysis

Here is comparative analysis of the Smart CR project compared to other projects:

ClassDojo: Both ClassDojo and Smart CR are communication platforms that allow teachers and students to share updates, photos, and resources. However, ClassDojo is primarily focused on connecting teachers, students, and parents, and does not offer as many features for managing studies and organizing materials.

MyHomework: Like Smart CR, MyHomework is a student planner app that helps students keep track of assignments, tests, and other important dates and deadlines. However, Smart CR also offers a range of other features, such as updates from teachers and class representatives (CRs), class routines, exam routines, study resources, and faculty information.

StudyBlue: StudyBlue is a study tool that provides students with access to millions of study materials and helps them create and share flashcards, notes, and other resources. While both Smart CR and StudyBlue offer a range of resources and tools to help students study, Smart CR also offers features for managing studies and staying organized.

ClassCloud: ClassCloud is a cloud-based platform that allows teachers to create and share lesson plans, assignments, and other resources with their students. While both ClassCloud and Smart CR offer tools for sharing resources and information, Smart CR also provides a range of features for managing studies and staying organized.

Schoology: Schoology is a learning management system that allows teachers to create and share course materials, assignments, and assessments with their students. Like Smart CR, Schoology offers a range of tools for sharing resources and information, but Smart CR also provides additional features for managing studies and staying organized.

Edmodo: Edmodo is a learning management system that connects teachers, students, and parents, and allows them to communicate and share resources with each other. While both Edmodo and Smart CR offer a platform for communication and resource sharing, Smart CR also provides a range of features for managing studies and staying organized.

Moodle: Moodle is an open-source learning management system that allows teachers to create and share course materials, assignments, and assessments with their students. Like Smart CR, Moodle offers a range of tools for sharing resources and information, but Smart CR also provides additional features for managing studies and staying organized.

Blackboard: Blackboard is a learning management system that provides teachers with a range of tools to create and share course materials, assignments, and assessments with their students. While both Blackboard and Smart CR offer tools for sharing resources and information, Smart CR also provides additional features for managing studies and staying organized.

Table 2.3.1: Comparative Analysis

| Feature | Smart CR | ClassDojo | myHomework | StudyBlue |
|---|---|---|---|---|
| Class information and updates | Yes | Yes | Yes | No |
| Study resources | Yes | No | No | Yes |
| Customization options | Yes | No | Yes | No |
| Language support | Yes | No | No | No |
| Cost | Free | Free | Free | Paid |

## 2.4 Scope of the Problem

Access to information and resources: Students may have difficulty finding and accessing the materials and information they need to succeed in their studies. This could include textbooks, lectures, online resources, and other materials that are relevant to their coursework. The Smart CR app could help by providing a central location for students to access these resources.

Staying organized: Students may struggle to keep track of assignments, tests, and other important dates and deadlines, which can impact their productivity and performance. The Smart CR app could help by providing tools for students to store and organize their materials, and by providing reminders and notifications for important dates and deadlines.

Collaboration and support: Students may benefit from being able to share resources and information with their classmates and collaborate with each other to support their studies. The Smart CR app could facilitate this by allowing students to share resources and work together on projects or assignments.

Communication with teachers and class representatives (CRs): Students may have difficulty staying informed about updates and important notices related to their studies, and may benefit from improved communication with their teachers and CRs. The Smart CR app could help by providing an easy way for students to receive updates and notices from their teachers or CRs.

## 2.5 Challenges

Here are some of the challenges we may face for the Smart CR project:

User adoption: It may be challenging to get students to use the app and take advantage of its features, especially if they are not used to using technology to manage their studies. To overcome this challenge, we need to invest in user outreach and education efforts to promote the app and demonstrate its value to students.

Data security and privacy: Ensuring the security and privacy of student data may be a concern, especially if the app involves the sharing of personal information or sensitive materials. To address this challenge, we need to implement measures such as secure data storage and encryption and establish clear policies for how student data will be used and shared.

Integration with existing systems: If the app is being implemented in a school or university, it may be challenging to integrate it with existing systems and processes, such as student databases and learning management systems. This requires us to work closely with IT departments and other stakeholders to ensure smooth integration.

Ensuring accuracy and relevance of information: It may be important to ensure that the information and resources provided by the app are accurate and up-to-date, and relevant to the needs of students. This may require ongoing efforts to review and update the materials and resources provided by the app.

Maintenance and updates: Maintaining and updating the app over time may be a challenge, especially if there are frequent changes or updates to the materials and resources that are being shared. To address this challenge, we need to establish processes for regularly reviewing and updating the app and allocate resources to support these efforts.

Funding and resources: Developing and maintaining the app may require a significant investment of time and resources, which may be a challenge for us. To overcome this challenge, we seek funding from external sources, or allocate resources from within our organization.

# CHAPTER 3
# REQUIREMENT SPECIFICATION

## 3.1 Business Process Modeling

This model of the Smart CR project includes elements such as:

Inputs: Raw materials, such as user requirements and design documents; data, such as student information and course schedules; and resources, such as software tools and hardware.

Processes: Activities such as design, coding, testing, and deployment of the app.

Outputs: The finished app, as well as documentation and user guides.

Participants: Developers, testers, and users of the app.

Decisions: Points in the process where decisions need to be made, such as whether to proceed with a particular design or feature.

Connections: The dependencies and relationships between different processes and activities, such as the order in which they are performed, or the resources they require.

## 3.2 Requirement Collection and Analysis

For the requirement specifications for the Smart CR project, we outline the specific features and functionality that the app is expected to provide. These requirements will be based on the results of the requirement collection and analysis process, and will be prioritized according to their importance or relevance to the users of the app.

The requirement specifications for the Smart CR project include:

Requirement analysis is the process of evaluating the requirements that will be collected for the Smart CR project, to identify common themes, priorities, and any conflicts or contradictions. This process is important because it helps to ensure that the app is designed and developed to meet the needs of its users, and that the requirements are clear, concise, and comprehensive.

To perform requirement analysis for the Smart CR project, we will review the requirements that will be collected, and sort them into categories or group them according to their importance or relevance. This may involve identifying any duplicates or conflicting requirements, and determining which requirements are most critical to the success of the project.

Table 3.2.1: User requirements

| **User Requirement** | **Description** |
|---|---|
| Usability | The app should be easy to use and understand, with a clear and intuitive user interface. |
| Functionality | The app should provide the necessary features and functionality to support the needs of the users. |
| Reliability | The app should be reliable and stable, with minimal downtime or errors. |
| Security | The app should protect the privacy and security of the users' data. |
| Customization | The app should allow users to customize certain aspects of the app, such as the notification settings or the color scheme. |
| Accessibility | The app should be accessible to users with disabilities, in accordance with relevant standards and guidelines. |

From the output of the requirement analysis process, we want a set of documented requirements that can be used to guide the design and development of the Smart CR app. This document will be clear, concise, and comprehensive, and will provide a detailed overview of the needs and expectations of the app's users. It should also prioritize the requirements based on their importance or relevance and should identify any conflicts or contradictions that need to be resolved.

## 3.3 Use Case Modeling and Description

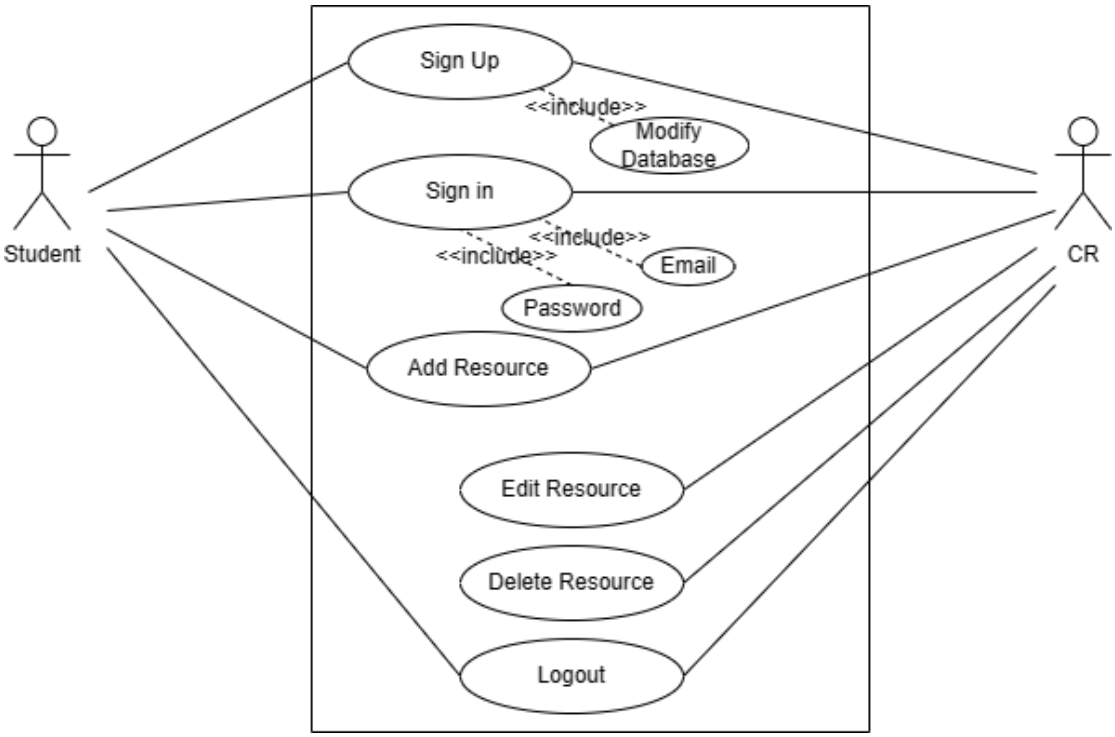


Figure 3.3.1: Use Case Diagram

Use case modeling is a technique used to identify and describe the functionality of a system or software application. In the context of the Smart CR project, use case modeling involves creating a visual representation of the different ways in which the app could be used by students, teachers, and class representatives (CRs).

A use case diagram is a common way to represent use cases visually. It typically consists of a series of circles or ovals, each representing a specific use case, and lines connecting them to a larger oval representing the system or application. To create a use case model for the Smart CR project, we identify the different ways in which the app could be used and describe these as individual use cases. For example, a use case for the app is "View class routines," which describes the steps and interactions involved in a student using the app to view their class schedule.

After identifying and describing the use cases, we organize and prioritize according to their importance or relevance. This will help to guide the design and development of the app and ensure that it meets the needs of its users.

## 3.4 Logical Data Model

A logical data model is a representation of the data structures and relationships within a system or software application. In the context of the Smart CR app, a logical data model is used to represent the different types of data that the app will need to store and manage, and the relationships between these data elements. To create a logical data model for the Smart CR app, we identify the different types of data that the app will need to store and manage and define the relationships between these data elements. This will include data such as student profiles, class schedules, exam schedules, and study materials.

The logical data model is represented using a diagram or visual notation, such as an entity-relationship diagram. This diagram would show the different data entities and the relationships between them, as well as any attributes or properties associated with the data. The logical data model will be used to guide the design and development of the app's data storage and management systems, and to ensure that the app is able to effectively store, retrieve, and manipulate the data it needs to function.

## 3.5 Design Requirement

Design requirements are the specific constraints and requirements that the Smart CR app must meet in order to be effective and usable. These requirements will be based on a variety of factors, such as the needs and preferences of the app's users, technical considerations, and any regulatory or compliance requirements.

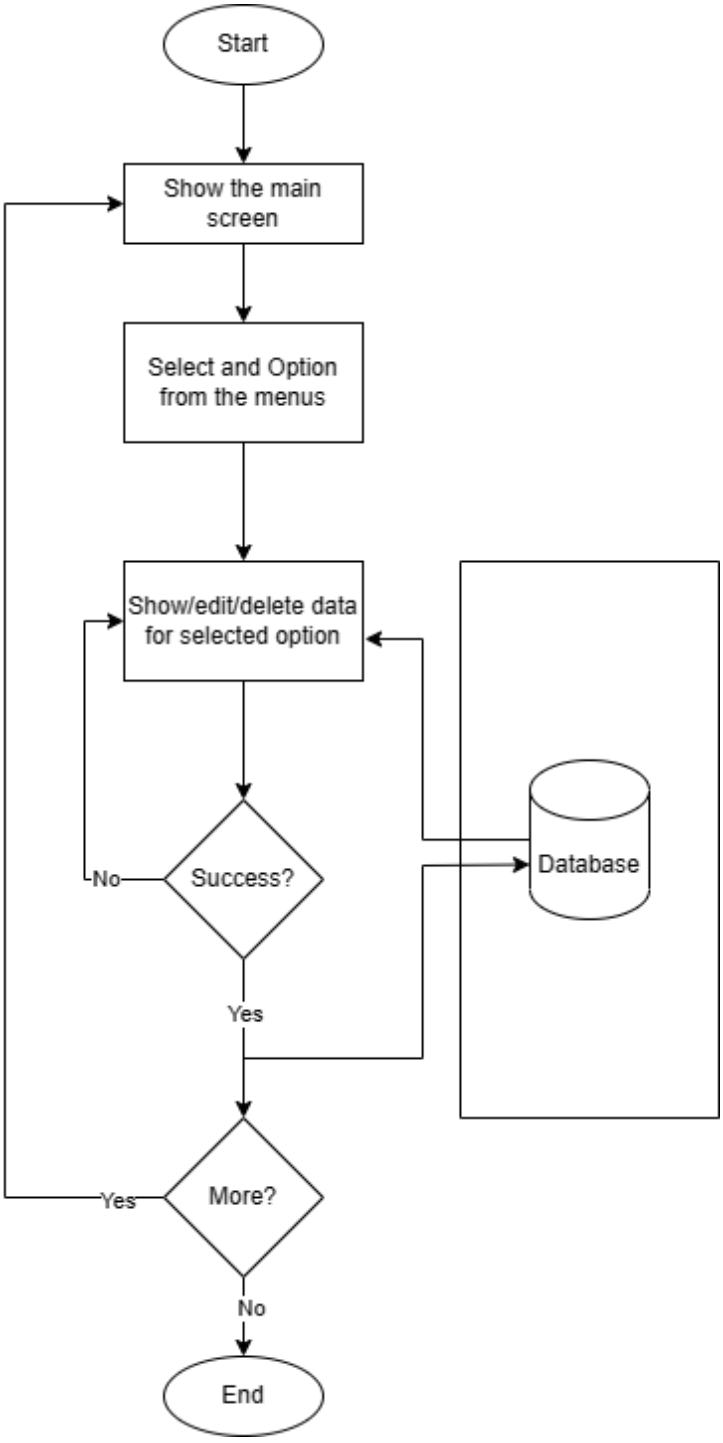


Figure 3.5.1: Application Architecture Flowchart

Here are some design requirements that we want to ensure for the Smart CR app: The app should have a clean, modern, and intuitive interface that is easy for students to navigate and use. The app should be responsive, and work effectively on a range of devices and screen sizes, including smartphones and tablets. The app should be

accessible to users with disabilities, with features such as text-to-speech and high contrast modes. The app should support multiple languages, to make it accessible to a diverse range of users.

The app should be secure, with measures in place to protect the privacy of student data. The app should be scalable, with the ability to accommodate a growing number of users. The app should be customizable, with the ability to tailor the interface and features to the specific needs of different schools or classrooms. The app should be able to integrate with other educational systems, such as student information systems or learning management systems. The app should meet any relevant regulatory or compliance requirements, such as data privacy laws or accessibility standards.

# CHAPTER 4
# DESIGN SPECIFICATION

## 4.1 Front-end Design

The front-end design of the Smart CR app refers to the visual and interactive aspects of the app that users interact with. This includes the layout, user interface (UI), and user experience (UX) of the app.

To design the front-end of the Smart CR app, we consider a number of factors, such as the target audience of the app, the goals and objectives of the app, and any technical or functional constraints.

Elements of the front-end design for the Smart CR app include:

Layout: The overall structure and organization of the app, including the placement and arrangement of different elements on the screen.

User interface (UI): The elements of the app that users interact with, such as buttons, menus, and input fields.

User experience (UX): The overall feel and functionality of the app, including how easy it is to use and navigate, and how well it meets the needs and expectations of users.

Visual design: The look and feel of the app, including the color scheme, typography, and imagery.

Interactivity: The ways in which users can interact with the app, such as submitting data, receiving feedback, or navigating between different screens.

The front-end design of the Smart CR app should be intuitive, user-friendly, and visually appealing, to help ensure that it is effective and engaging for users.

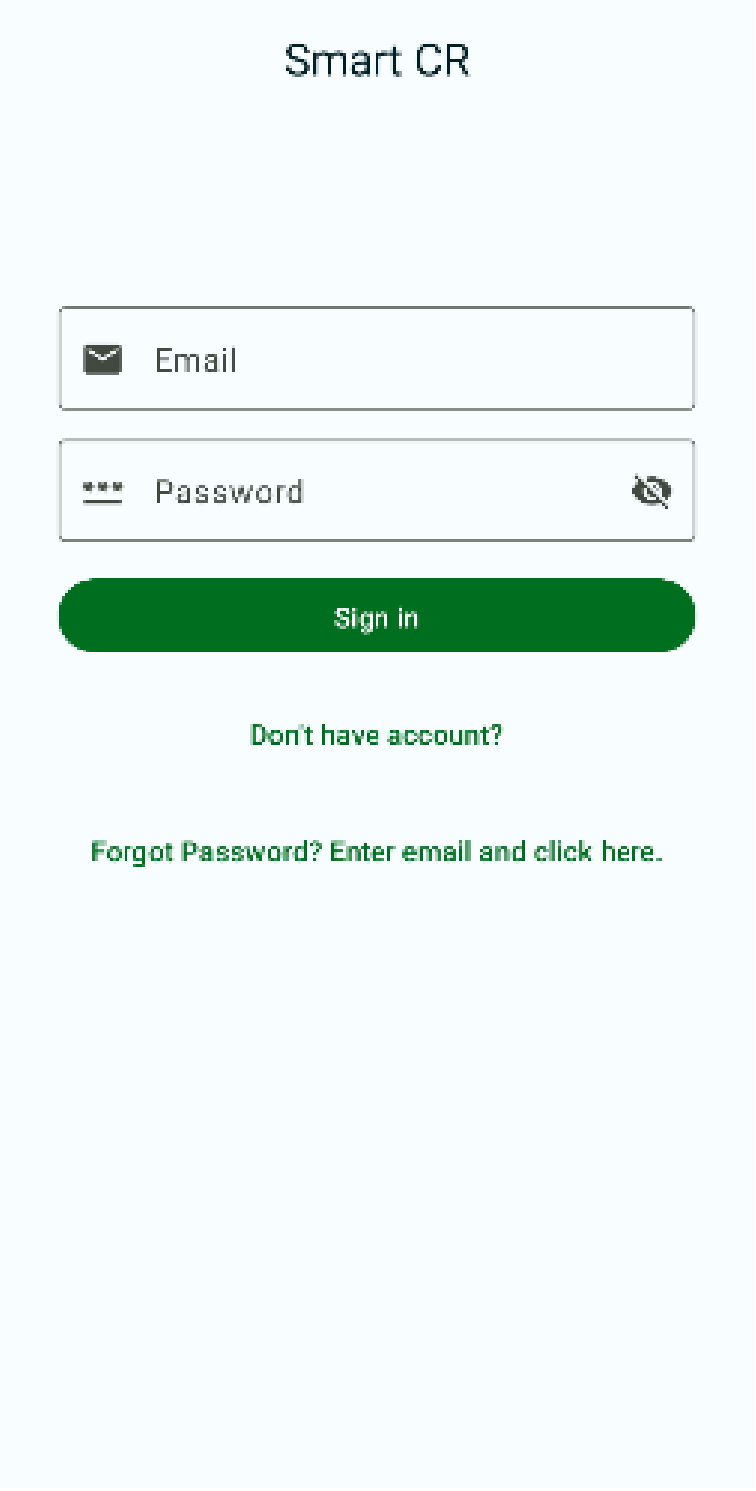


Figure 4.1.1: Login Screen

**Login Screen**: Allows Users to login with their credentials as well as shows option to create new accounts and get password recovery email.

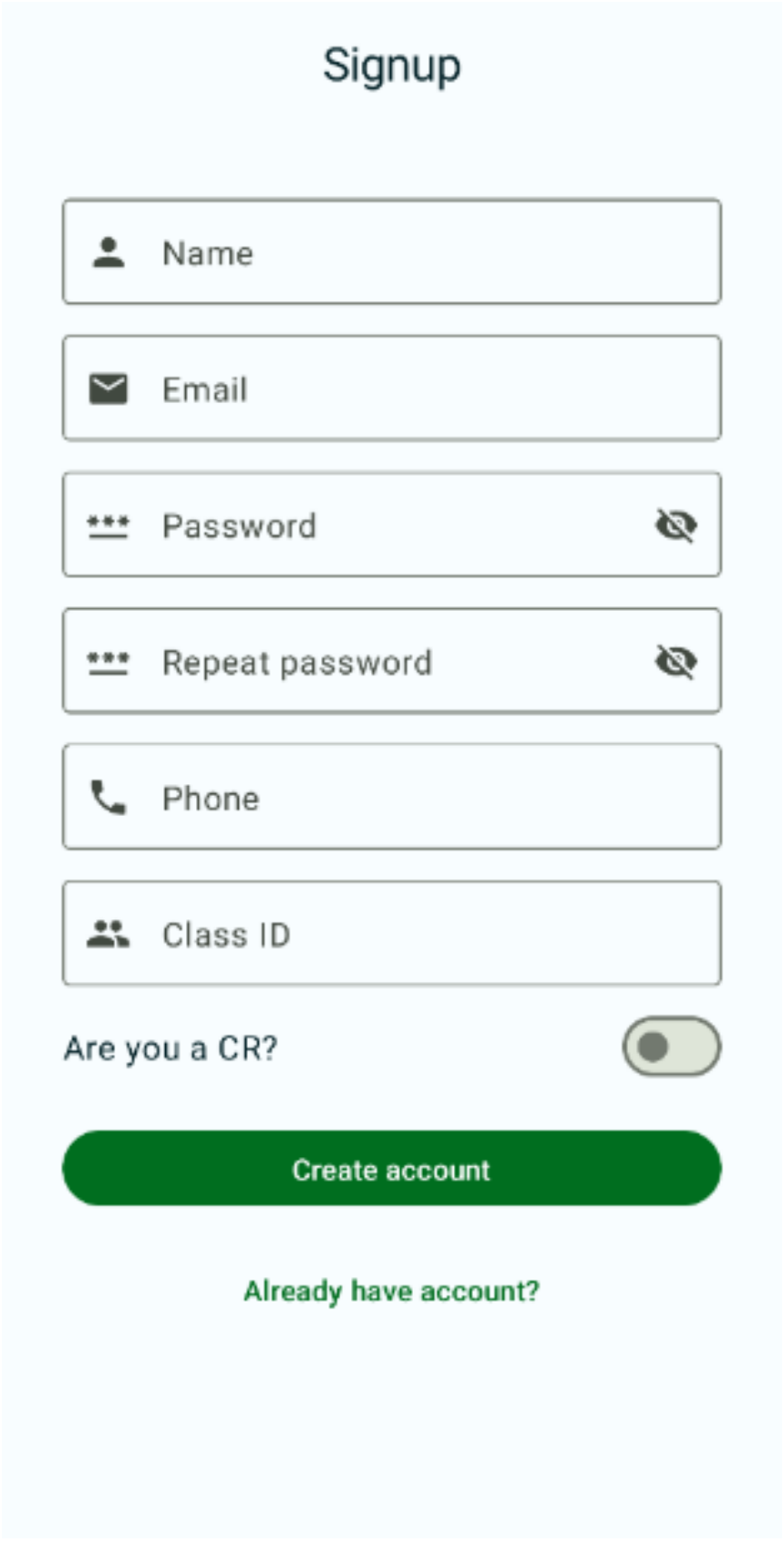


Figure 4.1.2: Sign Up Screen

**Sign Up Screen**: Allows new users to register.

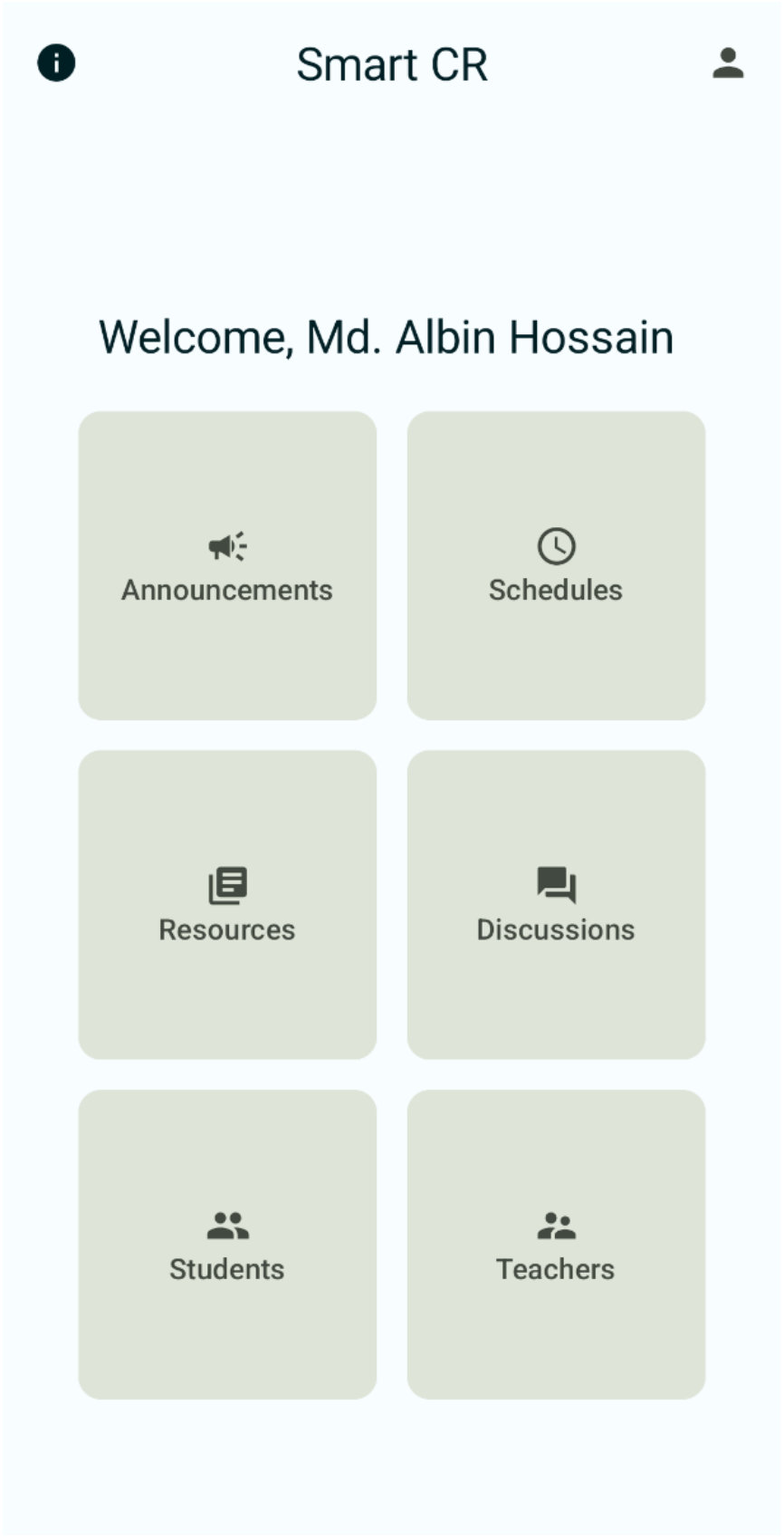


Figure 4.1.3: Home Screen

**Home Screen**: Shows the main menus of the application.

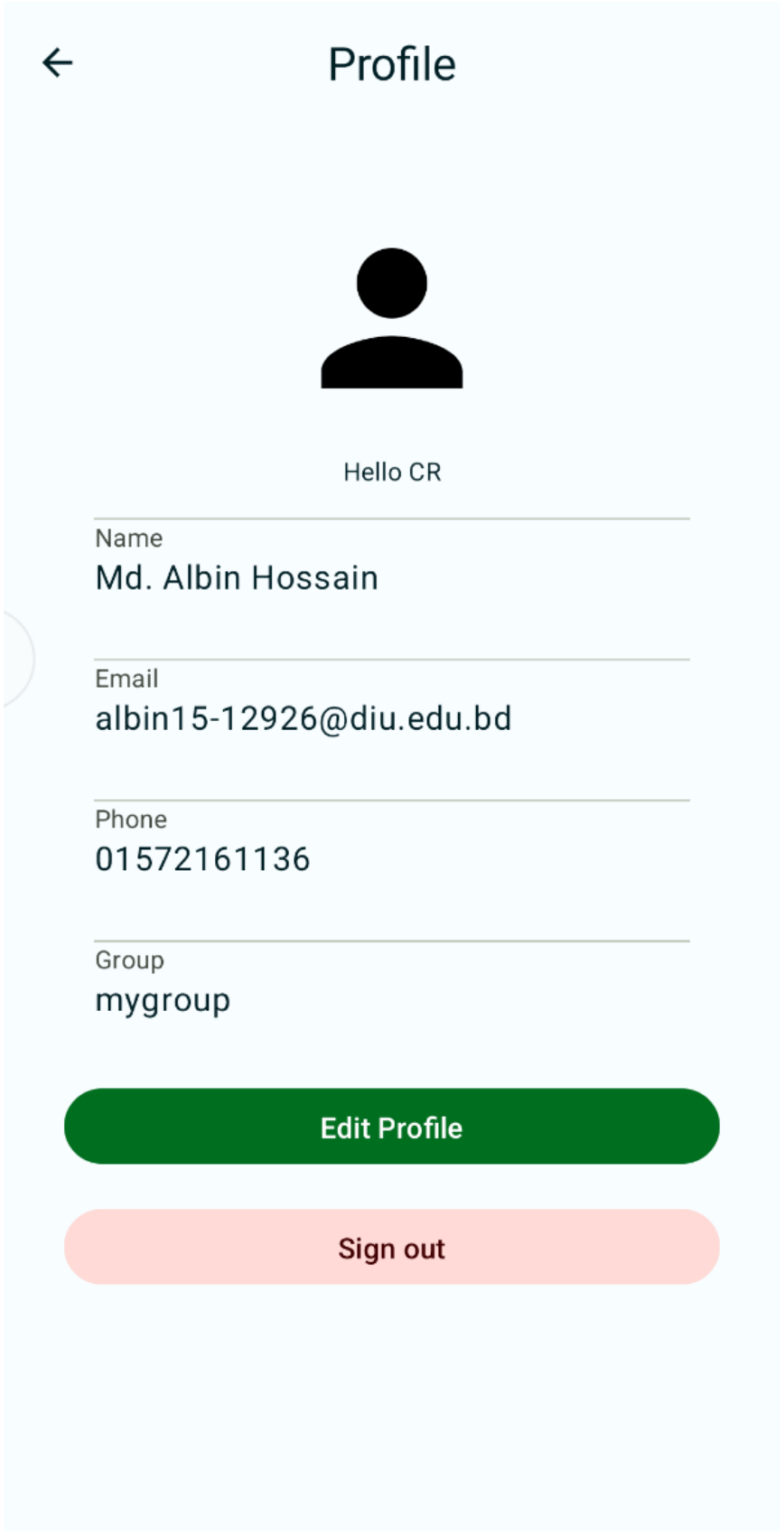


Figure 4.1.4: Profile Screen

**Profile Screen**: Shows Information about the currently logged in Users.

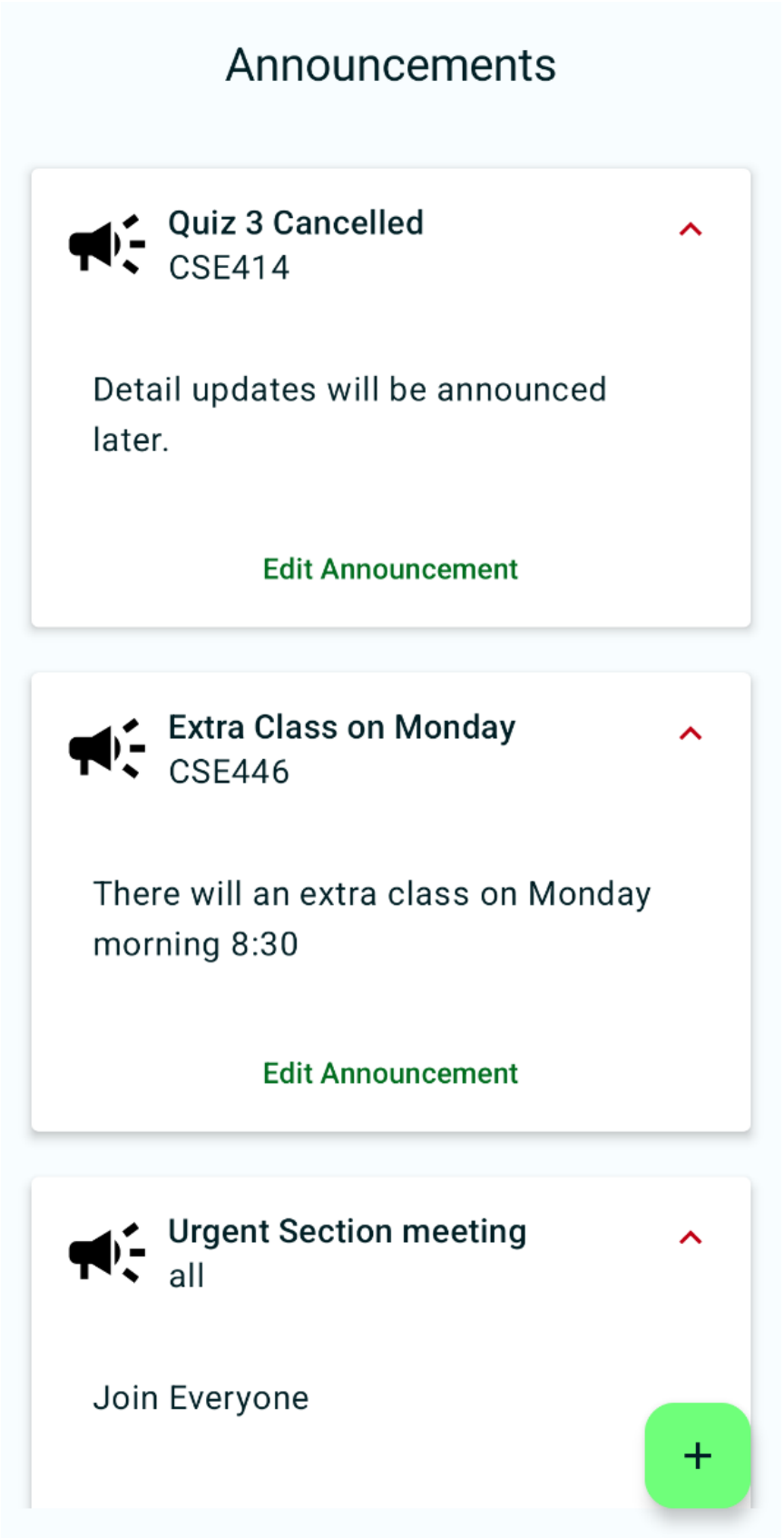


Figure 4.1.5: Announcements Screen

**Announcement Screen**: Shows Announcements for the joined class.

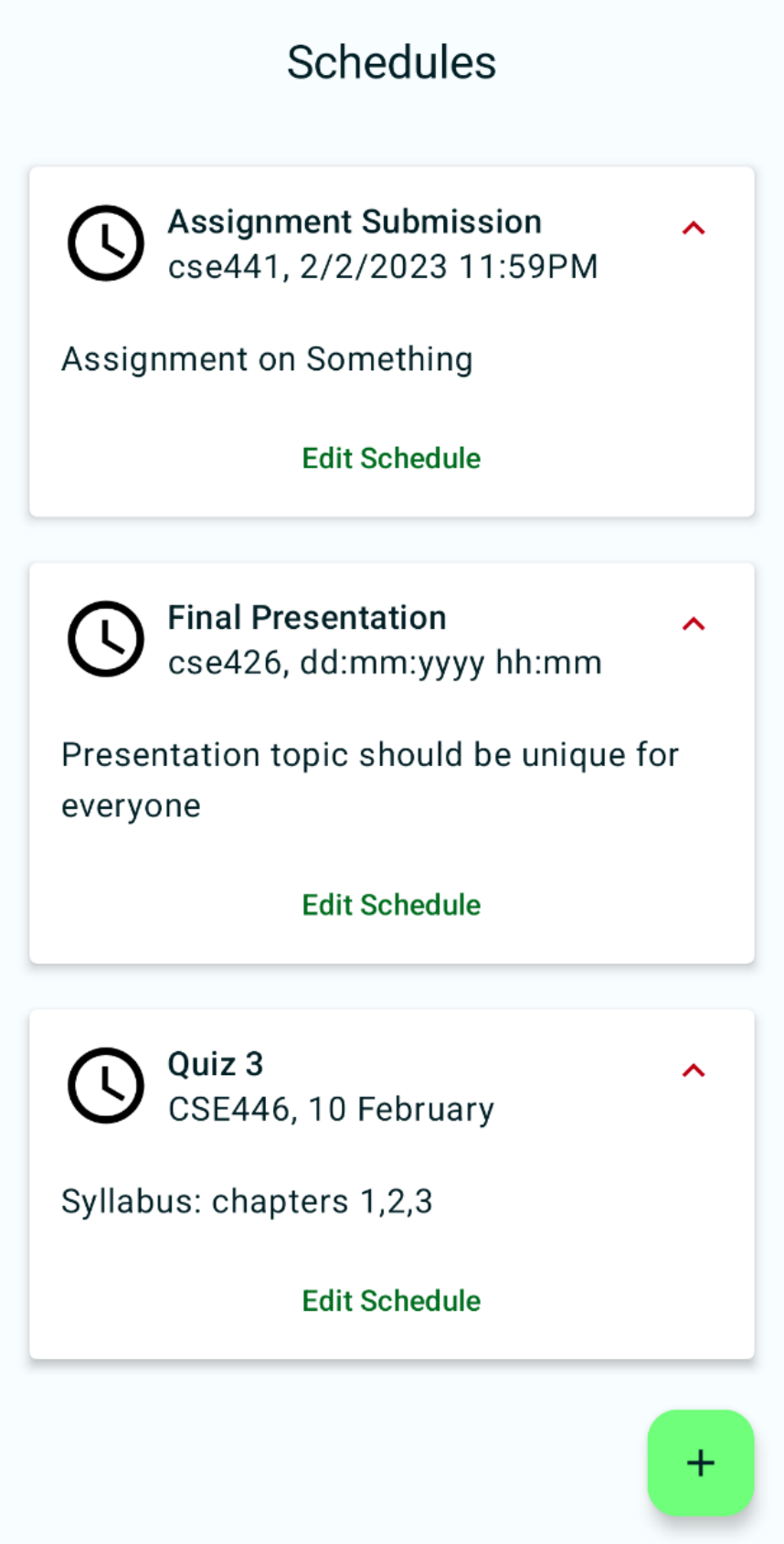


Figure 4.1.6: Schedules Screen

**Schedule Screen**: Shows Schedules added for the joined class.

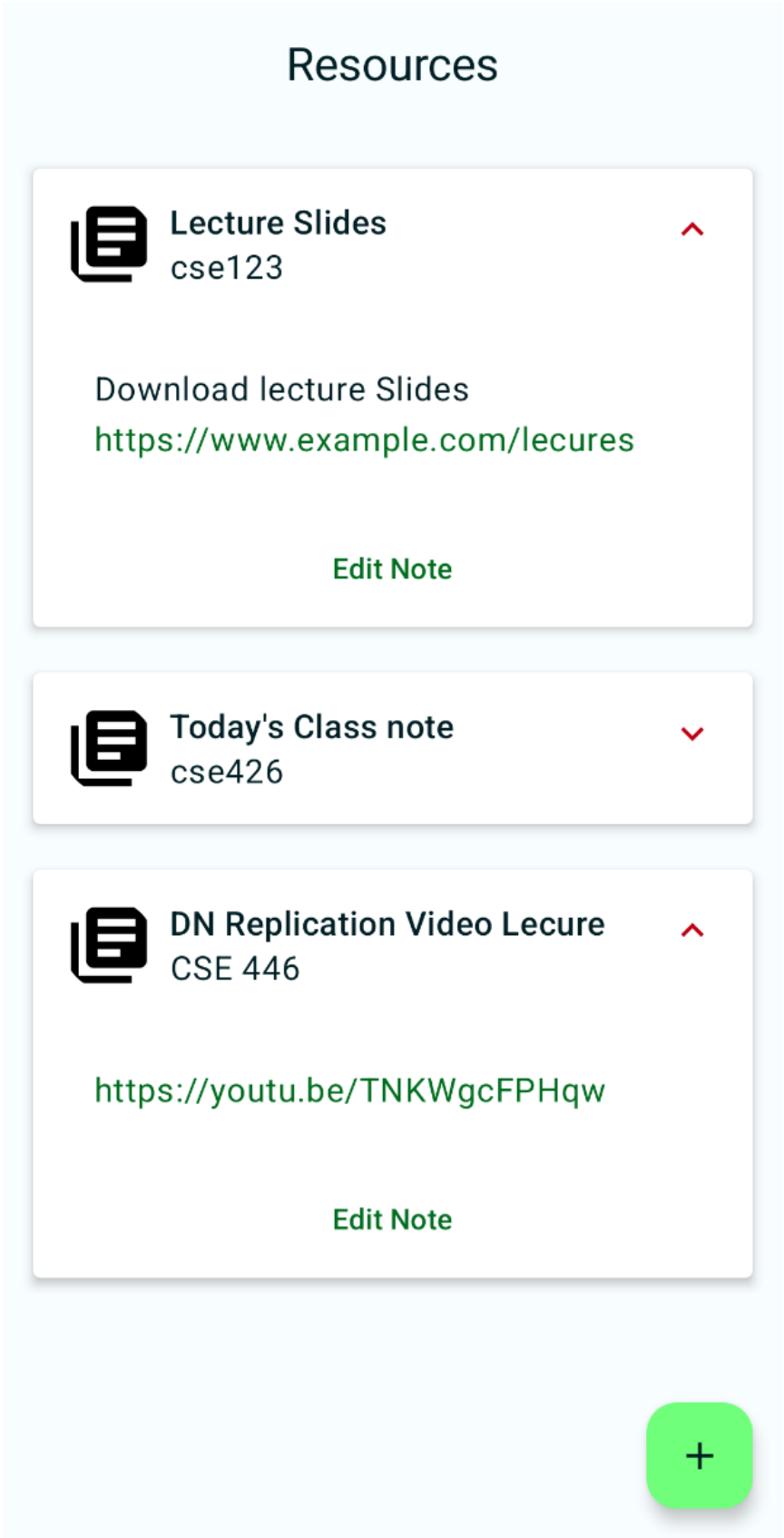


Figure 4.1.7: Resources Screen

**Resources Screen**: Shows Notes and Resources for the joined class.

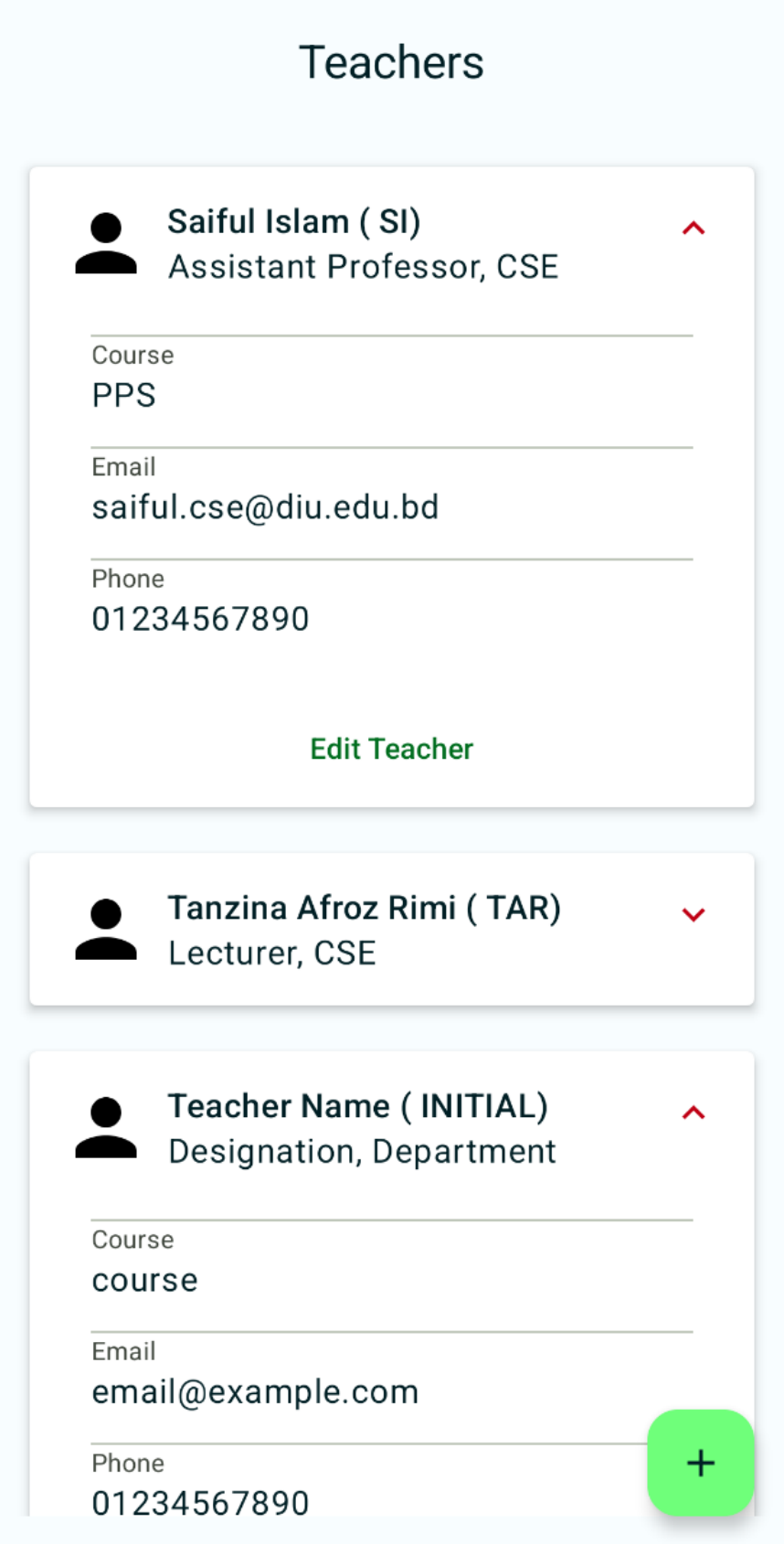


Figure 4.1.8: Teachers Screen

**Teachers Screen**: Shows Teachers for the joined class.


Figure 4.1.9: Discussions Screen

**Discussions Screen**: Allows User to discuss with the whole class.

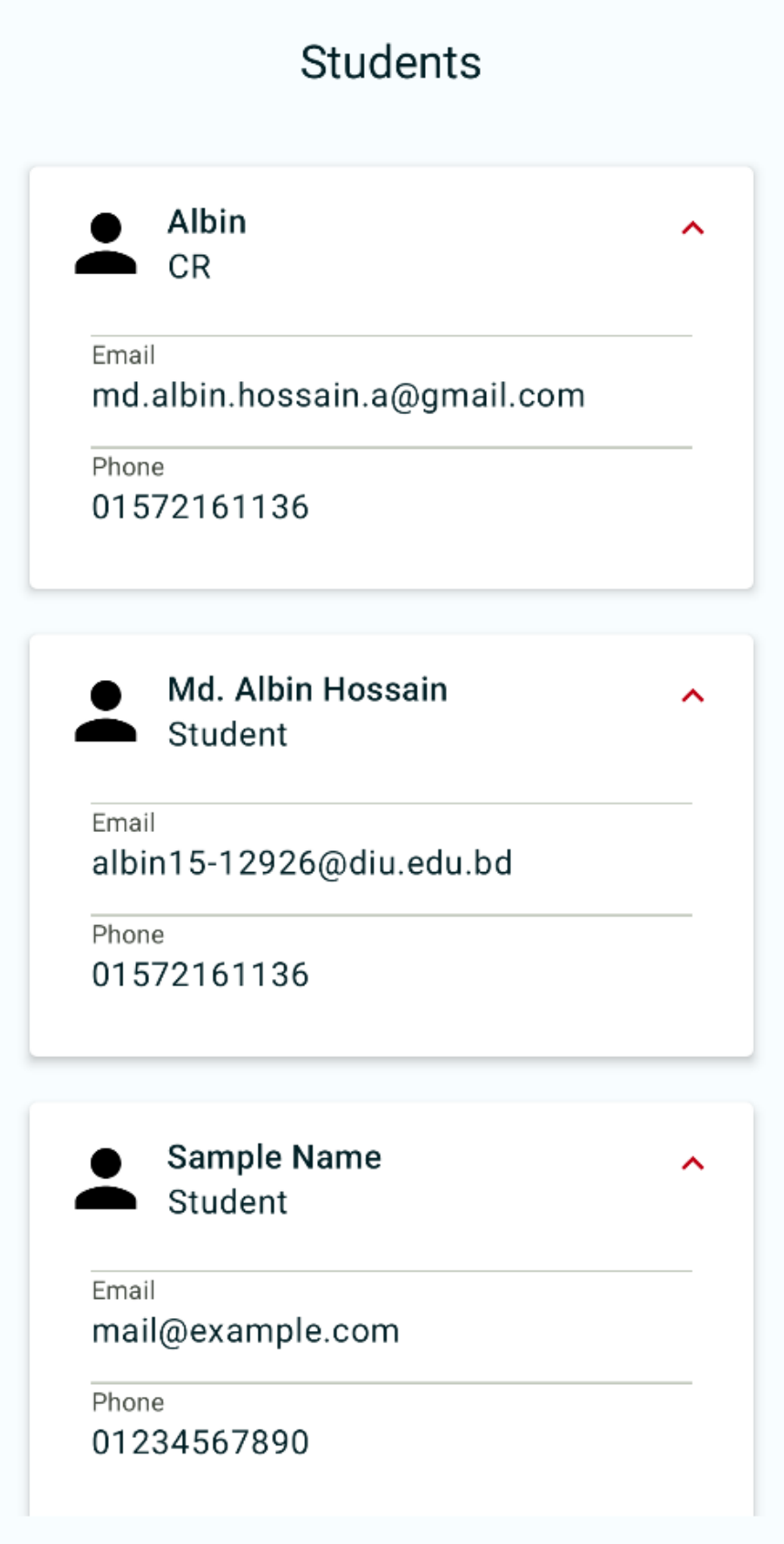


Figure 4.1.10: Students Screen

**Students Screen**: Lists the current students of the class.

## 4.2 Back-end Design

The back-end design of the Smart CR app refers to the underlying systems and components that support the app's functionality and performance. This includes the data storage and management systems, the server infrastructure, and the application programming interfaces (APIs) that enable the app to interact with other systems or services.

To design the back end of the Smart CR app, we consider a number of factors, such as the data storage and management requirements of the app, the performance and scalability needs of the app, and any technical or functional constraints.

As elements of the back-end design for the Smart CR app we include:

Data storage and management: The systems and processes used to store, retrieve, and manipulate the data needed by the app, such as student profiles, class schedules, and study materials.

Server infrastructure: The hardware and software systems that support the app, including servers, databases, and network infrastructure.

Application programming interfaces (APIs): The interfaces that enable the app to interact with other systems or services, such as student information systems or learning management systems.

Security: The measures in place to protect the app and its data from threats such as hacking or data breaches.

Scalability: The ability of the app to accommodate a growing number of users and data, and to maintain good performance as it scales.

The back-end design of the Smart CR app will be robust, scalable, and secure, to help ensure that it can effectively support the needs of the app and its users.

## 4.3 Interaction Design and User Experience (UX)

Interaction design refers to the design of the interactions between users and a system or software application. In the context of the Smart CR app, interaction design would

involve designing the ways in which students, teachers, and class representatives (CRs) can interact with the app, and the feedback and responses they receive in return.

To design the interactions for the Smart CR app, we need to consider a number of factors, such as the goals and objectives of the app, the needs and preferences of the app's users, and any technical or functional constraints.

Some possible elements of the interaction design for the Smart CR app could include:

User flows: The sequence of steps and actions that users take as they use the app, such as viewing class schedules or accessing study materials.

Feedback and responses: The ways in which the app communicates with users, such as through alerts, notifications, or error messages.

Navigation: The ways in which users can move between different screens or functions within the app, and the cues and indicators that help them do so.

Input and output: The ways in which users can enter data into the app, and the ways in which the app processes and presents this data to users.

Error handling: The strategies in place to handle errors or issues that may arise as users interact with the app.

The interaction design of the Smart CR app should be intuitive, user-friendly, and effective, to help ensure that it meets the needs and expectations of its users.

User experience (UX) refers to the overall feel and functionality of a system or software application. In the context of the Smart CR app, UX would encompass all of the interactions and experiences that students, teachers, and class representatives (CRs) have as they use the app.

To design the UX for the Smart CR app, we consider a number of factors, such as the goals and objectives of the app, the needs and preferences of the app's users, and any technical or functional constraints.

Some possible elements of the UX for the Smart CR app could include:

Usability: The ease with which users can understand and use the app, and the efficiency with which they can achieve their goals.

Learnability: The ease with which users can learn and become proficient at using the app.

Efficiency: The speed with which users can complete tasks or achieve their goals using the app.

Satisfaction: The overall enjoyment and satisfaction that users experience as they use the app.

Engagement: The extent to which users are motivated and engaged as they use the app.

To design a good UX for the Smart CR app, we aim to create an app that is easy to use, efficient, and enjoyable for its users. This may involve conducting user testing and gathering feedback to identify and address any issues or challenges.

## 4.4 Implementation Requirements

Implementation requirements are the specific constraints and requirements that must be met in order to successfully implement the Smart CR project. These requirements may be based on a variety of factors, such as technical considerations, resource limitations, and any regulatory or compliance requirements.

Here are the implementation requirements that for the Smart CR project:

Table 4.4.1: Technical Requirements

| Technical Requirement | Description |
|---|---|
| Operating system | The app should be compatible with Android versions 6.0 and above. |
| Hardware | The app should run smoothly on devices with a 1.5 GHz quad-core processor or higher. |
| Storage | The app should require a minimum of 100 MB of storage space on the device. |
| Internet connectivity | The app should function properly with both Wi-Fi and cellular data connectivity. |
| Screen size | The app should be optimized for devices with a screen size of 5 inches or larger. |

Technical requirements: The specific hardware, software, and infrastructure that are needed to support the app, such as servers, databases, and network infrastructure.

Resource requirements: The personnel, time, and budget that are needed to develop and implement the app.

Regulatory requirements: Any legal or compliance requirements that must be met, such as data privacy laws or accessibility standards.

Training requirements: The training and support that may be needed to ensure that users are able to effectively use and benefit from the app.

Maintenance and support requirements: The ongoing maintenance and support that will be needed to keep the app running smoothly and address any issues or problems that may arise.

Deployment requirements: The process and considerations for deploying the app to users, including testing and quality assurance.

To ensure the success of the Smart CR project, it is important to carefully plan and manage the implementation process, and to address any implementation requirements that may arise.

# CHAPTER 5
# IMPLEMENTATION AND TESTING

## 5.1 Implementation of Database

The implementation of Firebase Firestore was used for the database of the Smart CR app development process. Firebase Firestore is a cloud-based NoSQL document database that provides real-time synchronization and offline access. It is a flexible and scalable solution that is well-suited for the needs of the Smart CR app.

Firestore allows for the creation of collections of documents, where each document represents a single item of data. In the case of the Smart CR app, these documents could represent various types of information, such as exam schedules, class notes, or updates from teachers. The data in Firestore is organized into collections and documents, making it easy to structure and access the information required by the app.

Firestore also provides robust security features, allowing developers to control access to the data stored in the database. In the case of the Smart CR app, this means that only authorized users, such as students and teachers, can access the data. Firestore's security features also ensure that sensitive information, such as students' information, is protected from unauthorized access.

The real-time synchronization feature of Firestore is also valuable for the Smart CR app, as it ensures that all students have access to the same up-to-date information, regardless of whether they are online or offline. This is particularly important for students who may need to review information outside of class time, or when internet access is limited.

In conclusion, the implementation of Firebase Firestore as the database for the Smart CR app provides several key benefits. It allows for the flexible and scalable storage of data, robust security features, and real-time synchronization of information, making it an ideal solution for the needs of the Smart CR app. The use of Firestore in the development of the Smart CR app is a testament to the developers' commitment to providing students with a fast, reliable, and secure platform for managing their studies.

## 5.2 Implementation of Front-end Design

Android Jetpack Compose is a modern toolkit for building native Android user interfaces. It is designed to simplify and accelerate the process of building UI elements, and to make it easier to create consistent, responsive, and accessible apps.

To implement the front-end design of the Smart CR project using Android Jetpack Compose, the following steps may be taken:

Install and set up Android Jetpack Compose: The first step is to install and set up Android Jetpack Compose in the Android project. This will typically involve adding the appropriate dependencies to the project's build.gradle file, and configuring the project to use Compose.

Define the UI elements: Next, we define the various UI elements that the app will need, such as buttons, text fields, and lists. This can be done using Compose's declarative syntax, which allows developers to define UI elements using simple, intuitive code.

Design the app's layout: Once the UI elements have been defined, we use them to design the layout and structure of the app. This will involve defining the hierarchy and arrangement of the UI elements and specifying the relationships between them.

Implement app logic and interactions: The final step is to implement the logic and interactions that will govern how the app functions. This will involve writing code to handle events such as button clicks, and to manipulate the UI elements as needed.

By using Android Jetpack Compose to implement the front-end design of the Smart CR project, we get advantage of the simplicity and flexibility of the Compose toolkit, and focus on developing the app's features and functionality, rather than worrying about the underlying UI implementation.

## 5.3 Testing Implementation

Android provides several testing systems and tools that can be used to test the implementation of the Smart CR app, including both unit tests and instrumentation tests. These tools can help ensure that the app is reliable, stable, and performs well, and that it meets the needs and expectations of its users.

To test the implementation of the Smart CR app using Android testing systems and Jetpack, the following steps may be taken:

Write unit tests: Unit tests are small, isolated tests that test a specific component or functionality of the app. To write unit tests for the Smart CR app, we use tools such as JUnit or Android's built-in testing framework to define and run the tests.

Write instrumentation tests: Instrumentation tests are tests that run on a device or emulator and test the app's behavior and interactions with the system and other apps. To write instrumentation tests for the Smart CR app, we use tools such as Espresso or Android's built-in testing framework to define and run the tests.

Run tests: Once the tests have been written, we run them using Android's testing tools and frameworks. This will typically involve building and deploying the app to a device or emulator, and then running the tests using a command-line tool or an integrated development environment (IDE).

Analyze test results: After the tests have been run, we analyze the results to identify any issues or problems that need to be addressed. This may involve reviewing log output, debugging test failures, and modifying the app's implementation as needed.

By using Android testing systems and Jetpack to test the implementation of the Smart CR app, we ensure that the app is reliable, stable, and performs well, and that it meets the needs and expectations of its users.

## 5.4 Test Results and Reports

Table 5.4.1: Tests Cases and Results

| Test Case ID | Test Case Description | Test Steps | Expected Result | Actual Result | Pass/Fail |
|---|---|---|---|---|---|
| 1 | Launch app | Launch Smart CR app | App launches successfully | App launches successfully | Pass |
| 2 | Sign up | Navigate to sign up page, fill out the required information, and click sign up | User is successfully signed up | User is successfully signed up | Pass |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Login | Navigate to the login page, enter the correct username and password, and click login | User is successfully logged in | User is successfully logged in | Pass |
| 4 | Create resource | Navigate to the resources page, click on the create resource button, fill out the required information, and click create | Resource is successfully created | Resource is successfully created | Pass |
| 5 | Send message | Navigate to the discussion page, fill out the message, and click send | Message is successfully sent | Message is successfully sent | Pass |

# CHAPTER 6
# IMPACT ON SOCIETY, ENVIRONMENT AND SUSTAINABILITY

## 6.1 Impact on Society

The Smart CR project has the potential to have several positive impacts on society. Some of the ways in which the app could benefit society include:

Improved education: By providing students with access to important information about their studies, such as class schedules, study materials, and exam routines, the app could help improve their academic performance and success. This, in turn, could lead to a more educated and knowledgeable society.

Enhanced communication: By providing a platform for teachers, students, and class representatives (CRs) to communicate and collaborate, the app could help improve the flow of information and ideas within the education system. This could lead to more effective and efficient teaching and learning and could help foster a sense of community and engagement within the education system.

Increased productivity: By helping students to better manage their studies and schedules, the app could help increase their productivity and efficiency. This could free up more time for students to pursue other interests or activities and could help them make better use of their time and resources.

Greater accessibility: By providing students with access to information and resources from anywhere, at any time, the app could help increase the accessibility of education and learning. This could be particularly beneficial for students with disabilities, or for students who live in remote or underserved areas.

Overall, the Smart CR project has the potential to make a significant positive impact on society by improving the education system and increasing the accessibility, productivity, and communication within it.

## 6.2 Impact on Environment

The impact of the Smart CR app on the environment is likely to be minimal, as it is a digital application that does not have a direct physical presence or impact. However, the app could potentially have some indirect effects on the environment, depending on how it is used and adopted.

For example, if the app helps students to be more productive and efficient in their studies, it could potentially reduce the need for students to travel to and from school or other educational facilities. This could result in a reduction in greenhouse gas emissions and other environmental impacts associated with transportation.

In addition, if the app encourages the use of digital materials and resources, rather than printed materials, it could potentially reduce the demand for paper and other resources, which could have a positive impact on the environment.

Overall, while the direct impact of the Smart CR app on the environment is likely to be small, it has the potential to make a positive contribution to the environment through its indirect effects on transportation and resource use.

## 6.3 Ethical Aspects

There are several ethical aspects to consider when developing and using the Smart CR app. Some of the ethical issues that may be relevant to the app include:

Data privacy: As the app will be collecting and storing personal and sensitive information about students, teachers, and class representatives (CRs), it is important to ensure that this data is protected and secure. This may involve implementing appropriate security measures and protocols and being transparent about how the data is being collected and used.

Accessibility: To ensure that the app is accessible to all users, it is important to consider the needs of users with disabilities, and to design the app in a way that is inclusive and accommodating. This may involve implementing features such as high contrast mode, text-to-speech, and alternative input methods.

Fairness and equity: To ensure that the app is fair and equitable, it is important to consider the needs and perspectives of all users, and to avoid any biases or discrimination. This may involve conducting user testing and gathering feedback from a diverse group of users to identify and address any issues or challenges.

Responsibility and accountability: As the app will be used by students, teachers, and class representatives (CRs), it is important to consider the responsibilities and accountability of these different groups, and to ensure that the app is being used in a responsible and appropriate manner. This may involve setting clear guidelines for acceptable use and behavior, and enforcing these guidelines as needed.

Overall, it is important to consider the ethical implications of the Smart CR app at every stage of its development and use, and to take appropriate steps to ensure that it is used in a responsible and respectful manner.

## 6.4 Sustainability Plan

A sustainability plan is a plan that outlines the steps that will be taken to ensure that the Smart CR app is developed and used in a sustainable manner. Here are the elements that we include in the sustainability plan for the Smart CR app:

Resource efficiency: In the sustainability plan, we include measures to reduce the use of resources such as paper, energy, and transportation, to minimize the app's environmental impact. This could involve encouraging the use of digital materials and resources, rather than printed materials, and promoting the use of sustainable modes of transportation.

Data privacy and security: The plan includes measures to protect the personal and sensitive data that is collected and stored by the app, in order to ensure that the privacy and security of users is not compromised. This could involve implementing appropriate security measures and protocols and being transparent about how the data is being collected and used.

Accessibility: The plan includes measures to ensure that the app is accessible to all users, regardless of their abilities or needs. This could involve implementing features such as high contrast mode, text-to-speech, and alternative input methods.

Fairness and equity: The plan include measures to ensure that the app is fair and equitable, and that it does not discriminate against or unfairly advantage any particular group of users. This could involve conducting user testing and gathering feedback from a diverse group of users to identify and address any issues or challenges.

Responsibility and accountability: The plan include measures to ensure that the app is used in a responsible and accountable manner, and that all users are aware of their responsibilities and obligations. This could involve setting clear guidelines for acceptable use and behavior, and enforcing these guidelines as needed.

By implementing a sustainability plan, the Smart CR project team can ensure that the app is developed and used in a way that is sustainable, responsible, and respectful of the needs and interests of all stakeholders.

# CHAPTER 7
# CONCLUSION AND FUTURE SCOPE

## 7.1 Discussion and Conclusion

In conclusion, the Smart CR app is a valuable tool that has the potential to improve the education system and enhance the productivity, communication, and accessibility of students, teachers, and class representatives (CRs). By providing a platform for sharing important information and resources, the app can help students better manage their studies and schedules and can help teachers and CRs more effectively communicate and collaborate.

However, it is important to carefully consider the ethical and sustainability implications of the app, and to take appropriate steps to ensure that it is used in a responsible and respectful manner. This may involve implementing measures to protect data privacy and security, to ensure accessibility for all users, to promote fairness and equity, and to encourage responsibility and accountability.

Overall, the Smart CR app has the potential to make a positive contribution to the education system and to society, and can be a valuable resource for students, teachers, and CRs. It is important to continue to monitor and evaluate the app's impact and effectiveness, and to make any necessary adjustments or improvements as needed.

## 7.2 Scope for Further Developments

There are a few areas where the Smart CR app could potentially be further developed to enhance its functionality and value. Areas for further development include:

Integration with other systems: The app could be integrated with other systems or platforms, such as learning management systems or student information systems, to provide a more comprehensive and seamless experience for users.

Personalization and customization: The app could be further developed to allow for personalization and customization, such as the ability for students to customize their

class schedules or notifications, or for teachers to tailor their lesson plans and resources to the needs and preferences of their students.

More Platform Support: The app could be further developed to include a platforms like iOS and Windows, which would allow students and teachers to access the app from their devices and would provide greater availability and convenience.

Gamification and engagement: The app could be further developed to include gamification elements, such as rewards, achievements, and challenges, to encourage greater engagement and motivation among users.

Overall, there are many opportunities for further development of the Smart CR app, and by considering the needs and feedback of its users, we continue to enhance and improve the app to meet the changing needs and expectations of its users.

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