Android Application for Employee Rewarding and Management System using Kotlin [ERMS]

By

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Approval Sheet

"This is to certify that we have reviewed the thesis submitted by **Sabghat Ullah Khan (Reg No: CS120192060)** and **Saleh Hayat (Reg No: CS120192061).** After careful evaluation, we believe that the thesis meets the necessary standards and requirements for the **Bachelor Degree in Computer Science** at **Kohat University of Science and Technology, Kohat**. Therefore, we recommend its acceptance."

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PLAGIARISM STATEMENT

We, the students of **Kohat University of Science and Technology, Kohat**, hereby declare that the thesis titled **Android Application for Employee Rewarding and Management System using Kotlin (ERMS)** is an authentic work produced by us under the guidance and supervision of **Mr. Qadeem Khan**. We have conducted thorough research, analysis, and documentation to develop this project.

To maintain the integrity and originality of our work, we have conducted a rigorous plagiarism check using the renowned plagiarism detection tool, **Turnitin**. The resulting report confirms that our project is free from any substantial instances of plagiarism. We have adhered to the ethical guidelines and academic standards set forth by our institution, providing proper citations and references for any external sources used to support our research and findings.

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ACKNOWLEDGEMENTS

With utmost gratitude and heartfelt appreciation, we acknowledge the Almighty for the blessings bestowed upon us throughout the journey of developing **ERMS (Employee Rewarding and Management System).**

The completion of any task brings joy and fulfillment, but the true essence of this accomplishment lies in recognizing the individuals who played pivotal roles in its success. We firmly believe that those who provided constant guidance and encouragement deserve to be acknowledged first, as they paved the way for this achievement.

We express our sincere gratitude and profound respect to all the individuals behind the scenes who guided, inspired, and assisted us in completing this project. Our deepest thanks go to our project supervisor**, Mr. Qadeem Khan**, whose unwavering motivation and invaluable support propelled us forward throughout the project. He was always available to provide guidance and assistance whenever we sought his expertise. Without his mentorship, this project would not have reached its fruition. We also extend our thanks to **Dr. Shafi Ullah** for his guidance and support.

We consider ourselves incredibly fortunate to have had the opportunity to work on such an exceptional project. It has undoubtedly enriched our academic profile and contributed to our personal growth.

Lastly, we would like to express our gratitude to my team member **(Saleh Hayat)** who collaborated and cooperated during the course of this project. Their collective effort and dedication played a significant role in the successful realization of **ERMS**.

We are deeply indebted to all those who supported us and made this project a reality. Their unwavering faith in our abilities and their unwavering support have left an indelible mark on our hearts.

Thank you all for being an integral part of this journey.

DEDICATIONS

To

The **Almighty Allah**, the Creator of the universe, and to our beloved **Prophet Muhammad (S.A.W).** Their guidance and blessings have been our source of inspiration.

Our respected teachers, parents, sisters, and brothers, we dedicate this work with heartfelt gratitude. Your encouragement, support, and love have played a significant role in our educational journey.

We acknowledge the wisdom imparted by our teachers and the care and guidance provided by our parents. Their belief in us has motivated us to strive for excellence.

Our siblings, who have been our companions and friends, we dedicate this work as a token of our appreciation for their unwavering support and camaraderie.
May this dedication reflect our gratitude and serve as a reminder of the profound impact you have had on our lives.

ABSTRACT

The aim of the **Employee Rewarding and Management System (ERMS)** project is to develop an Android application that streamlines employee management and rewards within organizations. The ERMS application offers two main functionalities: **Rewarding** and **Management**.

In the management module, the application efficiently handles various office-related tasks. It manages employee attendance records, tracks their work progress, generates salary slips, compiles summary reports, and provides updates on company events. Additionally, the application enables managers to conduct meetings, assign tasks to employees, approve requests such as leaves and task completions, and make announcements regarding promotions, birthdays, and holidays.

The rewarding system of the **ERMS** application acknowledges the importance of employee appreciation. It enables organizations to recognize and reward employees based on their attendance, tasks completed, participation in events and meetings, and overall work performance. Points are assigned to employees, and the system selects deserving individuals for monthly, quarterly, biannual, and yearly rewards.

The **ERMS** application aims to create a thriving workplace by valuing employee efforts and contributions. By leveraging this application, organizations can improve efficiency, effectiveness, and employee satisfaction. The application enhances communication, tracks employee performance, and provides a platform for recognition and motivation.

Overall, the **Employee Rewarding and Management System (ERMS)** application plays a pivotal role in optimizing office management and creating a positive work environment by emphasizing employee appreciation and efficient task management.

UNDERTAKING

"We hereby confirm that the project work titled **"Employee Rewarding and Management System (Android App)"** is solely our own work. This work has not been submitted or presented elsewhere for assessment. In instances where we have utilized material from external sources, proper acknowledgment and referencing have been provided."

Sabghat Ullah Khan (CS120192060)

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Table of Content

List of Tables

List of Figures

Chapter 01

Introduction

Chapter 1: Introduction

1.1 Introduction

We are introducing an Android application for Employee Rewarding and Management. This application having two main functions; one is Rewarding and another one is Management. First, we have to talk about Management System. Office management is very important in every organization. It helps to improve efficiency and effectiveness. So, our goal is to manage office work with ERMS (Employee Rewarding and Management System). The application will manage and keep a record of employee attendance, work, salary slips, summary reports and events information.

Now the Rewarding System. As we know in organizations, there are multiple employees who working in different offices. Employee recognition and appreciation play a vital role in fostering a positive work environment and enhancing employee motivation and productivity. The ERMS (Employee Rewarding and Management System) aims to address this need by providing a platform to effectively manage and acknowledge employee performance. By valuing and recognizing the efforts and contributions of employees, the system aims to boost their satisfaction and drive their ongoing commitment to achieving excellence in their work. Through this application, the organization can create a culture of appreciation and recognition, leading to improved employee engagement and overall organizational success.

1.2 Background / Literature Review

1.2.1 Employee Management System – S (Techno Information) [1]

- **History**: This app is released to play store on April 28, 2021 by Techno Information.
- **How it works:**
  i) It is used to keep track of daily activities of employees like attendance, half day, holiday and overtime hours.
  ii) Calculate employees’ bonus and loan.
  iii) Generate salary slips.
  iv) Generate a summary report.
- **Issues:**
  i) There is no task-oriented system. Manager cannot interact with employees to give them tasks or other activities.

ii) There is no rewarding system, like rewards on task completion, attendance rewards.

iii) Broadcast notifications.

1.2.2 Bonusly (Smartly Inc. (dba Bonusly) [2]

- **History**: Bonusly is founded in 2012 by Raphael Crawford-Marks. Bonusly is very good and popular recognition system for employees, but we plan to make a user-friendly app to keep track employees' performance and managements records.
- **How it works:**

  i) Users can give small bonuses to their peers, direct reports, and managers to recognize their contributions in real time.

  ii) User can add and delete any peer.
- **Issues:**

  i) In Bonusly there is no attendance system.

  ii) There is no salary slip system.

  iii) There's no attendance and task-oriented system.

1.3 Proposed Solution

For business owners and managers, it might seem like a lot of extra effort to implement an employee rewards program. This can be especially so when the results aren't always immediate and tangible when it comes to their employees' performances. Employee reward has been proven to improve organizational values, enhance team efforts, increase customer satisfaction and motivate certain behaviors amongst members of staff.

1.3.1 Admin/Manager Problems:

a) Adding Employees: Admin or Manager will add employees to the application.

b) Managing employees: Updating or deleting employees from application.

c) Attendance: Admin or manager will mark employee's attendance. It will be based on time; Manager will visit the lobby between 8:30AM to 9:00AM and visit every employee desk to mark them present or absent. There will be half day, over time options also.

d) Generating Salary Slips: Manager will generate salary slips for employees and there will be multiple options to deliver to concerned employee via email, WhatsApp or contact number.

e) Generating summary reports

f) Creating events: Manager will create events and select required employees. Application have Push notifications option also, the selected employee will get notification on their phone.

g) Conducting meetings: If there is meeting, Manager will create a broadcast invitation and send it to all.

h) Task/work: Manager will set a task for employees and send them to concern employee. Employee will get notification on their phone and do the task which is sent by manager.

i) Approving Requests: Manager will approve requests from employees like Leave request, task completion request, salary slips request.

j) Announcement: Manager will make announcements off employee's promotions, birthdays, holidays etc.

1.3.2 User/Employee Problems:

k) User will see all their performance visually anytime.

l) Employee will mark task complete.

m) Employee will request for leave.

n) Employee will request for salary slip.

o) Request for loan.

p) Request for advance.

q) Can see all organizations employee's performance points.

r) Every employee will see another employee attendance status.

s) Employee can submit complaint.

1.3.3 Rewarding:

On the basis of attendance, task, events, meetings, work: employees will get points. And on basis of these points Organization will select an employee for reward. This selection will be monthly, 3 months, 6 months and yearly basis.

1.4 Motivation

We get motivated by the current environment in the different organizations by seeing the employee’s frustration after so much of hard working and also do their tasks on time and not get any appreciation neither bonus. That's why they leave that Organization and join the other who' s been kind to employees so by using that Android application the organization manager will be well informed all over the employees and giving them tasks specifically to each and checking their work and give them a bonus or even promotion if he/she deserve.

1.5 Objectives

- Reduce time consuming on manual work.
- Clean and accurate management of organization.
- Easy management for Manager.
- Keeping records of employees goes easy.
- Employees Satisfaction.
- Fair selection of employees for rewards.
- User Friendly Application

1.6 Challenges

1) Making Manager and Employees interaction in application.
2) Chatting feature between manager and employee.
3) Categorize Employees in different categories like Internees, Graphic designer, Developers etc.

1.7 Scop of the Project:

The scope of the Employee Rewarding and Management System (ERMS) project includes the development of an Android application that encompasses rewarding and management functionalities for organizations. The project will focus on addressing the challenges faced by administrators/managers and users/employees in managing and recognizing employee performance effectively. The key aspects within the scope of the project are as follows:

1. **Management System:**

   i) **Employee Management:** The application will provide features for administrators/managers to add, update, and delete employee information.

   ii) **Attendance Tracking:** The system will enable administrators/managers to mark employee attendance and record details such as presence, absence, half-day, and overtime.

   iii) **Salary Slip Generation:** Managers will be able to generate salary slips for employees and deliver them through various channels like email, WhatsApp, or contact number.

   iv) **Summary Reports:** The application will generate summary reports to provide insights into employee performance and other relevant metrics.

   v) **Event Management:** Managers can create events and select the employees involved. Push notifications will be sent to the selected employees to inform them about the events.

   vi) **Meetings:** The application will facilitate the creation and broadcasting of meeting invitations to relevant employees.

   vii) **Task Assignment:** Managers can assign tasks to employees, who will receive notifications on their phones and be able to mark tasks as complete.

   viii) **Request Approval:** Managers will have the authority to review and approve employee requests such as leave, task completion, and salary slip requests.

   ix) **Announcements:** Managers can make announcements regarding employee promotions, birthdays, holidays, and other relevant information.

2. **User/Employee Features:**

   i) **Performance Tracking:** Employees can view their performance visually at any time, enabling them to monitor their progress and identify areas for improvement.

   ii) **Task Completion:** Employees can mark tasks as complete to indicate their progress and contribute to their overall performance evaluation.

   iii) **Request Management:** Employees can submit requests for leave, salary slips, loans, advances, and also submit complaints through the application.

   iv) **Performance Comparison:** The application will allow employees to compare their performance with other employees in the organization, fostering healthy competition and motivation.

v) **Attendance Status:** Employees will be able to view the attendance status of their colleagues, enhancing transparency and communication within the organization.

3. **Rewarding System:** The application will implement a rewarding mechanism based on various performance criteria such as attendance, task completion, participation in events/meetings, and overall work quality. Employees will earn points based on their performance, and the organization will select individuals for rewards on a monthly, quarterly, semi-annual, and yearly basis.

It is important to note that the scope of the project primarily focuses on the development of the Android application and its associated functionalities. Integration with existing organizational systems, scalability, security, and additional features beyond the proposed scope would need to be considered as part of further development or customization efforts.

Chapter 02

Requirements Analysis

Chapter 2: Requirements Analysis

2.1 Project Requirements Gathering Process:

The requirements which we gathered from multiple sources are the following:

- Visited different sites across web for requirements gathering.
- Conducted face-to-face meetings with IBS students.

As a part of analysis different websites are visited and read different research papers.

- https://www.solvexia.com/blog/what-is-office-automation-your-complete-guide
- https://www.shrm.org/resourcesandtools/tools-and-samples/toolkits/pages/understanding-organizational-structures.aspx
- https://www.managementstudyguide.com/motivation-and-financial-and-non-financial-rewards.htm
- https://factohr.com/policy/employee-recognition-and-reward/

2.2 Feasibility Study:

A feasibility study is an evaluation of a proposed project or system to determine whether it is technically and economically feasible, and whether it is the best course of action. The purpose of a feasibility study is to analyze and determine the potential success of a proposed project before investing time and resources into its development.

The study typically includes the following steps:

2.2.1 Problem Definition:

The problem definition for the Employee Rewarding and Management System project is the need for a more efficient and effective way to manage employee attendance, work, salary slips, events, and performance in an organization. Currently, many organizations face challenges in managing these tasks manually, which can lead to errors and inefficiencies. Additionally, employee rewards and recognition programs are important for improving employee satisfaction and motivation, but often lack proper tracking and management systems. The proposed solution aims to address these problems by providing a centralized and automated platform for employee management and rewarding, enabling organizations to improve their efficiency, effectiveness, and employee engagement.

2.2.2 Technical Analysis:

For the technical analysis of the Employee Rewarding and Management System (ERMS) project, the following aspects should be considered:

- **Platform Compatibility:** The ERMS application is planned to run on Android Nugget 7.0 and above versions.
- **Technical Feasibility:** The technical feasibility of the project should be evaluated in terms of the availability of resources and skills needed to develop the application.
- **Integration with existing systems:** If the ERMS application needs to be integrated with any existing systems or tools, the feasibility of this integration should be analyzed.
- **Security:** The security of the ERMS application should be evaluated to ensure that sensitive employee information is protected and secure.
- **Performance:** The performance of the ERMS application should be evaluated to ensure that it can handle the expected workload and provide a fast and smooth experience for users.
- **Scalability:** The scalability of the ERMS application should be analyzed to ensure that it can accommodate future growth and changes in the organization.
- **Maintenance:** The maintenance and support needs of the ERMS application should be evaluated to ensure that it can be sustained over the long-term.

2.2.3 Risk Analysis:

Risk analysis is an important aspect of project management, and it involves identifying and assessing potential risks that may impact the successful completion of the project. For the Employee Rewarding and Management System (ERMS) project, some potential risks might include:

- **Technical Risks:** This project involves the development of an Android application, and there could be risks associated with software development such as bugs, compatibility issues, and security vulnerabilities.
- **Data Security:** ERMS will be handling sensitive employee information, and there is a risk of data breach or theft. Measures need to be taken to secure the data and prevent unauthorized access.
- **User Adoption:** The success of the ERMS application depends on the adoption of the application by employees and managers. If the users are not comfortable using the application, it might lead to a low level of usage, and the project may not meet its objectives.
- **Time and Cost Overruns:** The development and implementation of the ERMS application can be time-consuming and expensive, and there is a risk of exceeding the estimated time and budget.
- **Maintenance and Upgrades:** The ERMS application will require regular maintenance and upgrades to stay current with changes in technology and user needs. There is a risk that the application will become outdated and may not meet user needs over time.

2.3 Process Model:

The Waterfall model is a sequential software development process, in which progress is seen as flowing steadily downwards through the phases of Requirements gathering and analysis, Design, Implementation (coding), Testing, Deployment and Maintenance.

In this model, each phase of the project must be completed before the next phase can begin and there is no overlapping in the phases. The Waterfall model is best suited for projects where the requirements are well understood, and there is a low risk of changing requirements throughout the development life cycle.

In the context of the Employee Rewarding and Management System (ERMS), the Waterfall model could be applied in the following manner:

- **Requirements gathering and analysis:** This phase involves understanding the functional and non-functional requirements of the ERMS application and documenting them.
- **Design:** In this phase, the architecture of the ERMS application is defined, the database structure is determined and a detailed design of the user interface is created.
- **Implementation:** This phase involves writing the code to implement the design and develop the ERMS application.
- **Testing:** This phase involves testing the ERMS application to ensure that it meets the requirements and functions as intended.
- **Deployment:** In this phase, the ERMS application is deployed in the production environment and made available to the end-users.
- **Maintenance:** This phase involves fixing any bugs, adding new features and making changes to the ERMS application as required.

2.4 Functional Requirements:

Functional requirements are the specific functions and features that a system must have to fulfill the needs of its users. In the case of the Employee Rewarding and Management System (ERMS) Android application, the functional requirements may include:

- **Employee Management:** The ability to add, update, and delete employee information.
- **Attendance Management:** The ability to mark employee attendance, including half-day and overtime options.
- **Salary Slip Generation:** The ability to generate salary slips for employees and deliver them through various channels such as email, WhatsApp, or contact number.
- **Summary Report Generation:** The ability to generate summary reports for employees.
- **Event Management:** The ability to create events and send push notifications to selected employees.
- **Meeting Management:** The ability to create and send broadcast invitations for meetings.

- **Task Management:** The ability to set tasks for employees and send notifications to the concerned employee.
- **Request Approval:** The ability for the manager to approve requests from employees such as leave requests, task completion requests, and salary slip requests.
- **Announcements:** The ability for the manager to make announcements such as employee promotions, birthdays, holidays, etc.

2.5 Non-Functional Requirements:

Non-functional requirements are the constraints and characteristics that define the quality and performance of a system. Some of the non-functional requirements for the ERMS Android application may include:

- **User-friendly interface:** The application should have an easy-to-use and intuitive interface.
- **Performance:** The application should be fast and responsive, with minimal lag time.
- **Security:** The application should have strong security measures to protect employee information and data.
- **Scalability:** The application should be scalable to accommodate an increasing number of users and employees.
- **Compatibility:** The application should be compatible with a range of Android devices and operating systems.
- **Reliability:** The application should be reliable and available for use at all times.
- **Maintenance:** The application should have a well-defined maintenance process to ensure ongoing stability and performance.

2.6 Module Wise Requirements Analysis:

Module-wise requirement analysis is a process of breaking down the whole project into smaller and manageable modules, and then analyzing and defining the requirements for each module in detail. It helps to get a clear understanding of the functional and non-functional requirements of each module, which can then be used to guide the development and testing of that module.

In the case of the Employee Rewarding and Management System (ERMS) project, the following modules can be identified:

- **Admin/Company Module:** The company module will serve as the central hub for all employee-related operations within the ERMS system. Its main functions will include:
    - **Adding employees:** The module will allow the admin/manager to add new employees to the system by providing their basic details such as name, contact information, job title, and any other relevant information.
    - **Managing employees:** The company module will provide options for updating or deleting employee information in the ERMS system. This will ensure that the data is up-to-date and accurate at all times.
    - **Selecting managers:** The module will also allow the admin to select managers from the employee list, and assign them with additional responsibilities such as conducting meetings, setting tasks, and approving requests.
    - **Employee data security:** The company module will also ensure that all employee data is securely stored and protected, and only authorized personnel have access to it.

      In summary, the company module is an essential component of the ERMS system that provides a centralized platform for managing employee information and conducting related activities.

- **Admin/Manager Module:** This module will provide all the functionalities required by the admin or manager to manage the employees. This includes adding employees, updating or deleting employee records, marking attendance, generating salary slips, creating events, conducting meetings, setting tasks, and approving requests.
- **User/Employee Module:** This module will provide all the functionalities required by the employees to manage their own performance and requests. This includes viewing their performance, marking tasks complete, requesting for leave, salary slips, and loans, viewing other employees' attendance, submitting complaints, and more.
- **Rewarding Module:** This module will track the attendance, tasks, events, meetings, and work of the employees, and assign points to each employee. Based on these points,

the organization will select an employee for reward on a monthly, quarterly, half-yearly, or yearly basis.

2.7 Software Requirements

These requirements are separated where you are developing the app or running on a device.

2.7.1 For Development

- **Operating System**: Windows or Mac
- **Platform**: Android SDK Framework 26 or higher
- **Tools**: Android Studio
- **Technologies**: Kotlin, XML, Firebase
- **Debugger**: Android studio debugger
- **Android Devices**: Emulator or Personal Device

2.7.2 For Running on a device

- **Operating System**: Android 7.0 or higher
- **Cellular Data**: Mandatory

2.7.3 Hardware Requirements

- **Processor**: Intel i3
- **RAM**: 4GB DDR4
- **Space on disk**: 20GB

Chapter 03

System Design & Architecture

Chapter 3: System Design and Architecture

3.1 System Architecture:

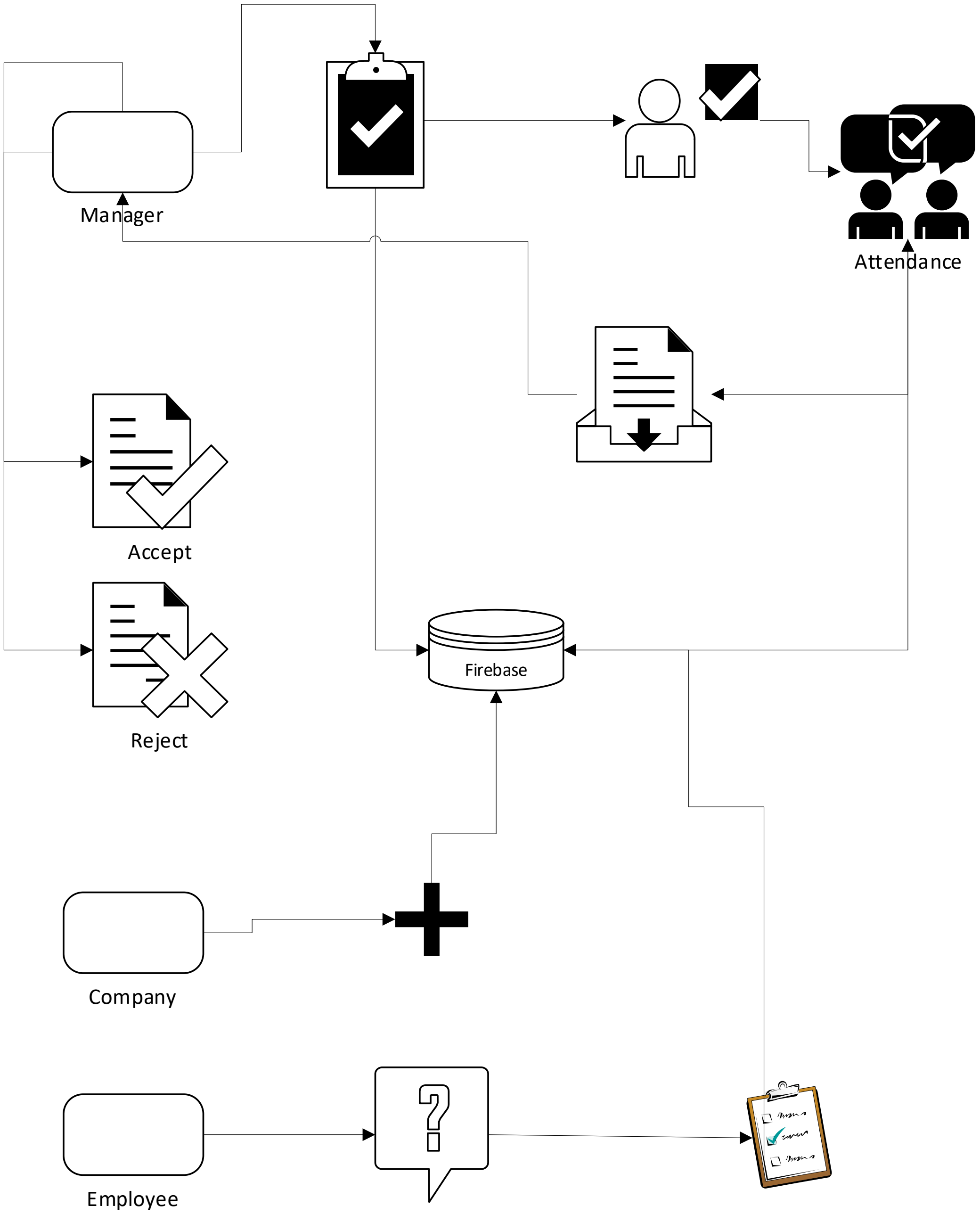


Figure 1 System Architecture

The different components in the architecture are:

- **Company/Admin**
    - This component represents the administrative role within the system.
    - The company/admin has the authority to add or remove employees, select managers, and resolve complaints.
    - They have overall control and management of the system's operations.
- **Employee/user**
    - This component represents the individual employees or users within the organization.
    - Employees can perform tasks assigned to them, attend meetings, lodge complaints, and view their attendance records.
    - They have access to functionalities relevant to their roles and responsibilities within the organization.
- **Manager/management**
    - This component represents the managers or management team within the organization.
    - Managers have additional responsibilities and privileges compared to regular employees.
    - They can assign tasks to employees, create events, mark attendance, work on resolving complaints, and edit employee information.
    - They play a crucial role in overseeing and supervising the performance of the employees.
- **Firebase**

    Firebase is a cloud-based platform provided by Google that offers a variety of services to support the development of web and mobile applications. In the ERMS application, Firebase is used as a backend service to handle tasks such as user authentication (Firebase Auth), real-time data storage (Firebase Realtime Database and Firestore), sending push notifications (Firebase Cloud Messaging), and performing transactions for data consistency.

- **Tasks**

  Tasks represent the specific work assignments or activities that managers assign to employees. Managers can set tasks for individual employees and send them notifications through the ERMS application. Employees can then mark the tasks as complete once they finish their assigned work.

- **Events**

  Events refer to special occasions or activities organized by the company or management. Managers can create events and select the employees who should participate. The selected employees receive notifications about the event, ensuring they are informed and can attend accordingly.

- **Attendance**

  The attendance component is responsible for tracking and managing employee attendance records. The admin or manager can mark employee attendance using the ERMS application, either manually or through automated processes. The attendance information helps in monitoring employee presence, calculating work hours, and generating relevant reports.

- **Broadcast receiver**
  - Broadcast receivers are a fundamental part of the Android platform.
  - They enable the system to deliver and handle broadcast messages or notifications.
  - In the context of ERMS, broadcast receivers are used to send notifications to employees regarding events, tasks, or important announcements. And to check network connectivity.

3.2 Use Case Diagram:

A use case diagram is a visual representation that illustrates the interactions between users and a system, highlighting the various actions, or use cases, that users can perform. It helps to identify the functional requirements of a system and provides a high-level view of how different actors interact with the system, aiding in the understanding and communication of system behavior.

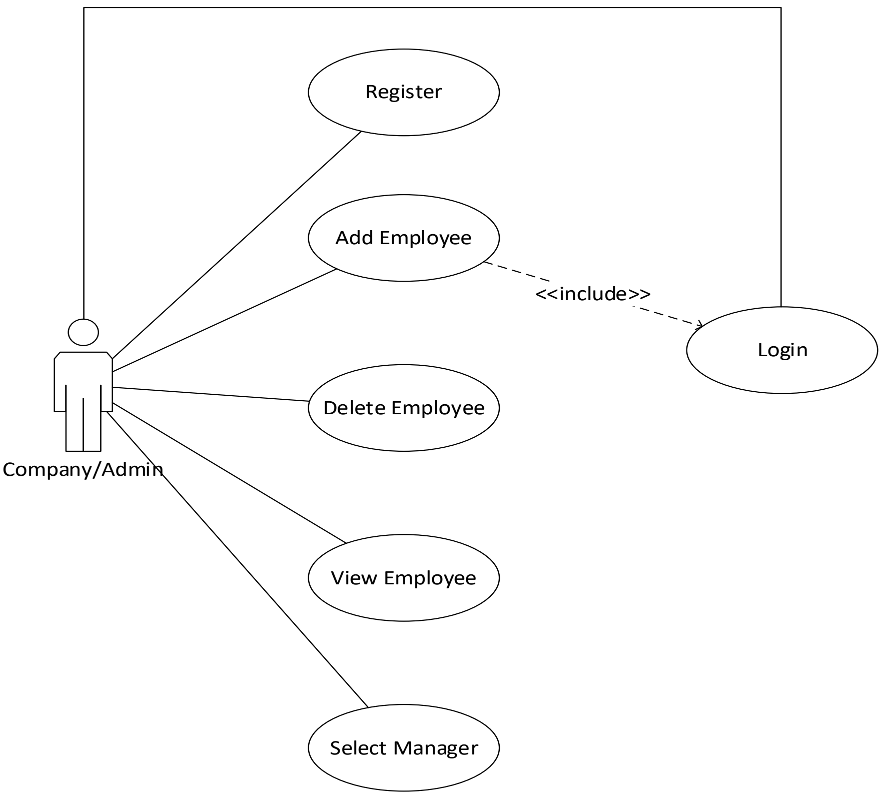


Figure 2 Company use case diagram

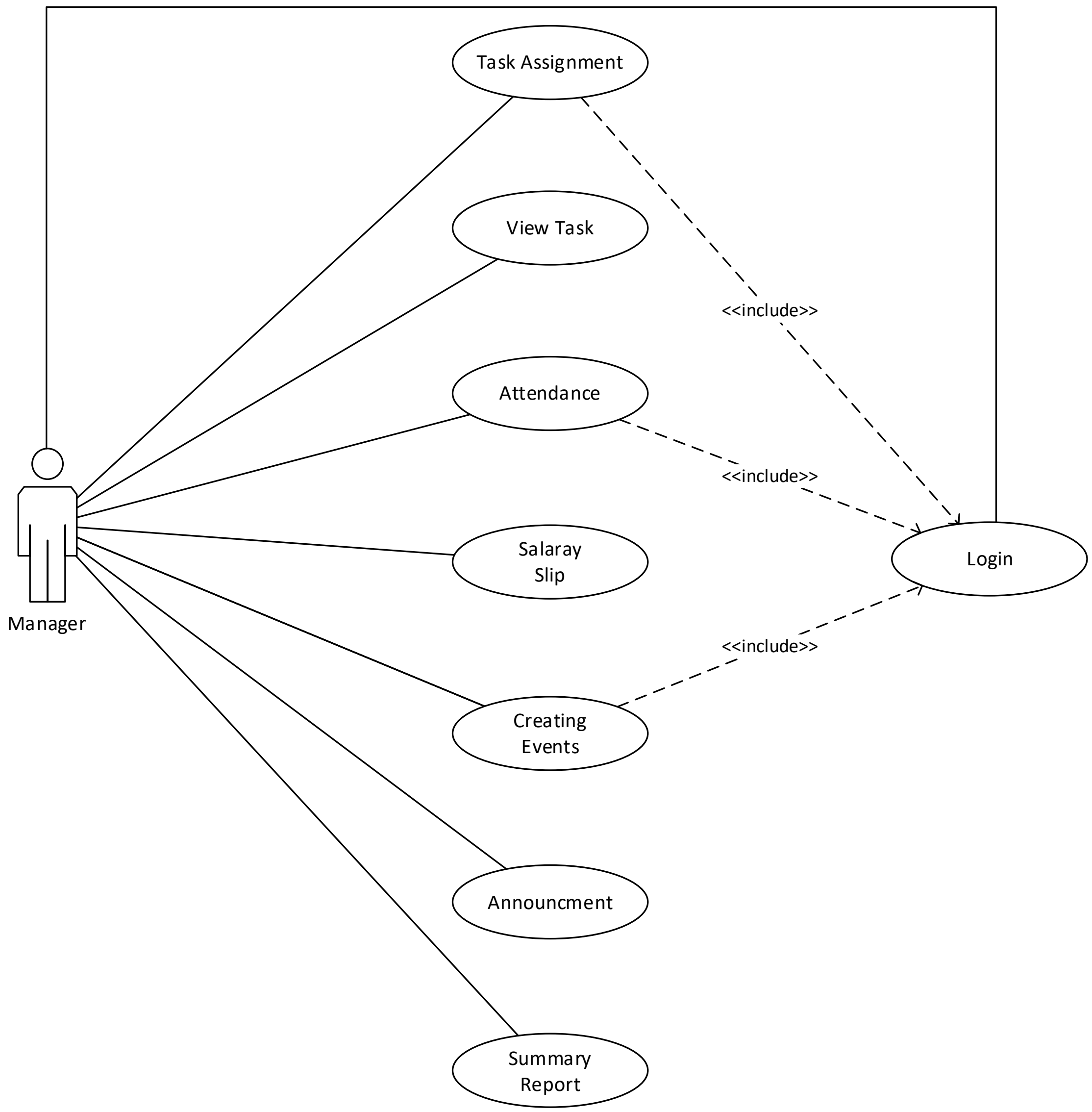


Figure 3 Manager Use Case Diagram

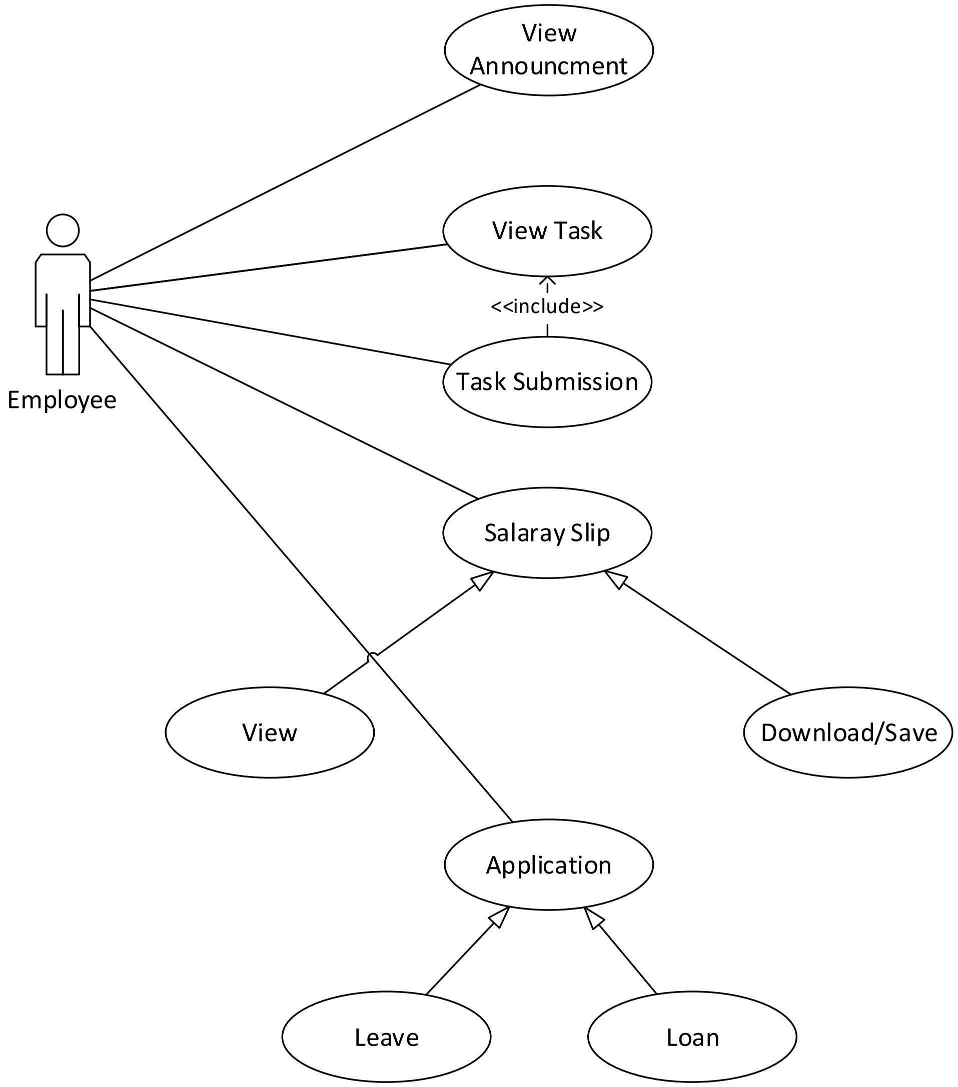


Figure 4 Employee Use Case Diagram

3.3 Sequence Diagram:

A sequence diagram is a type of interaction diagram that depicts the order of interactions between objects or components in a system over time. It represents the flow of messages exchanged between these objects, showcasing the dynamic behavior and collaboration between them. Sequence diagrams are useful for visualizing the chronological sequence of events and the interactions between different parts of a system, making it easier to understand the logic and functionality of the system.

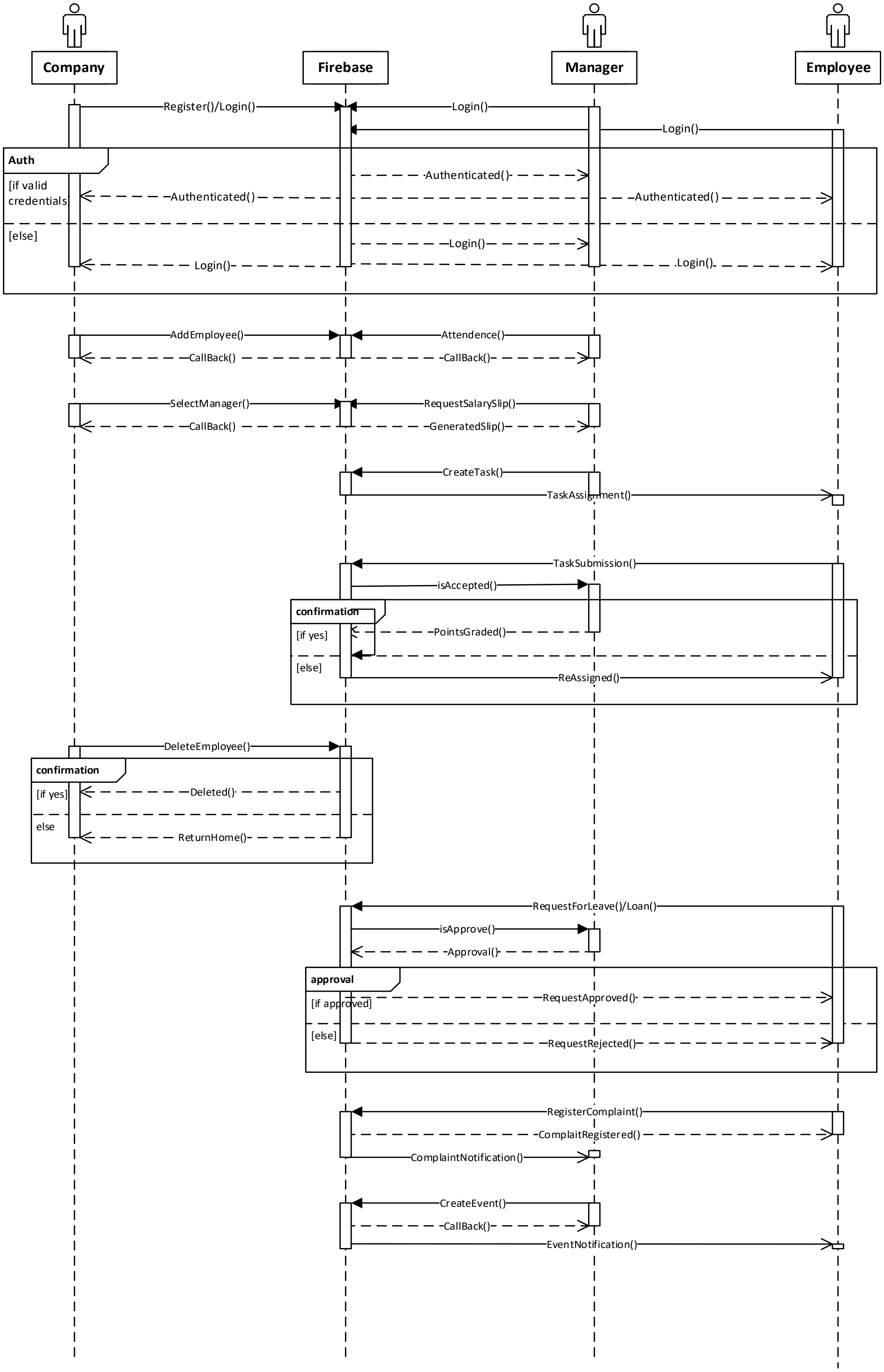


Figure 5 Sequence Diagram

3.4 Activity Diagram

An activity diagram is a graphical representation that illustrates the flow of activities or actions within a system or a business process. It visually depicts the sequential and parallel activities, decision points, branching paths, and the overall control flow of the system or process. Activity diagrams are helpful in modeling, analyzing, and communicating the steps and logic involved in a complex process, making it easier to understand, optimize, and improve the process flow. They are widely used in software development, business process modeling, and system analysis.

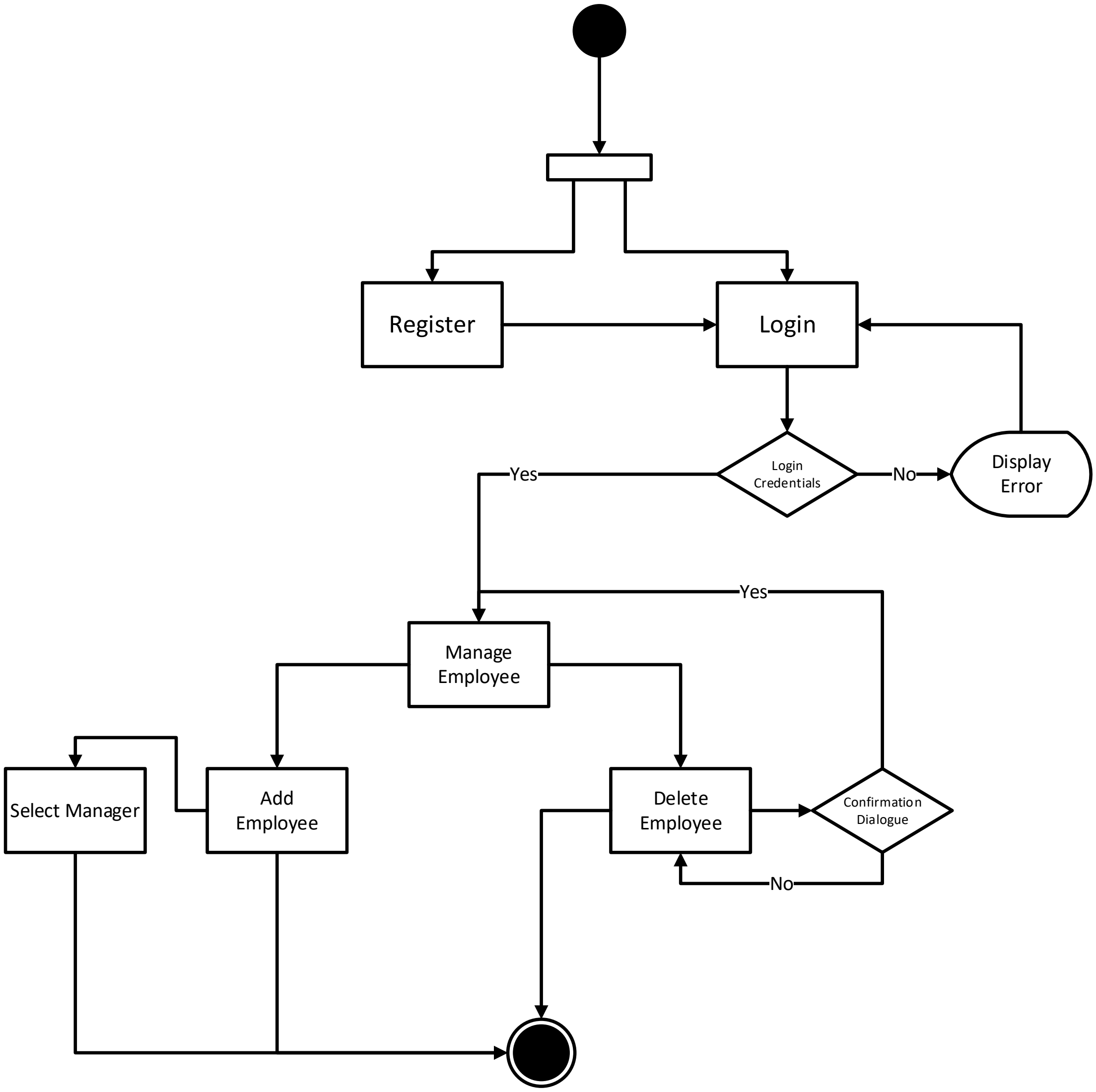


Figure 6 Activity Diagram / Company

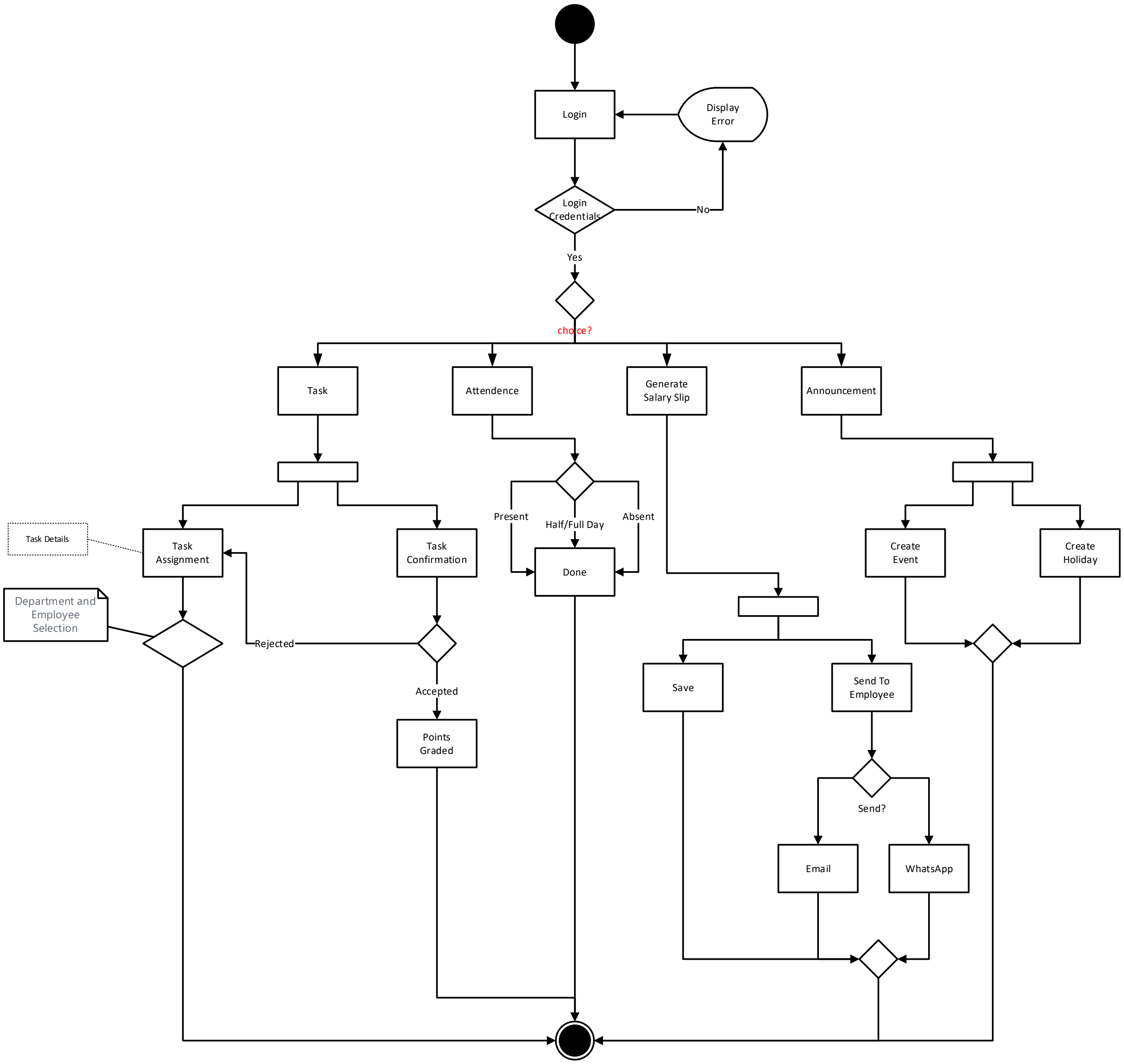


Figure 7 Activity Diagram / Manager Module

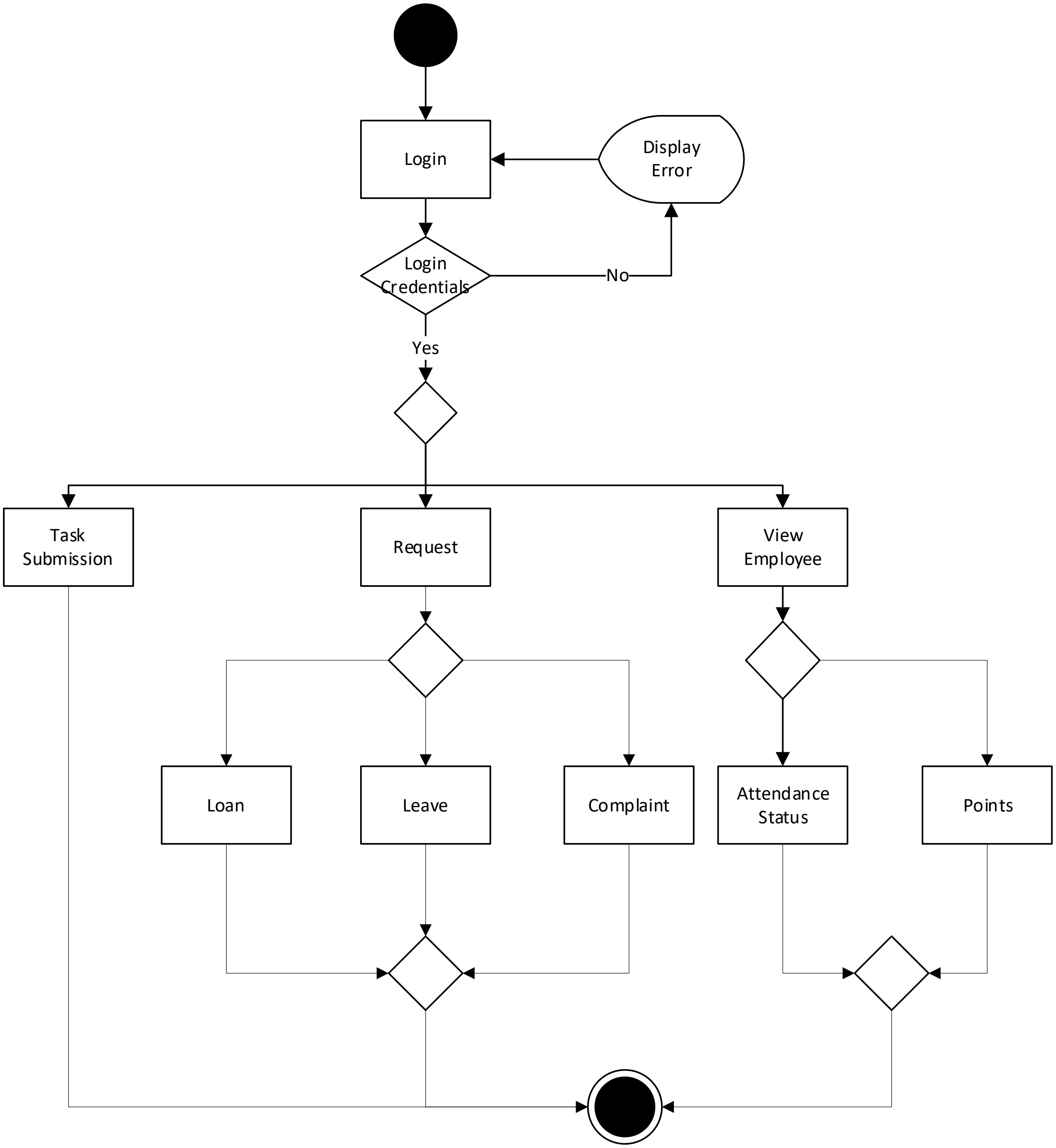


Figure 8 Activity Diagram / Employee Module

3.5 Entity Relationship Diagram:

An entity relationship diagram (ERD) is a visual representation that shows the relationships between different entities (or objects) in a system or database. It uses simple shapes like rectangles and lines to depict these entities and how they are connected. Think of it like a map that illustrates how different things in a system are related to each other. It helps to understand the structure and organization of the data, showing how entities interact and share information. By looking at the diagram, you can easily see which entities are linked, what kind of relationships they have (such as one-to-one, one-to-many, or many-to-many), and how they contribute to the overall system.

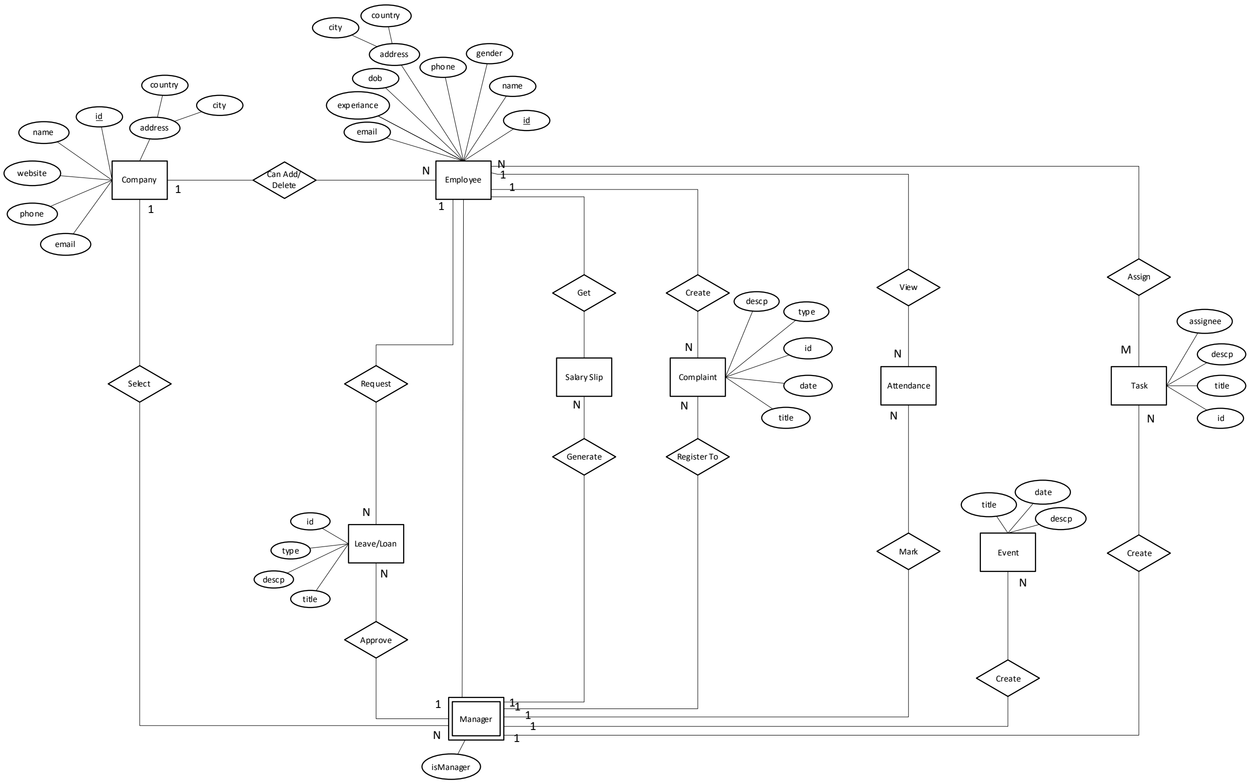


Figure 9 ERD

3.6 Data flow diagram:

A data flow diagram (DFD) is a visual representation that illustrates the flow of data within a system or process. It shows how data is input, processed, and outputted within the system, as well as the various entities and processes involved in the data flow. DFDs use symbols to represent data sources, processes, data storage, and data destinations, with arrows indicating the direction of data flow. They are useful for understanding the data flow and interactions between different components of a system, identifying data dependencies, and analyzing the system's functionality and information requirements. DFDs are commonly used in systems analysis, software engineering, and business process modeling.

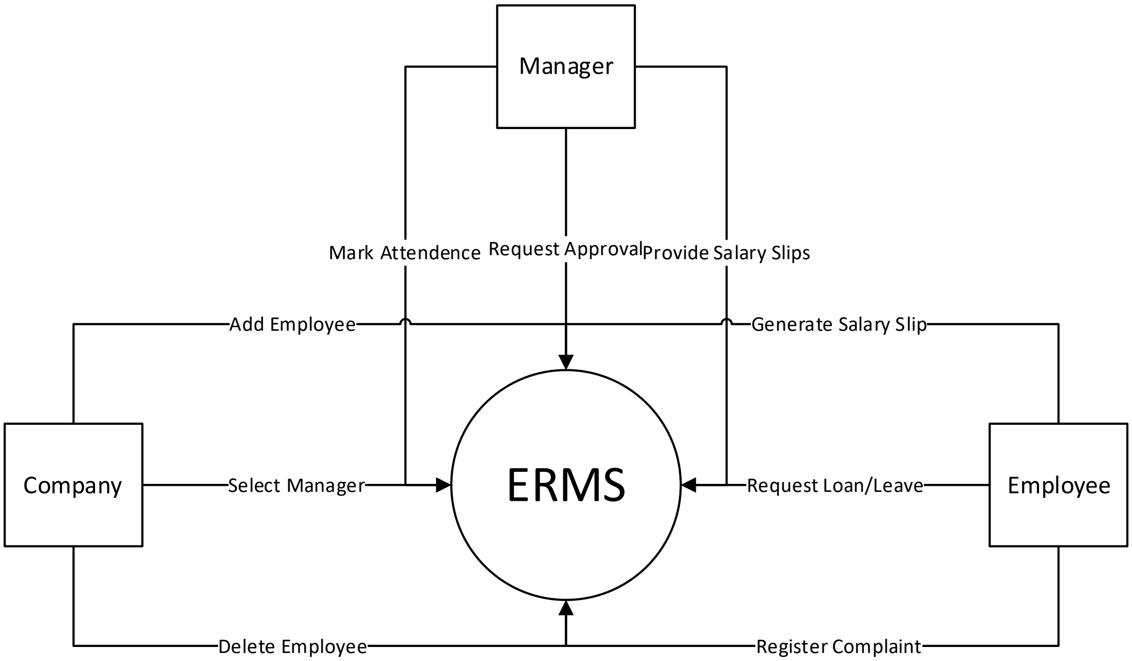


Figure 10 Level 0 DFD

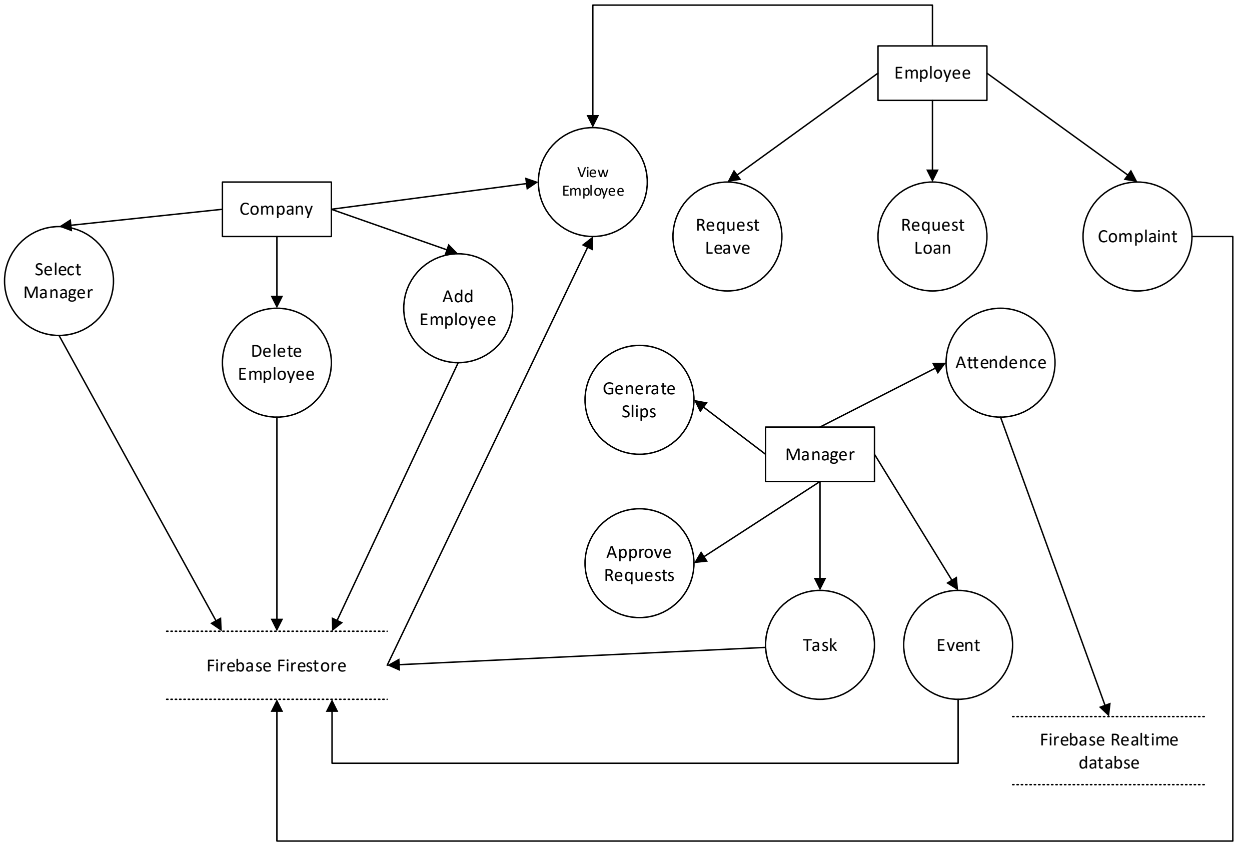


Figure 11 Level 1 DFD

Chapter 4

Implementation

Chapter 4: Implementation

4.1 System Implementation

4.1.1 Technology Stack:

- Programming Language: Kotlin
- Development Framework: Android SDK
- Database: Firebase Realtime Database and Firestore
- Authentication: Firebase Authentication
- Cloud Messaging: Firebase Cloud Messaging (FCM)
- Asynchronous Programming: Coroutines
- Architecture: Model-View-ViewModel (MVVM)
- UI Design: XML layouts with Android XML attributes and styles

4.1.2 System Architecture:

- The ERMS application follows a client-server architecture.
- The client-side consists of the Android application built using Kotlin and follows the MVVM architecture pattern.
- The server-side uses Firebase services for data storage, authentication, and cloud messaging.

4.2 Why I Choose these Technology Stack?

4.2.1 Kotlin:

- **Concise Syntax:** Kotlin offers a more concise syntax compared to Java, reducing boilerplate code and increasing code readability.
- **Null Safety:** Kotlin's type system includes built-in null safety features, reducing the risk of null pointer exceptions.
- **Interoperability:** Kotlin is fully interoperable with Java, allowing seamless integration with existing Java codebases and libraries.

4.2.2 Android SDK:

- **Comprehensive Toolset**: The Android SDK provides a wide range of tools and libraries for Android app development, including UI components, networking capabilities, database access, and more.
- **Platform Compatibility**: The SDK ensures compatibility with various Android versions and devices, enabling broad app distribution and support.

4.2.3 Firebase Realtime Database and Firestore:

- **Real-time Data Synchronization:** Firebase databases offer real-time data synchronization, enabling instant updates across devices. This feature is beneficial for real-time attendance tracking and updating employee records.
- **Offline Support:** Firebase databases provide offline support, allowing users to access and modify data even when they are offline. This ensures data consistency and usability in scenarios with limited or no internet connectivity.
- **Scalability and Performance:** Firebase databases are designed to handle large amounts of data and concurrent users, ensuring scalability and delivering optimal performance for your ERMS application.

4.2.4 Firebase Authentication:

- **Easy User Management:** Firebase Authentication simplifies user registration, login, and management by providing ready-to-use authentication methods and UI components.
- **Secure Authentication:** Firebase Authentication ensures secure authentication and protects user credentials with robust security mechanisms.
- **Integration with Other Firebase Services:** Firebase Authentication seamlessly integrates with other Firebase services, enabling enhanced functionality and data access control based on user authentication.

4.2.5 Firebase Cloud Messaging (FCM):

- **Reliable Messaging Infrastructure:** FCM provides a reliable and scalable messaging infrastructure for sending push notifications to users' devices.

- **User Engagement:** Push notifications sent through FCM help keep users engaged by providing updates, reminders, and important information about rewards, tasks, events, and announcements in the ERMS application.

4.2.6 Coroutines:

- **Asynchronous Programming:** Coroutines simplify asynchronous programming by providing a structured and sequential approach, making code more readable and maintainable.
- **Concurrency Efficiency:** Coroutines optimize resource utilization by minimizing the number of threads required for concurrent operations, resulting in improved performance and reduced resource overhead.

4.2.7 Model-View-ViewModel (MVVM) Architecture:

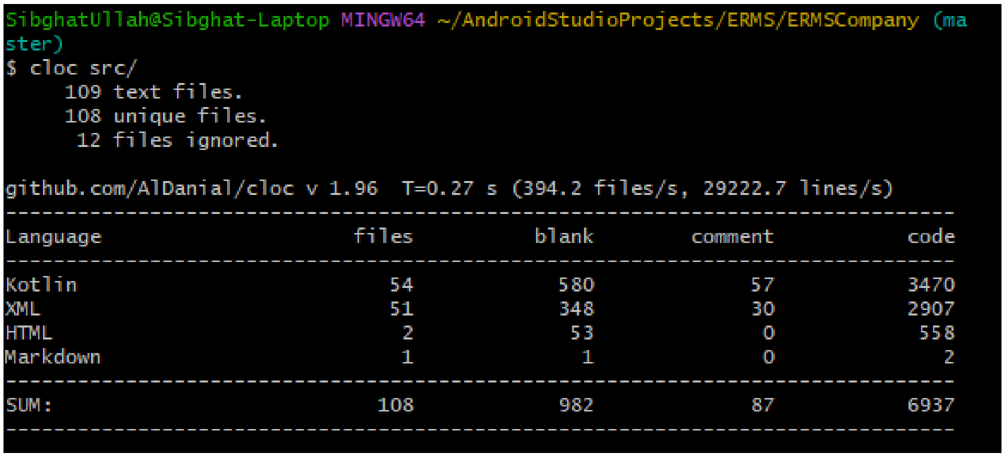
- **Separation of Concerns:** MVVM architecture separates the user interface (View) from the business logic (ViewModel) and data (Model), promoting modular and maintainable code.
- **Testability:** MVVM facilitates unit testing as the business logic resides in the ViewModel, which can be tested independently of the UI.
- **Code Reusability:** With MVVM, Views and ViewModels can be decoupled, allowing for code reusability across different screens and reducing duplication.

4.2.8 XML for UI Design:

- **Declarative UI Design:** XML provides a declarative approach to UI design, allowing developers to define the structure, appearance, and behavior of UI components in a clear and concise manner.
- **Separation of UI and Code:** XML enables a clear separation between UI layout and code logic, making it easier to maintain and update the user interface independently from the business logic.
- **Flexibility:** XML layouts provide flexibility in designing complex user interfaces, allowing for customization and adaptation to different screen sizes and orientations.

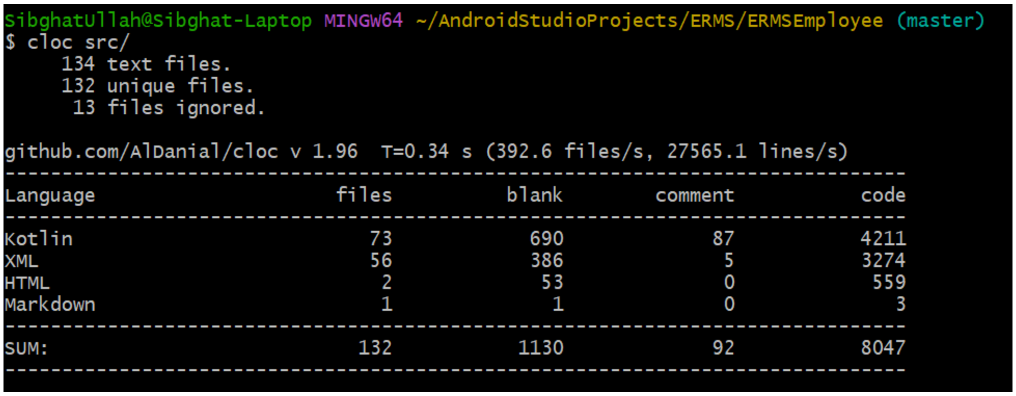
The **ERMS** app is a collection of Activities and Fragments that are presented to the user. These Activities and Fragment have associate XML files (Layouts) declared in the layout folder which determine the graphical interface for these components. The **ERMS** app also contains other

Service and Broadcast Receivers along with the declarations and necessary permissions in the Manifest file in the root directory of the project. The overall project files, LOC are other information as follows. This information is generated by famous tool cloc (Count Lines of Code).



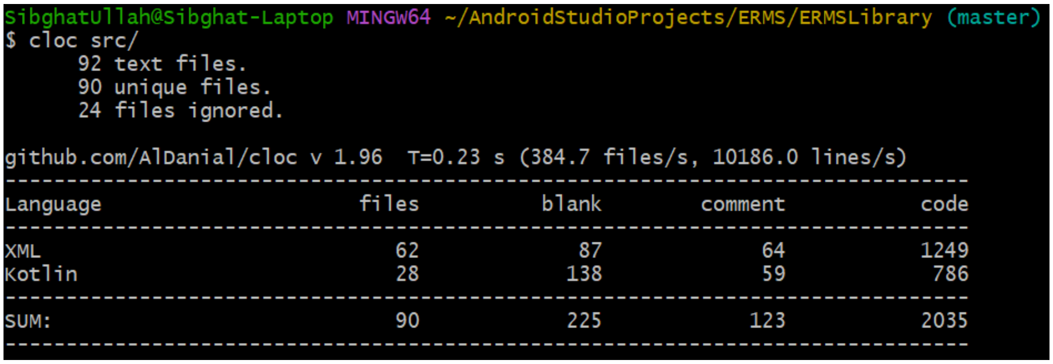
```
SibghatUllah@Sibghat-Laptop MINGW64 ~/AndroidStudioProjects/ERMS/ERMSCompany (ma
ster)
$ cloc src/
     109 text files.
     108 unique files.
      12 files ignored.

github.com/AlDanial/cloc v 1.96  T=0.27 s (394.2 files/s, 29222.7 lines/s)
-------------------------------------------------------------------------------
Language                     files          blank        comment           code
-------------------------------------------------------------------------------
Kotlin                          54            580             57           3470
XML                             51            348             30           2907
HTML                             2             53              0            558
Markdown                         1              1              0              2
-------------------------------------------------------------------------------
SUM:                           108            982             87           6937
-------------------------------------------------------------------------------
```

Figure 12 LOC of Company Module



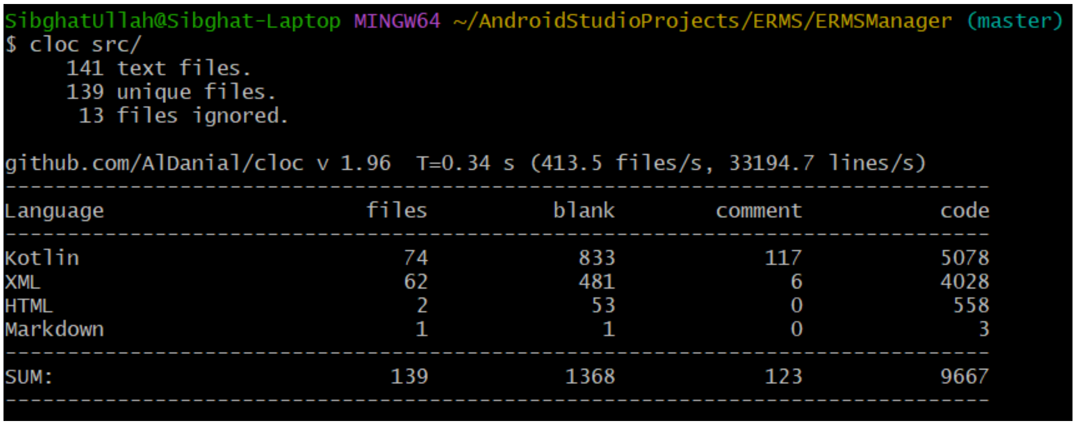
```
SibghatUllah@Sibghat-Laptop MINGW64 ~/AndroidStudioProjects/ERMS/ERMSEmployee (master)
$ cloc src/
     134 text files.
     132 unique files.
      13 files ignored.

github.com/AlDanial/cloc v 1.96  T=0.34 s (392.6 files/s, 27565.1 lines/s)
-------------------------------------------------------------------------------
Language                     files          blank        comment           code
-------------------------------------------------------------------------------
Kotlin                          73            690             87           4211
XML                             56            386              5           3274
HTML                             2             53              0            559
Markdown                         1              1              0              3
-------------------------------------------------------------------------------
SUM:                           132           1130             92           8047
-------------------------------------------------------------------------------
```

Figure 13 LOC of Employee Module



```
SibghatUllah@Sibghat-Laptop MINGW64 ~/AndroidStudioProjects/ERMS/ERMSLibrary (master)
$ cloc src/
      92 text files.
      90 unique files.
      24 files ignored.

github.com/AlDanial/cloc v 1.96  T=0.23 s (384.7 files/s, 10186.0 lines/s)
-------------------------------------------------------------------------------
Language                     files          blank        comment           code
-------------------------------------------------------------------------------
XML                             62             87             64           1249
Kotlin                          28            138             59            786
-------------------------------------------------------------------------------
SUM:                            90            225            123           2035
-------------------------------------------------------------------------------
```

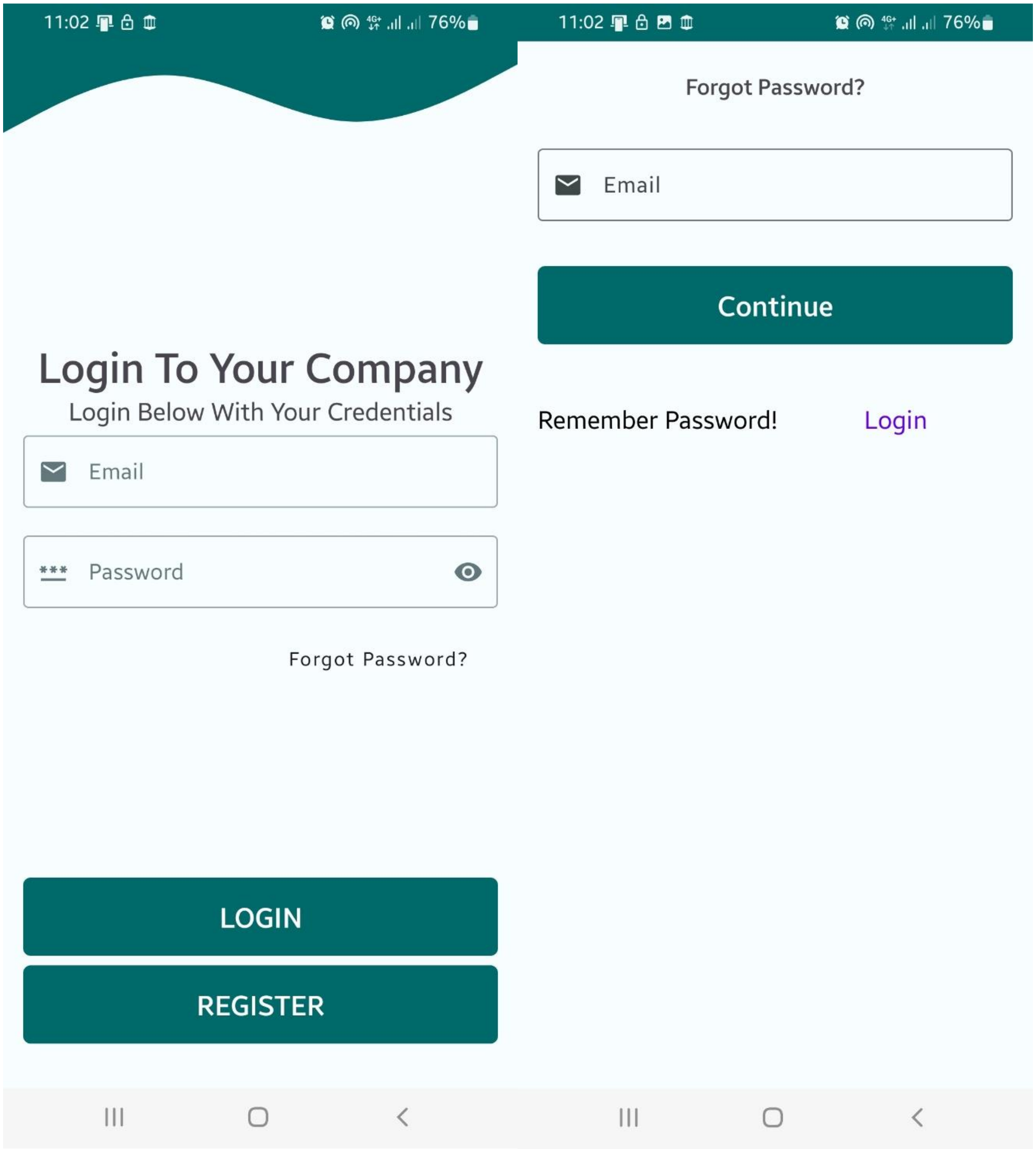
Figure 14 LOC of ERMS Library



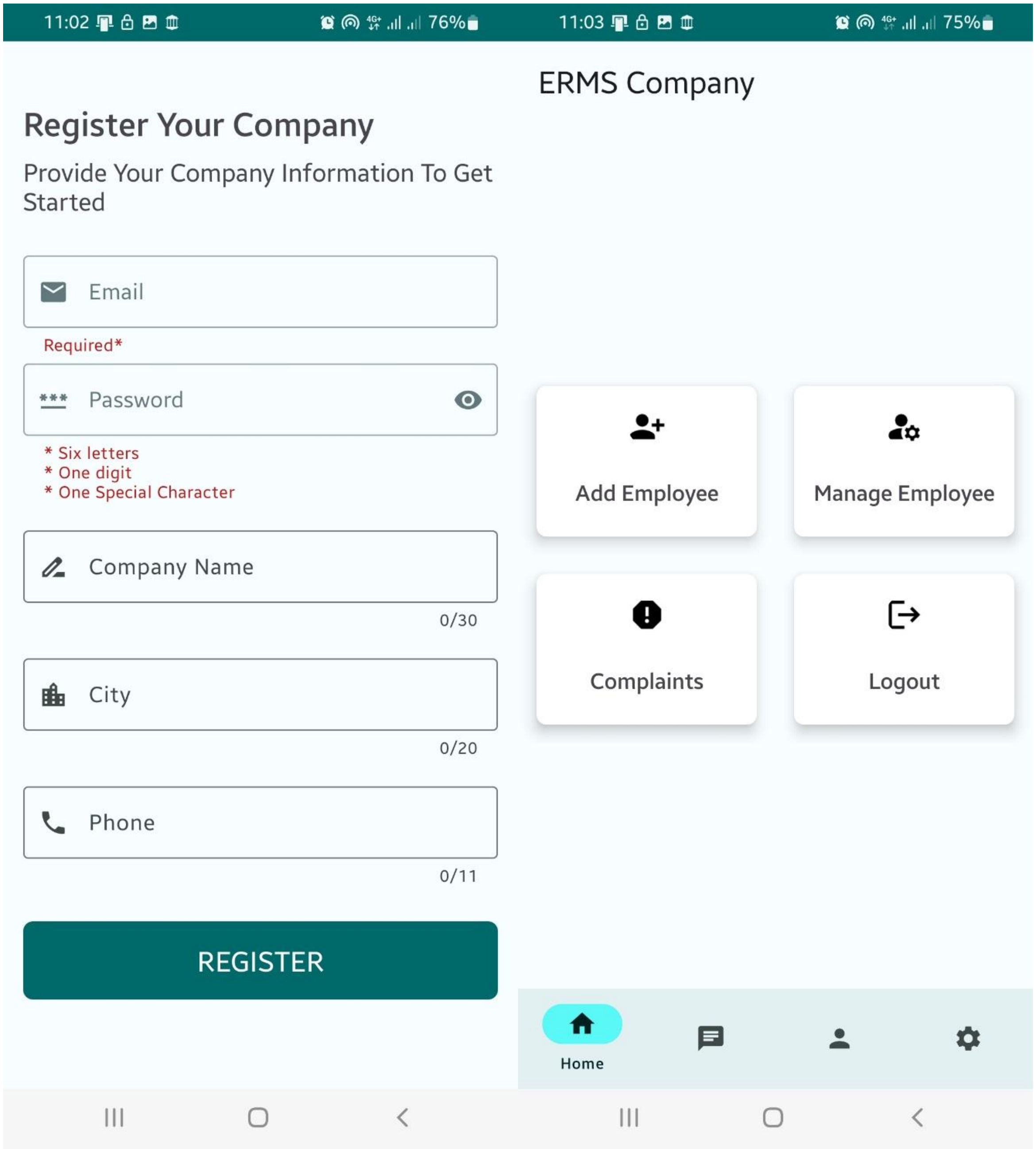
```
SibghatUllah@Sibghat-Laptop MINGW64 ~/AndroidStudioProjects/ERMS/ERMSManager (master)
$ cloc src/
     141 text files.
     139 unique files.
      13 files ignored.

github.com/AlDanial/cloc v 1.96  T=0.34 s (413.5 files/s, 33194.7 lines/s)
-------------------------------------------------------------------------------
Language                     files          blank        comment           code
-------------------------------------------------------------------------------
Kotlin                          74            833            117           5078
XML                             62            481              6           4028
HTML                             2             53              0            558
Markdown                         1              1              0              3
-------------------------------------------------------------------------------
SUM:                           139           1368            123           9667
-------------------------------------------------------------------------------
```

Figure 15 LOC of Manager Module

4.3 Graphical User Interface of Company Module:



Login and Forgot password screens for all modules. Company can register or login their account from this screen.



Register Your Company

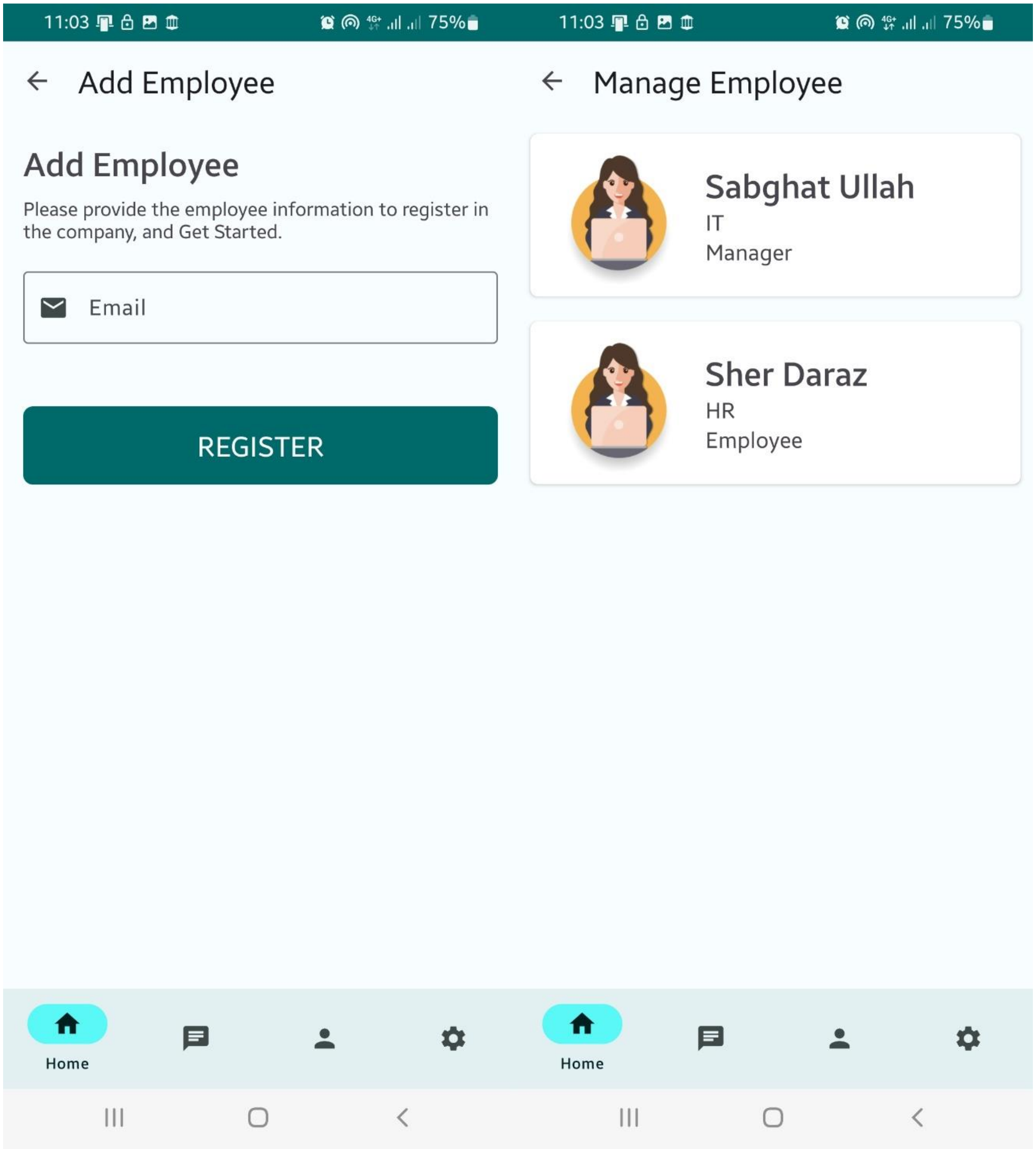
Provide Your Company Information To Get Started

Required*

* Six letters
* One digit
* One Special Character

ERMS Company

Registration screen and Home screen. Company can register their company. And from Home screen company can use multiple features of ERMS Company module.



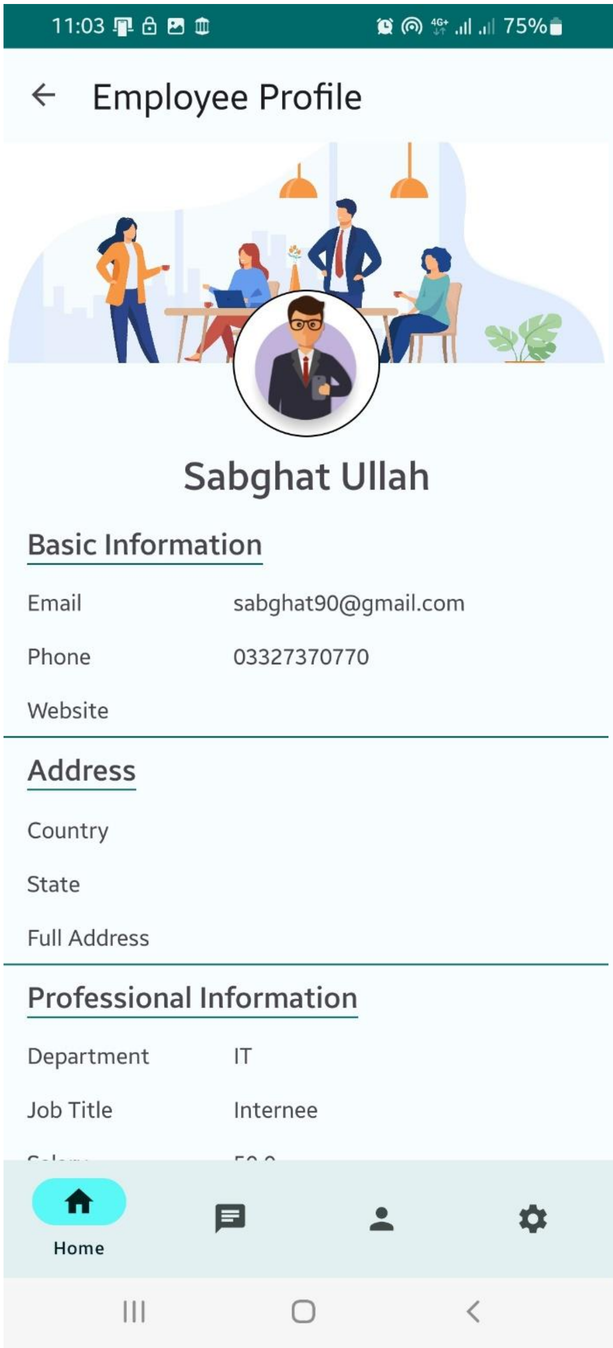
Add Employee

Please provide the employee information to register in the company, and Get Started.

Sabghat Ullah
IT
Manager

Sher Daraz
HR
Employee

From Add Employee screen company can put the employee email and add them to company. From Manage Employee Screen company see the added employee and their full profile.



11:03 75%

Employee Profile

Sabghat Ullah

Basic Information

Email sabghat90@gmail.com

Phone 03327370770

Website

Address

Country

State

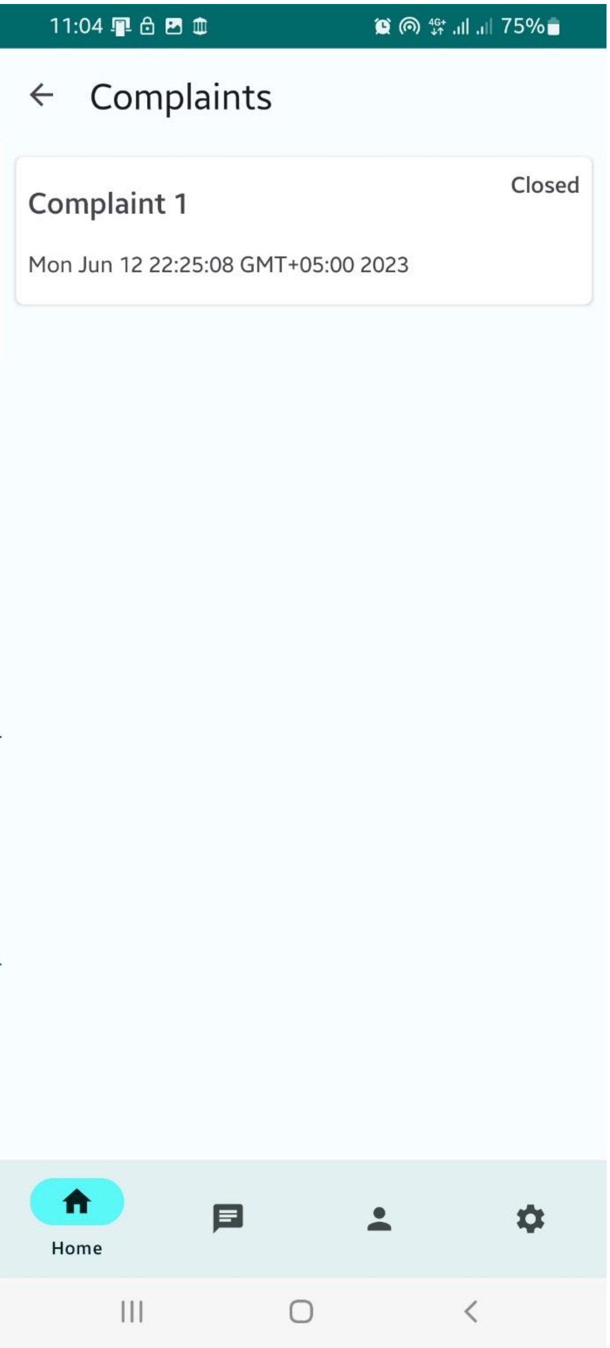
Full Address

Professional Information

Department IT

Job Title Internee

Salary 50.0



11:04 75%

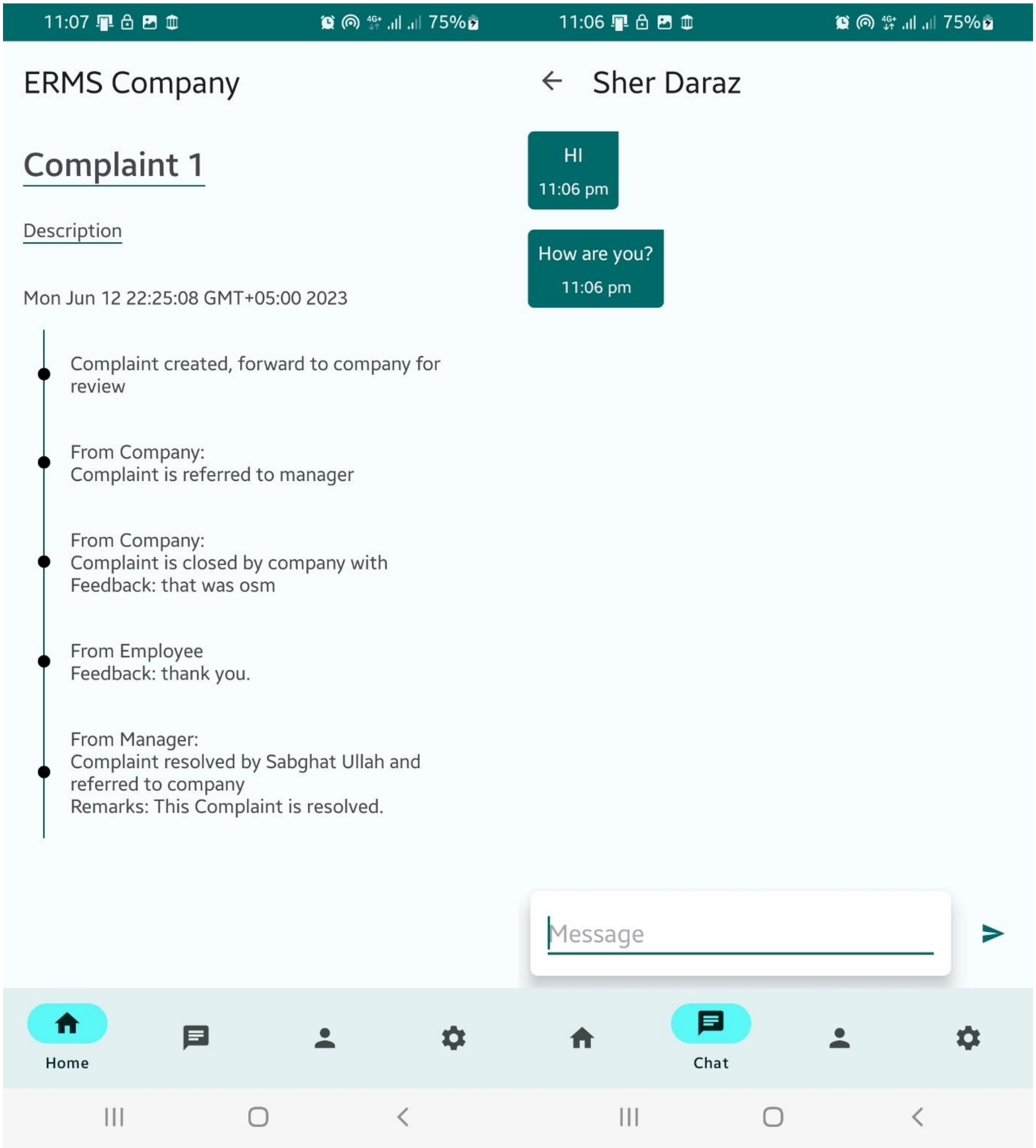
Complaints

Complaint 1 Closed

Mon Jun 12 22:25:08 GMT+05:00 2023

From Profile screen company can see employee profile, and select them Manager. If want to remove can remove them.

From Complaints screen company can see list of complaints.



11:07 75%

ERMS Company

Complaint 1

Description

Mon Jun 12 22:25:08 GMT+05:00 2023

- Complaint created, forward to company for review
- From Company:
Complaint is referred to manager
- From Company:
Complaint is closed by company with Feedback: that was osm
- From Employee
Feedback: thank you.
- From Manager:
Complaint resolved by Sabghat Ullah and referred to company
Remarks: This Complaint is resolved.

11:06 75%

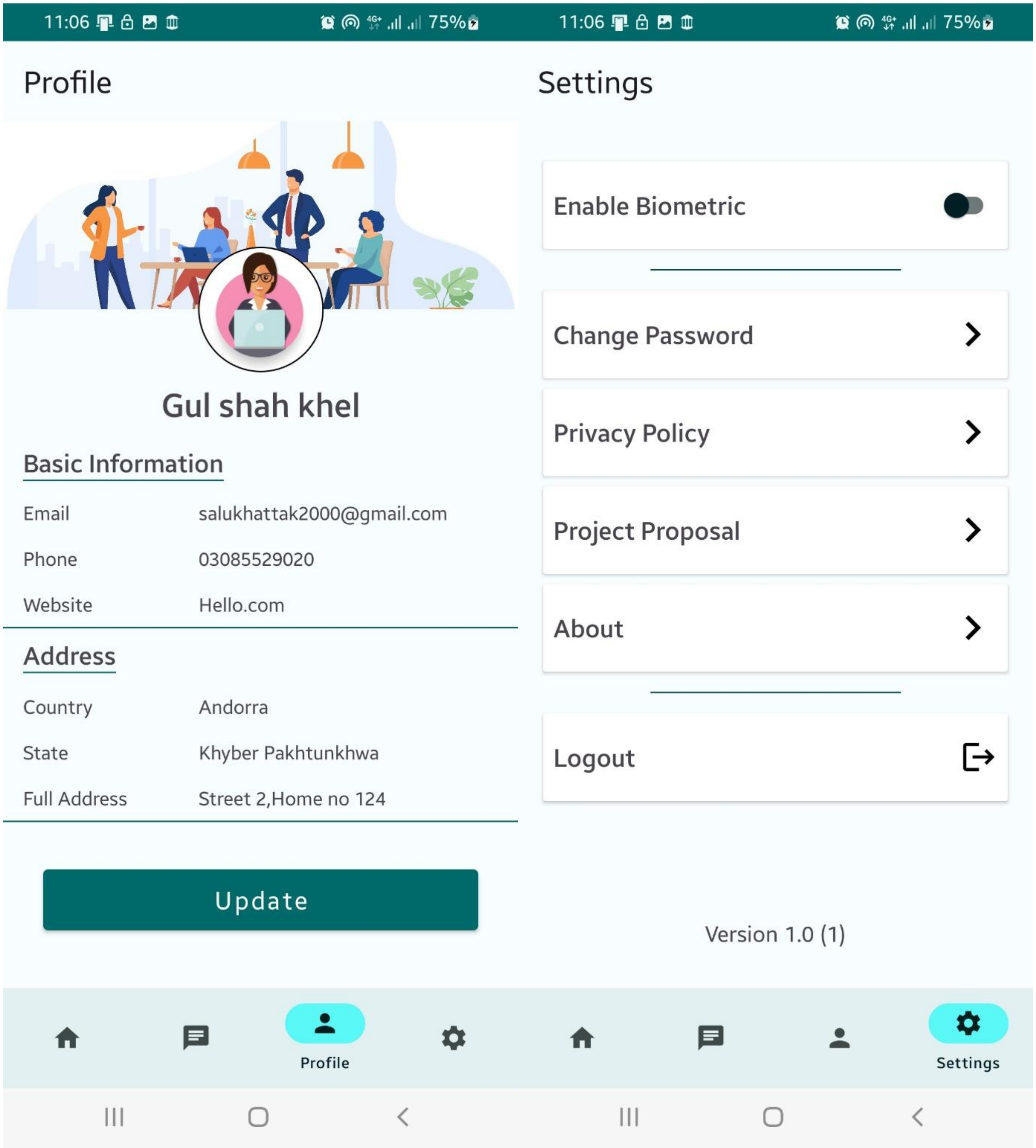
Sher Daraz

HI
11:06 pm

How are you?
11:06 pm

From the Complaint Details screen company can the Complaint full details and track full history of the complaints.

From the second screen company can interact with employees, Chat Feature.



Gul shah khel

Basic Information

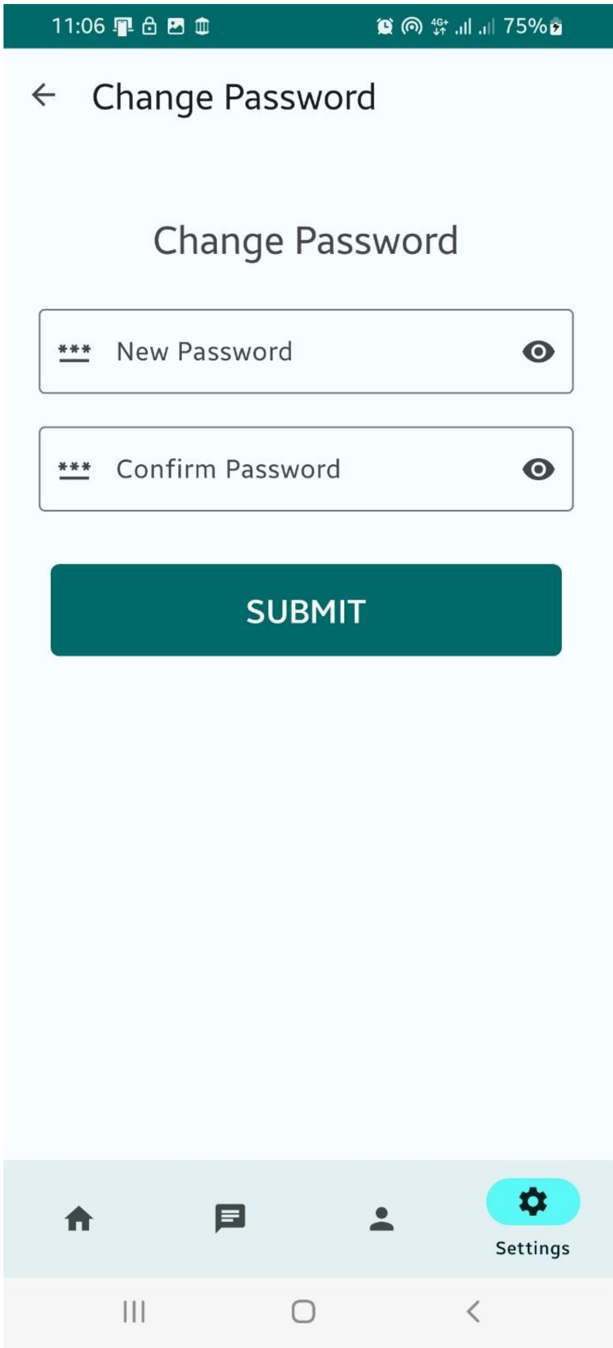
Email	salukhattak2000@gmail.com
Phone	03085529020
Website	Hello.com

Address

Country	Andorra
State	Khyber Pakhtunkhwa
Full Address	Street 2,Home no 124

From Profile Screen company can see his profile and update their profile.

From Settings screen company can select multiple options.

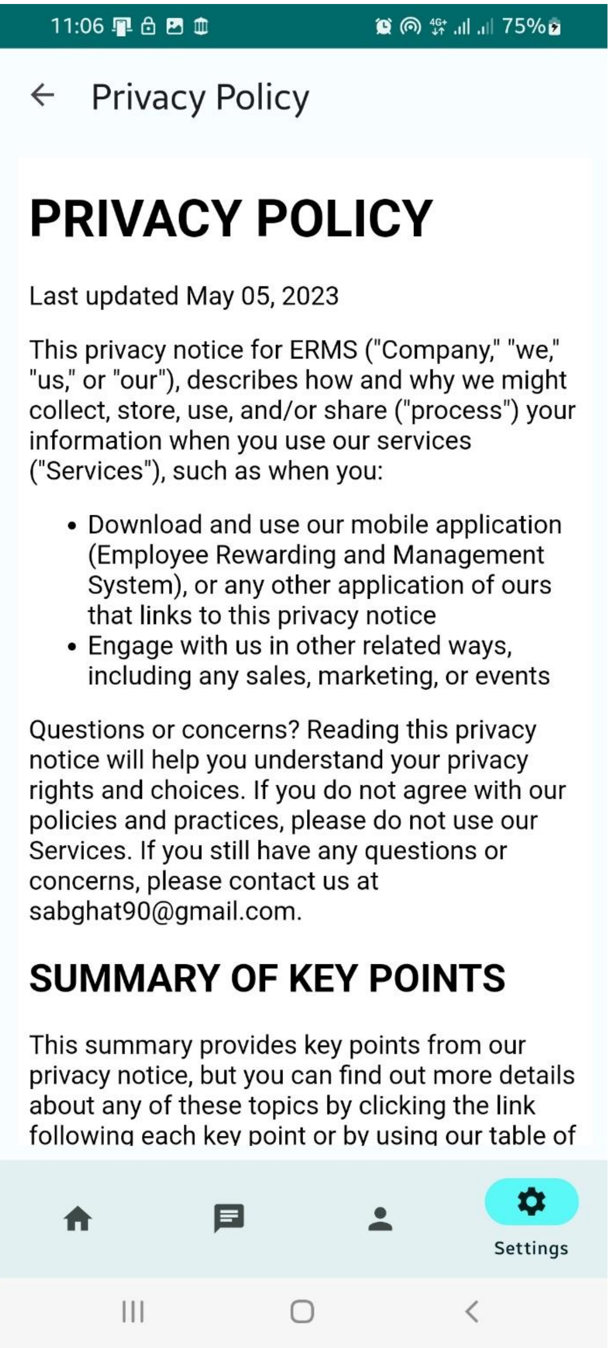


Change Password

New Password

Confirm Password

SUBMIT



PRIVACY POLICY

Last updated May 05, 2023

This privacy notice for ERMS ("Company," "we," "us," or "our"), describes how and why we might collect, store, use, and/or share ("process") your information when you use our services ("Services"), such as when you:

- Download and use our mobile application (Employee Rewarding and Management System), or any other application of ours that links to this privacy notice
- Engage with us in other related ways, including any sales, marketing, or events

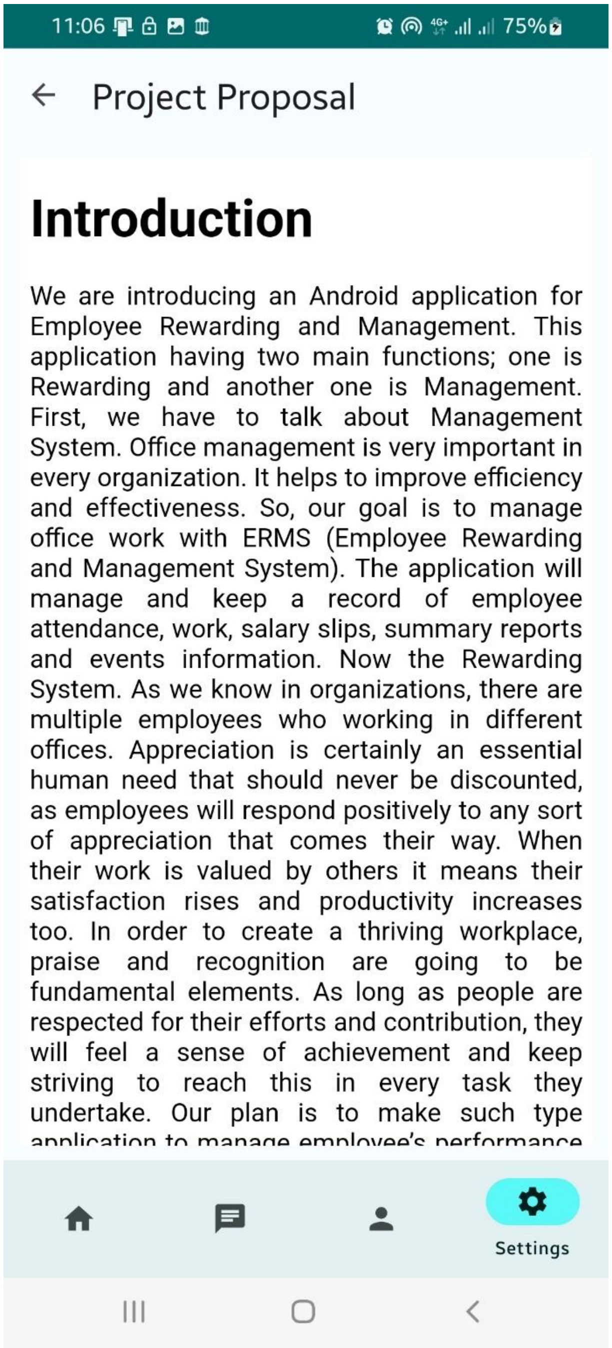
Questions or concerns? Reading this privacy notice will help you understand your privacy rights and choices. If you do not agree with our policies and practices, please do not use our Services. If you still have any questions or concerns, please contact us at sabghat90@gmail.com.

SUMMARY OF KEY POINTS

This summary provides key points from our privacy notice, but you can find out more details about any of these topics by clicking the link following each key point or by using our table of

Company can Change their password.

Can see the company privacy policy.



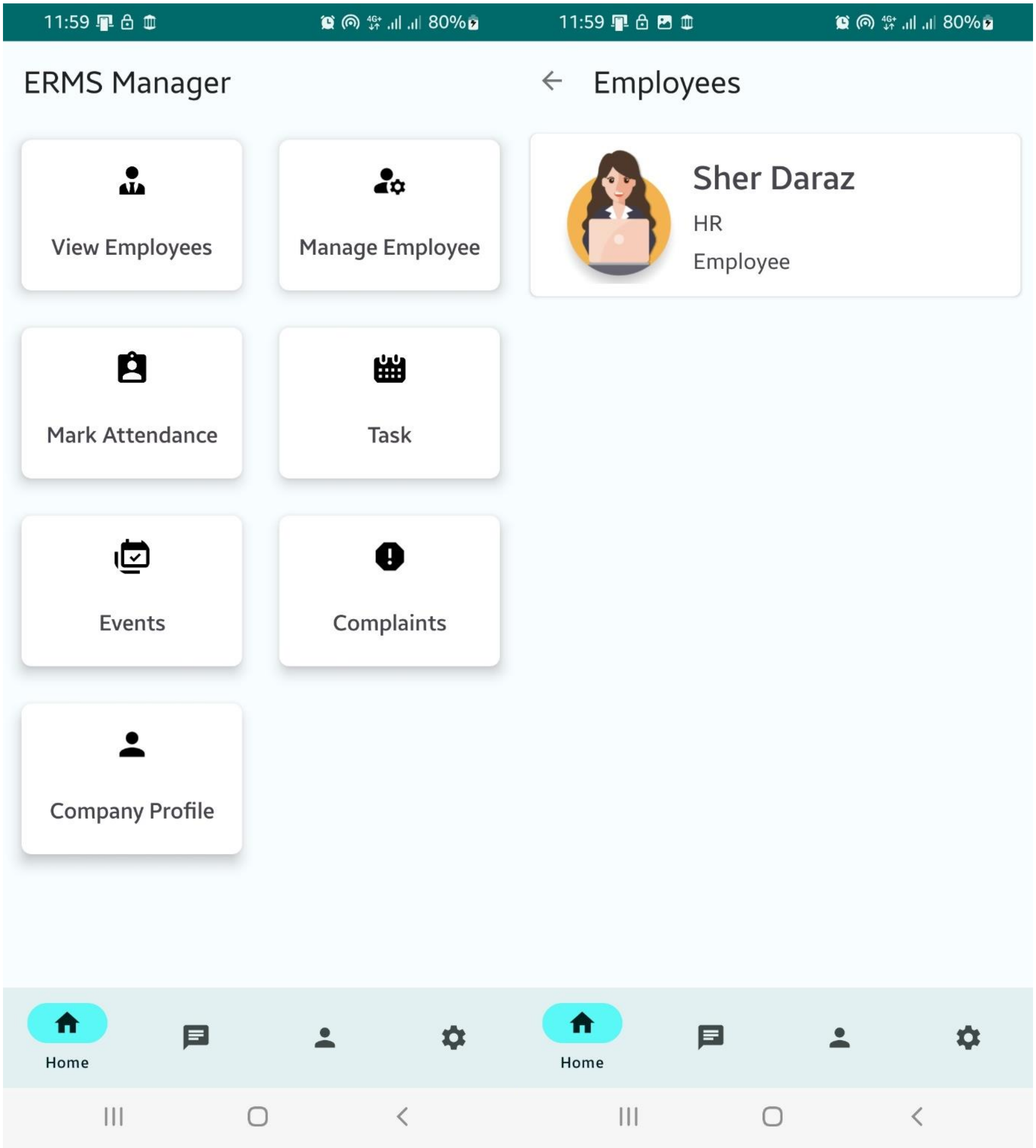
Project Proposal

Introduction

We are introducing an Android application for Employee Rewarding and Management. This application having two main functions; one is Rewarding and another one is Management. First, we have to talk about Management System. Office management is very important in every organization. It helps to improve efficiency and effectiveness. So, our goal is to manage office work with ERMS (Employee Rewarding and Management System). The application will manage and keep a record of employee attendance, work, salary slips, summary reports and events information. Now the Rewarding System. As we know in organizations, there are multiple employees who working in different offices. Appreciation is certainly an essential human need that should never be discounted, as employees will respond positively to any sort of appreciation that comes their way. When their work is valued by others it means their satisfaction rises and productivity increases too. In order to create a thriving workplace, praise and recognition are going to be fundamental elements. As long as people are respected for their efforts and contribution, they will feel a sense of achievement and keep striving to reach this in every task they undertake. Our plan is to make such type application to manage employee's performance

This is the overall proposal of the FYP.

4.4 Graphical User interface of Manager Module:



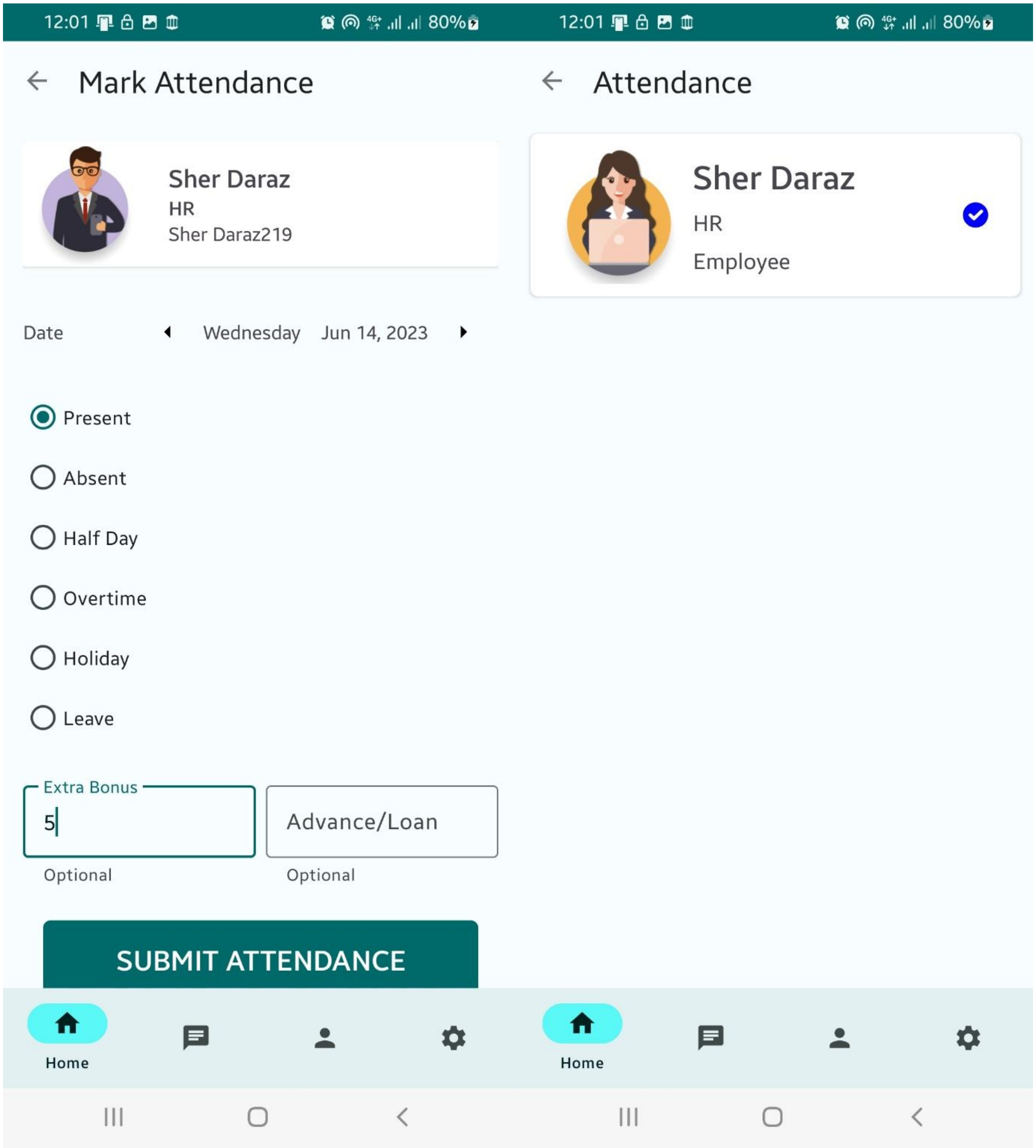
ERMS Manager

Employees

Sher Daraz
HR
Employee

The left one screen is the Manager Home screen, from here manager can select multiple features as per need.

On the second Employee Screen manager can see the overall employees of the company.



Mark Attendance

Sher Daraz
HR
Sher Daraz219

Date ◂ Wednesday Jun 14, 2023 ▸

● Present

○ Absent

○ Half Day

○ Overtime

○ Holiday

○ Leave

Extra Bonus: 5
Optional

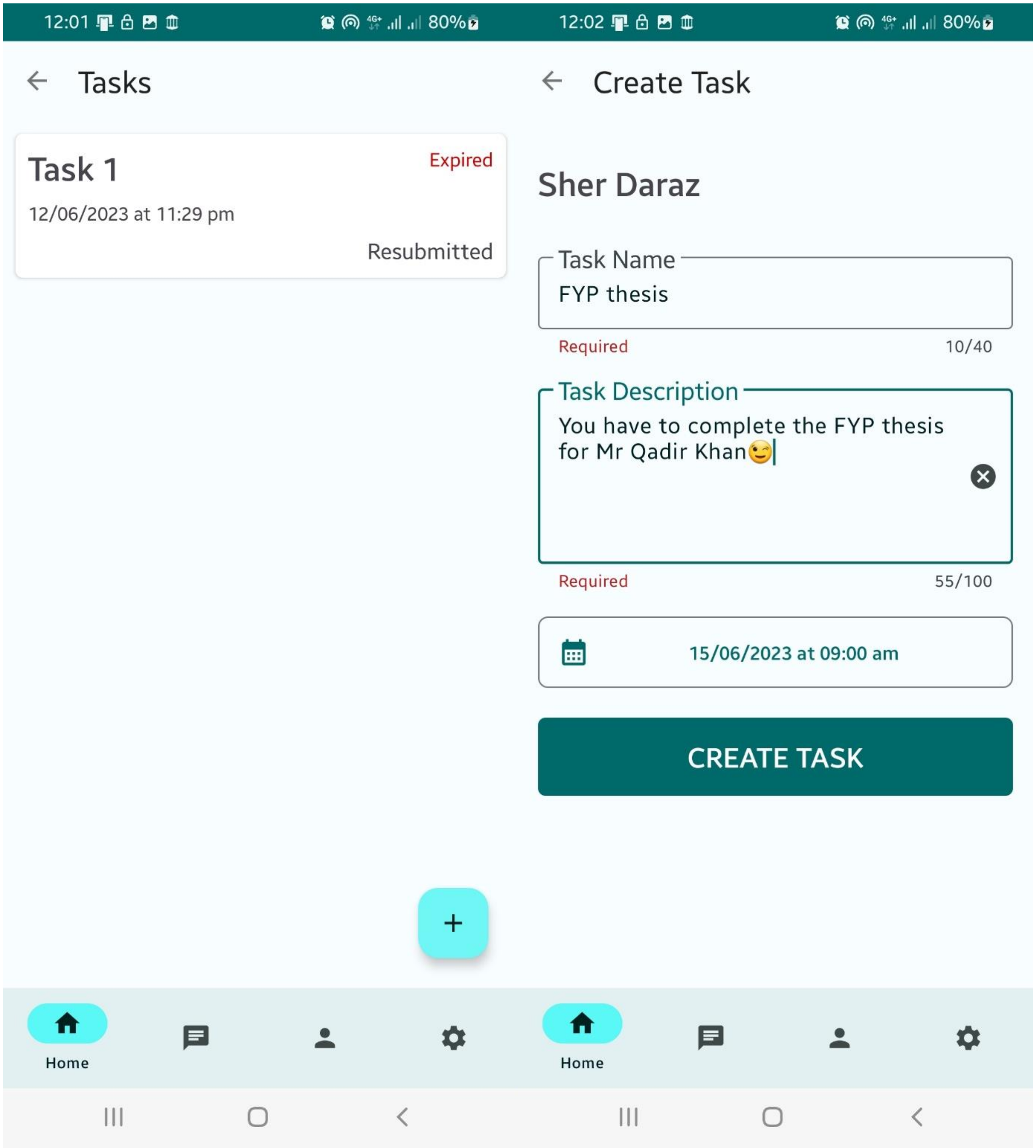
Advance/Loan
Optional

Attendance

Sher Daraz
HR
Employee ✓

From Mark Attendance screen manager can mark employee’s attendance, and submit them.

On second screen manager can see the marked attendance employees.



Task 1 — Expired

12/06/2023 at 11:29 pm

Resubmitted

Sher Daraz

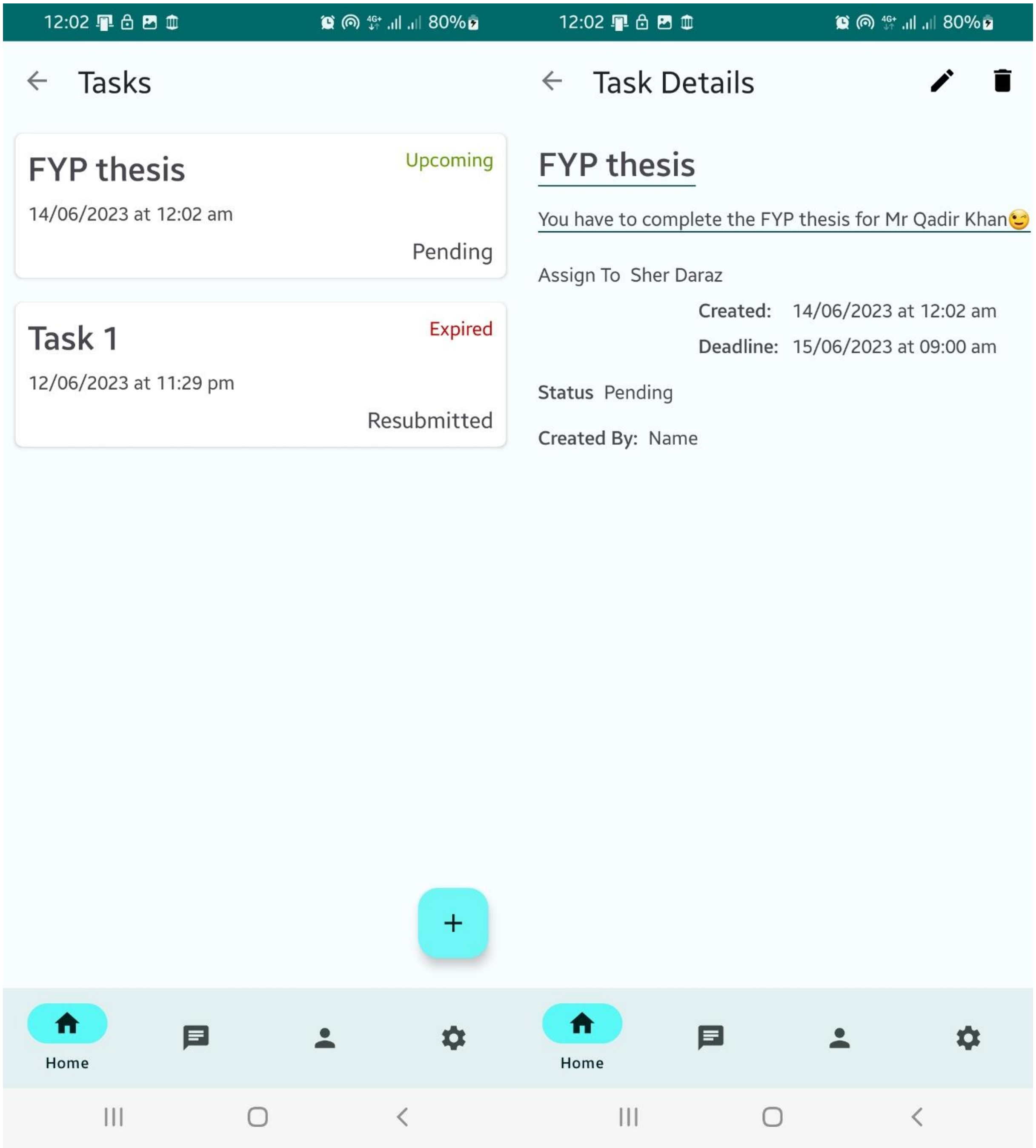
Task Name: FYP thesis

Required 10/40

Task Description: You have to complete the FYP thesis for Mr Qadir Khan😉

Required 55/100

15/06/2023 at 09:00 am



FYP thesis
Upcoming
14/06/2023 at 12:02 am
Pending

Task 1
Expired
12/06/2023 at 11:29 pm
Resubmitted

FYP thesis

You have to complete the FYP thesis for Mr Qadir Khan😉

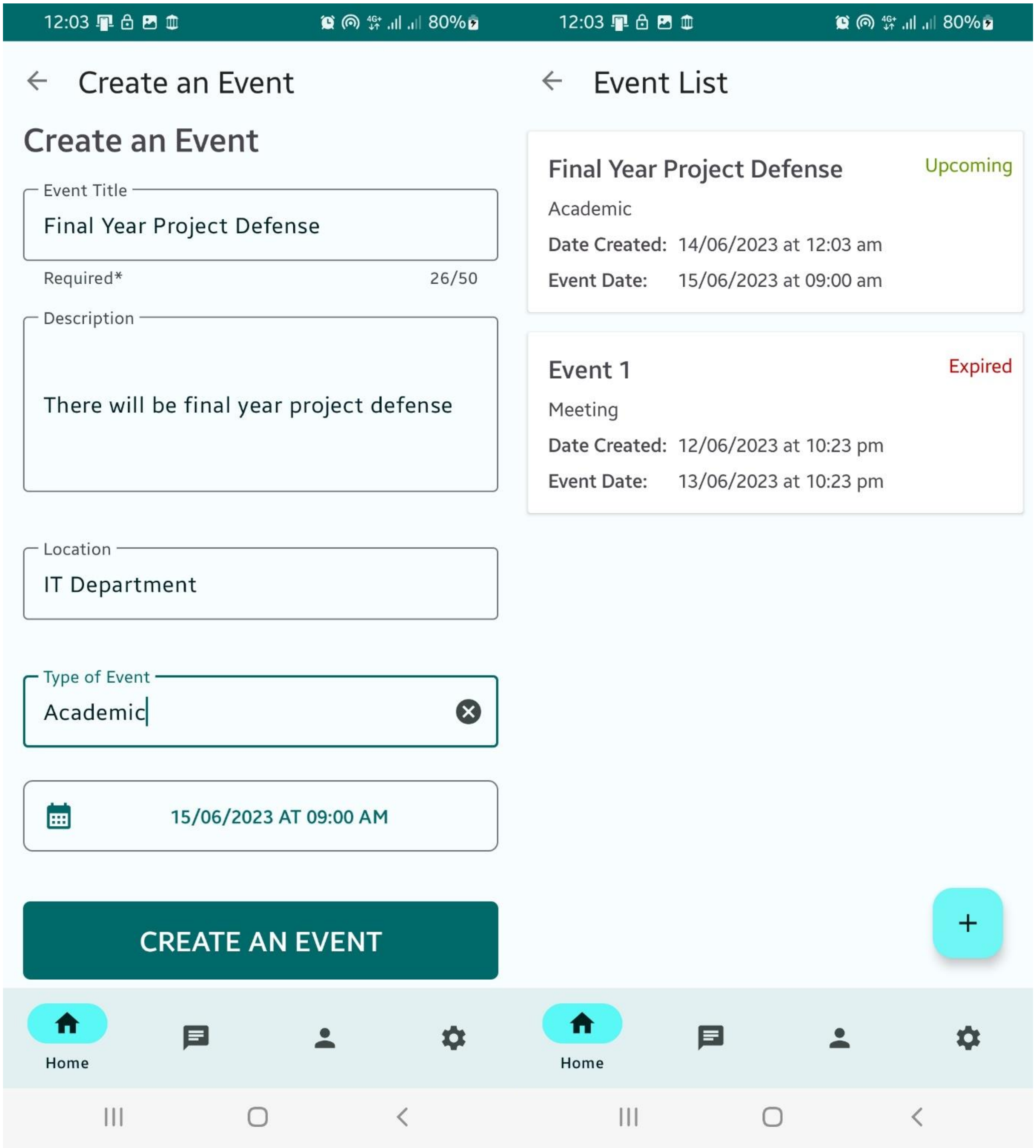
Assign To Sher Daraz

Created: 14/06/2023 at 12:02 am

Deadline: 15/06/2023 at 09:00 am

Status Pending

Created By: Name



Create an Event

Create an Event

Event Title: Final Year Project Defense

Required* 26/50

Description: There will be final year project defense

Location: IT Department

Type of Event: Academic

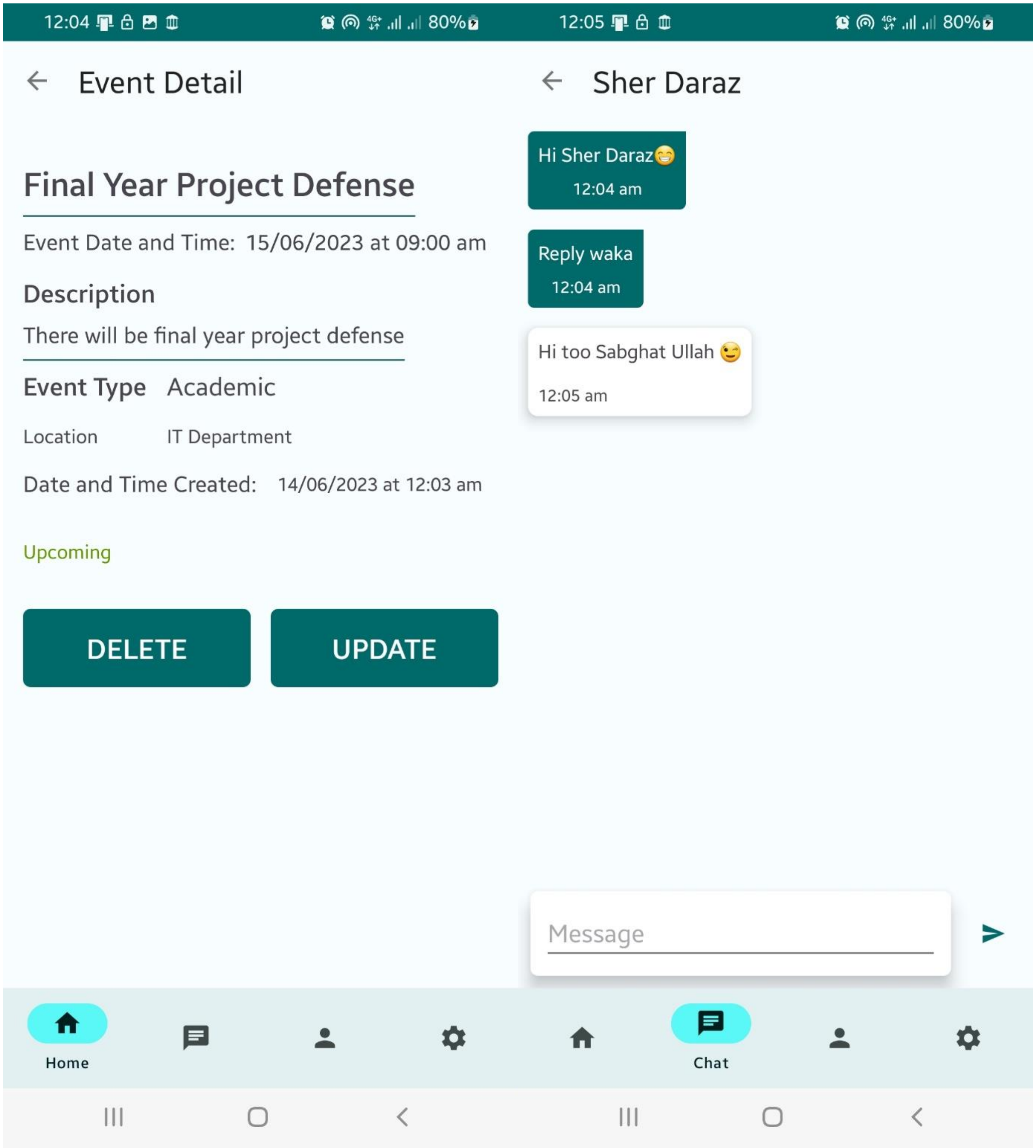
15/06/2023 AT 09:00 AM

CREATE AN EVENT

Event List

Final Year Project Defense Upcoming
Academic
Date Created: 14/06/2023 at 12:03 am
Event Date: 15/06/2023 at 09:00 am

Event 1 Expired
Meeting
Date Created: 12/06/2023 at 10:23 pm
Event Date: 13/06/2023 at 10:23 pm



Final Year Project Defense

Event Date and Time: 15/06/2023 at 09:00 am

Description

There will be final year project defense

Event Type Academic

Location IT Department

Date and Time Created: 14/06/2023 at 12:03 am

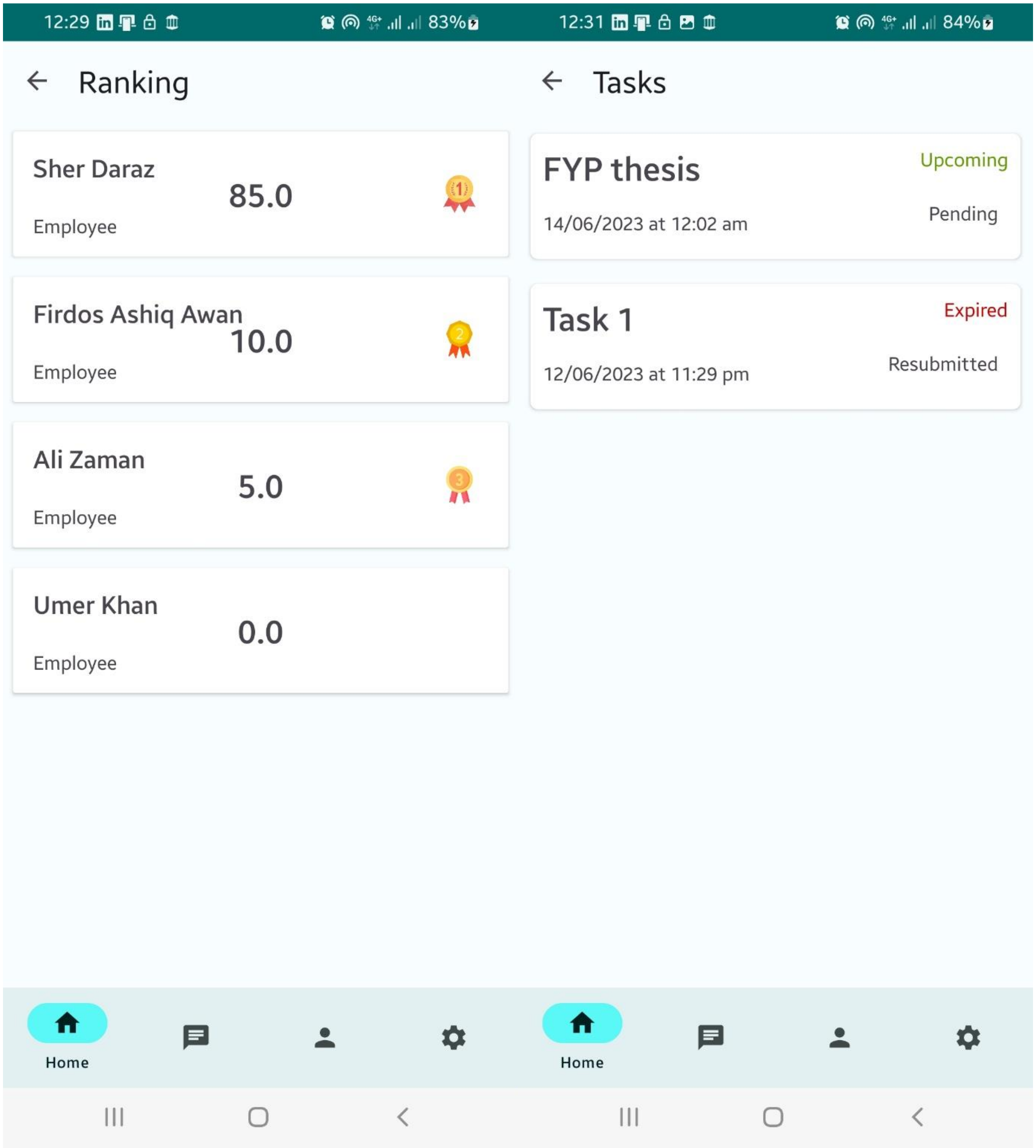
Upcoming

Hi Sher Daraz😁
12:04 am

Reply waka
12:04 am

Hi too Sabghat Ullah 😉
12:05 am

Graphical User Interface of Employee Module:



Ranking

Sher Daraz 85.0
Employee

Firdos Ashiq Awan 10.0
Employee

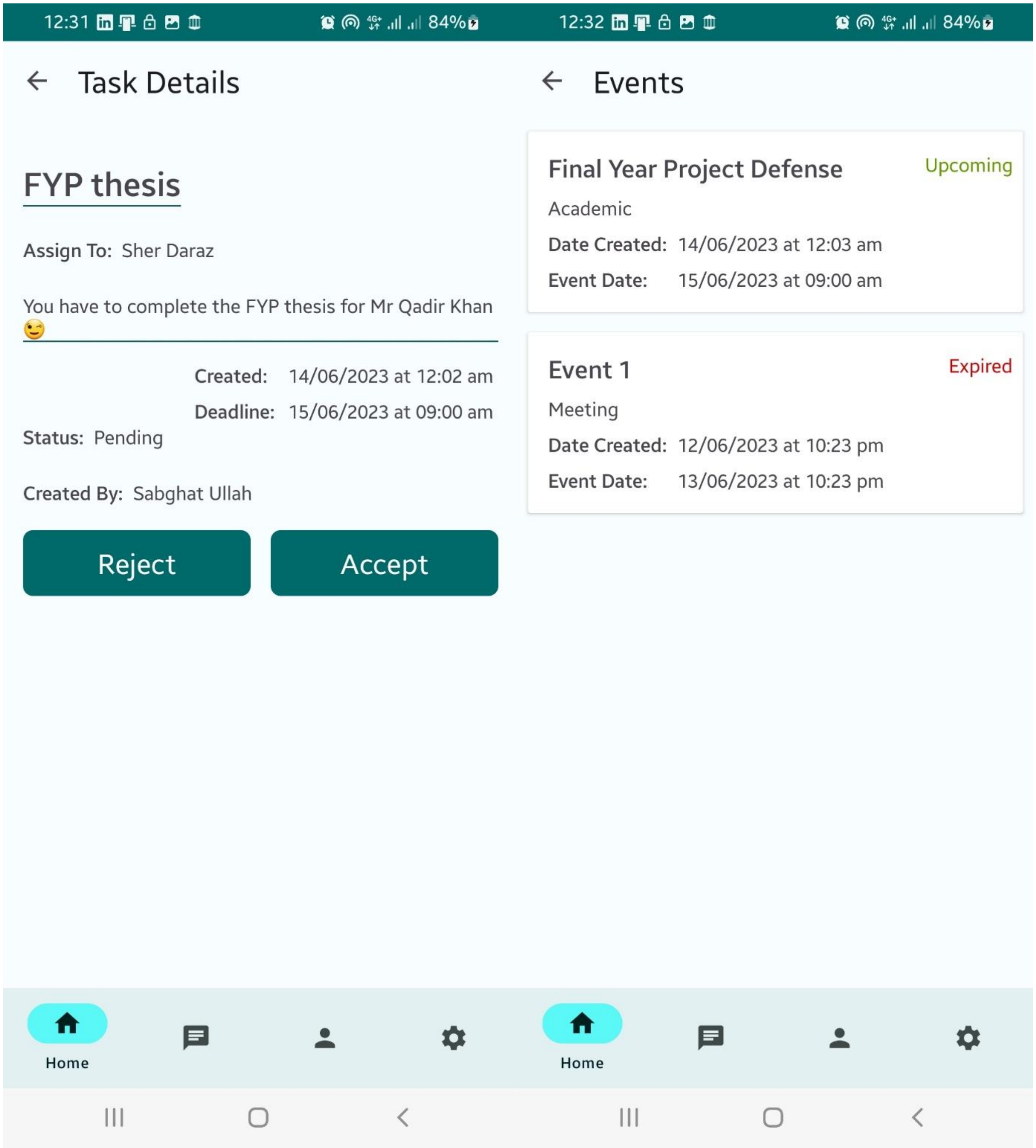
Ali Zaman 5.0
Employee

Umer Khan 0.0
Employee

Tasks

FYP thesis — Upcoming
14/06/2023 at 12:02 am — Pending

Task 1 — Expired
12/06/2023 at 11:29 pm — Resubmitted



Task Details

FYP thesis

Assign To: Sher Daraz

You have to complete the FYP thesis for Mr Qadir Khan 😉

Created: 14/06/2023 at 12:02 am

Deadline: 15/06/2023 at 09:00 am

Status: Pending

Created By: Sabghat Ullah

Events

Final Year Project Defense — Upcoming

Academic

Date Created: 14/06/2023 at 12:03 am

Event Date: 15/06/2023 at 09:00 am

Event 1 — Expired

Meeting

Date Created: 12/06/2023 at 10:23 pm

Event Date: 13/06/2023 at 10:23 pm

Chapter 5

Testing

Chapter 5: Testing

Testing is a crucial phase in the development of the Employee Rewarding and Management System (ERMS) application. It ensures that the system meets both its functional and non-functional requirements, ensuring its effectiveness and reliability.

In software testing, two important concepts are Verification and Validation. Verification involves evaluating the work-products such as requirement specifications, design specifications, and test cases throughout different development phases. This process ensures that each phase meets the specific requirements and standards, confirming that the system is built correctly. On the other hand, Validation involves evaluating the final software product to ensure it meets the business requirements and intended use. This step confirms that the end product is built correctly and fulfills its intended purpose.

The Android Studio debugger is a powerful feature within the Android development environment. It enables developers to analyze the application's code execution, identify and fix errors, and gain insights into the application's behavior during runtime. By leveraging the Android Studio debugger, you can closely examine variables, breakpoints, and step through the code to understand and address any issues that may arise.

During the testing phase, you will use the Android Studio debugger to track the flow of the application's execution, identify potential bugs, and validate the correctness of the code. The debugger will help you analyze the application's behavior, view variable values, and observe the stack trace for any exceptions that occur. By utilizing the Android Studio debugger, you can effectively debug and resolve issues in your ERMS application, ensuring its stability, reliability, and adherence to the desired functionality.

In addition to the Android Studio debugger, you will also employ various testing strategies, such as unit testing, integration testing, and possibly automated testing frameworks, to comprehensively evaluate the different components and features of the ERMS application. These testing approaches will help validate the application's behavior, verify the accuracy of its functions, and ensure that it meets the specified requirements.

By utilizing the Android Studio debugger and implementing a comprehensive testing approach, you can effectively identify and rectify any issues in your ERMS application, enhancing its quality, performance, and user experience.

5.1 Unit Testing:

Unit testing for the Employee Rewarding and Management System (ERMS) involves testing individual components or units of code in isolation to ensure their correctness and functionality. It helps catch bugs early, ensures component isolation, improves code quality, facilitates refactoring, and serves as living documentation for the codebase. By implementing unit testing, you can enhance the reliability and stability of the ERMS application.

Table 1 Unit Test / Login Screen

S.No	Test Case	Pre-Condition	Post-Condition	Result
01	Clicking Login Button	Email and password files are empty	Show notifications to enter email and password	Pass
02	Clicking Login Button	Email and password are entered	Should proceed to authentication	Pass
03	Clicking Register Button	All the necessary fields are empty	Show errors to fill all the fields	Pass

Table 2 Unit Test / Login Screen

Pre-Condition	User must enter valid email and password
Purpose	Can the login screen perform the task
Input data	Email: Sabghat90@gmail.com Password: 123456
Post-Condition	User should authenticate and navigate to Home Activity
Result	Pass

Table 3 Unit Test / Register Screen

Pre-condition	User must fill all fields
Purpose	Can register screen perform the task?
Input data	Email: sabghat90@gmail.com Password: 123456 Company Name: KUST City: Kohat Phone: 03331234567
Post-condition	Company should register successfully
Result	Pass

Table 4 Unit Test / Add Employee

Pre-condition	Employee must be added to company
Purpose	To see whether the employee is adding or not?
Input data	Email: employee1@gmail.com
Post-condition	Employee should register in company
Result	Pass

Table 5 Unit Test / Complaint

Pre-condition	Company must able to forward complaint to manager
Purpose	To be able to forward
Input data	Click on forward to management
Post-condition	Complaint should forward
Result	Pass

Table 6 Unit Test / Biometric

Pre-condition	Company must be able to enable or disable biometric
Purpose	To check biometric
Input data	Enable
Post-condition	Should be enable biometric

Result	Pass

Table 7 Unit Test / Logout

S.No	Test case	Pre-condition	Post-condition	Result
1	Clicking on logout	Should logout	Logout	Pass

5.2 Component Testing

Component testing, also known as unit testing, is a level of software testing that focuses on testing individual components or units of a system in isolation. A component refers to the smallest testable part of a software application, such as a function, method, or class. The purpose of component testing is to ensure that each component performs its intended functionality correctly and meets the specified requirements.

Table 8 Component Test / Attendance

Pre-condition	The Attendance Management component must be accessible, and perform their task to mark employee attendance
Purpose	To Mark the Attendance
Input data	Select Employee, Mark attendance status
Post-condition	Successfully marked attendance
Result	Pass

Table 9 Component Test / Task

Pre-condition	Manager can assign task to employees
Purpose	To check whether task is assigned or not?
Input data	Title, Description, Employee Selection, Deadline
Post-condition	Successfully Assigned task
Result	Pass

5.3 Performance Test

Performance testing evaluates the performance characteristics of a software system, such as its speed, scalability, responsiveness, and resource usage. It aims to assess how well the system performs under different workloads and stress levels.

5.3.1 Company Module Performance Test:

This is the results using Apptim tool to test ERMS Application.

Table 10 Performance Test/ Company Module

App size	5.96 mb
Avg. CPU	4.2%
Max. CPU	11.0%
Avg. Memory Usage	242.1 mb
Total Network Download	3.5 mb
Total Network Upload	1.2 mb
Crashes	0
Errors	0

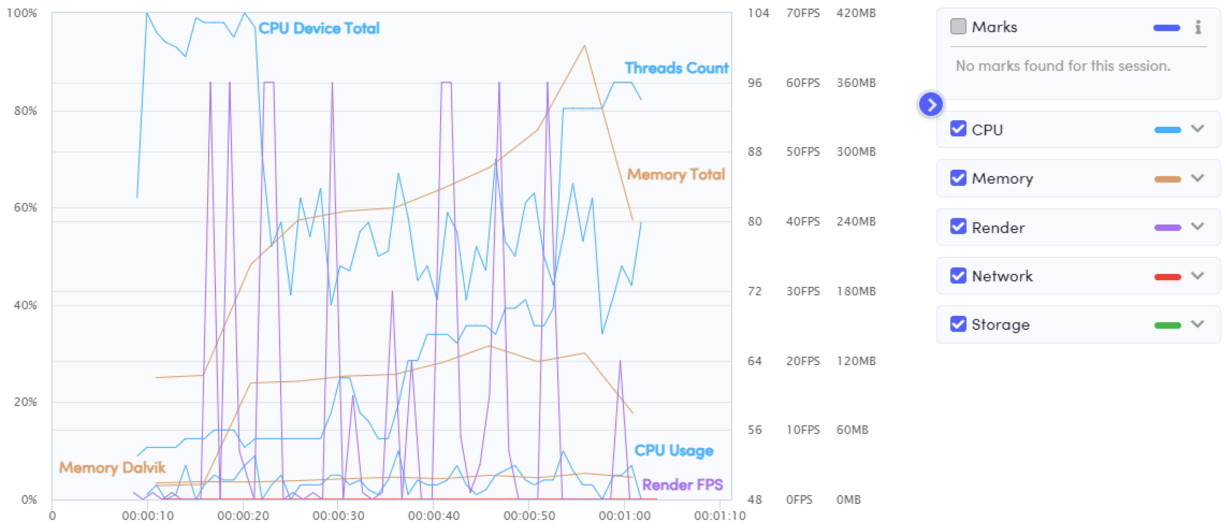
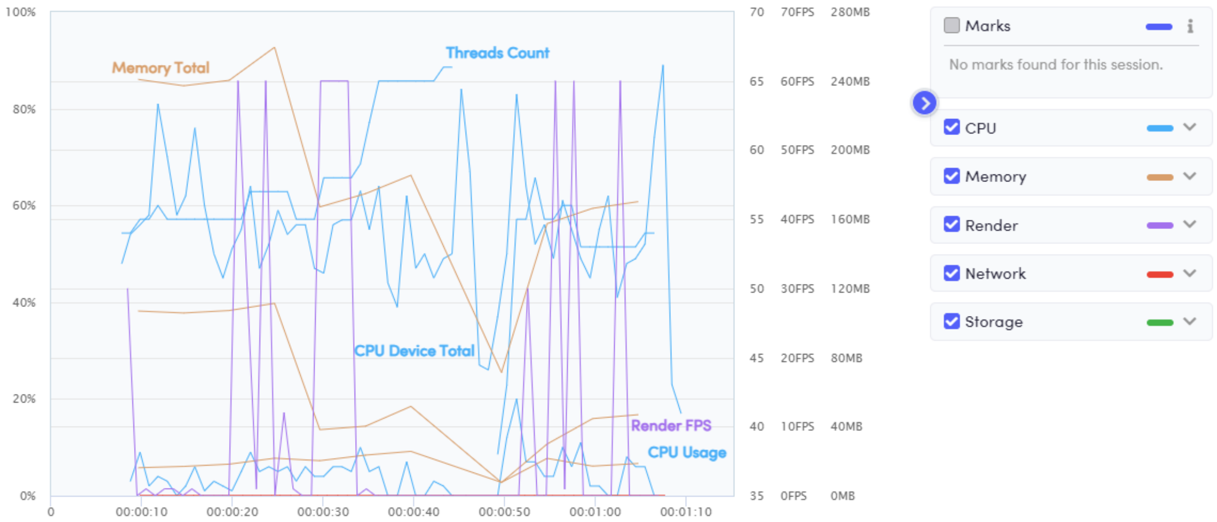


Figure 16 Performance Test Graph / Company Module

5.3.2 Manager Module Performance Test:

Table 11 Performance Test / Manager Module

App size	9.66 mb
Avg. CPU	5%
Max. CPU	20.8%
Avg. Memory Usage	188.2 mb
Total Network Download	5.3 mb
Total Network Upload	2 mb
Crashes	0
Errors	0



No marks found for this session.

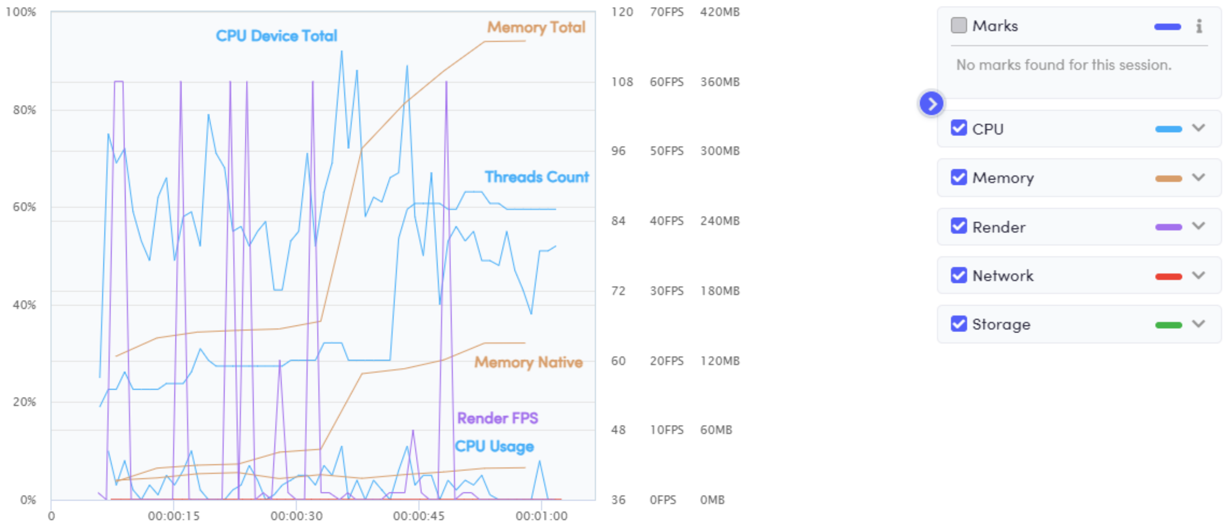
Figure 17 Performance Test Graph / Manager Module

5.3.3 Employee Module Performance Test:

Table 12 Performance Test / Employee Module

App size	9.62 mb
Avg. CPU	3.7%
Max. CPU	11.6%
Avg. Memory Usage	241.3 mb

Total Network Download	2.8 mb
Total Network Upload	1.6 mb
Crashes	0
Errors	0



No marks found for this session.

Figure 18 Performance Test Graph / Employee Module

Future Enhancement

Future Enhancement

- **Changing from XML to JetPack Compose:** Consider migrating your UI design from XML to JetPack Compose, which is a modern toolkit for building user interfaces in Android applications. JetPack Compose offers a more declarative and efficient way of designing UI components, enabling you to create dynamic and interactive user interfaces with less code. It provides a simpler and more intuitive development experience, allowing for easier customization and maintenance of UI elements.
- **Office Tracking:** Implement office tracking functionality to keep a record of employee movements within the office premises. This can be achieved through technologies like GPS or Bluetooth beacons. By tracking employee locations, you can gather data on their presence in specific areas, such as meeting rooms or common areas. This feature can help optimize office space utilization, monitor employee activities, and improve overall workplace efficiency.
- **Check-in & Check-out:** Introduce a check-in and check-out system to track employee attendance accurately. This can be implemented through a mobile app where employees can mark their arrival and departure times. The system can also incorporate features like geofencing, where employees can check in/out only when they are within a designated location. This data can be used for attendance management, generating reports, and calculating work hours for payroll processing.
- **Summary Reports:** Develop a module that generates summary reports for various aspects of the ERMS, such as employee performance, attendance, rewards, and event participation. These reports can provide valuable insights to managers and administrators, allowing them to analyze trends, identify areas for improvement, and make informed decisions. The reports can be presented in a visually appealing and easy-to-understand format, with options for filtering, sorting, and exporting data.
- **Salary Slips:** Enhance the salary management module by incorporating the generation and distribution of electronic salary slips. This feature allows managers to generate salary slips for individual employees or groups and securely deliver them through the ERMS. Employees can access their salary slips within the application, eliminating the need for physical copies. Additionally, the system can send notifications or reminders to employees when salary slips are available, ensuring timely access to this important information.

Conclusion

Conclusion

The Employee Rewarding and Management System (ERMS) application is a crucial tool for organizations seeking to enhance their employee management and recognition processes. By offering features such as attendance tracking, task management, salary slip generation, event management, and rewards allocation, ERMS provides a comprehensive solution for optimizing office operations and fostering a positive work environment.

The ERMS application aims to address the fundamental human need for appreciation and recognition in the workplace. By valuing and rewarding employee efforts, organizations can improve overall satisfaction and productivity levels. The application's rewarding system, based on attendance, task completion, and overall performance, ensures that deserving employees receive recognition and incentives on a regular basis.

Throughout the development of the ERMS application, various technologies and tools have been utilized, including Kotlin for business logic, view models, coroutines, live data, XML for UI design, and Firebase services such as authentication, real-time database, Firestore, and FCM. These technologies have been carefully selected to enhance functionality, performance, and user experience.

In conclusion, the ERMS application offers a comprehensive solution for employee rewarding and management in organizations. By leveraging its features and capabilities, organizations can streamline their office management processes, enhance employee satisfaction, and create a thriving work environment. The project has provided valuable exposure to Android development, database management, and performance testing, further expanding knowledge and skills in mobile application development. The ERMS application is poised to make a positive impact on organizations and their employees by fostering appreciation, recognition, and efficient management practices.

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