Myanmar Institute of Information Technology

I Semester 2024-2025

CSE 5000 Capstone Project

Midterm Report

Form Apply System with Workflow Management

2018-MIIT-CSE-041

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Submitted in Partial Fulfillment of the Course CSE 5000

Capstone Project

and

Requirements of B.E. (Hons.) Degree in Computer Science & Engineering

at

DIR-ACE Technology Ltd., (DAT)

January 2025

Self-Declaration by the Student

I hereby certify that this Final Report submitted by me in partial fulfillment of the course CSE 5000 Capstone Project in I Semester 2024-2025 embodies work done by me at DIR-ACE Technology Ltd., (DAT) under the supervision of Ko Han Htoo Hlaing.

I certify that I have written this report, all the text, figures, tables, etc. that are not my original contributions have been appropriately acknowledged, and the sources cited clearly.

I also certify that the report submitted is free of any plagiarism and/or violations of academic ethics. I further state that I shall be solely responsible for consequences if any transgressions of academic ethics are found in this report.

27.1.2024

Date **Sandi Sharoi**

Certificate

This is to certify that this report Capstone Project Final Report submitted by 2018-MIIT-CSE-041, Sandi Sharoi done under the supervision of Ko Han Htoo Hlaing, Deputy Project Manager, DIR-ACE Technology Ltd., Yangon, Myanmar embodies work done by the student as part of the course CSE 5000 Capstone Project in I Semester 2024-2025, and towards fulfillment of the partial requirements of the BE (Hons.) Degree in Computer Science & Engineering.

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Acknowledgments

I would like to express my sincere gratitude to Dr. Win Aye, the MIIT Rector, and Dr. Myat Thuzar Tun, the MIIT pro-rector, for allowing me to undertake this project. I am so grateful for their support and faith in me.

I want to thank Dr. Phyu Myo Thwe, Lecturer of the Faculty of Computer Science and my dedicated Supervisor, for her invaluable mentorship and support during this project. I am thankful for her patience and efforts in helping me learn and grow.

I would also like to thank Ko Han Htoo Hlaing, Deputy Project Manager and my company supervisor at DIR-ACE Technology Ltd., (DAT) under whose practical advice & support, this project was successfully implemented.

Moreover, I express my utmost gratitude to my seniors and colleagues for sharing their knowledge with me and guiding me when necessary. Their support has been a key part of my progress.

Finally, thank you to my teammates, I am forever grateful for your passion, efforts, and comradery during this journey. This success was only possible by their persistent support and collaboration.

Abstract

The Form Apply System with Workflow Management is a web-based application designed to streamline the process of form submission and approval within an organization. This system leverages modern technologies, including Spring Boot, Thymeleaf, Bootstrap CSS, JavaScript, and PostgreSQL, to create an efficient, role-based workflow. The system supports three user roles: Admin, Employee, and Approver. All roles can apply forms and track their status, while Approvers have the additional responsibility of approving or rejecting forms. The workflow ensures a hierarchical process, where forms are reviewed sequentially by the Project Manager (PM), Department Head (DPH), and Division Head (DVH). By automating the approval process and providing real-time status updates, the system reduces delays and enhances transparency in organizational workflows.

Keywords: Workflow management, form submission, hierarchical approval, Spring Boot, PostgreSQL, Thymeleaf, role-based access control, organizational efficiency.

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Chapter 1: Introduction

1.1. Introduction

Form submission and approval procedures are a core part of many businesses' everyday processes. However, manual workflows often lead to inefficiencies, latency, and a lack of visibility. So, this project focuses on the errors those solutions provide by creating a simplified role-based form management system. This system uses modern web technology to ensure forms are processed effectively and that all parties can check their status.

The project implements a hierarchical workflow, where forms pass through sequential review stages for the Project Manager (PM), Department Head (DPH), and Division Head (DVH). These approaches minimize the inefficiencies of approval processes while making sure that there is accountability at every stage.

1.2. Overview

The Form Apply System allows users to log in, submit forms, and track their status. Users have different access and functionality depending on their role:

- Admin: Responsible for managing user accounts and overseeing operations.
- Employee: Submits forms and tracks their status.
- Approver (PM, DPH, DVH): Reviews submitted forms and decides whether to approve or reject them.

The system follows a defined workflow:

1. Forms submitted by employees are first reviewed by the Project Manager (PM).
2. If approved, the forms are forwarded to the Department Head (DPH) for further review.
3. Finally, approved forms are reviewed by the Division Head (DVH).
4. Forms rejected at any stage would not proceed to the next.

1.3. Timeline

The project is planned to run over four months, from December 2, 2024, to March 31, 2025. It includes multiple stages, from development to implementation, ensuring all objectives are met within the timeframe. A detailed breakdown of the key milestones and tasks is provided in the table below.

Table 1.1. Project Timeline

Task	Week							
	1	2	3	4	5	6	7	8
Research & Self-Study								
Project Outline & Project Planning								
HTML Mock Design								
Spring Boot Project Setup and Configuration								
Database Integration and Management								
Login based on user's role								
User Registration & Registration List								
Form Decisin by Approvers								
Codebase Integration: Merging Team Contributions								
Project Testing								

Chapter 2: Theory Background

This project mainly uses the following software: Spring Boot Java, Bootstrap CSS, JS, Thymeleaf HTML, and PostgreSQL. A brief explanation of this software is as follows:

- Spring Boot (Java)

  Spring Boot is a Java-based framework that simplifies the development of production-ready applications by minimizing configuration requirements. It offers features like embedded servers (e.g., Tomcat), auto-configuration, and dependency management, making it easier to build and deploy scalable web applications. Its integration with various tools and frameworks allows for efficient workflow management and robust backend development, making it an ideal choice for this project.

- Bootstrap (CSS & JavaScript)

  Bootstrap is a popular front-end framework designed for creating responsive, mobile-first web designs. It provides pre-styled components like navigation bars, buttons, modals, and forms, as well as a powerful grid system for designing layouts. By leveraging Bootstrap, this project ensures consistent styling, compatibility across different devices, and faster development of user interfaces.

- Thymeleaf (HTML)

  Thymeleaf is a server-side Java templating engine used to dynamically generate HTML content. It integrates seamlessly with Spring Boot, allowing for easy data binding and rendering of views directly from the backend. Thymeleaf simplifies the process of linking dynamic content with static templates, enabling the creation of interactive and visually appealing web pages.

- PostgreSQL

  PostgreSQL is a powerful, open-source relational database management system known for its reliability and scalability. It supports advanced features such as complex queries, indexing, transactions, and extensibility, making it suitable for handling large

datasets and ensuring data integrity. PostgreSQL's performance and flexibility make it a robust choice for managing the application's data.

2.1. Hardware Specification

This web page project's hardware specifications require an internet-accessible device with any operating system, such as Windows, macOS, or Linux. The project can be accessed and run on any modern web browser, including Google Chrome, Mozilla Firefox, Safari, or Microsoft Edge.

Table 2.1. Hardware Specifications

Category	Specifications
Device	Any internet-accessible device (Laptop, Desktop)
Operating System	Windows, macOS, or Linux
Browser	Google Chrome, Mozilla Firefox, Safari, Microsoft Edge

2.2. Software Specification

The project uses several tools and technologies to ensure its functionality and efficiency. For backend development, the Spring Boot Framework helps build a strong and scalable application, while Java is the main programming language used to handle the logic and create dynamic web pages. For frontend development, Bootstrap (CSS & JS) is used to design a responsive and easy-to-use interface. PostgreSQL manages the database, providing secure and efficient storage and retrieval of data.

Table 2.2. Software Specifications

No.	Category	Tools/Technologies	Purpose
1.	Frontend Development	Bootstrap (CSS & JS), Thymeleaf (HTML)	To design a responsive and user-friendly interface.
2.	Backend Development	Spring Boot Framework	To create a robust and scalable backend application.
3.	Programming Language	Java	To dynamically render server-side web pages.
4.	Database	PostgreSQL	To provide secure and efficient data storage and retrieval.

Chapter 3: Project Description

3.1. Project Purpose

The primary goal of this project is to develop a system that automates the submission and approval of forms within an organization. The system aims to:

- Reduce delays in the approval process.
- Improve transparency and accountability.
- Provide real-time status updates to users.
- Meet predetermined organizational workflows

The project tries to improve productivity and decision making speed, by introducing an automated system in place of manual work.

3.2. Project Scope

The scope of the project includes the following:

- User Roles:
    - Admin Role: Admins are responsible for all user roles, permissions, and system admin configurations.
    - Employee Role: Employees are able to submit forms, as well as, check the statuses of all forms submitted on their behalf.
    - Approver Role: Approvers are able to check forms submitted, and approve, or decline them based on the defined hierarchical workflow.
- Workflow Coverage:
    - Forms are processed through PM, DPH, and DVH to reach the approval stage.
    - Forms denied at any stage are not moved to the next stage.
- Technologies Used
    - Backend: Spring Boot for business logic and APIs.
    - Frontend: Thymeleaf, HTML, CSS, JavaScript, and Bootstrap for UI/UX design.

- Database: PostgreSQL for data storage and management.

3.3. Project Objectives

The project's objective is to design a system which would automate the submission and approval of organizational forms. In particular, this systems focuses on achieving the following objectives:

- Increase efficiency of workflows: The automated approval process ensures that forms get processed without any delay.
- Improve Transparency and Accountability: The system provides a clear overview of form progress, with role-specific responsibilitiess.
- Real-Time Monitoring: All users will receive real time notifications when a change in form status from pending to either approved or rejected occurs.

The system is designed to meet the company's pre-existing workflows. This ensures that there is proper form control and management without infringement on the organizational policies.

3.4. Project Features

The Form Apply System includes the following features:

1. Role-Based Access Control:
    - Users can access functionalities based on their roles.
    - Approvers have additional permissions for form management.
2. Form Submission:
    - Employees can submit forms with relevant details.
    - Forms are stored in the database for processing.
3. Hierarchical Workflow:
    - Forms move through three approval stages: PM -> DPH -> DVH.
    - Only approved forms proceed to the next stage.

4. Approval and Rejection:
    - Approvers can view submitted forms and either approve or reject them.
    - Rejected forms are returned to the employee for correction or withdrawal.
5. Form Status Tracking:
    - Users can view the current status of their submitted forms.
    - Status updates are provided in real time.
6. User-Friendly Interface:
    - The system provides a responsive and intuitive interface.
    - Technologies like Bootstrap CSS and JavaScript ensure cross-device compatibility.
7. Data Management:
    - The system stores all form data securely in PostgreSQL.
    - Form details and user information are managed efficiently.

3.5. ER Diagram and Flowchart

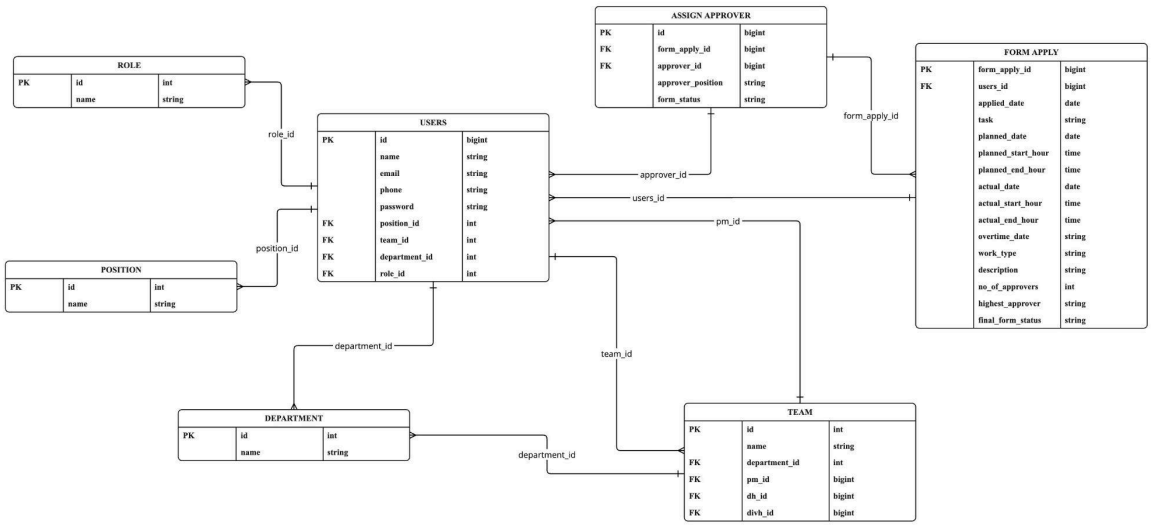

Figure 3.1. ER Diagram

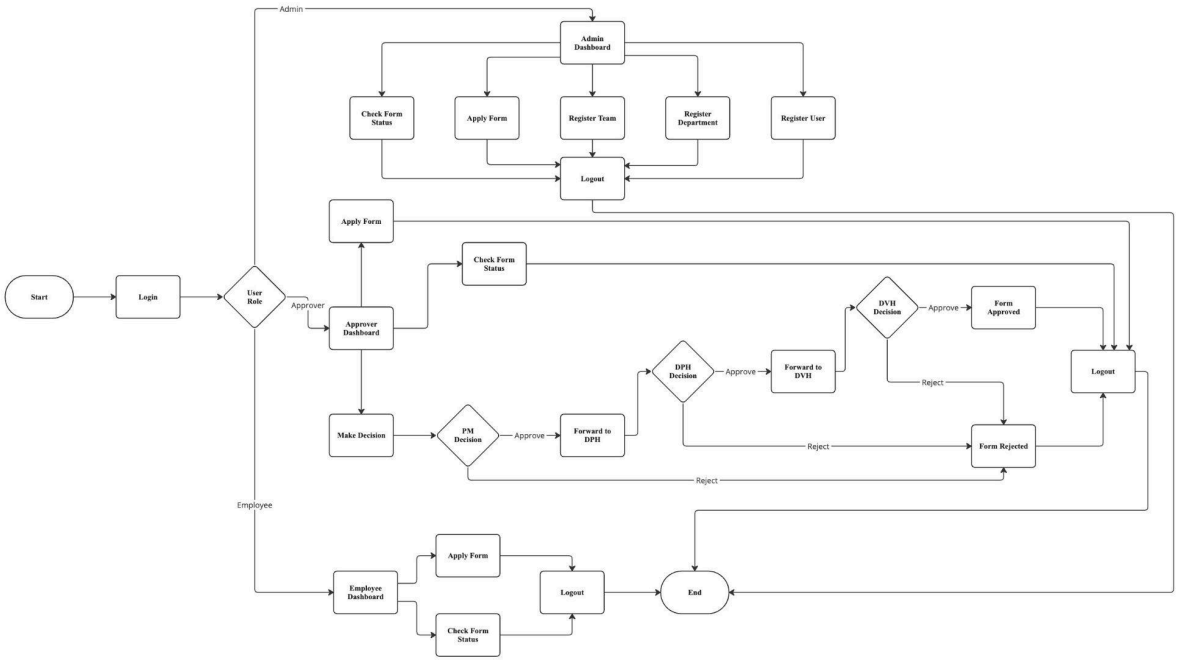

Figure 3.2. Flowchart

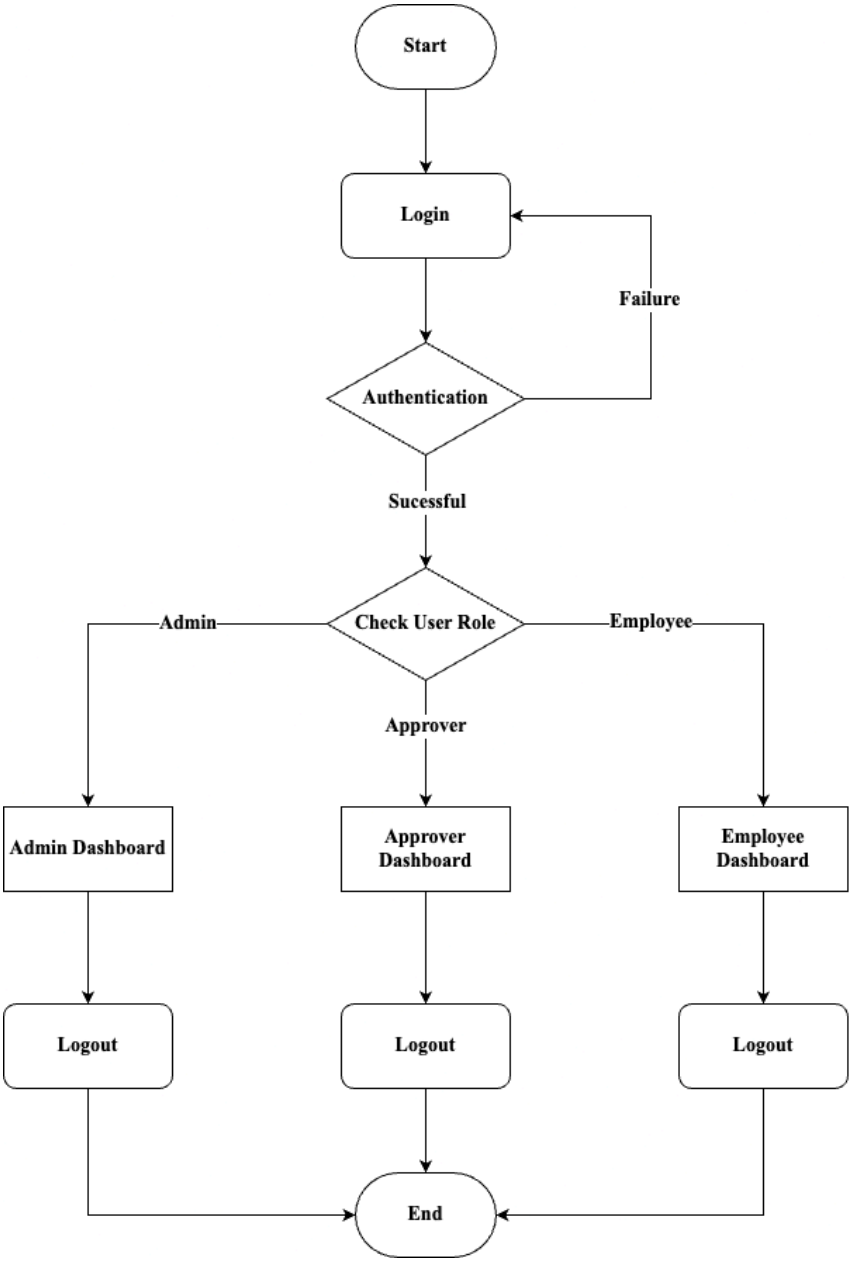

Figure 3.3. Main Flowchart

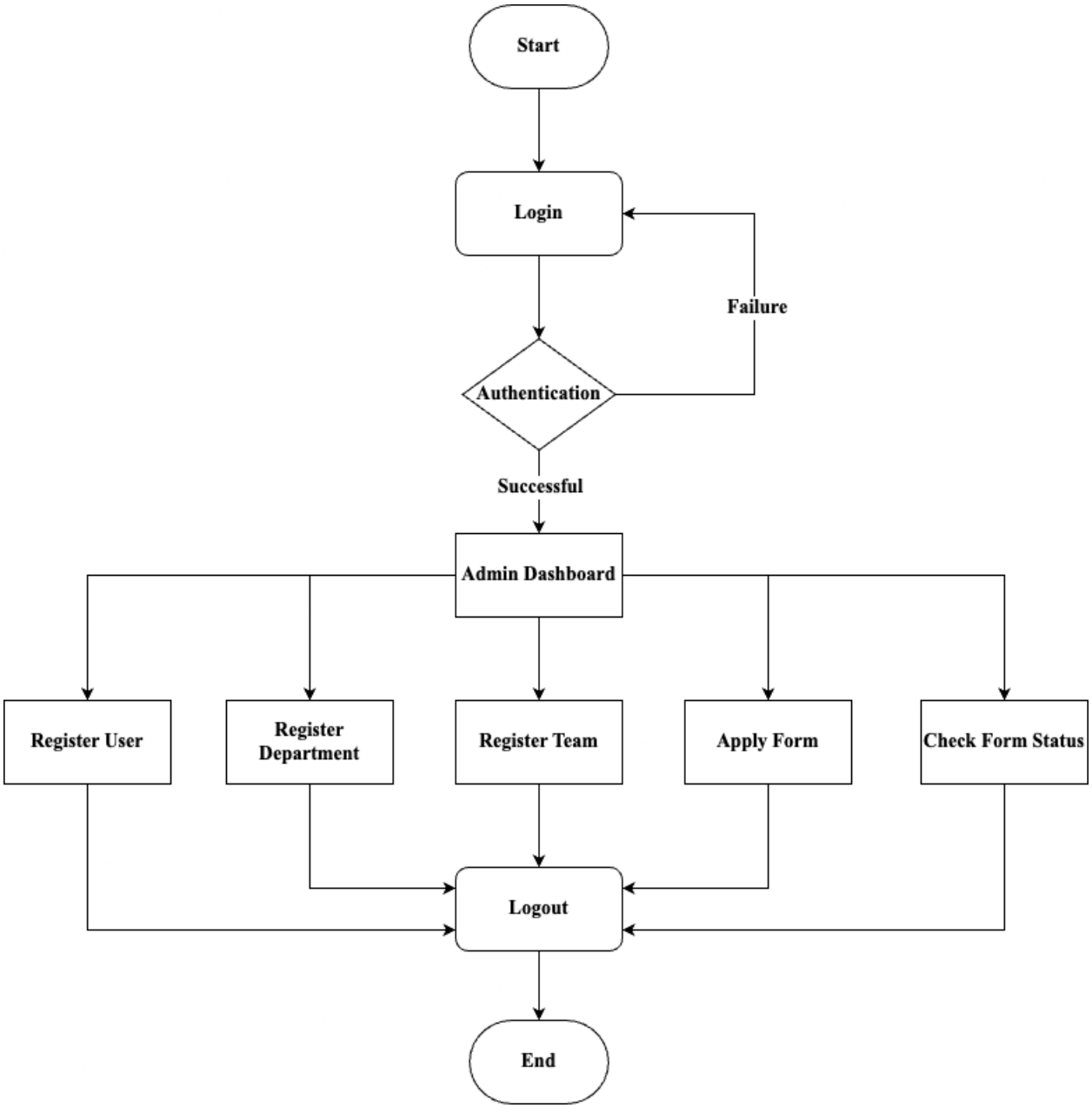

Figure 3.4. Admin Flowchart

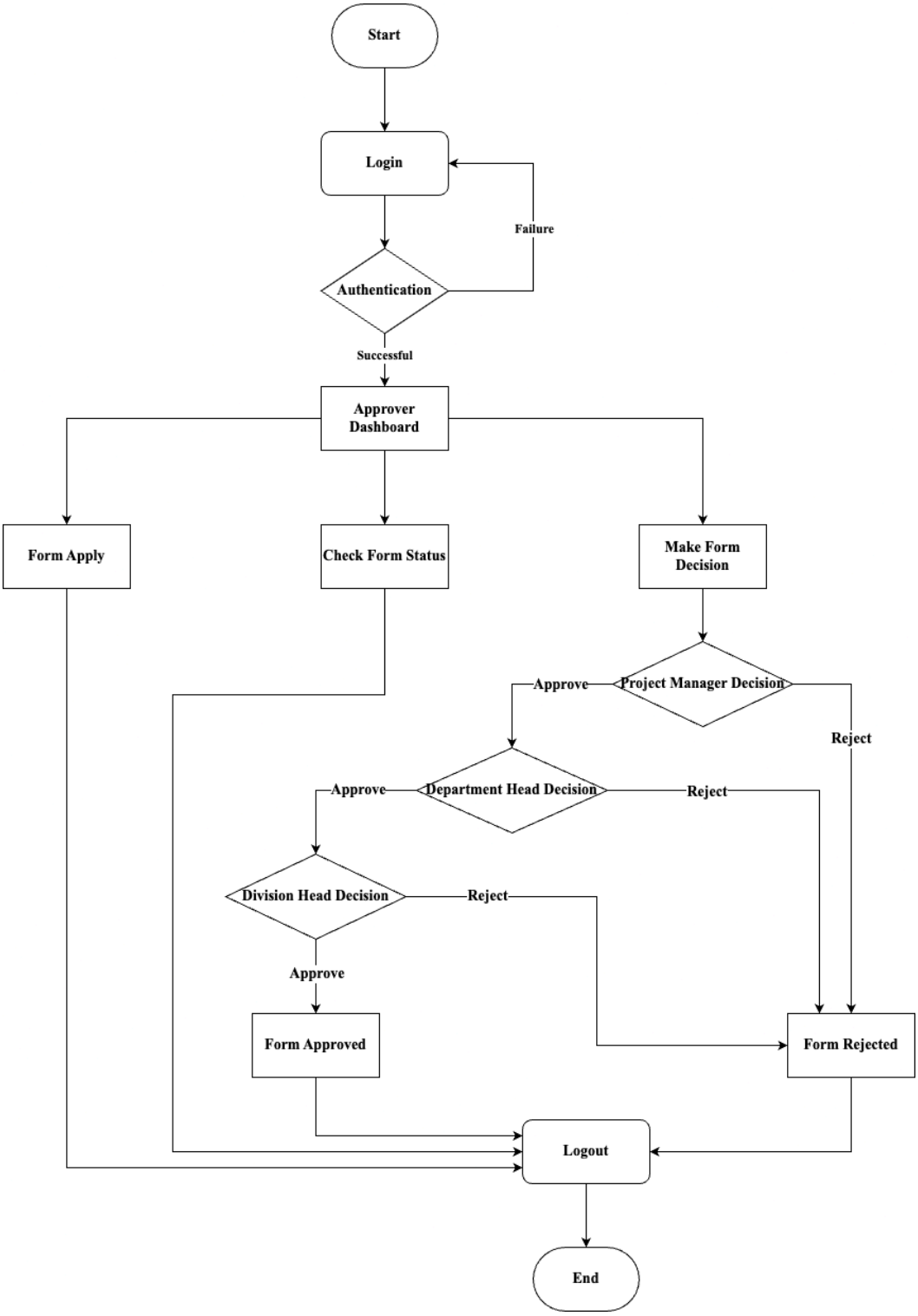

Figure 3.5. Approver Flowchart

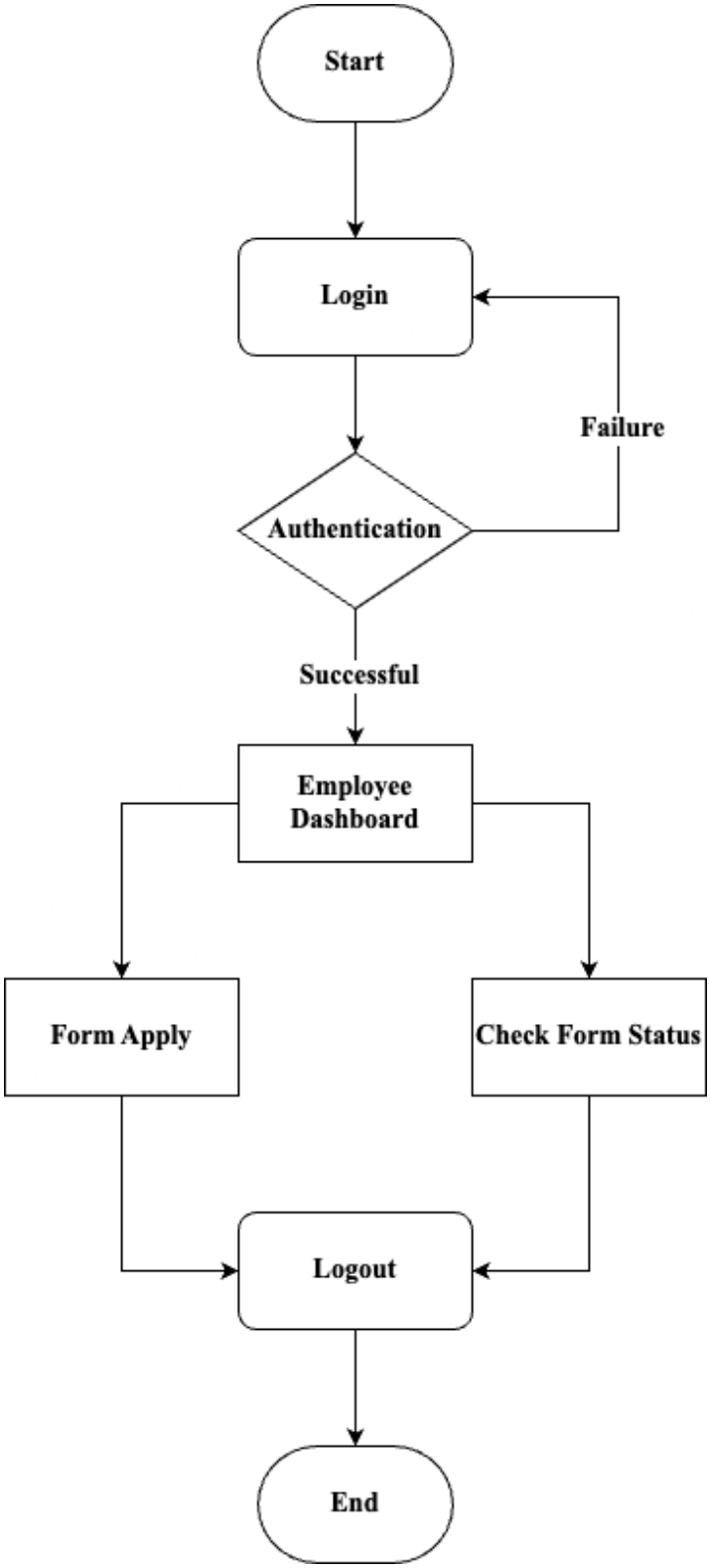

Figure 3.6. Employee Flowchart

3.6. Progress of the Project

The development of the Form Apply System with Workflow Management is ongoing. Below is the current progress of the system:

Completed Features:

- User Registration with Roles: Users can register and be assigned specific roles (Admin, Employee, Approver).
- Team Registration: Teams can be created and managed within the system.
- Department Registration: Departments can be added and assigned to users.
- Login: Role-based login functionality implemented for secure access.
- Different Dashboards: Custom dashboards are displayed based on the user's role.
- Apply Form: Users can fill out and submit forms through the system.
- View, Edit Forms: Users can view their submitted forms, and edit them if needed.
- Check Form Status: Users can track the status of their submitted forms in real time.
- Hierarchical Workflow: The applied forms will be handled through the hierarchical workflow.

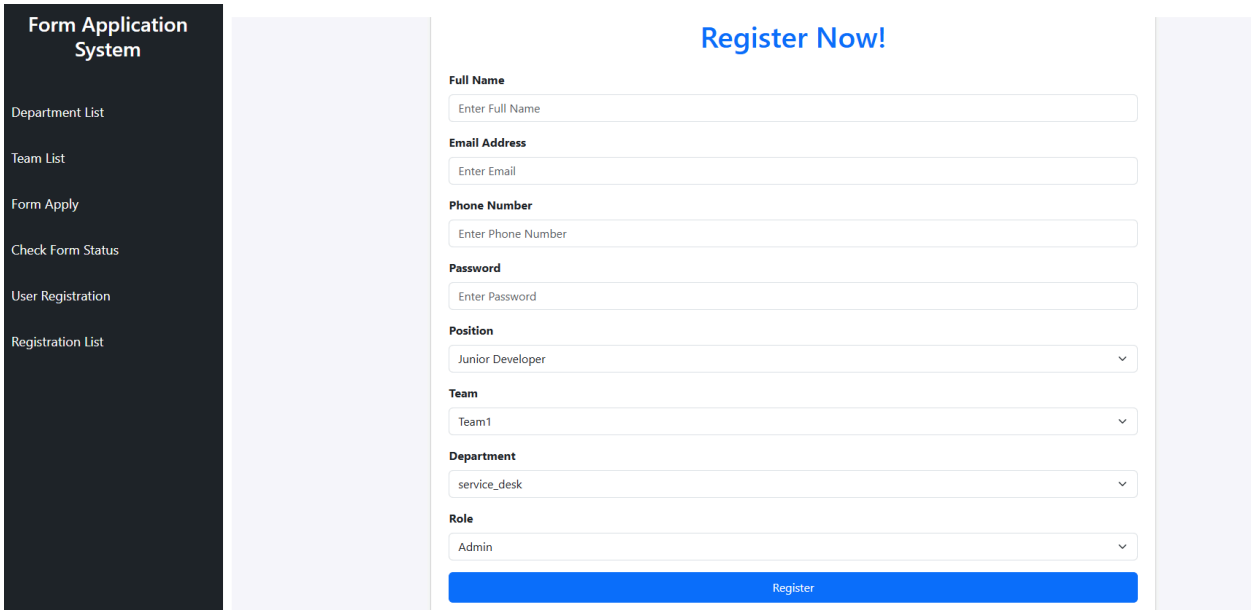

Figure 3.7 Admin Dashboard

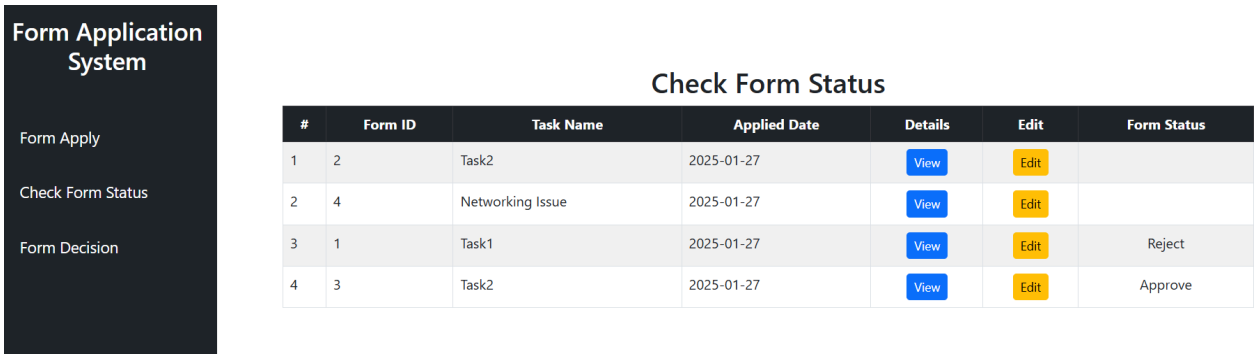

Figure 3.8 Approver Dashboard

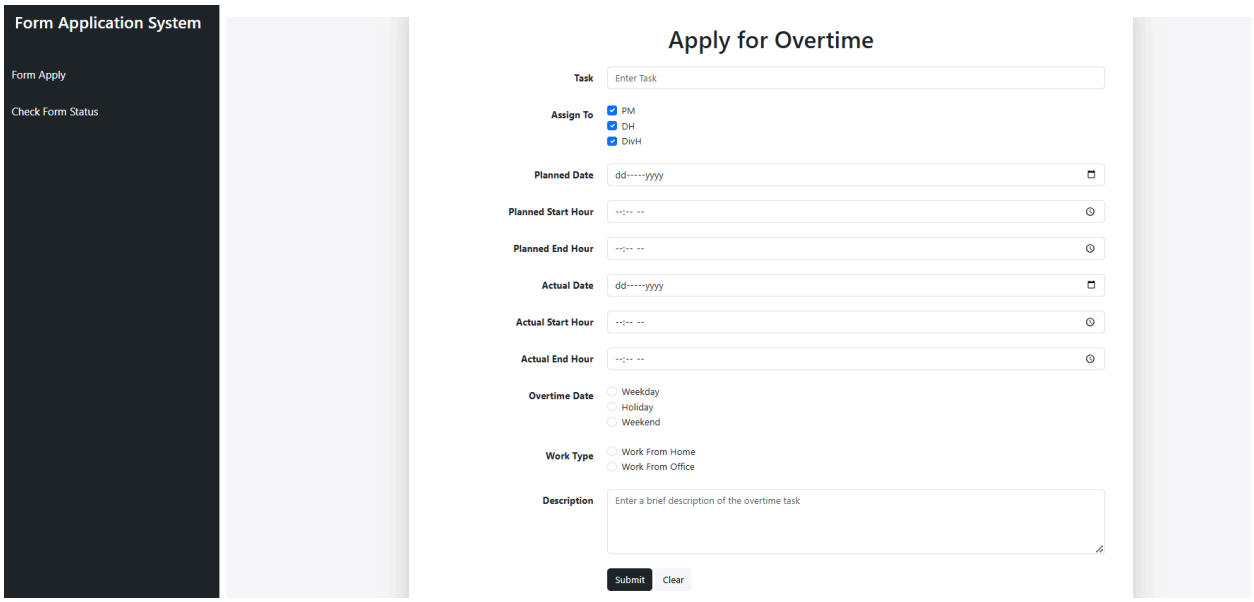

Figure 3.9 Employee Dashboard

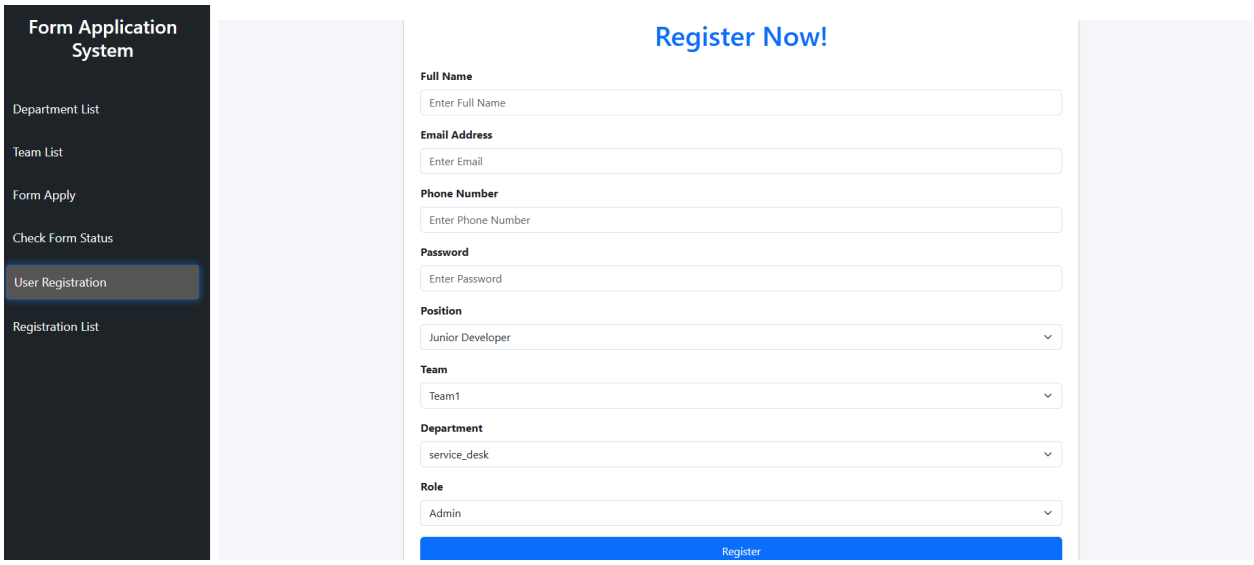

Figure 3.10 User Registration

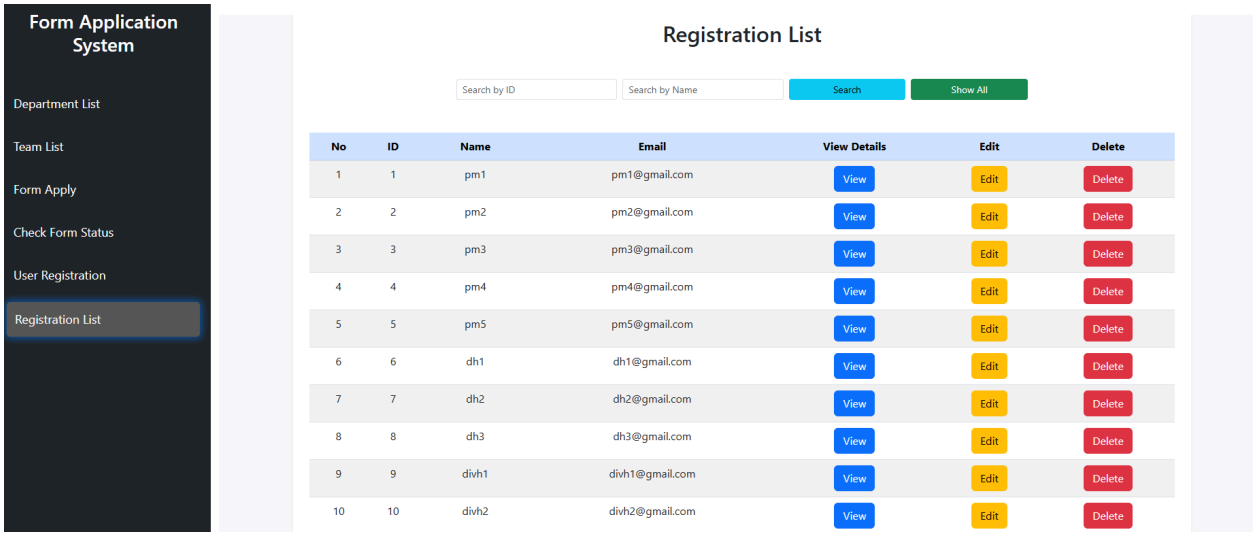

Figure 3.11 Registration List

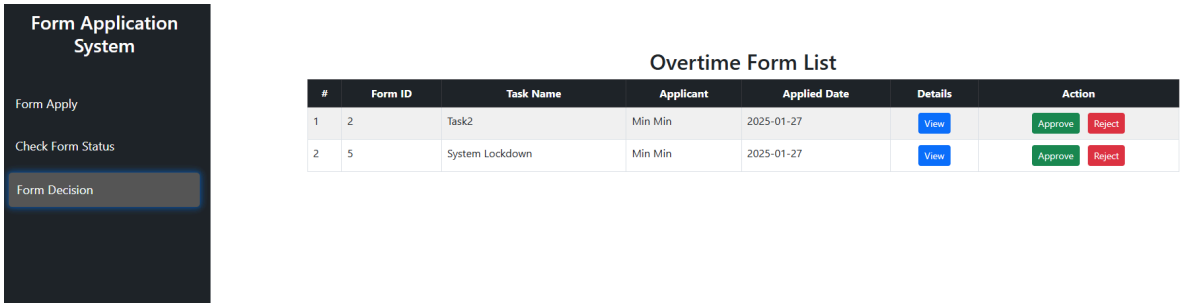

Figure 3.12 Form Decision

Chapter 4: Remaining Tasks

While significant progress has been made, the following critical tasks are yet to be completed:

1. Email Notifications:
    - Configure the system to notify approvers when new forms are available for review.
    - Notify users when there is a change in the status of their form, such as approval or rejection.
2. Form History
    - Implement a feature allowing approvers to view a history of the forms they have previously approved or rejected.
3. User Password Change
    - Enable users to change their passwords through the system securely.
4. Attachment in Form Apply
    - Add functionality for users to attach files when submitting forms.

Chapter 5: Challenge of the Project

The main challenge of the project was to adapt to new technologies. This also necessitated a lot of learning to be able to use the frameworks and tools effectively to get the best performance out of them. Emulating a super-fast workflow to reduce the delay while submitting forms and getting them approved, required in-depth knowledge of these cross-cutting technologies and handing them over together.

This workflow process was also multi-layered, which added complexity or simply just a challenge. With the addition of different contributions at different approver levels: Project Manager (PM), Department Head (DPH), and Division Head (DVH), it was complex and required planning to ensure proper execution between the approvers. The additional need for accountability and transparency at each stage of the process also complicated the workflow even more.

Chapter 6: References

Spring Boot Tutorial - javatpoint

https://www.w3schools.com/postgresql/postgresql_pgadmin4.php