THESIS/ PROJECT AUTOMATION SYSTEM

TAUSIFUR RAHMAN TALHA (C191001)
PROJNAJIT BARUA (C191007)
SHAHIDUZZAMAN FAHAD (C191027)

INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG
(IIUC)

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TAUSIFUR RAHMAN TALHA (C191001)
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SHAHIDUZZAMAN FAHAD (C191027)

PROJECT SUBMITTED IN FULFILLMENT FOR THE DEGREE OF
B. Sc. IN COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)
INTERNATIONAL ISLAMIC UNIVERSITY CHITTAGONG (IIUC)
CHITTAGONG, BANGLADESH

2024

DECLARATION

We hereby declare that the work in this project is our own except for quotations and summaries which have been duly acknowledged.

25 SEPTEMBER, 2024

Tausifur Rahman Talha
(C191001)

Projnajit Barua
(C191007)

Shahiduzzaman Fahad
(C191027)

SUPERVISOR'S DECLARATION

I/ We hereby declare that we have read this project and in my opinion this project is sufficient in terms of scope and quality for the award of the degree of B. Sc. in Computer Science & Engineering.

25 SEPTEMBER, 2024

Muhammad Shamsul Alam
Professor, Dept.of CSE, IIUC

DECLARATION OF THESIS / PROJECT REPORT AND COPYRIGHT

THESIS/ PROJECT AUTOMATION SYSTEM

AUTHORS

SL NO.	AUTHOR'S NAME	STUDENT ID	SIGNATURE
1	Tausifur Rahman Talha	C191001	
2	Projnajit Barua	C191007	
3	Shahiduzzaman Fahad	C191027	
NAME OF SUPERVISOR: Muhammad Shamsul Alam			
SIGNATURE OF SUPERVISOR:			

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ACKNOWLEDGEMENT

First and foremost, praise be to Almighty Allah for all his blessings for giving me patience and good health throughout the duration of this thesis work. We are very fortunate to have Professor Muhammad Shamsul Alam as a project supervisor. Moreover, I am grateful to the faculties and staffs of the Dept. of CSE, IIUC. I would like to thank everyone.

ABSTRACT

The Thesis/Project Automation System aims to improve the efficiency of administering academic projects in university environments. This solution incorporates Agile techniques, microservices architecture, and CI/CD approaches to enhance project operations. Essential aspects encompass project planning, task allocation, document management, feedback mechanisms, and progress monitoring. The platform facilitates excellent collaboration among students, supervisors, and administrators, assuring prompt project completion and improved communication.

User-centric design offers an intuitive interface, but microservices facilitate scalability and adaptability in addressing various academic requirements. The system utilizes continuous integration and deployment tools to facilitate seamless updates, hence fostering continual enhancements. The platform provides comprehensive security features, such as JWT-based authentication and multi-tier routing protection, ensuring the safety of user data and project information. The system's modular architecture accommodates diverse roles with designated permissions, enhancing accountability and transparency.

This system promises to transform how institutions conduct academic projects, minimizing administrative costs and creating a collaborative academic environment. Future prospects entail the incorporation of AI-driven project recommendations and mobile accessibility, hence augmenting user engagement and performance outcomes.

Keywords: Project Management, Agile Techniques, Micro services Architecture, Thesis Automation, Collaboration Platform.

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CHAPTER I

INTRODUCTION

1.1 Research Background

The development of an automated system for managing thesis/projects [1] is becoming very important in today's fast and complex work environments. As organizations work on multiple thesis/projects at the same time, they need effective management tools that simplify processes [2], encourage teamwork, and improve the results of theses/projects. However, traditional management systems [3] often struggle to keep up with the changing demands of modern projects, leading to inefficiencies and misunderstandings among team members.

The incorporation of Agile approaches into thesis/project [4] management has evolved as a solution to these issues. Agile stresses iterative development, continuous feedback, and collaboration among cross-functional teams [5], allowing organizations to react swiftly to changing requirements and stakeholder needs. This method not only boosts team participation but also improves thesis/project visibility and accountability. The adoption of Agile principles [6] has been found to contribute to better thesis/project success rates, since teams can respond more effectively to unforeseen difficulties and possibilities.

In parallel, the microservice's architecture [7] has gained traction as a technique to boost the scalability and flexibility of thesis/project automation systems. By breaking down applications into smaller, independent services [8], businesses may develop, launch, and scale components individually, supporting faster development cycles and decreasing the chance of system-wide failures. This modularity matches nicely with Agile principles, allowing teams to work on different areas of a thesis/project concurrently without dependence bottlenecks [9].

Continuous Integration (CI) and Continuous Deployment (CD) [10] methods further enhance Agile and microservices methodologies by automating the integration and deployment processes. CI/CD pipelines enable teams to automate testing and deployment, ensuring that code changes are integrated easily and delivered to customers rapidly [11]. This automation lowers manual errors and accelerates the feedback loop, allowing teams to iterate rapidly and maintain a high level of software quality.

The combination of Agile methodology, microservices architecture, and CI/CD practices gives a robust framework for constructing a thesis/project automation system that suits the different needs of enterprises. By fostering cooperation, boosting flexibility, and supporting continuous improvement, this integrated strategy allows enterprises to achieve their thesis/project goals more effectively and efficiently.

1.2 Problem Statement

In academic institutions, managing thesis and project workflows offers particular issues that might inhibit student development and faculty monitoring. Many colleges still rely on obsolete systems, which often contribute to confusion, miscommunication, and delays in project submissions.

Current methods of tracking thesis progress and managing project milestones lack transparency and efficiency, making it difficult for students and advisers to stay focused on goals and deadlines. Moreover, the absence of a unified platform for document exchange, feedback, and resource allocation exacerbates these challenges, leading to higher stress for students and professors alike.

This project intends to design a comprehensive project management system optimized for university thesis and project management. The system will promote simplified communication, deliver transparency to project statuses, along with tools for effective resource management. By using this approach, we hope to improve the entire academic experience, stimulate collaboration, and assure timely completion of student projects.

1.3 Motivation

The successful management of thesis/ projects is vital for academic achievement, yet many universities rely on outmoded practices that lead to inefficiencies and communication gaps. Students typically suffer with confusing criteria, missing deadlines, and lack of help.

This project management system intends to overcome these difficulties by offering a single platform for students and instructors to communicate effortlessly. By streamlining project tracking, strengthening communication, and improving resource access, the system will build a more structured and friendly academic atmosphere. Ultimately, this effort intends to empower students to complete their assignments successfully and enrich their overall educational experience.

1.4 Objective of Project

The fundamental purpose of this project is to establish a complete thesis/ project automation system that promotes the efficiency and efficacy of administrative procedures inside higher education institutions. The precise aims include:

- **Streamline Project Workflow:** Develop a user-friendly platform that enables the planning, implementation, and monitoring of thesis and project activities for students and teachers.

- **Enhance Communication:** Implement elements that enable real-time communication and feedback between students and advisors to boost collaboration.

- **Track Progress and Milestones:** Create tools for tracking project progress, deadlines, and milestones, assuring timely completion of academic tasks.

- **Centralize Resources:** Provide a consolidated repository for project-related papers and resources, making them easily available to all stakeholders.

- **Improve Accountability:** Establish a framework for defining clear expectations and responsibilities, helping students stay accountable for their project timeframes and deliverables.

- **Facilitate Reporting:** Enable easy compilation of progress reports for both students and professors, boosting transparency and oversight in project management.

By achieving these objectives, the project aims to contribute to the general advancement of educational outcomes and institutional effectiveness in the higher education sector.

1.5 Scope of Project

This project management system for university thesis and project management will encompass the following areas:

- **User Roles:** The system will enable several user roles, including students, academic advisors, and administrative personnel, each with specialized functionalities and access levels.

- **Project Planning:** It will provide tools for students to describe project objectives, timeframes, and milestones, supporting effective planning from the outset.

- **Collaboration Features:** The system will incorporate communication capabilities like texting, discussion forums, and file sharing, boosting collaboration between students and advisors.

- **Progress Tracking:** A dashboard will allow users to monitor project status, track deadlines, and visualize progress through Gantt charts or comparable tools.

- **Document Management:** Users will have access to a centralized repository for storing and managing project-related documents, ensuring quick retrieval and version control.

- **Reporting and Analytics:** The system will enable the development of progress reports for students and professors, offering insights into project schedules and completion rates.

- **Integration:** The project management system will be built to integrate with current university systems, including educational technology systems and student information systems (SIS).

- **Mobile Access:** The platform will be adaptable and available on mobile devices, allowing users to manage projects on-the-go.

The project will not cover areas outside academic thesis and project management, such as finance management or non-academic project tracking.

CHAPTER II

LITERATURE REVIEW

As the landscape of higher education project management becomes increasingly complicated, the integration of project management systems has become vital. These technologies are specifically developed to increase operational efficiency and enhance the academic experience by expediting numerous project-related activities, particularly thesis management [12], tracking projects [13], faculty monitoring, and resource allocation [14].

Research underlines the crucial relevance of feedback mechanisms in digital project management systems, particularly within academic institutions [15]. Gaining insights into user viewpoints can greatly influence workflow efficiency and quality assurance. Numerous studies demonstrate that integrating students and teachers in the design and implementation phases of project management systems leads to improved workflows and heightened satisfaction. Aligning user needs with system capabilities is crucial for building systems that not only meet technical specifications but also promote user engagement [16].

[17] The literature underlines the significance of adapting project management systems to satisfy the individual requirements of distinct user groups. Customizable solutions can maximize information retrieval and user engagement, ensuring that project management systems effectively serve varied academic subjects. For example, systems that offer customizable dashboards [18] help users to prioritize key information, hence boosting productivity and decision-making processes.

The introduction of automated project management systems highlights the potential of technology to increase administrative efficiency [19]. Automated tracking tools, [20] for instance, decrease the administrative strain on professors and mitigate errors associated with manual changes. Evaluating system performance based on characteristics such as usability, efficiency, and user satisfaction underscores the necessity for rigorous assessments in the construction of project management systems. This review process often incorporates user testing and iterative design, which are vital for enhancing system functionalities.

The implementation of data analytics within project management systems [21] has been examined, indicating that advanced analytics may extract significant insights from huge datasets.

This capability boosts resource management and optimizes decision-making processes within universities. For instance, [22] predictive analytics can identify students at danger of underperforming, allowing institutions to engage proactively and provide appropriate support services. Such data-driven initiatives not only improve student results but also maximize resource allocation.

[23] The demand for intuitive designs is further highlighted in the literature, underlining the advantages of current technology in managing academic tasks. Creating user-friendly systems fosters better connection and engagement among users. [24] Research suggests that systems with straightforward navigation, responsive design, and accessible interfaces contribute to greater adoption rates among students and faculty. Additionally, training programs accompanying system adoption are vital for assuring users can effectively employ the new technologies.

[25] The literature highlights the significance of comprehensive records management inside project management systems, emphasizing compliance with complicated requirements in retaining academic documents. Effective records management not only streamlines data storage and retrieval but also assures conformity to legal and regulatory norms. Institutions using thorough records management methods can better preserve sensitive information and ensure the integrity of academic records [26].

Finally, [27] the research stresses the significance of integrating new project management systems with current university platforms, such as Learning Management Systems (LMS) and administrative software. This connection allows continuous data flow and interoperability, offering a holistic perspective of project progress and institutional efficacy. [28] Studies indicate that universities that properly integrate their systems experience greater collaboration across departments and enhanced data accuracy.

In conclusion, [29] the literature underlines the need of building comprehensive project management systems that are user-centric, adaptive, and capable of leveraging sophisticated technologies. By addressing the different needs of stakeholders and adding feedback mechanisms, these systems can considerably boost the efficiency and effectiveness of project management in higher education. The constant advancement of technology gives continuous chances for improvement, ultimately benefiting students, instructors, and administrative staff alike.

CHAPTER III

PROJECT CONCEPT & VISION

3.1 Concept

The suggested project management system seeks to provide a comprehensive digital platform customized exclusively for managing university thesis and project operations. This system will facilitate the design, implementation, and monitoring of academic projects, boosting the entire experience for students, faculty advisers, and administrative staff.

- **User Roles and Access:** The system will support different user roles, including students, faculty advisers, and administrative personnel, each with tailored access and functions to fulfill their individual needs.
- **Project Planning and Tracking:** Users will be able to develop extensive project plans, set milestones, and measure progress through visual dashboards. Task assignments and deadlines will provide accountability and clarity in project timetables.
- **Collaboration Tools:** Integrated communication capabilities, including as messaging and discussion boards, will enable smooth cooperation between students and faculty, establishing a friendly academic atmosphere.
- **Document Management:** A centralized repository will allow users to upload, save, and manage project-related documents, assuring easy access and version control.
- **Comments Mechanisms:** The system will contain capabilities for offering and receiving comments on project drafts, increasing the iterative process of academic writing and project development.
- **Analytics and Reporting:** Advanced analytics will provide insights into project performance, enabling users to discover potential hazards and opportunities for improvement. The system will create progress reports for both students and educators.

- **Integration with current Systems:** The project management system will link with current university platforms, such as Learning Management Systems (LMS) and student information systems, to enable a seamless flow of data and increase user experience.
- **User Training and Support:** Comprehensive training programs will be supplied to ensure all users can efficiently navigate the system and utilize its capabilities to their utmost potential.

The fundamental purpose of this project management system is to streamline the thesis and project management process, lowering administrative hassles and boosting communication between students and faculty. By providing a user-friendly platform that incorporates feedback mechanisms and powerful analytics, the system intends to improve project outcomes and overall academic achievement.

3.2 Vision

Our objective is to design an innovative project management system that alters the way university students and professors manage thesis and project workflows. We seek to develop an academic atmosphere where collaboration, efficiency, and transparency are inherent to the educational experience, thereby boosting the quality of academic work done.

We envisage a system that empowers students by providing straightforward and accessible tools that ease every stage of their project journey—from initial preparation to final submission. By including features such as configurable dashboards, work tracking, and real-time collaboration tools, we hope to enable students to take ownership of their projects, encouraging a sense of accountability and engagement.

For faculty advisers, we attempt to provide a thorough overview of project progress, enabling them to offer timely guidance and support. The system will contain analytics and reporting tools that allow instructors to monitor student performance and identify at-risk projects early, permitting proactive intervention when necessary. This will deepen the mentor-student relationship and enrich the entire educational experience.

Furthermore, our goal involves the seamless integration of this project management system with existing university platforms, such as Learning Management Systems (LMS) and student information systems. This interoperability would ensure a holistic view of student performance and project status, minimizing administrative duties and allowing teachers to focus on what they do best—teaching and mentoring.

We also understand the value of customer feedback in the continuing enhancement of the system. By actively engaging students and teachers in the design and iterative development process, we want to guarantee that the system corresponds with their requirements and expectations, thereby boosting user satisfaction and adoption rates.

In short, our mission is to develop a culture of academic achievement and innovation within the university context. We think that by giving students the resources and support they need to succeed in their academic activities, we can lead to increased completion rates and improved project outcomes. Our project management system will act as a catalyst for revolutionizing the academic experience, empowering the next generation of scholars to fulfill their full potential.

CHAPTER IV

DEVELOPMENT APPROACH

4.1 Methodology

In designing the project management system for university thesis and project management, we will apply Agile methodology to ensure a responsive and iterative approach that matches with the dynamic character of academic projects. Agile stresses collaboration, flexibility, and continuous improvement, allowing the project team to adapt successfully to changing requirements and user feedback throughout the development process. By splitting the project into small, manageable iterations known as sprints, often lasting two to four weeks, we can focus on providing incremental additions that bring instant value to users.

During each sprint, we will convene sprint strategic meetings to prioritize activities based on user demands and project goals. This collaborative approach guarantees that all team members are aligned on objectives and duties. Daily stand-up meetings will promote open communication, enabling team members to discuss progress, confront obstacles, and rapidly resolve any issues that may develop. These regular touchpoints establish a culture of accountability and teamwork, which is vital for maintaining momentum throughout the project.

At the end of each sprint, we carry out sprint assessments in order to present completed features to stakeholders, allowing them to provide feedback and insights. This continual feedback loop is critical for ensuring that the system evolves in harmony with user expectations and requirements. Additionally, sprint retrospectives will be held to reflect on what worked well and highlight areas for growth, further refining our procedures and team relationships.

By incorporating Agile concepts, we seek to design a project management system that is not only high-quality and user-friendly, but also flexible to the unique difficulties faced by students and professors. This process will enable us to respond fast to customer feedback, add new ideas, and develop functionality based on real-world usage. Ultimately, the Agile approach will equip our team to develop a robust project management system that effectively promotes academic performance and fosters collaboration within the university community.

4.2 Team Collaboration and Communication

Effective team collaboration and communication are important to the success of the project management system for university thesis and project management. Utilizing the Agile approach, we will build a collaborative environment where all team members, including developers, designers, and stakeholders, actively participate in the project's success. Regular stand-up meetings will be held to discuss ongoing tasks, address obstacles, and agree on goals, ensuring that everyone remains informed and involved. Additionally, collaborative solutions such as project management software, shared document repositories, and communication platforms will be deployed to promote smooth information exchange and real-time feedback. This method not only promotes openness but also encourages team members to contribute their ideas and experience, leading to innovative solutions and improved project outcomes. By promoting open lines of communication and collaborative practices, we hope to build a cohesive team dynamic that supports the effective growth of the project management system, ultimately benefiting the university community.

4.3 Continuous Integration and Deployment with GitHub

To optimize the development process of the project management system for university thesis and project management, we will integrate Continuous Integration and Deployment (CI/CD) methods utilizing GitHub. CI/CD enables our team to automatically test and release code changes, guaranteeing that new features and upgrades can be integrated seamlessly and rapidly. With each code commit, automated tests will run to validate functionality and catch any issues early in the development cycle. This technique not only improves code quality but also accelerates the delivery of new features to users. GitHub Actions will be employed to automate the entire operation, allowing for fast deployment to our staging and production environments. By creating a culture of rapid iteration and timely feedback, CI/CD techniques will enable us to respond rapidly to user feedback and adapt to changing requirements, ultimately leading to a more robust and dependable project management system that meets the increasing demands of students and teachers.

CHAPTER V

FEATURES

5.1 Student Features

The user interface (UI) and navigation of the application have been meticulously designed to offer an intuitive and engaging experience for users of all ages. With a user-centric approach, the UI elements and navigation pathways have been crafted to ensure easy access to features while maintaining a visually appealing and cohesive design.

- **Task Assignment:** Ability to divide down projects into tasks and assign deadlines to each task for better organization.
- **Document Upload and Management:** Students can upload relevant documents, such as research papers, proposals, and progress reports, and maintain version control.
- **Progress Tracking:** Visual dashboards to manage project progress, deadlines, and milestones to assist students stay on schedule.
- **Collaboration Tools:** Integrated messaging and discussion forums to promote contact with supervisors and peers.
- **Input Mechanism:** Ability to receive and respond to input from supervisors on project drafts and submissions.
- **Resource Access:** Access to university resources, such as libraries, databases, and templates, to aid in research and project development.
- **Notifications & Alerts:** Automated notifications for approaching deadlines, feedback updates, and key announcements.

5.2 Supervisor (Admins) Features

- **Project Oversight:** Supervisors can access and monitor any student projects given to them, including progress and deadlines.

- **Task Review and Feedback:** Ability to review student tasks and provide feedback immediately within the system.
- **Document Management:** Access to all documents provided by students for review, with the opportunity to add comments and suggestions.
- **Progress Reports:** Generate reports on student progress, identifying at-risk projects and areas for help.
- **Collaboration Tools:** Facilitate communication with students through messages, comments, and forums.
- **Approval Workflows:** Manage and approve project proposals, modifications, and submissions, ensuring all requirements are satisfied.
- **Resource Sharing:** Share materials with students, including templates, instructions, and best practices for project management.

5.3 Super Admin Features

- **User Management:** Manage user accounts for students and supervisors, including creating, modifying, and deactivating accounts.
- **Role Assignment:** Assign roles and permissions to users, guaranteeing appropriate access levels for students, supervisors, and other personnel.
- **Insights and Reporting:** Access extensive insights on system usage, project completion rates, and user engagement to inform decision-making.
- **Support and Maintenance:** Provide technical support and maintenance for the system, guaranteeing smooth operation and addressing user issues.
- **Compliance and Security:** Ensure that the system complies with university policy and data protection legislation, securing sensitive information.
- **Feedback Collection:** Gather feedback from users to continuously improve system functionality and user experience.

CHAPTER VI

DESIGN & IMPLEMENTATION

6.1 Design Method

User-Centered Design and Agile UX Method:

In the development of the project management system for university thesis and project management, we are utilizing a combination of User-Centered Design (UCD) and Agile UX approaches to build a highly effective and user-friendly platform. User-Centered Design stresses a comprehensive understanding of the needs, interests, and behaviors of end users—students and faculty—ensuring that the system fulfills their specific requirements. To do this, we will conduct thorough user research, including surveys, interviews, and usability testing. These methods will allow us to obtain qualitative and quantitative data that provides insights into how users engage with similar systems, what obstacles they experience, and what features they find most beneficial. This underlying information will inform our design decisions, ensuring that the system is intuitive and accessible.

Simultaneously, we will integrate the Agile UX methodology into our development process, which allows the quick iteration of design and development. Agile UX allows us to work in short cycles, or sprints, where design concepts are swiftly translated into practical prototypes. After each sprint, user input will be collected through sessions that allow students and teachers to test new features and provide insights based on their experiences. This iterative process helps us to uncover usability issues and develop features in real-time, ensuring that we remain responsive to user needs throughout the project lifespan.

6.2 Architecture

Microservices Architecture and Event-Driven Architecture

In designing the project management system for university thesis and project management, we are employing a combination of Microservices Architecture and Event-Driven Architecture to produce a scalable, flexible, and efficient platform. Microservices Architecture allows us to decompose the system into smaller, independent services that may be created, deployed, and scaled independently. Each microservice will handle a specific functionality—such as user management, document storage, task tracking, and notification services—enabling teams to work concurrently and hasten the development process. This modular approach not only promotes maintainability but also allows for easier updates and the introduction of new features without disturbing the overall system.

Complementing this paradigm, Event-Driven paradigm (EDA) provides real-time communication between microservices using asynchronous event messaging. This design pattern enables services to react to events, such as a new document upload or a task completion, without the requirement for direct coupling. By introducing an event-driven strategy, we boost the responsiveness of the system, allowing it to process and respond to user actions in real time. For instance, when a student submits a project document, an event can trigger messages to supervisors and update the project status effortlessly. This architecture not only increases system performance but also promotes scalability, as new services can be introduced or current ones updated with minimum influence on the overall system.

By merging Microservices Architecture with Event-Driven Architecture, we hope to create a resilient and adaptive project management system that can efficiently handle shifting workloads and user expectations. This strategy will ensure that the system remains responsive and capable of evolving alongside the requirements of students and teachers, ultimately generating a more effective and engaging academic experience

6.3 Database

In designing the project management system for university thesis and project management, we have chosen MongoDB as our database option due to its flexibility, scalability, and performance advantages. MongoDB, a NoSQL database, allows us to store data in a JSON-like format, making it easier to handle varied data types and structures associated with people, projects, tasks, and documents. This schema-less design provides the adaptability needed to react to changing requirements, enabling rapid development and iteration.

MongoDB's robust querying capabilities enable for efficient data retrieval, which is critical for handling complicated relationships across collections such as Users, Projects, Tasks, Documents, Comments, Roles, and Notifications. Additionally, its built-in support for horizontal scaling assures that the system can accept rising volumes of data and users without affecting performance. The usage of MongoDB also promotes easy interaction with modern web applications, allowing for real-time data processing and dynamic user experiences.

By employing MongoDB, we hope to construct a robust and responsive project management system that successfully supports students and professors in their academic activities, ultimately boosting cooperation and project success within the university setting.

6.4 Database Functionalities

In the sophisticated expanse of our backend database architecture, an ensemble of advanced functionalities converges, embracing elements such as User Management, Project management, Task Management, Document Management, Feedback and Communication, Search Functionality, Data Security and Backup, Administration and Maintenance. These collective components unite in harmonious synergy to amplify the performance, accessibility, and overall usability of data management infrastructure

1. User Management

- **User Registration:** Enable students, supervisors, and administrators to establish accounts.
- **Role Assignment:** Specify user roles (e.g., student, supervisor, administrator) and regulate permissions.
- **Profile Management:** Allow users to modify their personal information and credentials.

2. Project management

- **Project Management:** Enable students to create, modify, and remove project entries.
- **Project Status Monitoring:** Record and revise the status of each project (e.g., in progress, completed, submitted).
- **Milestone Oversight:** Establish and monitor project milestones and deadlines.

3. Task Management

- **Task Creation and Assignment:** Enable users to create tasks, assign them to team members, and establish deadlines.
- **Task Status Updates:** Allow users to update the status of tasks (e.g., pending, completed, in progress).
- **Dependency Management:** Track task dependencies to ensure correct sequencing.

4. Document Management

- **Document Upload and Storage:** Allow users to upload and store project-related documents (e.g., proposals, reports).
- **Version Control:** Implement versioning for documents to track changes over time.
- **Document Retrieval:** Provide effective search and retrieval functionalities for documents.

5. Feedback and Communication

- **Comments Submission:** Allow supervisors to provide comments on student projects and responsibilities.
- **Commenting System:** Enables users to remark on tasks and documents for collaborative communication.
- **Notification System:** Implement notifications for task updates, feedback received, and deadlines approaching.

6. Search Functionality

- **Search Functionality:** Enable users to search for projects, tasks, and documents based on various parameters.

7. Data Security and Backup

- **Data Encryption:** Ensure sensitive data, such as user credentials and documents, is securely encrypted.
- **Regular Backups:** Implement automated backups to prevent data loss and ensure data integrity.

8. Administration and Maintenance

- **User Activity Monitoring:** Enable admins to monitor user activity and system utilization.
- **System Configuration Management:** Allow admins to configure system settings and manage roles and permissions.

DevDependencies:

- **eslint:** Linter for ensuring code quality and consistency.
- **prettier:** Code formatter for maintaining consistent style.
- **webpack:** Module bundler to bundle JavaScript files for usage in a browser.
- **webpack-cli:** Command line interface for Webpack.
- **webpack-dev-server:** Local server with hot-reloading for React development.
- **@babel/core:** Core Babel package for transpiling JavaScript.
- **@babel/preset-env:** Babel preset for compiling ES6+ syntax.
- **@babel/preset-react:** Babel preset for compiling React JSX syntax.
- **babel-eslint:** Integrates ESLint with Babel parser for better linting of modern JavaScript features.

6.5 Database Collections

In the creation of the project management system for university thesis and project management, we have built many major database collections that will support effective data administration and user interactions. Each collection serves a unique purpose within the system, ensuring that all relevant information is structured and accessible.

Users Collection

The Users Collection collects critical information about all system users, including students, supervisors, and admins. Each user record comprises details such as usernames, passwords, contact information, and role assignments. This collection is crucial for managing user authentication and access control within the system.

Projects Collection

The Projects Collection is dedicated to storing information on each student's thesis or project. This covers project titles, descriptions, progress updates, deadlines, and associated milestones. By maintaining a full record of all projects, this collection helps users track progress and handle their academic duties effectively.

Tasks Collection

The Tasks Collection organizes all tasks connected to individual projects. Each task entry includes details such as task descriptions, assignees, deadlines, and current status. This collection supports task assignment and monitoring, ensuring that project components are performed on time.

Documents Collection

The Documents Collection acts as a repository for all project-related documents. Users can upload numerous file kinds, including proposals, reports, and presentations. This collection offers version control and document retrieval, making it easier for users to manage their project documentation efficiently.

Comments Collection

The Comments Collection allows users to engage in discussions concerning projects and assignments. Each comment post is linked to specific tasks or documents, enabling students and supervisors to provide comments and interact efficiently. This collection promotes teamwork and enriches the overall user experience.

Roles Collection

The Roles Collection defines and manages user roles within the system. It describes the rights associated with each role, such as student, supervisor, or admin. This collection is critical for managing access to various functionalities and ensuring that users can only execute actions related to their jobs.

Notifications Collection

The Notifications Collection collects notifications and messages delivered to users regarding project updates, task deadlines, and feedback. This collection ensures that users remain informed about major events and changes within the system, boosting communication and user engagement.

By building our database with these collections, we seek to create a solid and efficient framework for handling the complex interconnections involved in thesis and project management at the university level.

6.6 Diagrams

Activity Diagram

Fig. 6.1 Outlines a project submission and review process for students, supervisors, and admins. The student creates and submits a project, which is reviewed by a supervisor (assigned by an admin if needed). Supervisors provide feedback, review tasks, and approve the final project before completion.

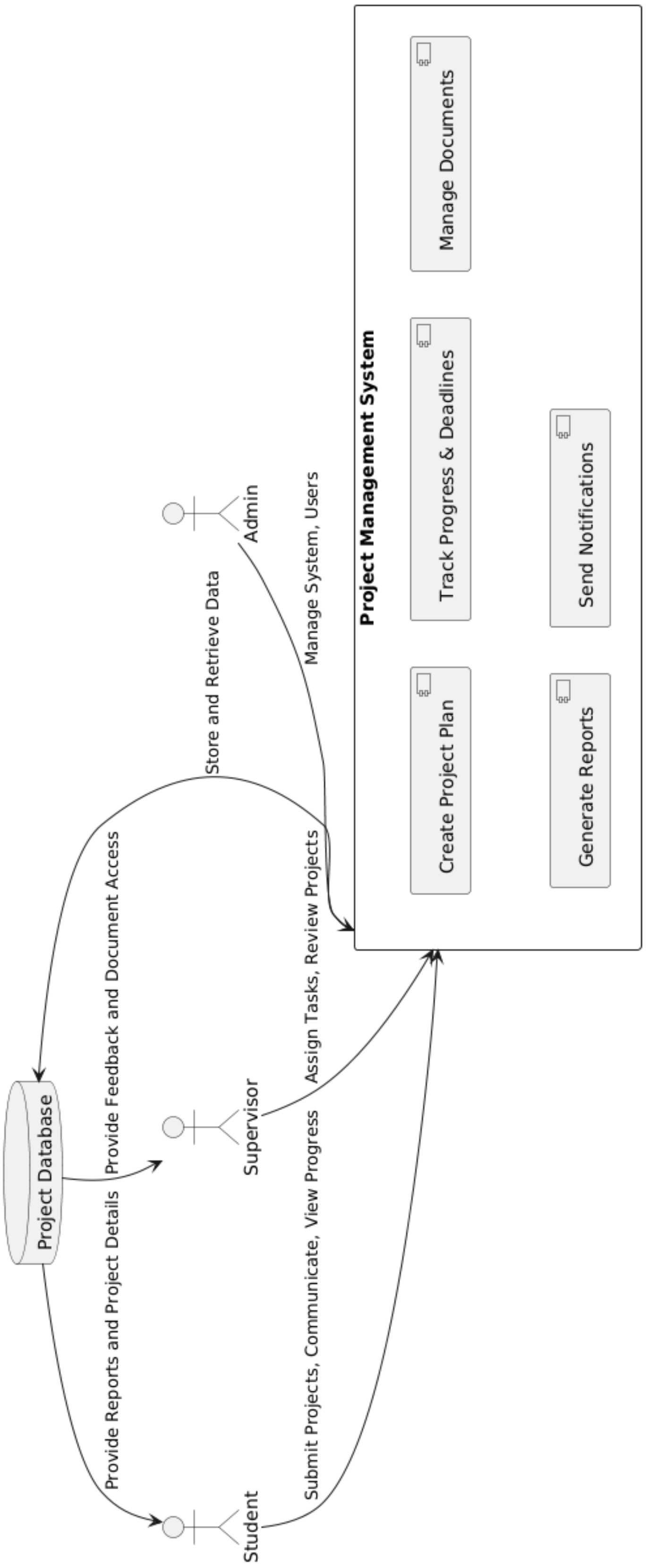
Project Management System
Create Project Plan
Track Progress & Deadlines
Manage Documents
Generate Reports
Send Notifications
Admin
Supervisor
Student
Project Database
Manage System, Users
Store and Retrieve Data
Assign Tasks, Review Projects
Submit Projects, Communicate, View Progress
Provide Feedback and Document Access
Provide Reports and Project Details

Fig. 6.1. Data Flow Diagram (DFD) of Thesis/ Project Automation

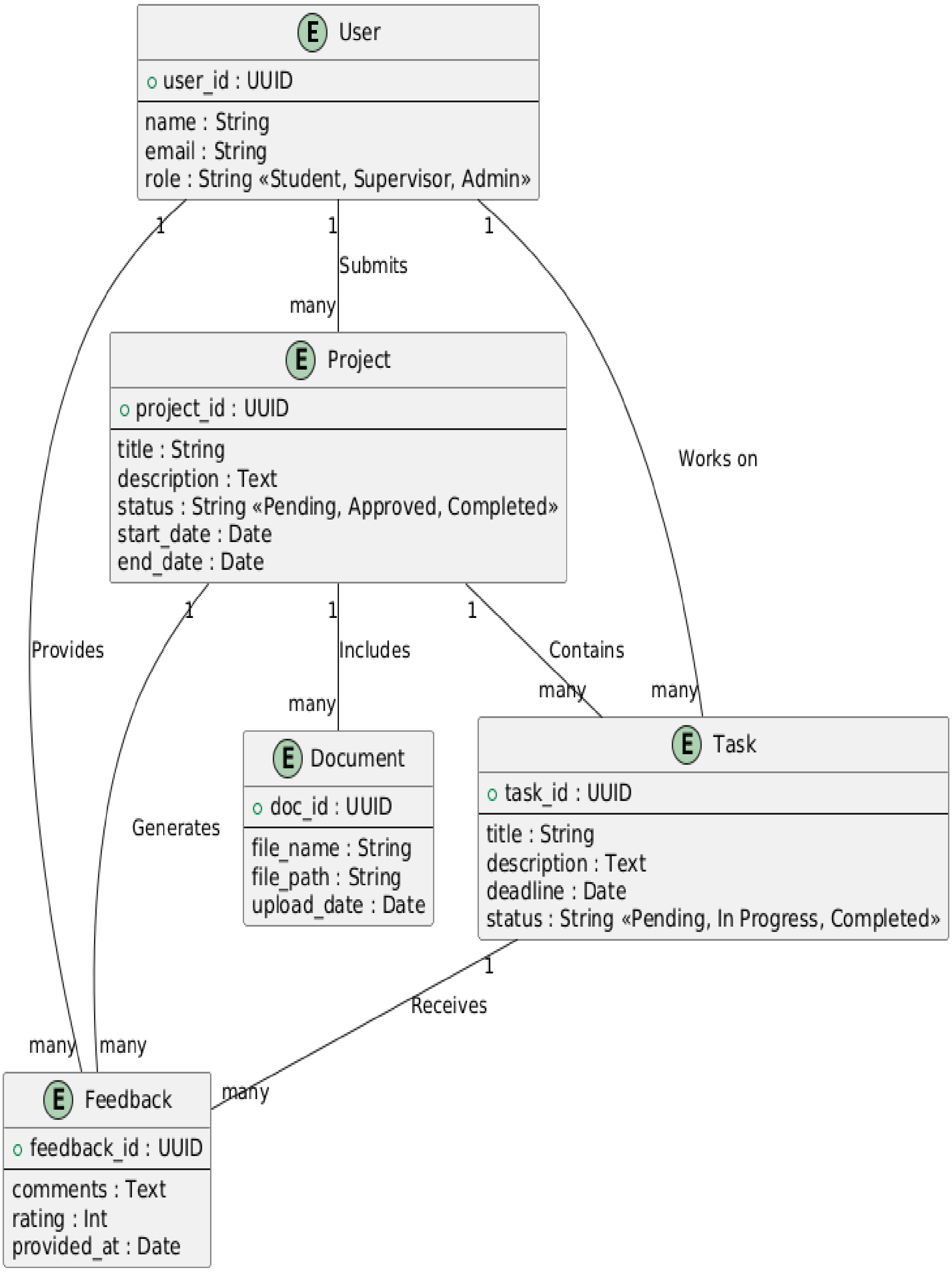

Fig. 6.2. Entity Relationship Diagram (ERD) of Thesis/ Project Automation

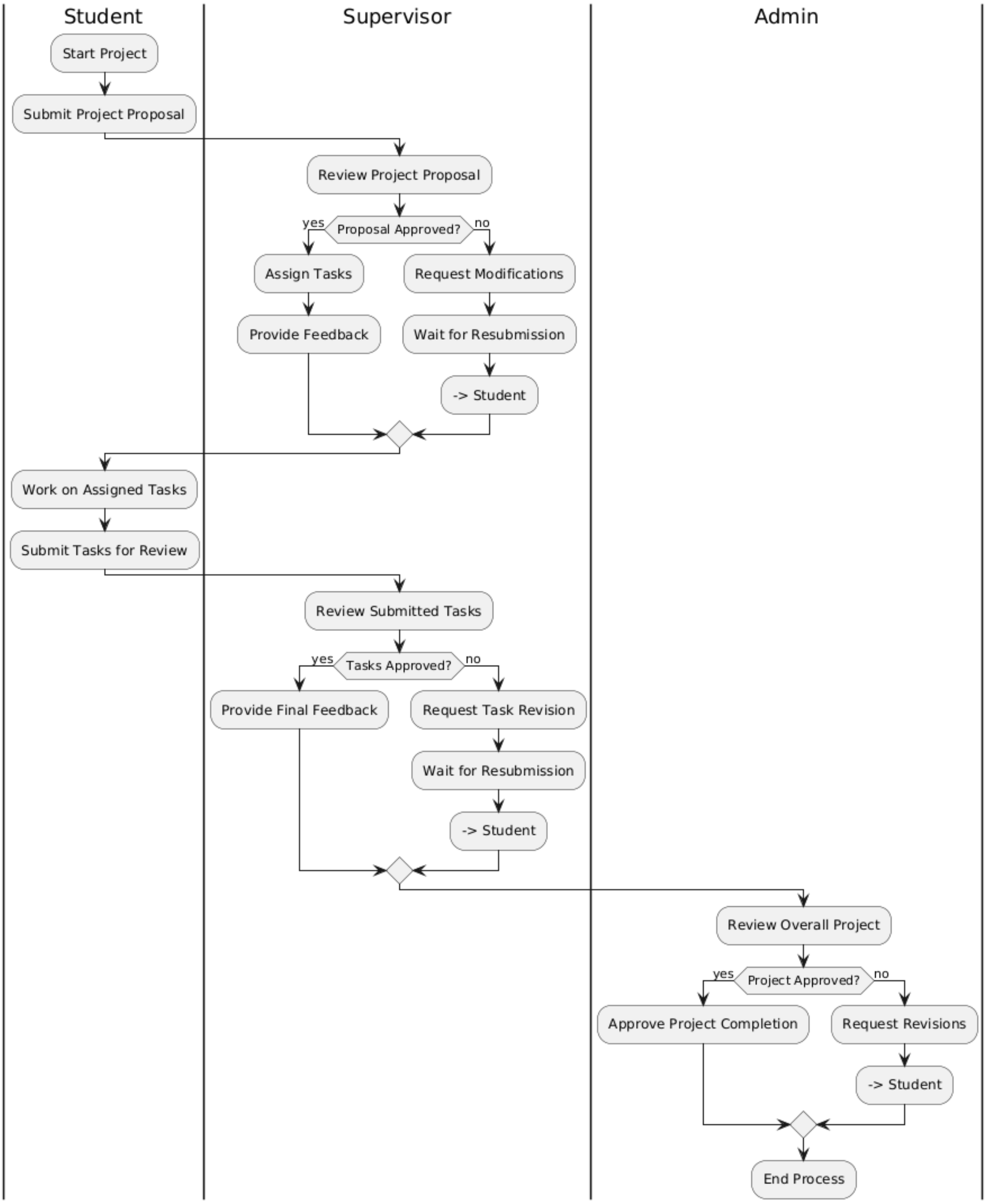

Fig. 6.3. Activity diagram of Thesis/ Project Automation

6.7 Front-End Development With React.js

For the project management system created for university thesis and project management, we have chosen React as our front-end framework. React's component-based architecture enables us to build a dynamic and responsive user experience by splitting it down into reusable components. Its efficient virtual DOM increases performance by optimizing UI updates, ensuring a pleasant user experience during interactions such as project tracking and document uploads. Additionally, React's ecosystem, which includes tools like React Router and Redux, provides seamless navigation and state management. By leveraging React, we want to develop an easy interface that increases collaboration and productivity for students and instructors.

Data Handling and Interaction:

- **Axios**: Efficiently manages data requests and responses for seamless interactions with the server.
- **React-query:** Optimizes data fetching, caching, and synchronization for seamless user interactions.
- **React-router-dom:** Seamless navigation to explore the platform effortlessly.
- **React-helmet:** Enables the dynamic manipulation of the document's head for improved SEO and meta information.

User Interface and Design:

- **React:** The foundation of the front-end, facilitating component-based UI development for an engaging user interface.
- **Tailwind css and antdesign:** Streamlined and responsive UI design for intuitive user interactions.
- **React-countup:** Engaging number animations for dynamic content display.
- **Sweetalert2:** Elegant alerts and modals to provide user-friendly notifications.

User Authentication:

Node.js with Express and JWT (JSON Web Token) provides a robust authentication system for securing your application. It allows you to handle user accounts, roles, permissions, and stateless authentication using JWTs. This setup leverages tokens to manage user sessions without the need for cookies, making it scalable and efficient. In this section, we'll explain how the default implementation works with Express and JWT, and how you can extend and customize it to meet the specific requirements of your project.

CHAPTER VII

DATA SECURITY, TESTING & MAINTENANCE

7.1 Data Security

The project management system for university thesis and project management stresses security through a comprehensive strategy that incorporates both the frontend and backend levels. At the basis of our security framework is JWT (JSON Web Tokens), a widely established way for securely exchanging information. We employ JWT to authenticate and validate users, guaranteeing that interactions between the frontend and backend are encrypted and tamper-proof. This cryptographic strategy promotes user privacy and safeguards sensitive data, providing a secure environment for all users.

Our routing system is separated into three tiers: public, private, and protected routes, each designed to manage different levels of user access and data accessibility.

- **Public Routes:** These routes enable unfettered access to critical components of the platform, such as landing pages and information about accessible features, allowing users to acquaint themselves with the system.

- **Private Routes:** Designed for registered users, private routes give access to tailored material and features. Authentication with JWT is necessary to access these routes, guaranteeing that only authenticated users may engage with specialized capabilities.

- **Protected Routes:** These routes are accessible exclusively to authorized individuals, such as administrators or faculty members. They deploy multi factor authentication and severe verification methods to secure sensitive data and vital system functions.

Additionally, our security architecture follows a layer-by-layer defense strategy:

- **Presentation Layer:** This topmost layer safeguards user interactions through input validation, data sanitization, and client-side encryption, defending against attacks like Cross-Site Scripting (XSS) and Cross-Site Request Forgery (CSRF).

- **Application Layer:** The middle layer, where fundamental functionalities sit, is secured with tight authorization and access controls. Comprehensive input validation and strong error handling are incorporated to reduce vulnerabilities such as injection attacks and inappropriate data manipulation.

- **Data Layer:** The deepest layer, which holds the database, is protected with encryption techniques and correct database design. This helps prevent unauthorized data access and SQL injection attacks.

By integrating these security measures—JWT authentication, tiered routing, and a thorough layer-by-layer protection strategy—we offer a secure and trustworthy environment for users. Students and professors may engage confidently with the project management system, knowing that their data is safeguarded, and their interactions are secure.

7.2 Testing & Bug Fixing

Our testing methodology for the project management system, built for university thesis and project management, covers a range of approaches and practices that ensure robustness, dependability, and user-centric performance. This comprehensive strategy represents our dedication to delivering a seamless and safe user experience through precise preparation, rigorous implementation, and continual refinement.

Testing Methodologies

- **Agile Testing:** We follow an Agile development style, including testing into each sprint. This iterative process allows us to continuously check and verify features as they are produced, promoting early bug detection and rapid issue resolution.

- **Continuous Integration and Continuous Deployment (CI/CD) Testing:** Our CI/CD pipeline contains automated testing at multiple phases, from code integration to deployment. This automation accelerates testing cycles, maintains consistent quality, and provides immediate feedback for developers.

- **Exploratory Testing:** To imitate real-world user behavior, we undertake exploratory testing, where testers engage with the system to find unforeseen difficulties, ambiguities, and potential usability concerns.

- **Performance and Load Testing:** We extensively assess the platform's performance utilizing load testing techniques. By subjecting the system to diverse user loads, we measure response times, resource utilization, and scalability, assuring a seamless experience even during high usage.

- **Security Testing:** Our security testing approach comprises vulnerability assessments, penetration testing, and code reviews to detect and address potential security flaws, safeguarding user data and privacy.

Testing Work

- **Test Planning and Design:** Before testing begins, we prepare a thorough test strategy outlining objectives, scope, resources, and schedules. Test cases and scenarios are rigorously crafted to cover varied capabilities, user interactions, and probable edge cases.
- **Test Execution and Bug Reporting:** We execute test cases across numerous environments and devices, documenting findings and bug reports in detail. Identified bugs are reported with steps to recreate, enabling developers to handle them effectively.
- **Automated Testing:** We leverage automated testing frameworks to expedite repeating test scenarios, assuring consistency and minimizing human error. This allows our testers to focus on more difficult areas of the platform.
- **User Acceptance Testing (UAT):** UAT involves real users accessing the system and offering input on usability and functionality. This input informs refinements that connect the platform with user expectations.
- **Regression Testing:** With each code change or update, we do rigorous regression testing to verify that new additions or fixes do not negatively impact existing functionalities.
- **Collaboration and Feedback Loop:** Our testing approach is collaborative, featuring tight cooperation among developers, testers, and stakeholders. Regular feedback loops promote fast issue resolution and enhancements aligned with user needs.

By embracing a variety of testing approaches and maintaining a commitment to continuous improvement, our testing methodology guarantees that the project management system continually achieves the highest standards of quality, performance, security, and user satisfaction. This focused testing work is crucial to ensuring a seamless and enriching experience for users, supporting successful project management and academic success.

7.3 Maintenance

The dedication to quality in our project management system for university thesis and project management extends beyond its original launch, comprising a strong maintenance approach that ensures the platform's endurance, efficiency, and constant enhancement.

- **Continuous Monitoring and Performance Optimization:** Our maintenance plan entails careful monitoring of the platform's performance and responsiveness. We deploy powerful monitoring technologies to track crucial data like server uptime, response times, and user interactions. This proactive strategy enables us to promptly identify and address any potential bottlenecks or performance concerns, providing an ideal user experience, even during peak usage periods.

- **Bug Tracking and Resolution:** To ensure a seamless experience, our maintenance routine includes rigorous problem tracking and resolution. User comments and automated problem reports aid our staff in discovering and correcting flaws, inconsistencies, or unexpected actions. Swift bug resolution boosts the user experience and contributes to the platform's reliability and stability.

- **Security Updates and Patches:** Security is a major priority, and our maintenance activities reflect this dedication. We regularly monitor developing security vulnerabilities and swiftly implement updates and fixes to fortify the platform against potential attackers. Regular security audits and vulnerability evaluations ensure that our system's security posture remains resilient, safeguarding user data and privacy.

- **Content Refresh and Feature Expansion:** Maintenance also entails the continual evolution of the platform's content and functionality. We regularly renew and update material to give users engaging and relevant experiences. Additionally, we work on growing the system's offers by introducing new functionalities and refining existing ones, boosting user involvement and pleasure.

- **User Support and Assistance:** Our maintenance strategy prioritizes user support and help. We provide accessible communication channels to rapidly resolve user requests, problems, or technical issues. By providing responsive and helpful assistance, we ensure that users can navigate the platform smoothly and maximize its capabilities.

- **Scalability and Future-Proofing:** Our maintenance strategy is developed with scalability and future-proofing in mind. As the user base increases and technology evolves, we conduct scalability assessments and strategic planning to suit increasing demands. We proactively investigate upcoming technologies and trends to guarantee that the project management system remains cutting-edge and relevant in an ever-evolving academic field.

In essence, our maintenance philosophy comprises a holistic approach that encompasses performance optimization, bug resolution, security fortification, content enrichment, user support, and strategic planning. By meticulously attending to these features, we sustain the platform's integrity, lifespan, and user-centric focus, ensuring that it remains a dynamic, secure, and engaging tool for effective thesis and project management.

CHAPTER VIII

CONCLUSION

8.1 Project Impact & Significance

The project management system for university thesis and project management is meant to dramatically enhance the academic experience for students and professors alike. By offering a unified platform for managing projects, the system streamlines the process of project planning, execution, and monitoring. This leads to greater organization and efficiency, enabling students to manage their time and resources more effectively.

The system facilitates collaboration among students, supervisors, and administrators, providing transparent communication and feedback throughout the project lifetime. This collaborative environment not only boosts the quality of the work but also develops a sense of community inside the academic setting.

Moreover, by including tools such as task management, document storage, and performance tracking, the platform encourages users to take responsibility for their academic work, cultivating skills such as time management and accountability. The ability to conveniently access resources and receive fast feedback from supervisors further enriches the learning experience, ultimately leading to higher quality thesis submissions and project outcomes.

In summary, the project management system not only optimizes the workflow for thesis and project management but also adds to the overall academic achievement and professional development of students, making it an important instrument in the modern educational landscape.

8.2 Future Prospects

The future prospects of the project management system for university thesis and project management are good, with possibilities for considerable modifications and expansions. As technology improves, we want to include advanced features such as artificial intelligence and machine learning algorithms to provide individualized recommendations for project planning and resource allocation. These advances could help students locate relevant materials, enhance their workflows, and increase overall project outcomes.

Additionally, incorporating mobile accessibility will boost user engagement, allowing students and professors to manage their projects on-the-go, ensuring that they remain connected and productive regardless of their location. We also foresee expanding the platform to facilitate interdisciplinary initiatives, facilitating collaboration across different departments and building a deeper academic atmosphere.

Furthermore, ongoing user feedback will lead incremental changes, ensuring that the system adapts to suit the changing demands of the university community. By developing links with industry stakeholders, we can also investigate options for internships and real-world project collaborations, further enriching the academic experience.

In essence, the project management system is primed for expansion, with a commitment to innovation that will expand its functionality and user experience, ultimately contributing to the academic achievement and professional development of students in the years to come.

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APPENDIX A

SCREENSHOTS

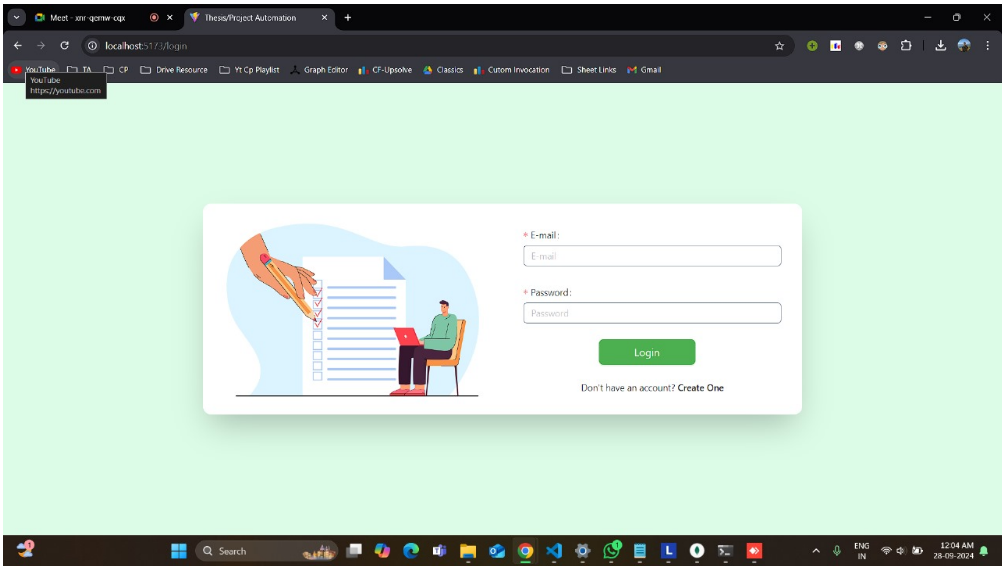


Fig. A.1. Login and Signup-1

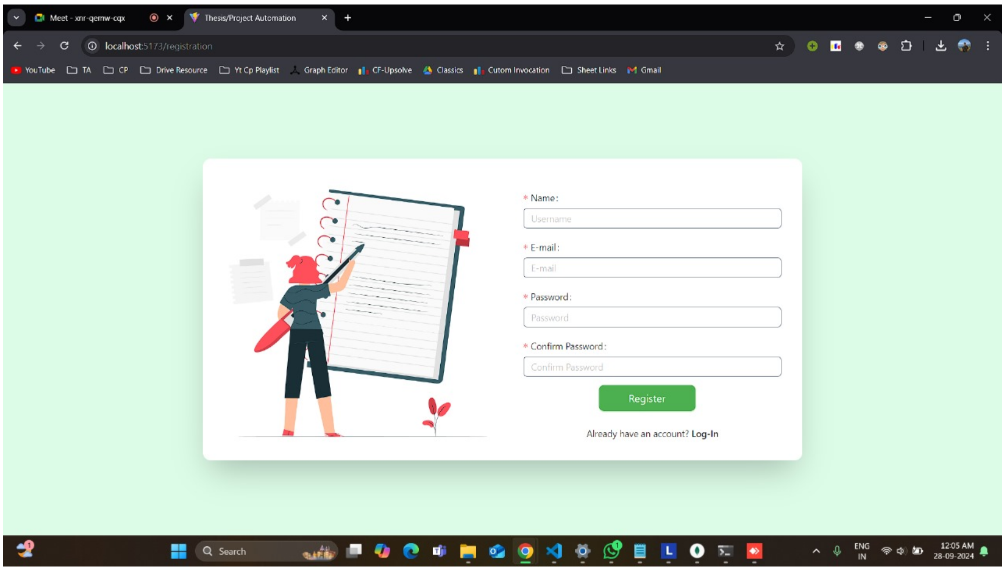
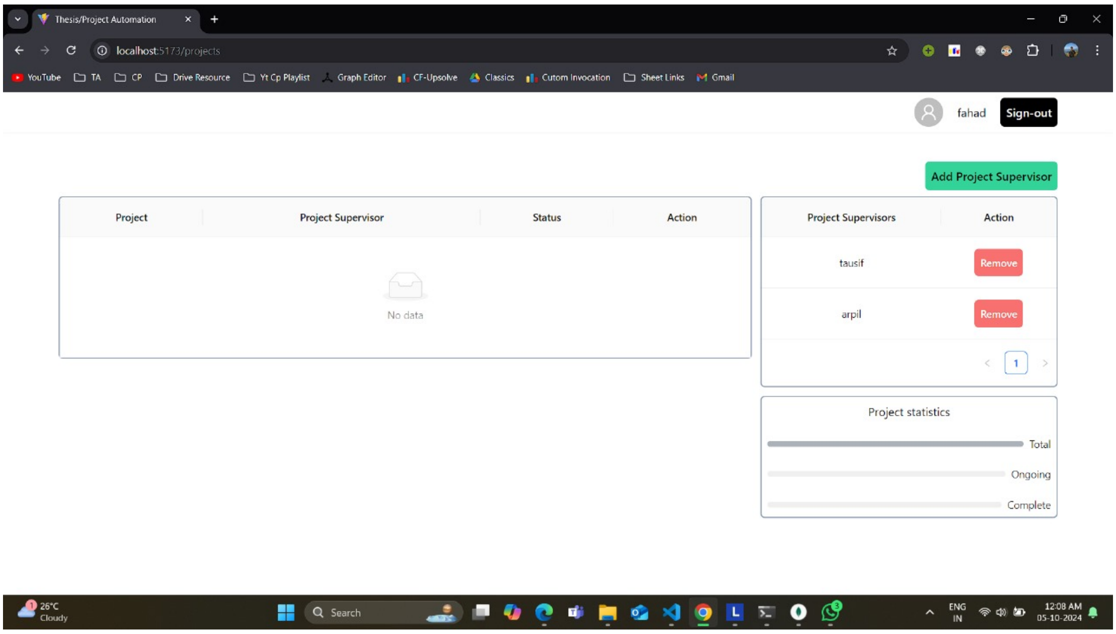


Fig. A.2. Login and Signup-2



Project	Project Supervisor	Status	Action

No data

Project Supervisors	Action
tausif	Remove
arpil	Remove

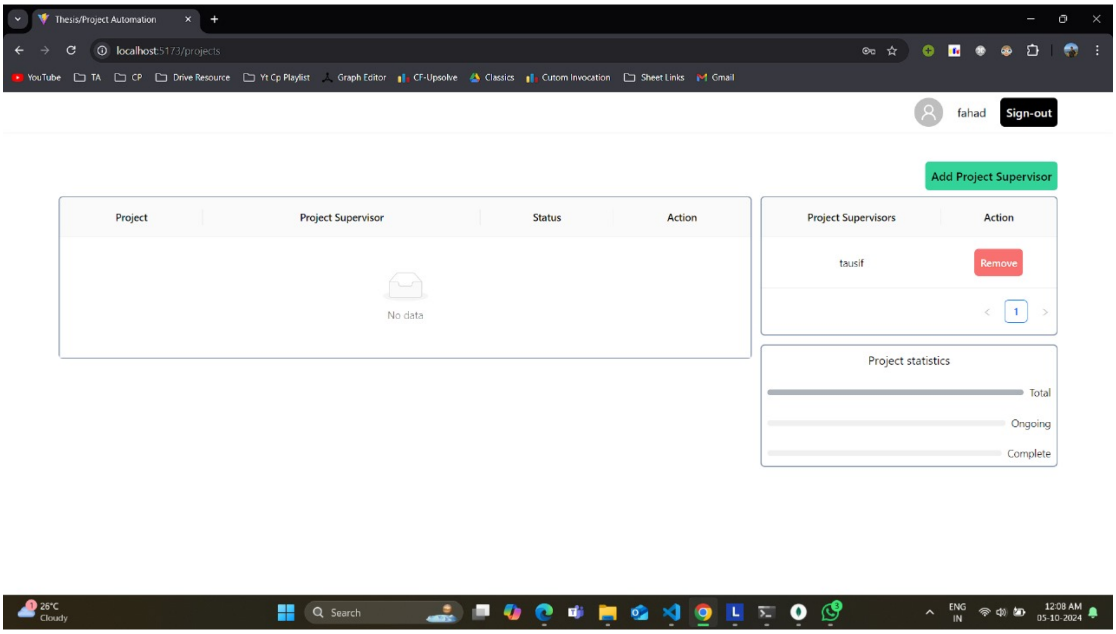
Project statistics

Total

Ongoing

Complete

Fig. A.3. Admin Panel-1



Project	Project Supervisor	Status	Action

No data

Project Supervisors	Action
tausif	Remove

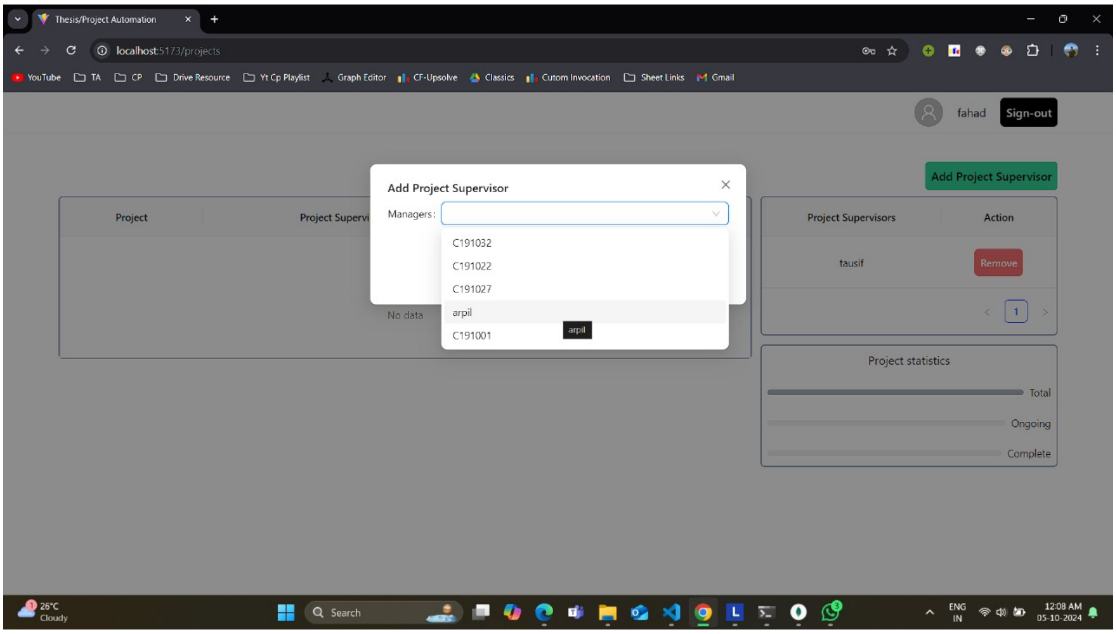
Project statistics

Total

Ongoing

Complete

Fig. A.4. Admin Panel-2



Add Project Supervisor

Managers:

- C191032
- C191022
- C191027
- arpil
- C191001

Project	Project Supervi
No data	

Project Supervisors	Action
tausif	Remove

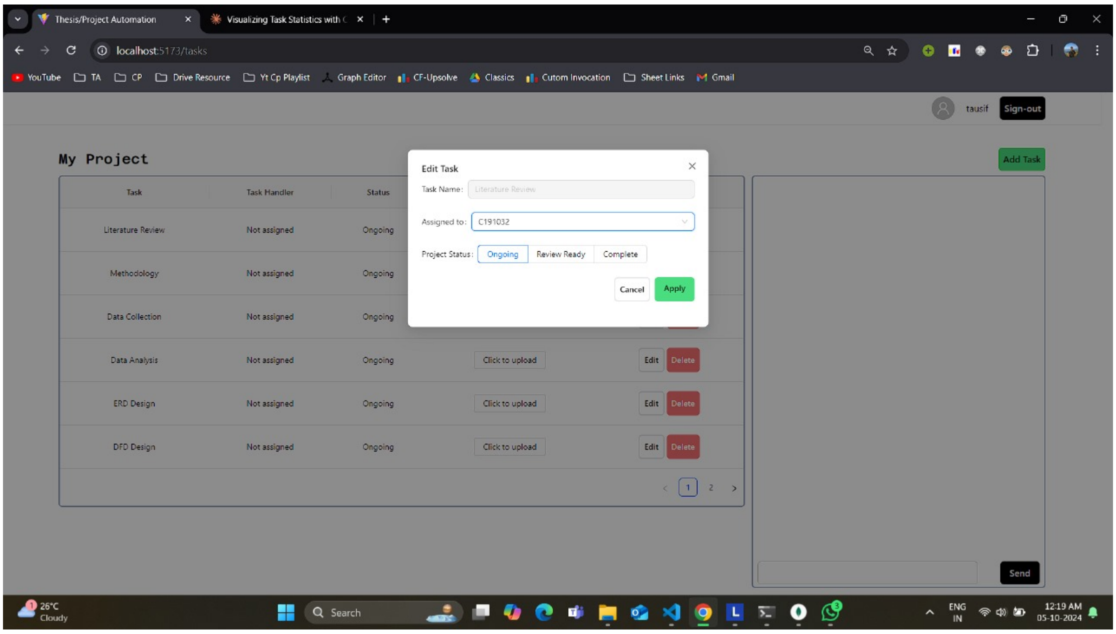
Project statistics

Total

Ongoing

Complete

Fig. A.5. Admin Panel-3



My Project

Task	Task Handler	Status		
Literature Review	Not assigned	Ongoing		
Methodology	Not assigned	Ongoing		
Data Collection	Not assigned	Ongoing		
Data Analysis	Not assigned	Ongoing	Click to upload	Edit Delete
ERD Design	Not assigned	Ongoing	Click to upload	Edit Delete
DFD Design	Not assigned	Ongoing	Click to upload	Edit Delete

< 1 2 >

Edit Task

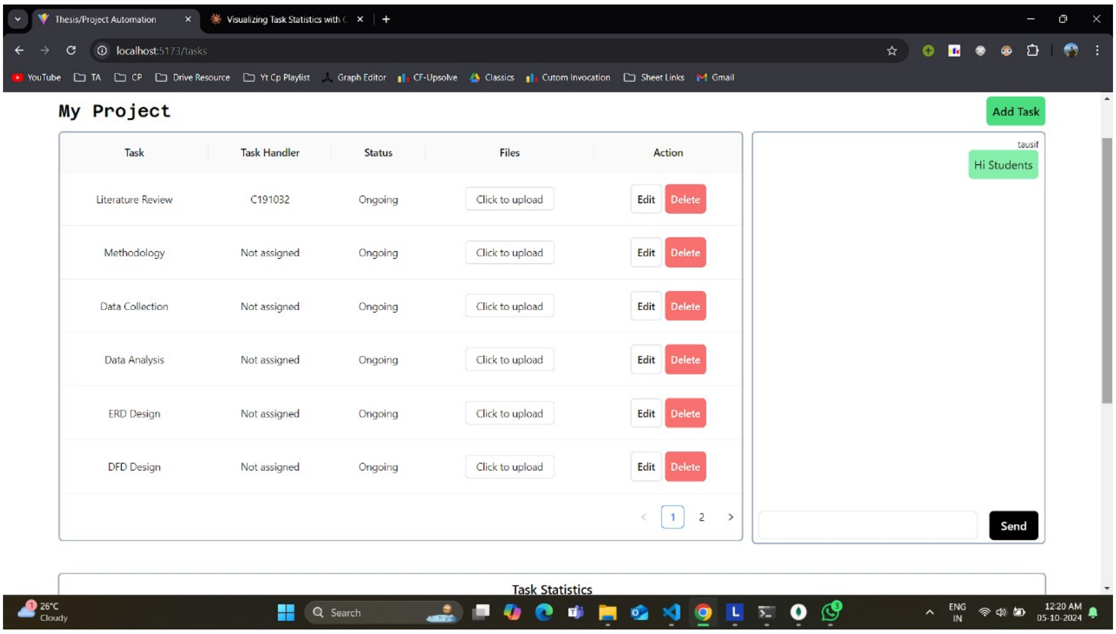
Task Name: Literature Review

Assigned to: C191032

Project Status: [✓ Ongoing] Review Ready Complete

Cancel Apply

Fig. A.6. Supervisor Panel-1



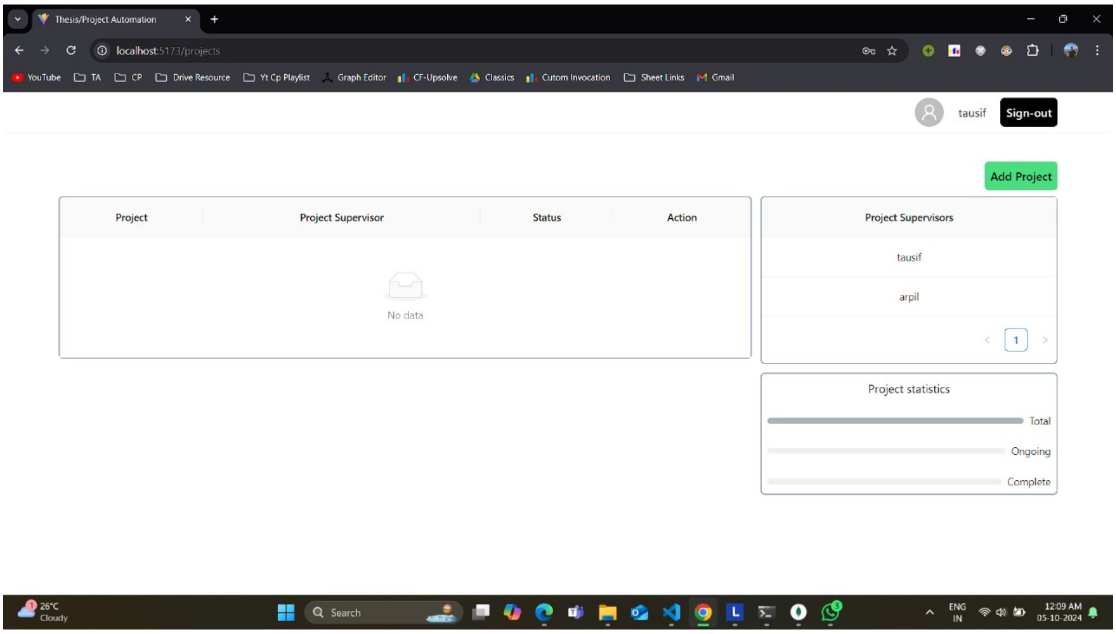
My Project

Task	Task Handler	Status	Files	Action
Literature Review	C191032	Ongoing	Click to upload	Edit Delete
Methodology	Not assigned	Ongoing	Click to upload	Edit Delete
Data Collection	Not assigned	Ongoing	Click to upload	Edit Delete
Data Analysis	Not assigned	Ongoing	Click to upload	Edit Delete
ERD Design	Not assigned	Ongoing	Click to upload	Edit Delete
DFD Design	Not assigned	Ongoing	Click to upload	Edit Delete

tausif
Hi Students

Task Statistics

Fig. A.7. Supervisor Panel-2



Project	Project Supervisor	Status	Action

No data

Project Supervisors
tausif
arpil

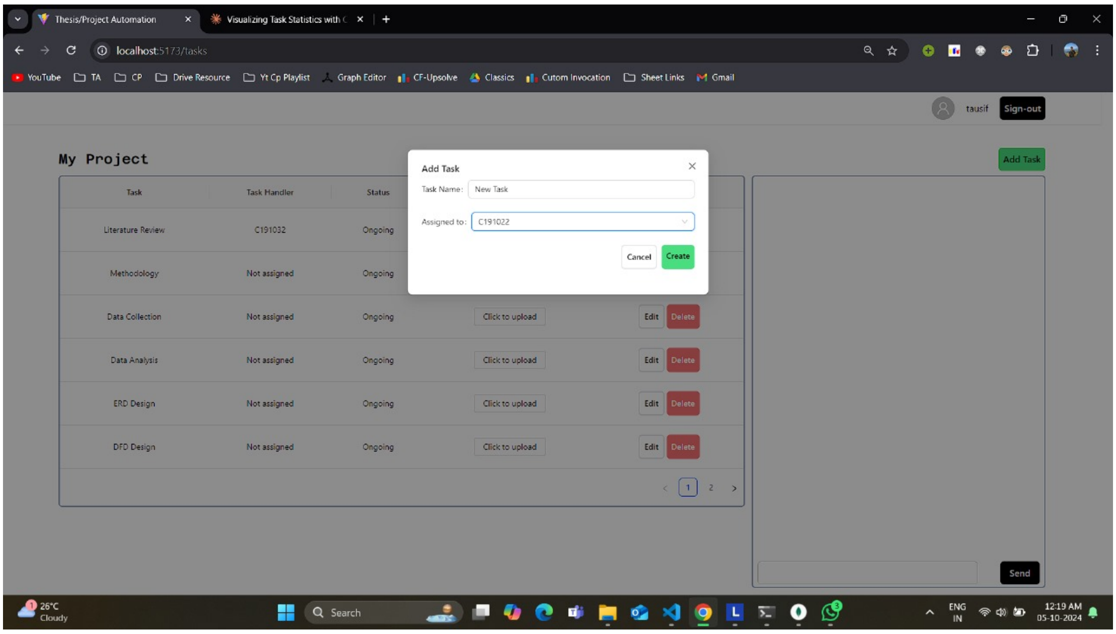
Project statistics

Total

Ongoing

Complete

Fig. A.8. Supervisor Panel-3



My Project

Task	Task Handler	Status		
Literature Review	C191032	Ongoing		
Methodology	Not assigned	Ongoing		
Data Collection	Not assigned	Ongoing	Click to upload	Edit Delete
Data Analysis	Not assigned	Ongoing	Click to upload	Edit Delete
ERD Design	Not assigned	Ongoing	Click to upload	Edit Delete
DFD Design	Not assigned	Ongoing	Click to upload	Edit Delete

< 1 2 >

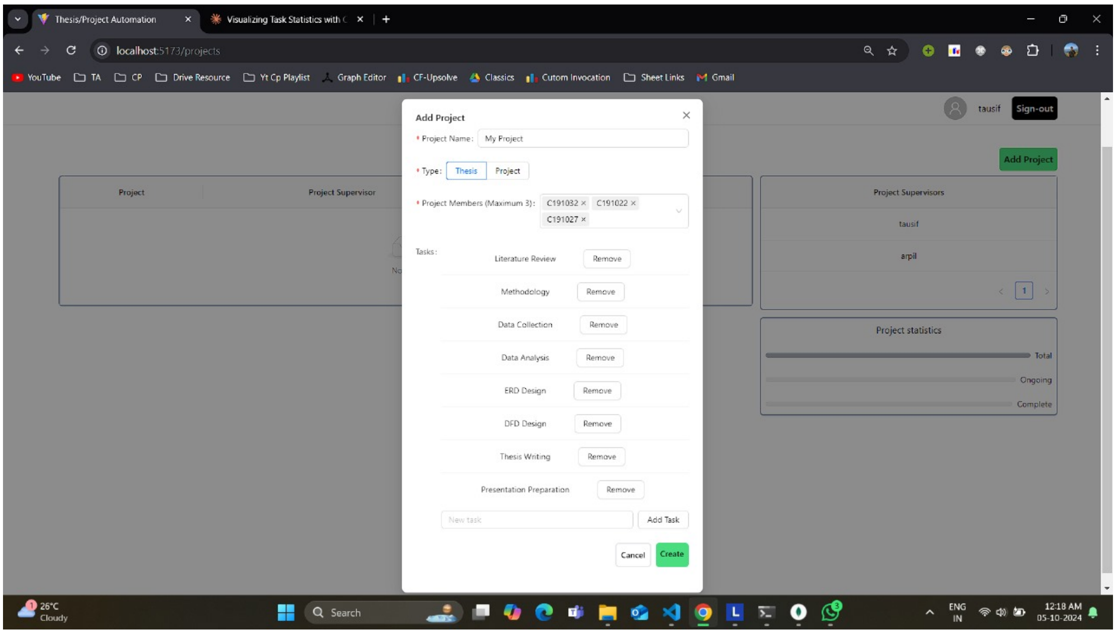
Add Task

Task Name: New Task

Assigned to: C191022

Cancel Create

Fig. A.9. Supervisor Panel-4



Add Project

* Project Name: My Project

* Type: Thesis Project

* Project Members (Maximum 3): C191032 × C191022 × C191027 ×

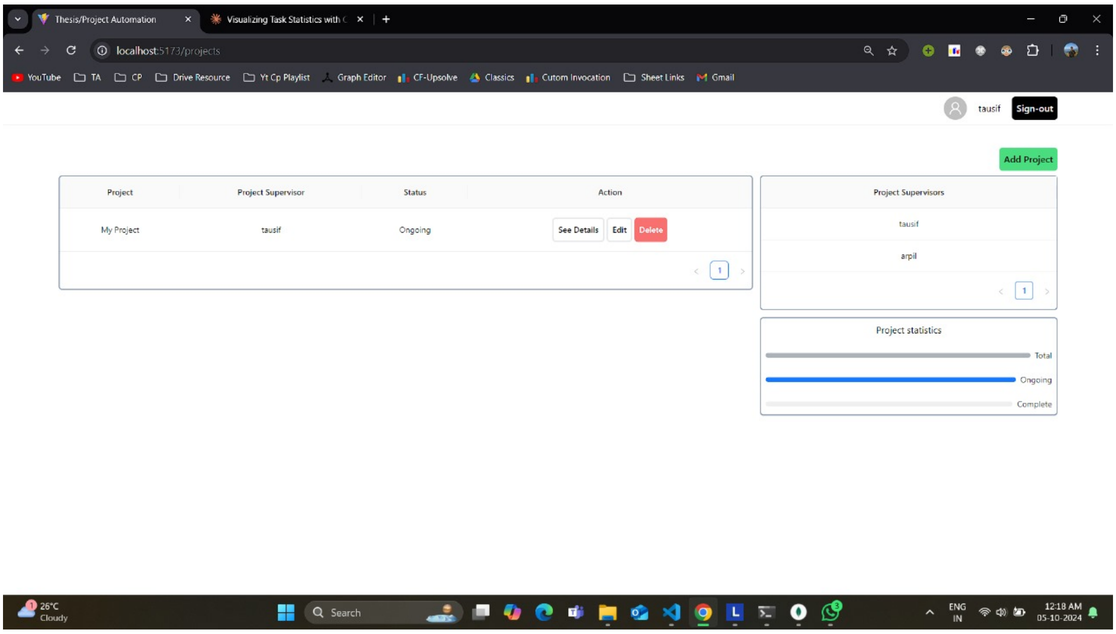
Tasks:

Literature Review	Remove
Methodology	Remove
Data Collection	Remove
Data Analysis	Remove
ERD Design	Remove
DFD Design	Remove
Thesis Writing	Remove
Presentation Preparation	Remove

New task Add Task

Cancel Create

Fig. A.10. Supervisor Panel-5



Project	Project Supervisor	Status	Action
My Project	tausif	Ongoing	See Details Edit Delete

Project Supervisors
tausif
arpil

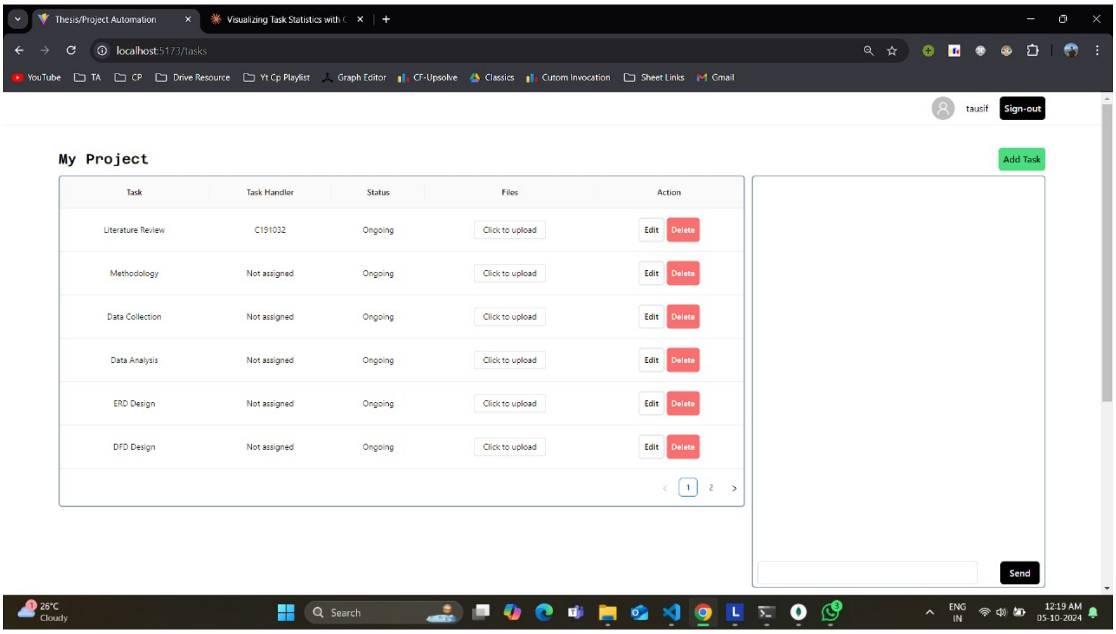
Project statistics

Total

Ongoing

Complete

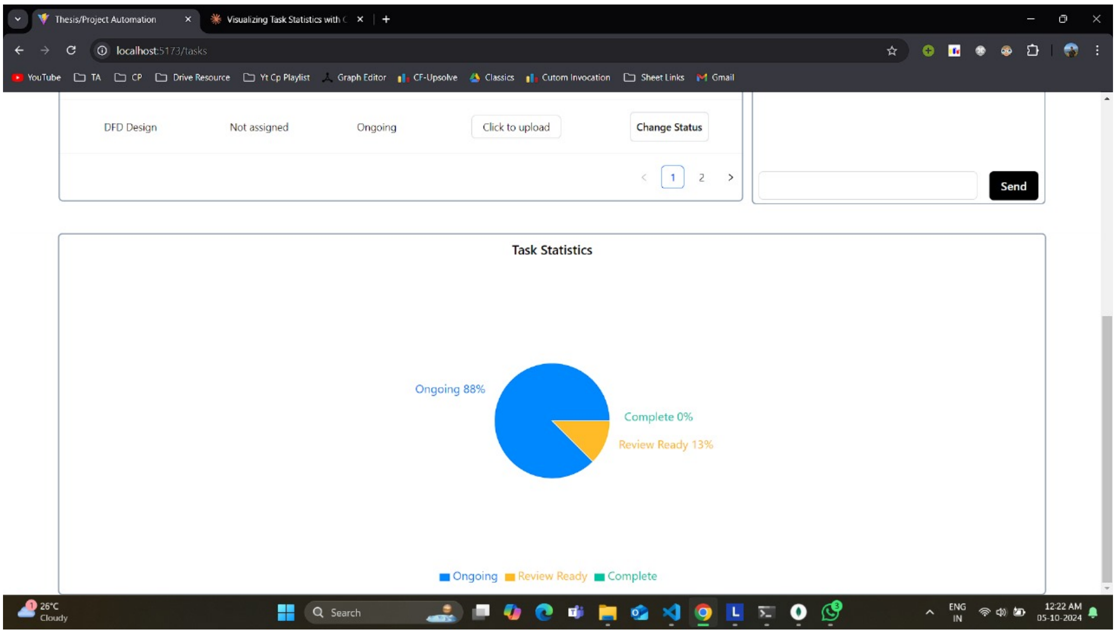
Fig. A.11. Supervisor Panel-6



My Project

Task	Task Handler	Status	Files	Action
Literature Review	C191032	Ongoing	Click to upload	Edit Delete
Methodology	Not assigned	Ongoing	Click to upload	Edit Delete
Data Collection	Not assigned	Ongoing	Click to upload	Edit Delete
Data Analysis	Not assigned	Ongoing	Click to upload	Edit Delete
ERD Design	Not assigned	Ongoing	Click to upload	Edit Delete
DFD Design	Not assigned	Ongoing	Click to upload	Edit Delete

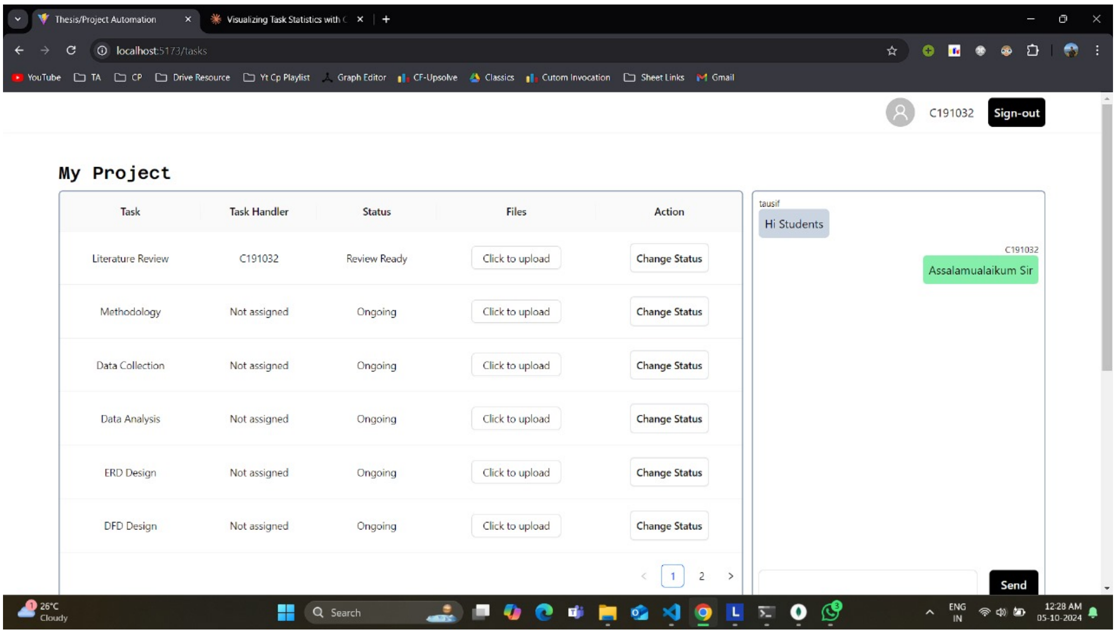
Fig. A.12. Supervisor Panel-7



DFD Design	Not assigned	Ongoing	Click to upload	Change Status

Task Statistics

Fig. A.13. Student Panel-1



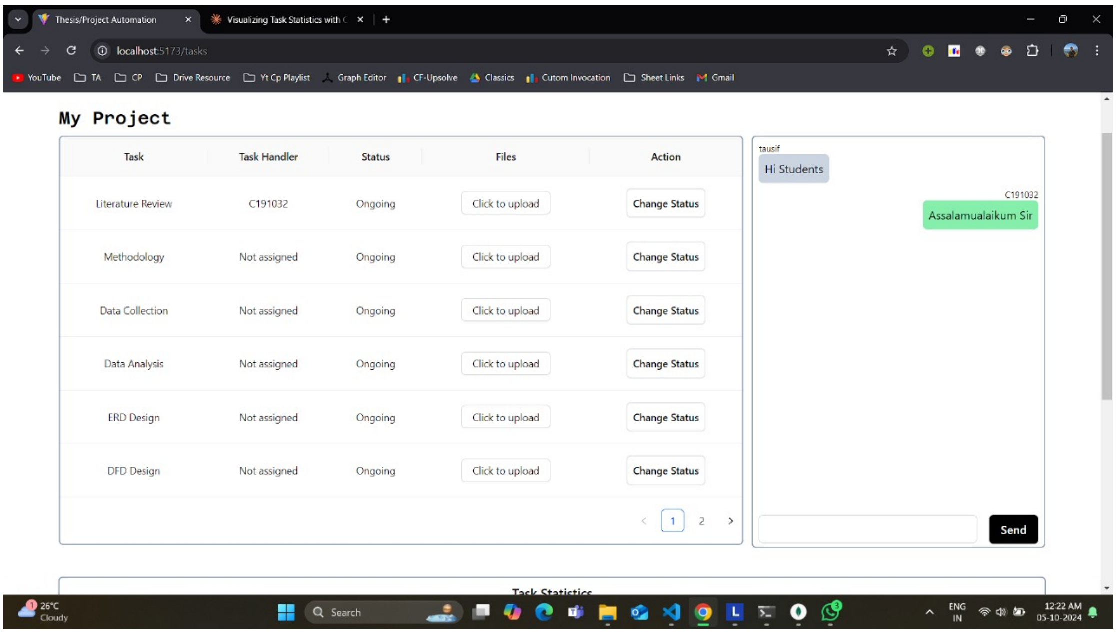
My Project

Task	Task Handler	Status	Files	Action
Literature Review	C191032	Review Ready	Click to upload	Change Status
Methodology	Not assigned	Ongoing	Click to upload	Change Status
Data Collection	Not assigned	Ongoing	Click to upload	Change Status
Data Analysis	Not assigned	Ongoing	Click to upload	Change Status
ERD Design	Not assigned	Ongoing	Click to upload	Change Status
DFD Design	Not assigned	Ongoing	Click to upload	Change Status

tausif
Hi Students

C191032
Assalamualaikum Sir

Fig. A.14. Student Panel-2



My Project

Task	Task Handler	Status	Files	Action
Literature Review	C191032	Ongoing	Click to upload	Change Status
Methodology	Not assigned	Ongoing	Click to upload	Change Status
Data Collection	Not assigned	Ongoing	Click to upload	Change Status
Data Analysis	Not assigned	Ongoing	Click to upload	Change Status
ERD Design	Not assigned	Ongoing	Click to upload	Change Status
DFD Design	Not assigned	Ongoing	Click to upload	Change Status

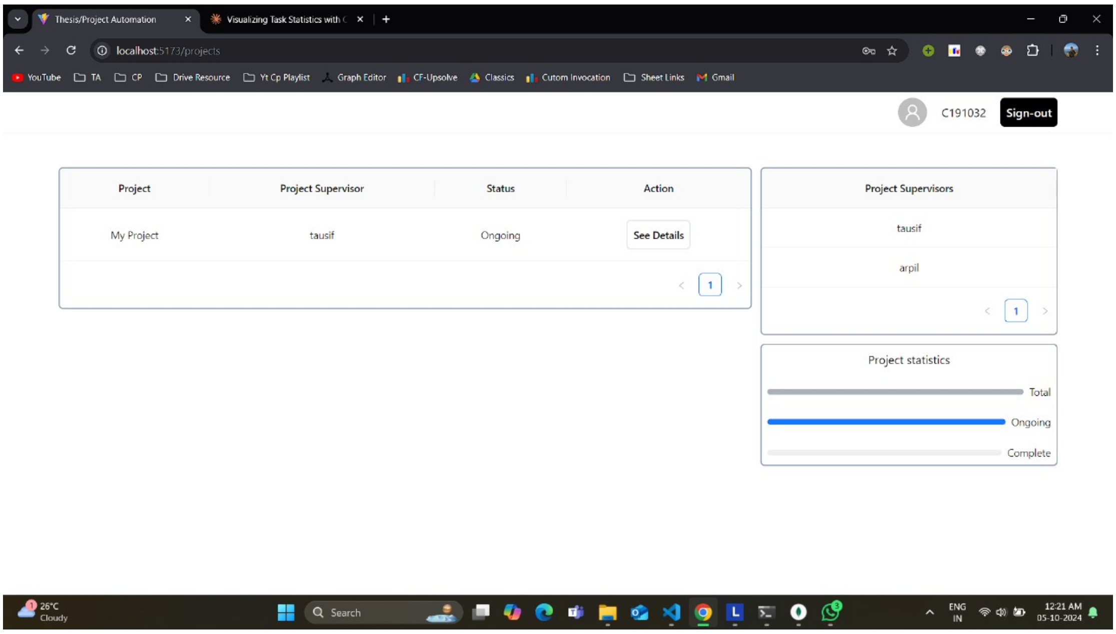
< 1 2 >

tausif
Hi Students

C191032
Assalamualaikum Sir

Send

Fig. A.15. Student Panel-3



C191032 Sign-out

Project	Project Supervisor	Status	Action
My Project	tausif	Ongoing	See Details

< 1 >

Project Supervisors
tausif
arpil

< 1 >

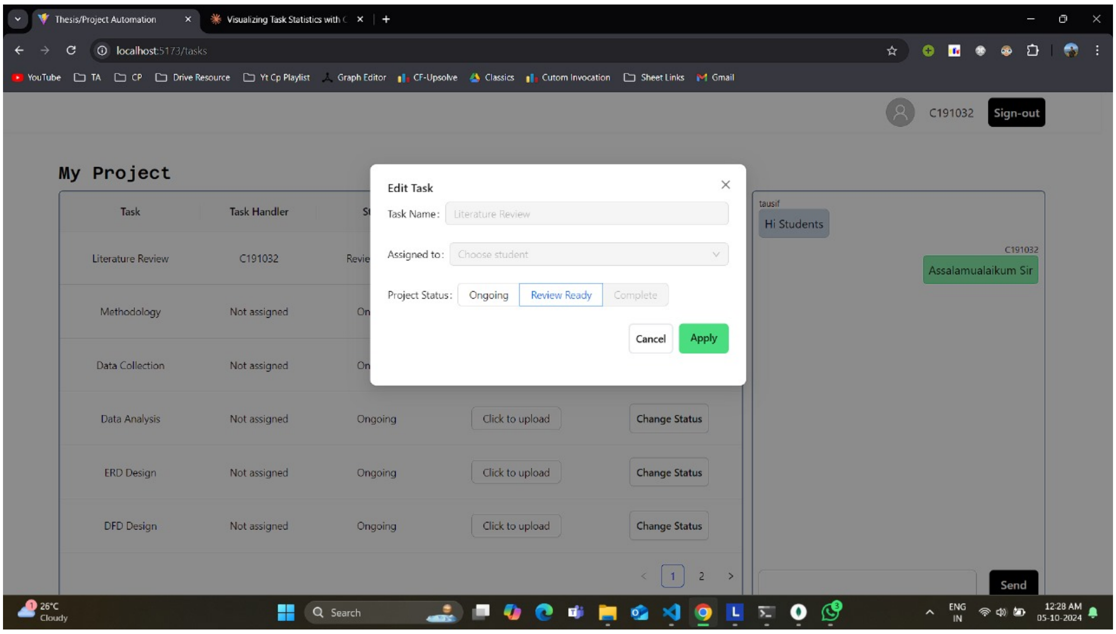
Project statistics

Total

Ongoing

Complete

Fig. A.16. Student Panel-4



localhost:5173/tasks

My Project

Task	Task Handler	St		
Literature Review	C191032	Revie		
Methodology	Not assigned	On		
Data Collection	Not assigned	On		
Data Analysis	Not assigned	Ongoing	Click to upload	Change Status
ERD Design	Not assigned	Ongoing	Click to upload	Change Status
DFD Design	Not assigned	Ongoing	Click to upload	Change Status

Edit Task

Task Name: Literature Review

Assigned to: Choose student

Project Status: Ongoing [✓ Review Ready] Complete

tausif
Hi Students

C191032
Assalamualaikum Sir

Fig. A.17. Student Panel-5