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TASK MANAGEMENT APPLICATION

A Project

Presented to the

Faculty of

California State University,

San Bernardino

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

in

Computer Science

by

Dhaval Chaturbhai Hirpara

August 2024

TASK MANAGEMENT APPLICATION

A Project

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by

Dhaval Chaturbhai Hirpara

August 2024

Approved by:

Dr. Jennifer Jin, Advisor, Computer Science and Engineering

Dr. Khalil Dajani, Committee Member, Computer Science and Engineering

Dr. Ronald Salloum, Committee Member, Computer Science and Engineering

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ABSTRACT

The Task Management Application is a web-based platform designed to facilitate efficient task and project management for individuals. The application features three distinct roles: Administrator, Project Manager, and Employee, each endowed with specific functionalities and permissions to streamline workflow.

The Administrator role encompasses comprehensive project oversight, including the ability to add, view, and manage project managers, as well as supervise ongoing projects and view employee details. Project Managers can effortlessly manage employees, assign tasks, and oversee project progress. Employees, on the other hand, have dedicated functionalities to view and manage tasks assigned to them.

The application prioritizes user convenience with an intuitive interface, ensuring a seamless experience in project and task management. Additionally, all user roles are equipped with the capability to change their passwords upon login, enhancing security.

By providing these tailored features and a user-friendly design, the Task Management Application aims to improve productivity and ensure efficient project execution.

ACKNOWLEDGEMENTS

There are a lot of people who have helped us during the course of this project. Without their assistance this project would have been incomplete.

I, student at California Student University – San Bernardino; feel obliged to Department of Natural Sciences, for teaching us the basics of Software development and guiding me in the right direction.

I would like to extend our gratitude to our Dr. Jennifer Jin, my advisor, and committee members Dr. Khalil Dajani and Dr. Ronald Salloum who mentored me throughout the project development process and provided their valuable assistance throughout different stages of software development.

DEDICATION

To my wife, parents, friends, and family: Your love, support, and friendship have shaped me. This project is dedicated to you with heartfelt gratitude and appreciation.

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CHAPTER ONE:

INTRODUCTION

Background

We developed a web application for managing tasks and projects. It consists of tools for project management, assigning tasks, and tracking progress.

The Administrator can manage project managers and projects, as well as view employee details. The Project Manager can manage employees and assign tasks. Employees can view and manage their assigned tasks. Additionally, all users can change their passwords after logging in, enhancing security.

By combining task management with role-specific functionalities, our application aims to improve productivity and ensure efficient project execution.

Significance

This application will help users manage and track their tasks and projects effectively by assigning roles with specific functionalities. The Administrator can oversee all projects and manage project managers, ensuring smooth operations.

Project Managers can easily assign tasks to employees and monitor progress, which helps in efficient project execution. Employees can view and manage their assigned tasks, ensuring they stay on track and meet deadlines.

Users can receive notifications for upcoming deadlines and important tasks, which helps prevent missed deadlines and ensures timely completion of projects.

Additionally, there will be modules for users to learn best practices in project management and task prioritization. This will enable users to enhance their productivity, improve team collaboration, and achieve their project goals more effectively.

By providing a structured approach to task management with role-specific functionalities, our application aims to improve productivity, ensure efficient project execution, and promote better team collaboration.

Purpose

This application will help users manage and track their tasks and projects efficiently. It will assist with project planning, task assignment, and progress monitoring. Users can assign tasks, set deadlines, and stay on top of their responsibilities.

With distinct roles for Administrators, Project Managers, and Employees, the application ensures smooth workflow and enhances productivity. Administrators can oversee projects, Project Managers can manage tasks and employees, and Employees can efficiently handle their assigned tasks.

By providing a structured approach to task management, our application aims to improve productivity and ensure efficient project execution.

CHAPTER TWO:

PROJECT PROFILE

Requirement Gathering

- User Roles:
    - The Task Management Application will have three primary roles: Admin, Project Manager, and Employee.
- Admin Functionality:
    - Admins will be able to create and manage Project Managers and Projects according to user requirements.
- Project Manager Functionality:
    - Project Managers will be able to add and manage Employees.
    - Project Managers can view projects added by Admins and assign these projects to Employees.
- Employee Functionality:
    - Employees will be able to manage the projects assigned to them.
    - Employees can provide updates on their projects.
- General Functionality:
    - Adding and modifying information will be smooth for all user roles.
    - All user roles will be able to update their credentials after logging in.

Non-Functional Requirement

- Scalability: System should be able to handle several users. For e.g., handling around thousand users at the same time.
- Usability: Simple user interfaces that a layman can understand.
- Speed: Speed of the system should be responsive i.e., response to a particular action should be available in short period of time.

Hardware Requirements

- Operating System: Windows 10/8/7 (64-bit), macOS 10.10 (Yosemite) or later, or a Linux distribution (such as Ubuntu)
- RAM: 8 GB RAM
- Disk Space: Minimum 4 GB of available disk space
- CPU: Intel i5 processor or equivalent, with support for Intel VT-x, Intel EM64T (Intel 64), and Execute Disable (XD) Bit functionality
- Screen Resolution: 1280x800 minimum screen resolution

Software Requirements

- IDE: Visual Studio Code, IntelliJ IDEA
- Technologies: React, Spring Boot, JavaScript, HTML, CSS, Bootstrap
- Database: MySQL
- Tools: MySQL Workbench, Maven, NPM, GitHub, Nodemon
- Server: Apache Tomcat

CHAPTER THREE:

TOOLS AND TECHNOLOGIES

Spring Boot

Spring Boot is an open-source framework that simplifies the development of Java-based applications by providing auto-configuration, embedded servers, and simplified dependency management [1]. It supports microservices architecture and includes tools like Spring Initializer and Spring Boot Actuator.

To install packages, I used Maven to define dependencies in the ‘pom.xml’ file, which automatically handled the downloads and management. For connecting to a MySQL database, I added the MySQL Connector dependency in ‘pom.xml’ and configured the JDBC URL, username, and password in the ‘application.properties’ file. This setup enabled efficient interaction between my Spring Boot application and the MySQL database.

React

React is a JavaScript library for building user interfaces (UI) by rendering components like buttons, text, and graphics [2]. The user interface is composed of small, reusable components. I used React version 18.2.0, initialized development with npx (Node Package Executor), and installed the required libraries using npm (Node Package Manager). I developed single-page web applications using a component-based structure that leverages the virtual DOM (Document Object Model) for efficient rendering. For user-friendly navigation, I

implemented the ‘react-router-dom’ library.

MySQL

MySQL is a robust, multithreaded, multiuser, and fast SQL (Structured Query Language) database server [3]. It is designed for embedding in widely distributed software and high-load production systems. I used MySQL in the Task Management Application because it provides a reliable relational database management system. MySQL adheres to the ACID (Atomicity, Consistency, Isolation, and Durability) properties, ensuring consistent data even during system failures.

MySQL Workbench

MySQL Workbench is a unified visual tool developed for MySQL database design, development, and administration [4]. It supports various MySQL operations, such as database design, SQL development, and server configuration. Using its graphical interface, any SQL query can be easily executed while managing databases, tables, columns, relations, indexes, users, and permissions.

I can efficiently design and manage the database, and visualize the data and their relationships using MySQL Workbench for the Task Management Application.

Maven

Maven is a powerful build automation tool used primarily for Java projects [5]. It simplifies project management by handling dependencies, compiling code, running tests, and packaging the application. Maven uses a pom.xml file to manage project configurations and dependencies, ensuring consistency and ease of build processes across different environments.

Bootstrap

Bootstrap is a popular open-source CSS framework for developing responsive and mobile-first web applications [6]. It provides a collection of CSS and JavaScript components such as grids, navigation bars, modals, and buttons, enabling developers to quickly design and customize websites. Bootstrap ensures consistent styling and functionality across different browsers and devices.

CHAPTER FOUR:

SYSTEM DESIGN

Activity Representation

Activity diagram (as shown in Figure 1) is another important behavioral diagram in UML (Unified Modeling Language) diagram to describe dynamic aspects of the system [7]. Activity diagram is essentially an advanced version of flow chart that modeling the flow from one activity to another activity.

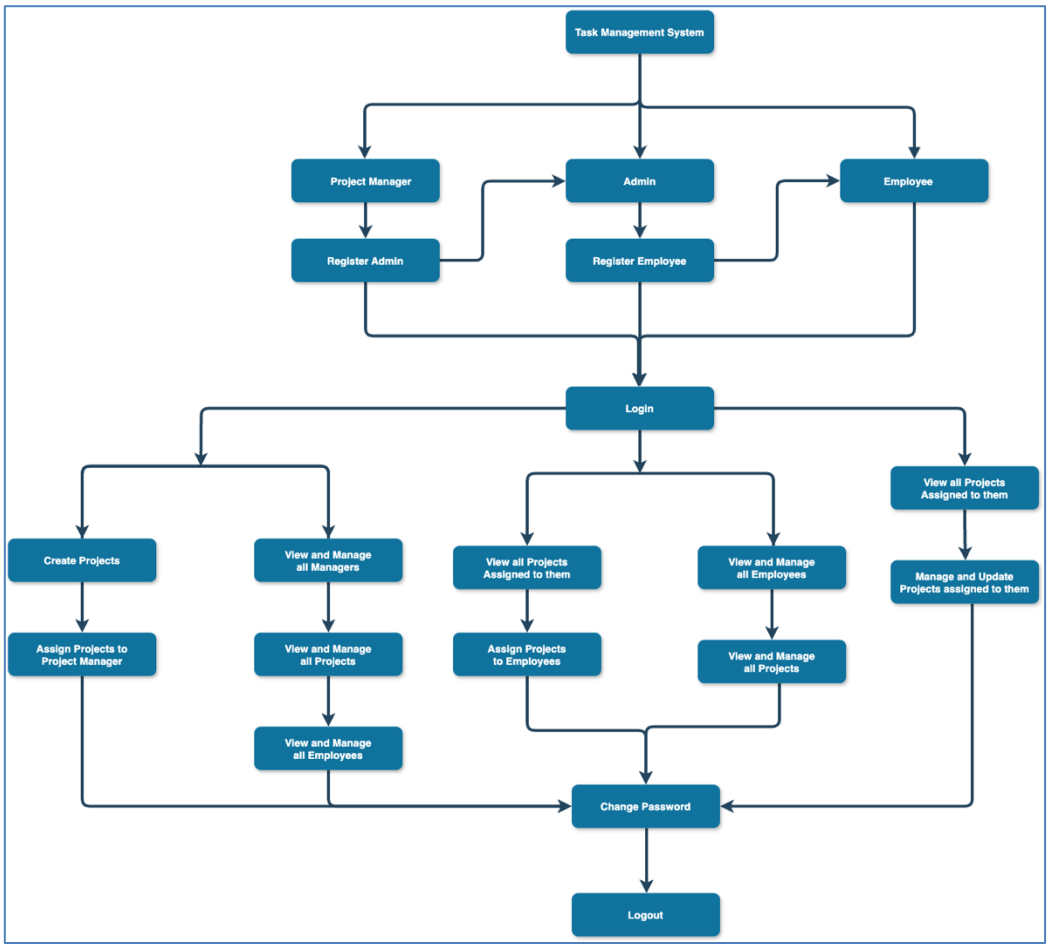

Figure 1. Activity Diagram

Use Case Representation

The interactions between a user and a system can be represented with the help of a use case diagram [8]. Figure 2 shows the interactions of three leading roles in the Task Management Application.

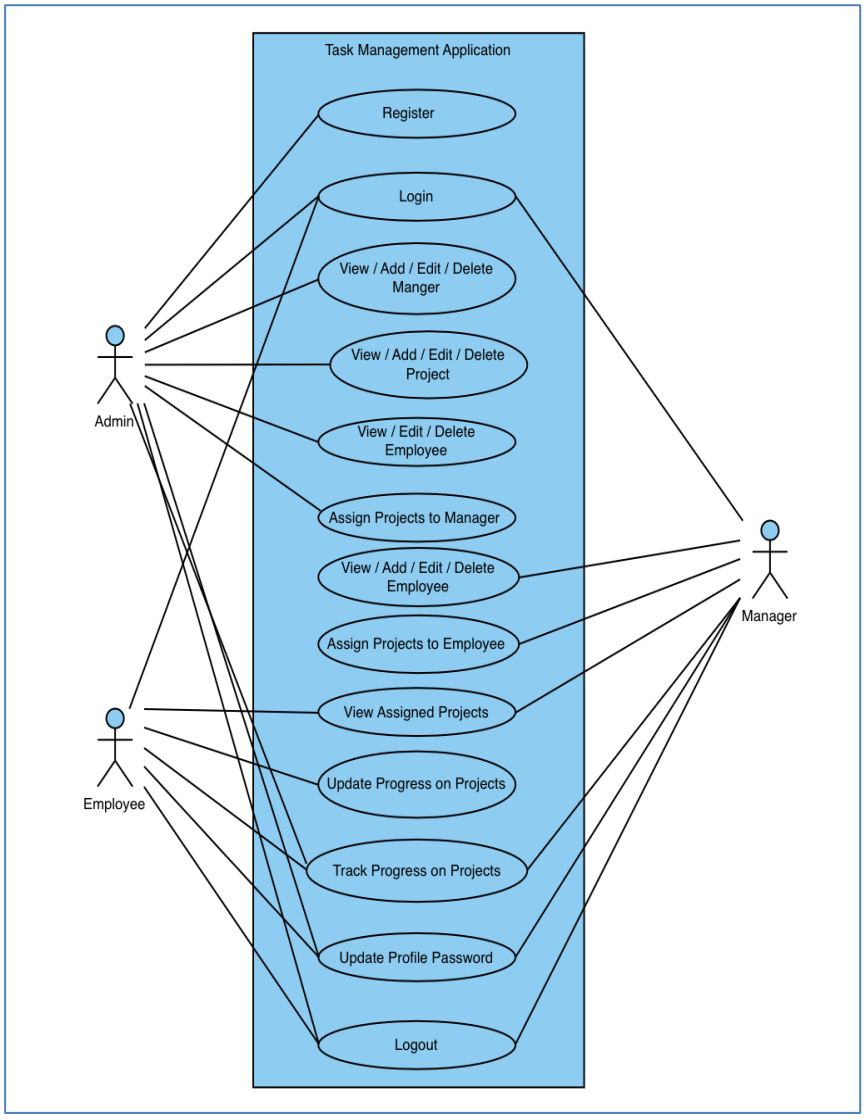

Figure 2. Use Case Diagram

CHAPTER FIVE:

SYSTEM ANALYSIS

Proposed System

The Task Management Application will feature three primary roles: Administrator, Project Manager, and Employee. Each role will have specific permissions tailored to their responsibilities within the application.

Administrator Role

The Administrator will have overarching control over the system, including the ability to manage Project Managers, Projects, and Employee details. They will oversee project allocation and ensure organizational oversight.

Project Manager Role

Project Managers will be responsible for managing teams and project tasks. They will have the authority to assign tasks to Employees, monitor project progress, and update project statuses as needed. Additionally, Project Managers can view project details and collaborate with team members effectively.

Employee Role

Employees will manage tasks assigned to them by Project

Managers. They can update task statuses, submit progress reports, and communicate with their Project Managers regarding project-related matters. Employees will have access to project details relevant to their assigned tasks and can collaborate with team members as necessary.

This structured approach ensures efficient task management, clear communication, and effective project oversight across all user roles within the Task Management Application.

CHAPTER SIX:

IMPLEMENTATION

Primary Implementation

Initially, I installed Node.js and the Java JDK from their official websites to set up the development environment for the project [9]. I then launched the command prompt and executed "npx create-react-app task-management-application" to install and configure React. Following this, I set up Apache, MySQL, and MySQL Workbench environments.

To design the user interface, I created components and stylesheets using HTML, SCSS, React Router Dom, Redux, Axios, and React Bootstrap. These packages helped build the business logic for the front end, resulting in a user-friendly interface.

For the backend setup, I developed RESTful APIs using Spring Boot. These APIs handle various operations, such as managing users (admins, managers, employees), projects, and authentication. I ensured that the backend APIs correctly manage authorization and authentication using JSON Web Tokens (JWT) [10].

I also established the connection between the backend server and the MySQL database to perform CRUD (Create, Read, Update, Delete) operations. This connection was configured using the application.properties file in Spring Boot, which is essential for configuring the application (shown in Figure 3).

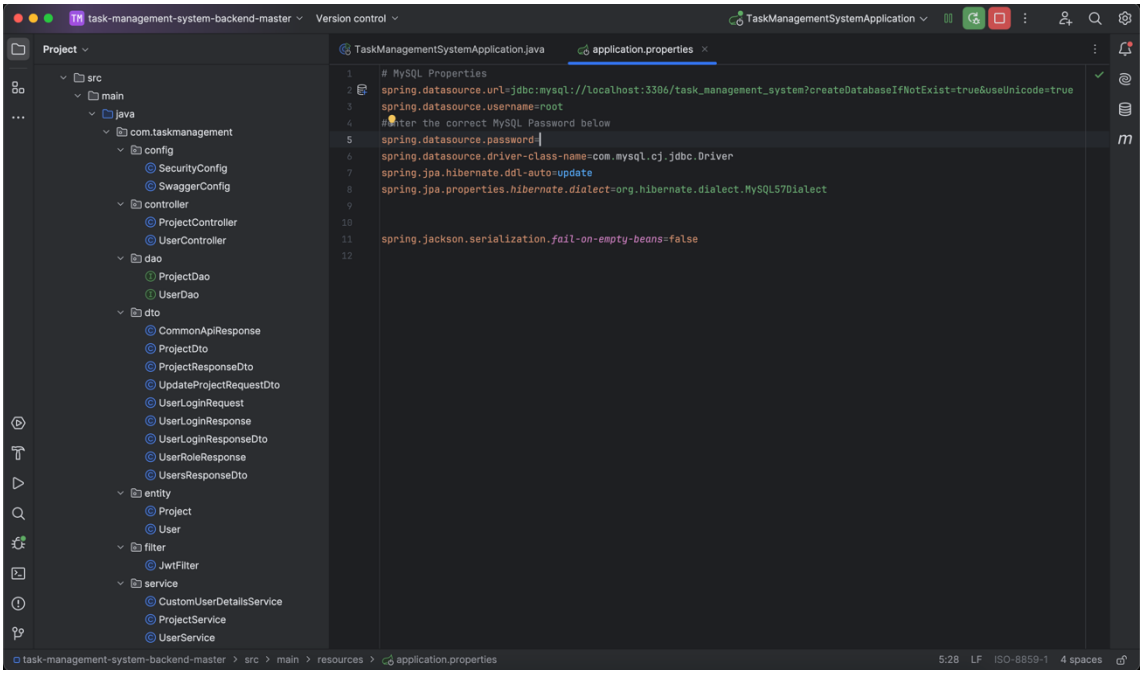

Figure 3. Database Connection

I utilized the "HTTP" module to send requests from the frontend to the backend APIs, establishing a connection between the two. For developing RESTful API services, I used the AXIOS package, which allows for the execution of asynchronous activities within API calls.

Additionally, I configured the Apache and MySQL servers to enable localhost website development and testing, ensuring seamless integration and functionality of the database.

CHAPTER SEVEN:

USER INTERFACE

Home Page

When you open the Task Management Application in the web browser, the home page appears as shown in Figure 4. I used Bootstrap, a CSS framework, to create an effective user interface.

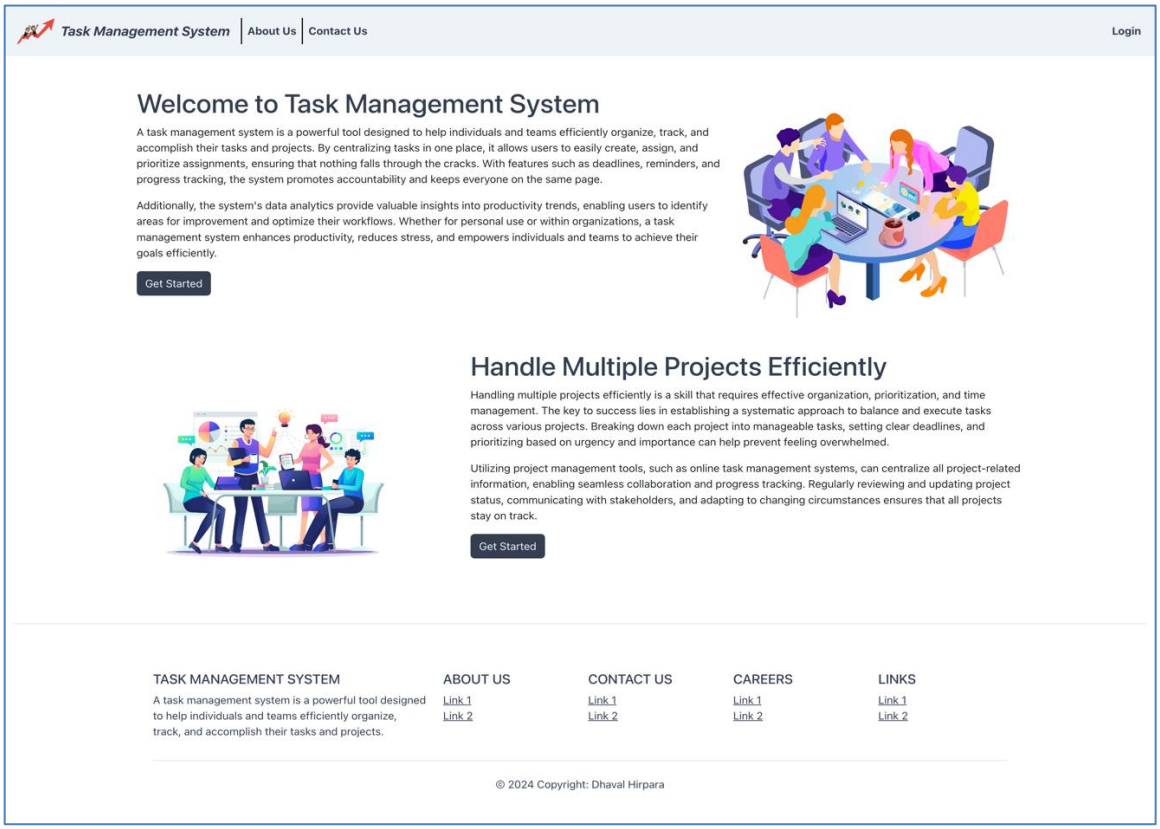

Figure 4. Home Page

Figure 5 shows the registration page for administrators, while Figure 6 displays the login page for all user types.

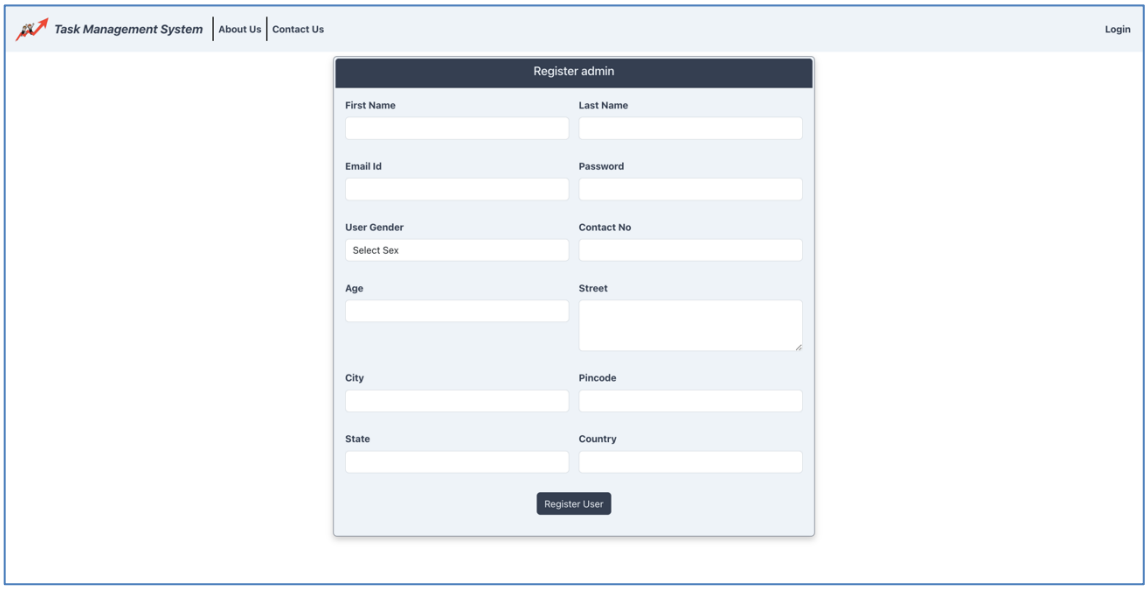

Figure 5. Register Admin Page

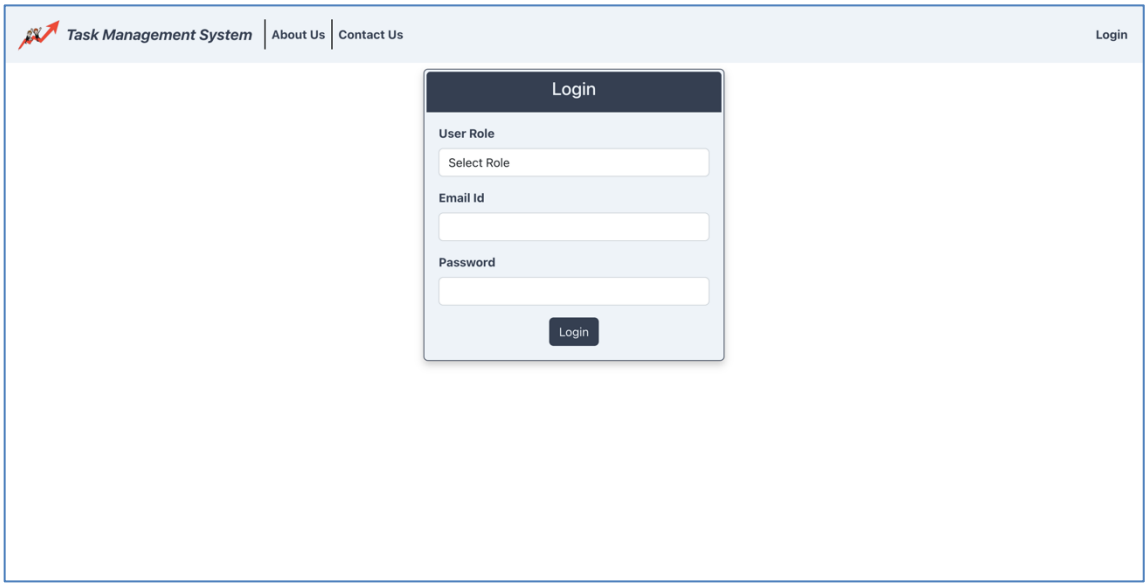

Figure 6. Login Page

Admin

Once the admin successfully logs in, they will be directed to the home screen (as shown in Figure 7). The admin can access various options such as courses, departments, instructors, and students using the navigation bar. For example, the admin can register a Manager (as shown in Figure 8) or view and manage Managers (as shown in Figure 9). Similarly, the admin can add a Project (as shown in Figure 10) to the system and view or manage all projects (as shown in Figure 11). The admin can then assign a project to a Manager (as shown in Figure 12) and view or manage all employees (as shown in Figure 13). The admin and all other user types can also change their account password (as shown in Figure 14). Additionally, the admin can log out of the Task Management Application by clicking the logout button (as shown in Figure 15).

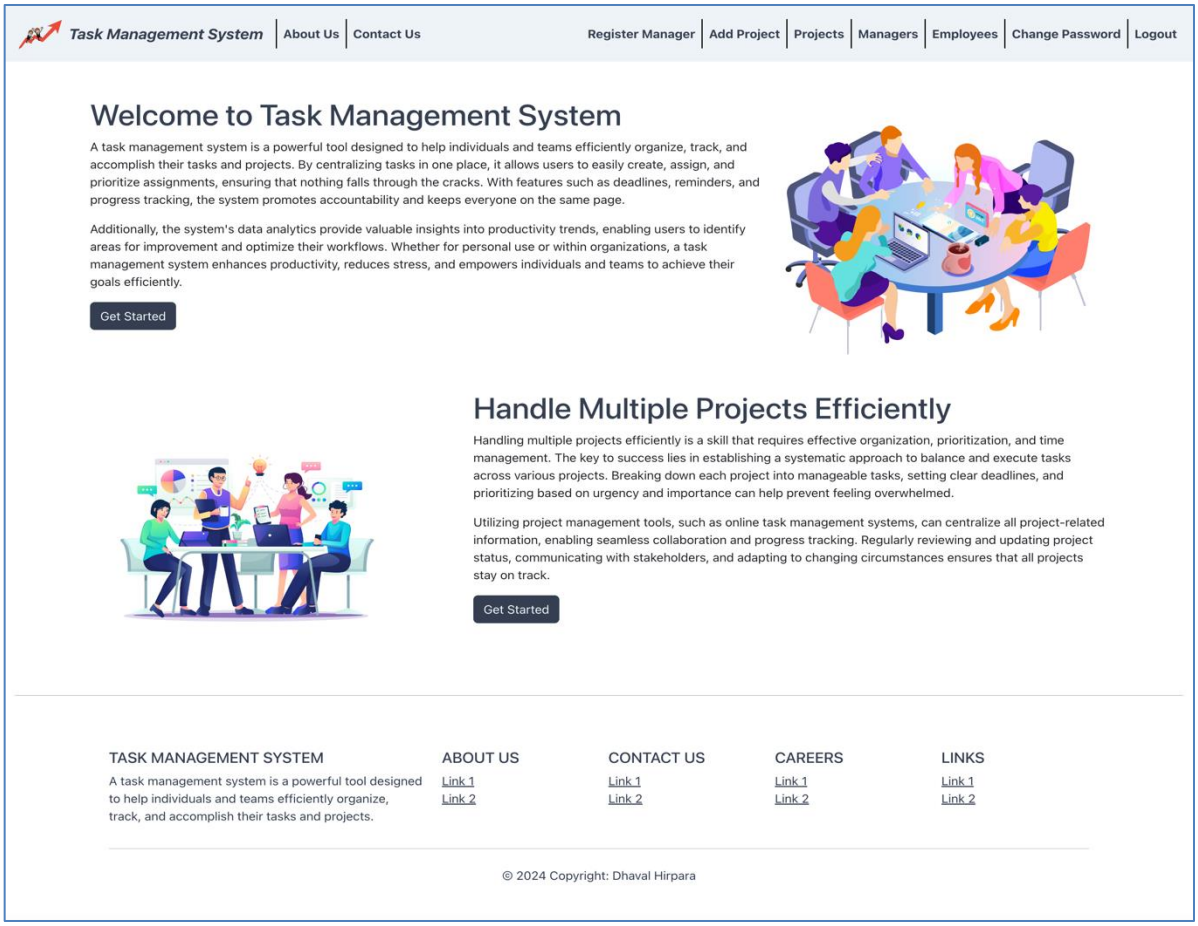

Figure 7. Admin – Home Page

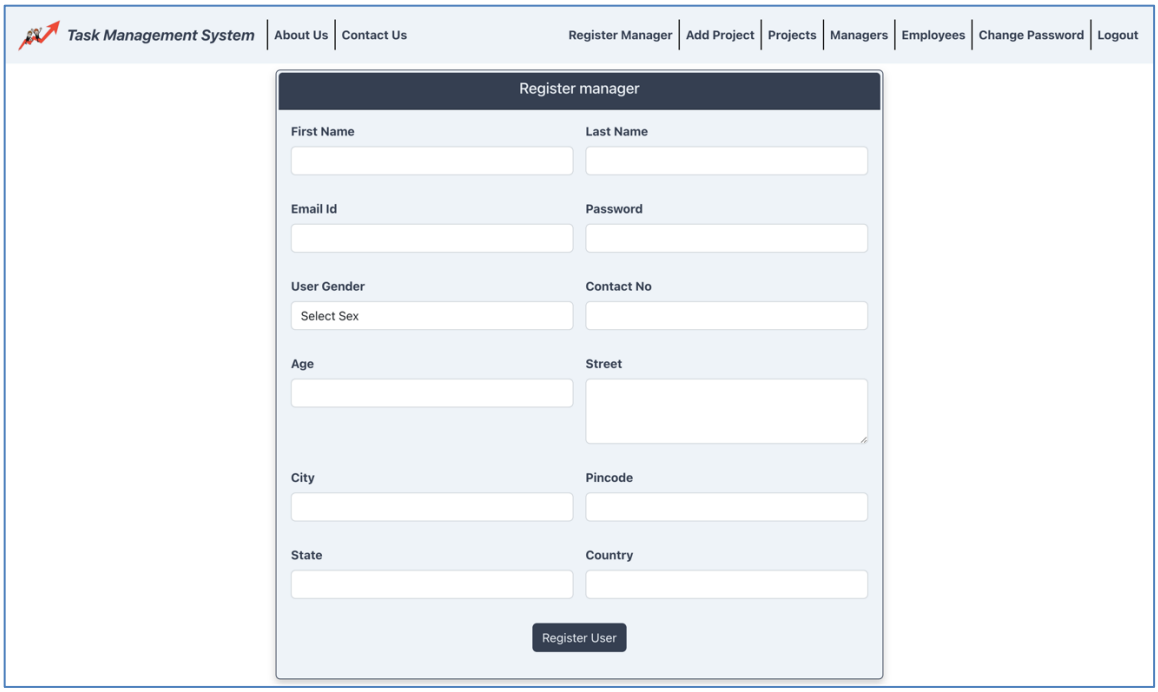

Figure 8. Admin – Register Manager

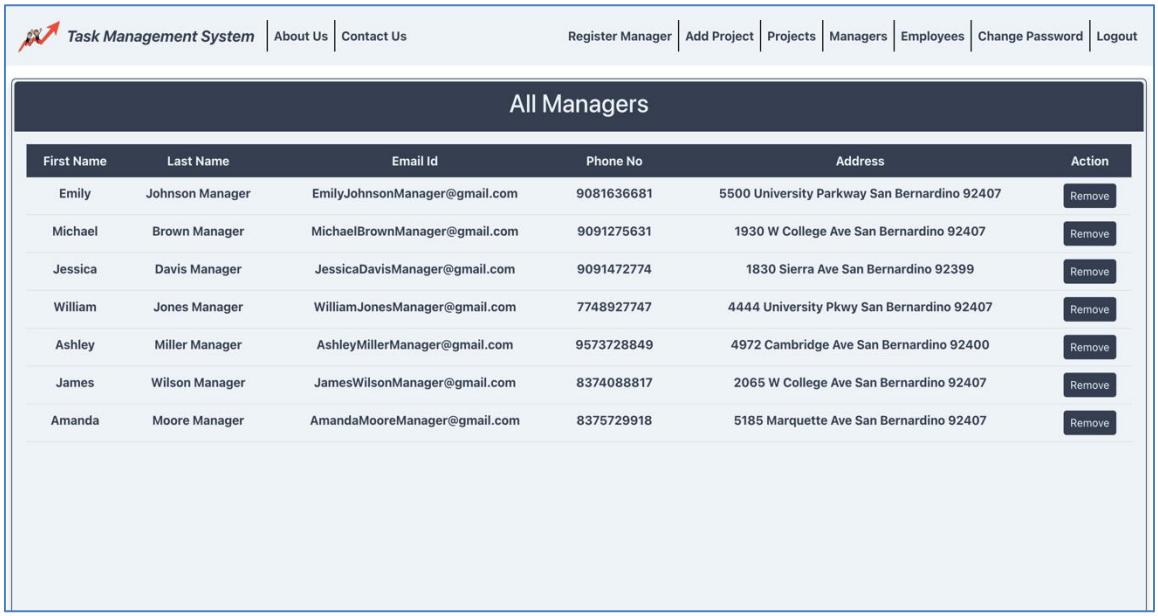

Figure 9. Admin – View/Manage All Managers

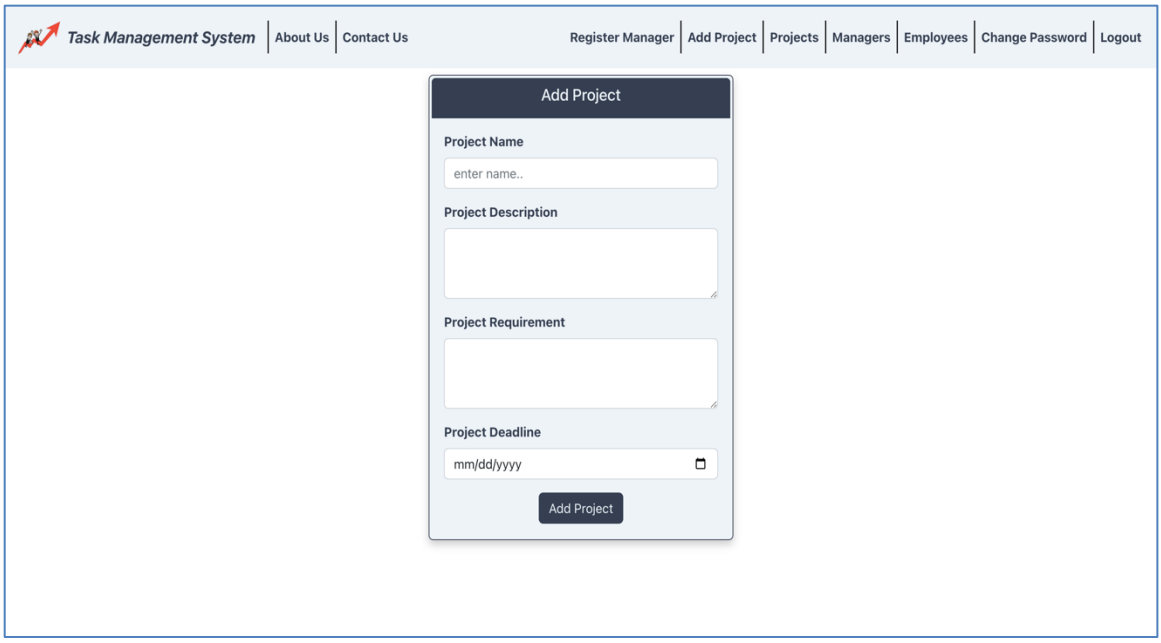

Figure 10. Admin – Add project

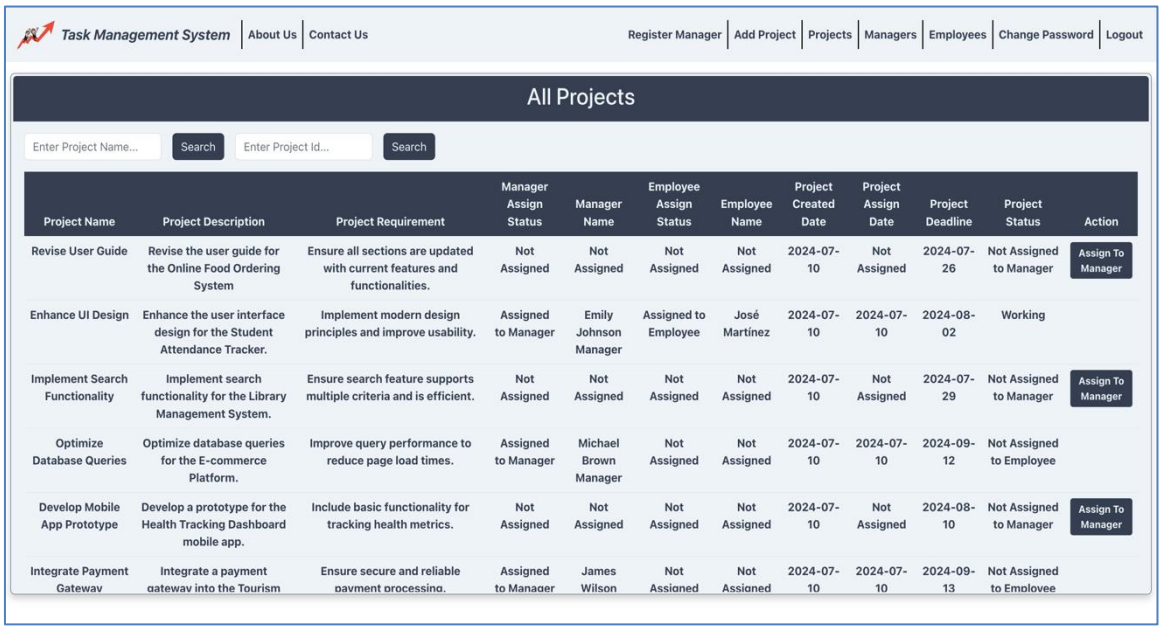

Figure 11. Admin – View/Manage All Projects

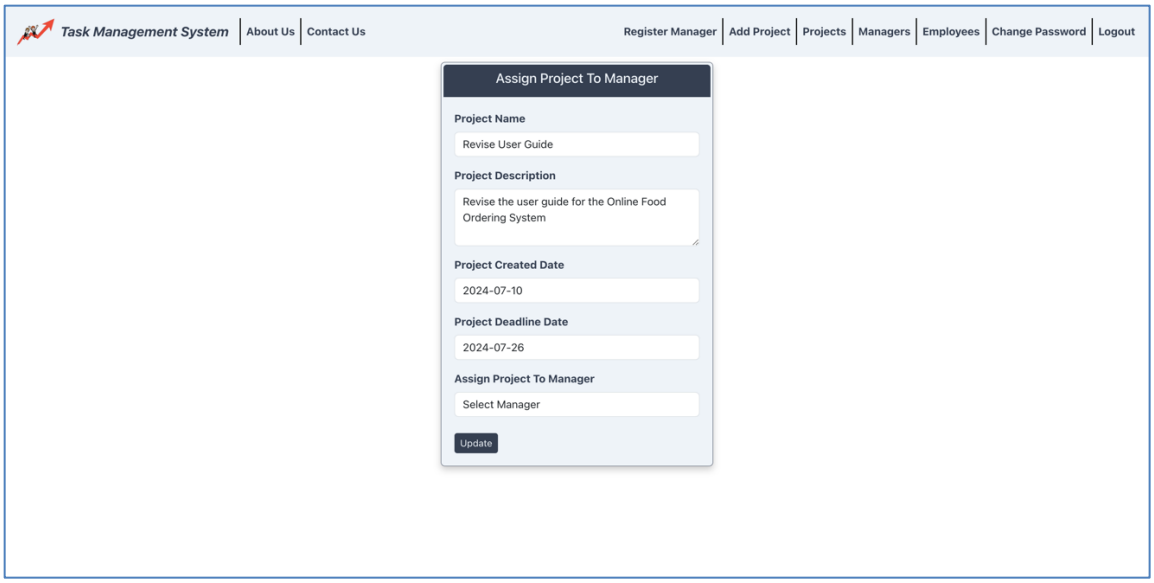

Figure 12. Admin – Assign Project To Manager

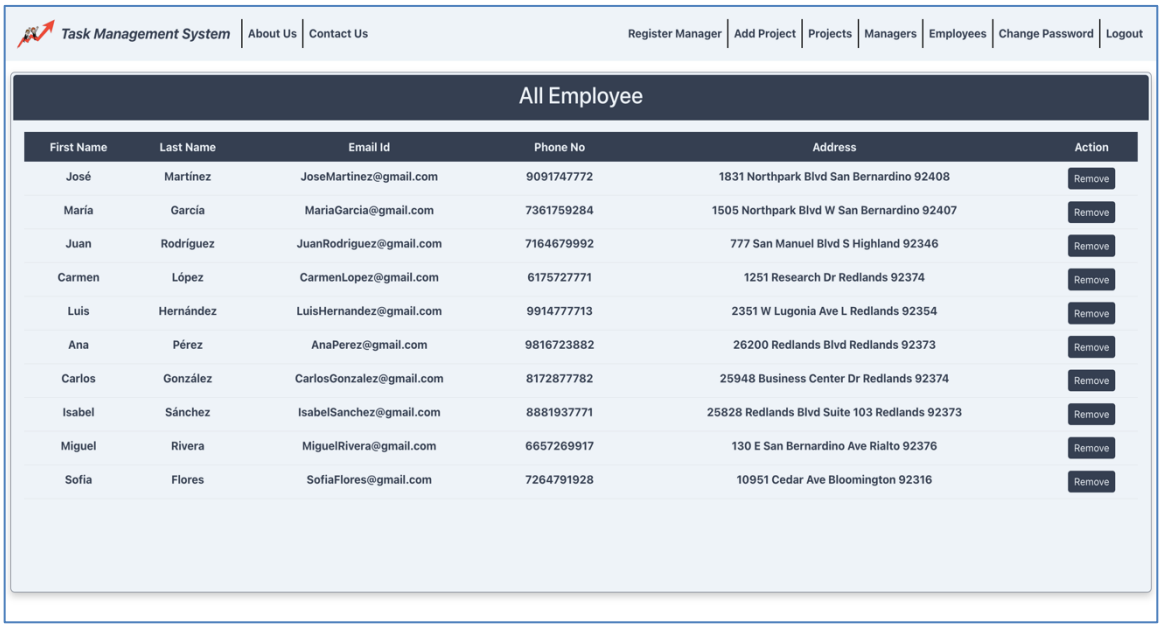

Figure 13. Admin – View/Manage All Employees

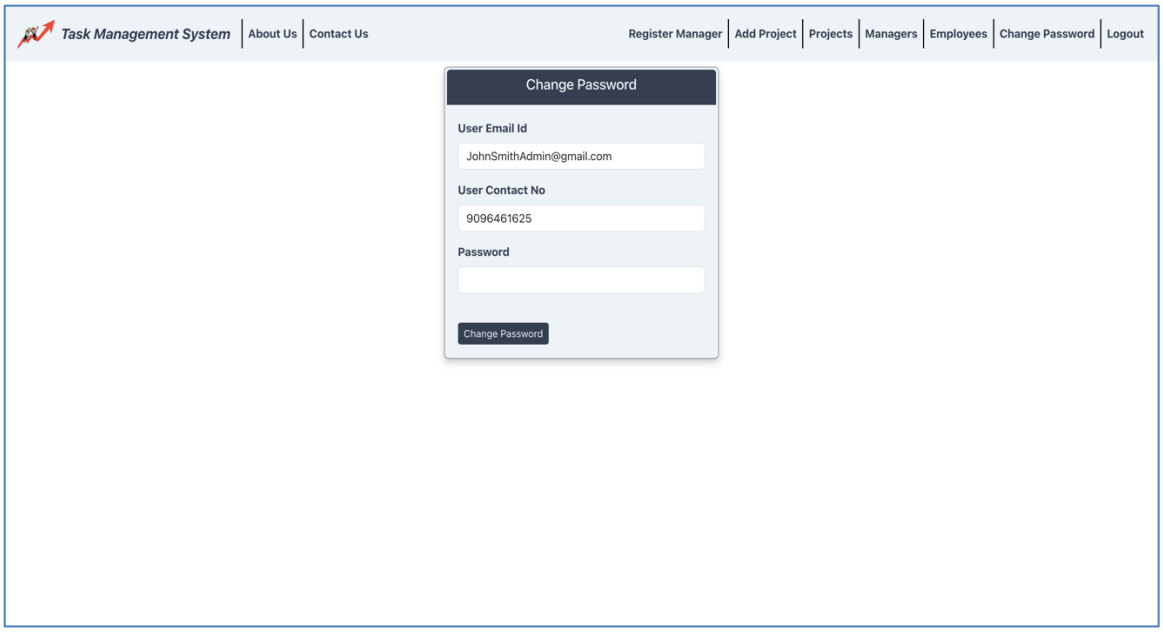

Figure 14. All Users – Change Password Page

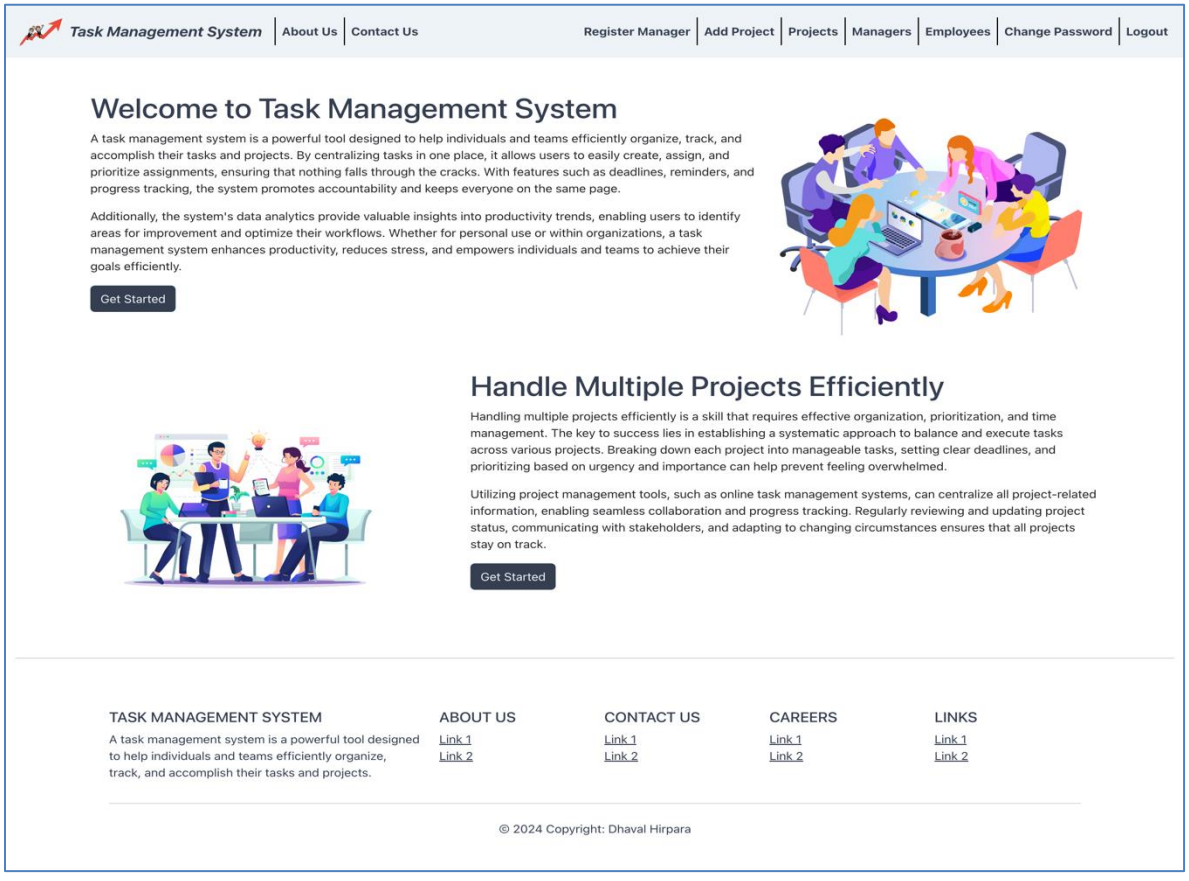

Figure 15. All Users – Logout Component

Manager

Once the manager successfully logs in, they will be directed to the home screen (as shown in Figure 16). The manager can access various screens using the navigation bar at the top of the screen, including options to view and manage assigned projects, assign projects to employees, register employees, and view or manage all employees. The manager can register an employee (as shown in Figure 17) or view and manage employees (as shown in Figure 18). Similarly, the manager can view and manage all assigned projects (as shown in Figure 19) and assign them to employees (as shown in Figure 20).

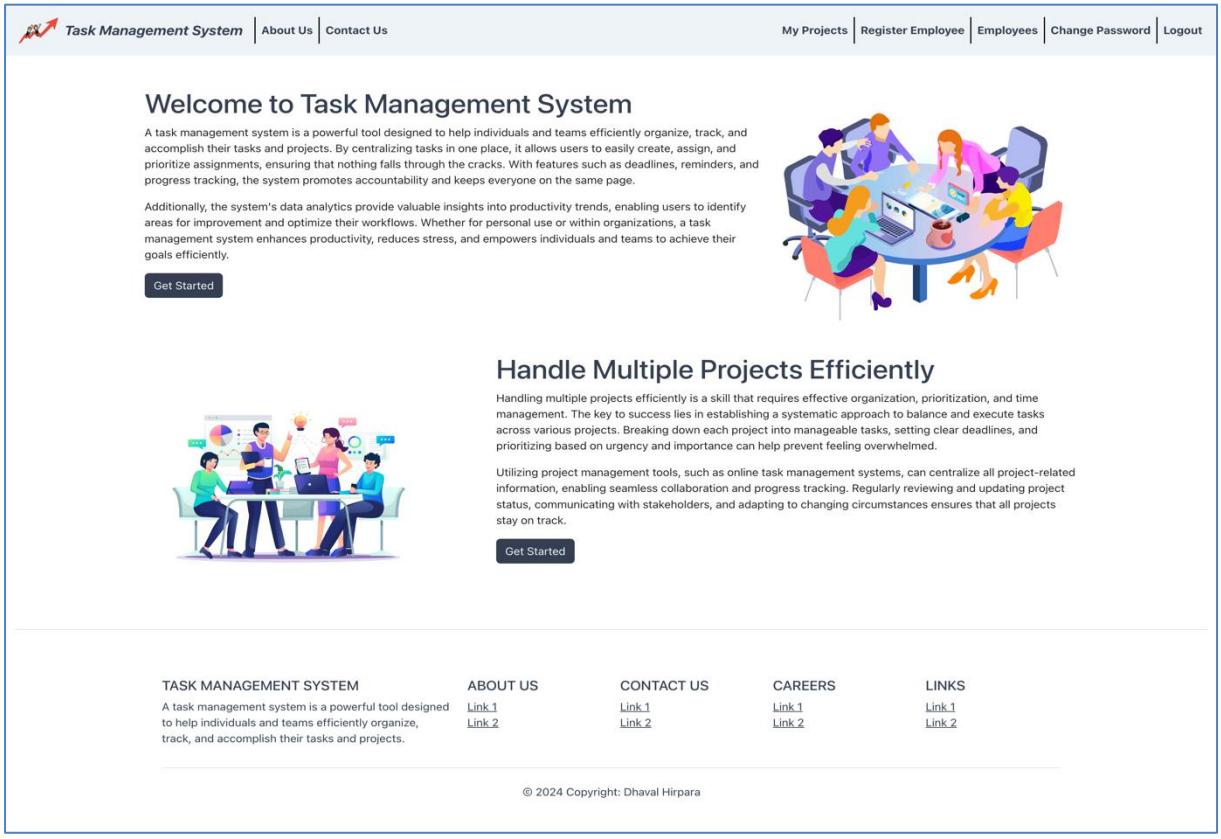

Figure 16. Manager – Home Page

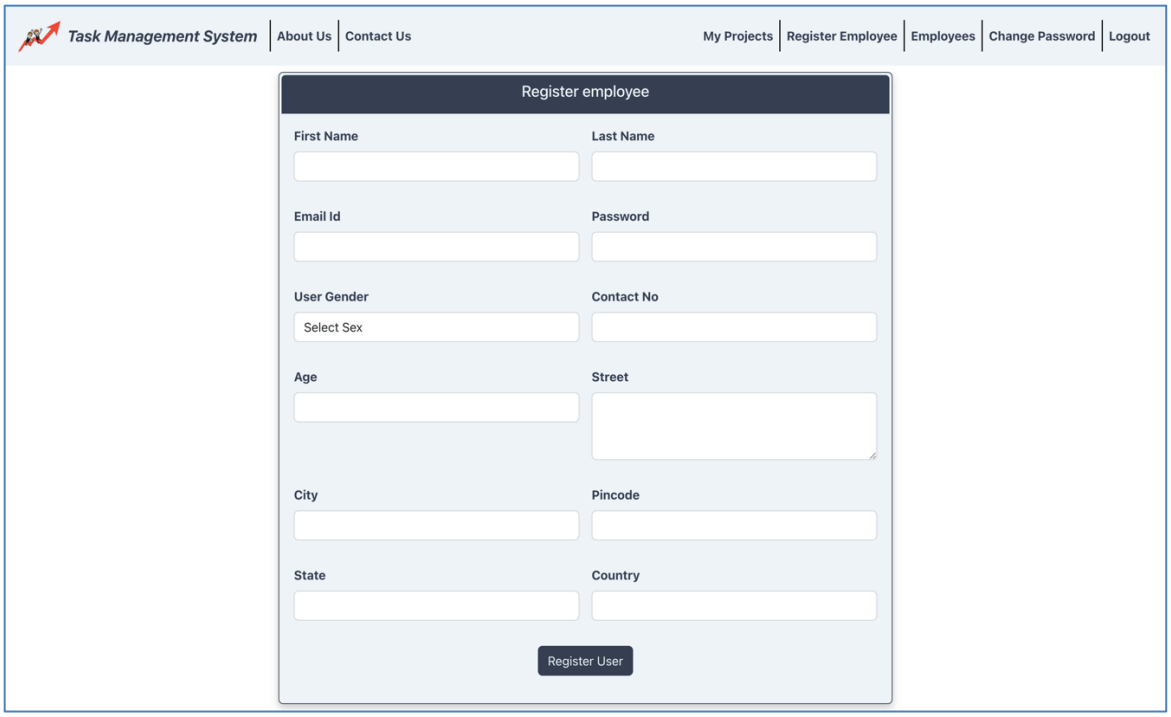

Figure 17. Manager – Register Employee Page

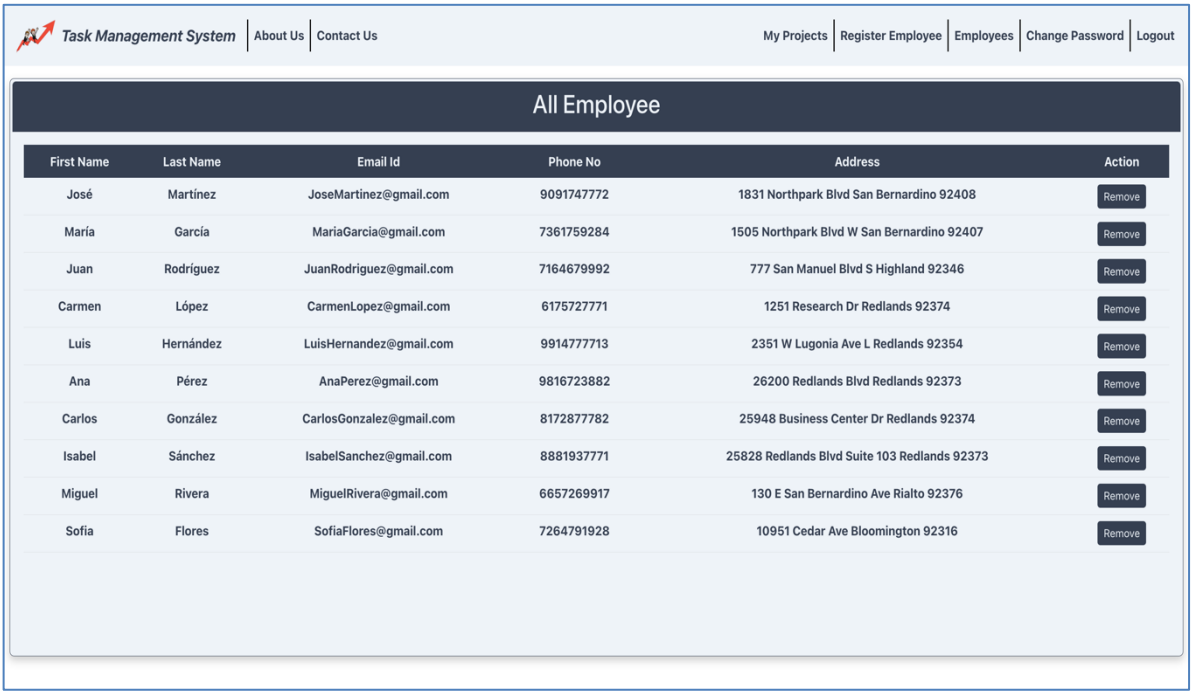

Figure 18. Manager – View/Manage All Employees

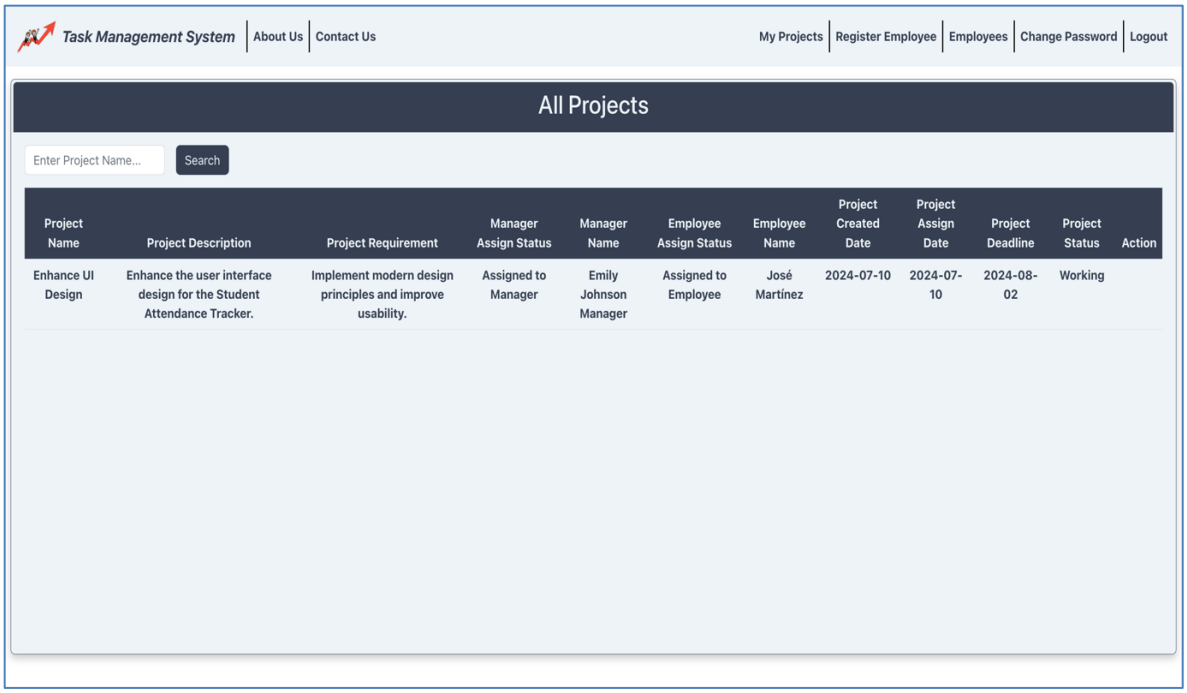

Figure 19. Manager – View/Manage All Assigned Projects

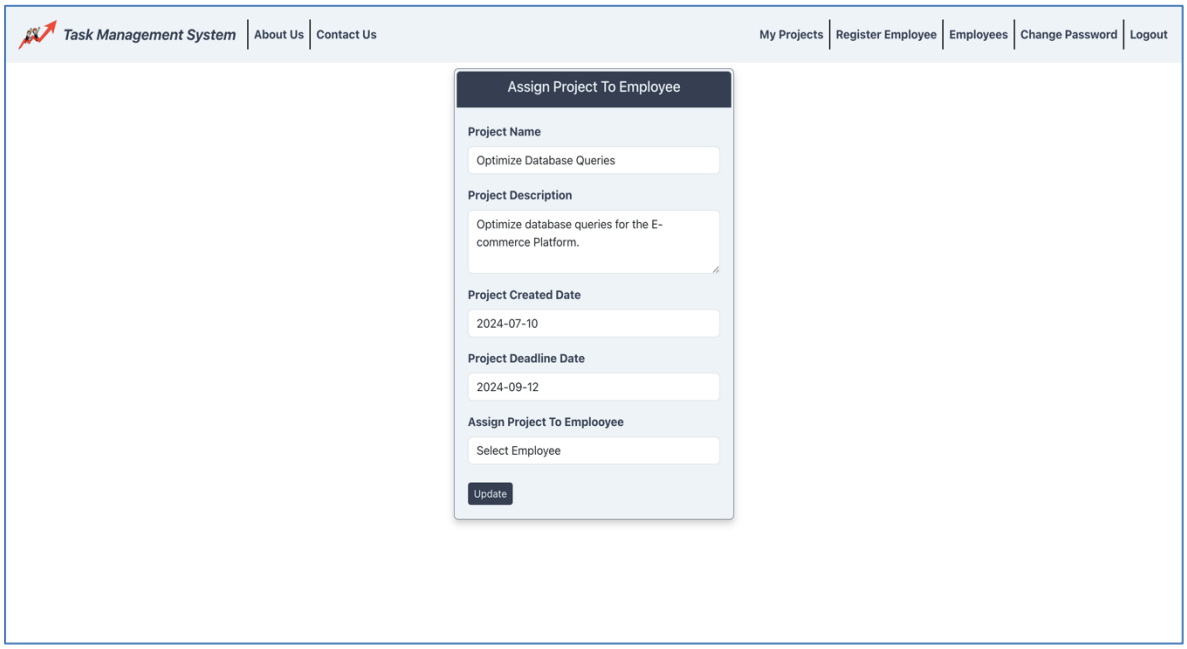

Figure 20. Manager – Assign Project To Employee

Employee

Once the employee successfully logs in, they will be automatically directed to the home screen (as shown in Figure 21). Using the navigation bar at the top, employees can access projects assigned to them (as shown in Figure 22). They can update the progress on projects (as shown in Figure 23). Figure 24 indicates the screen that appears after the employee successfully completes a project.

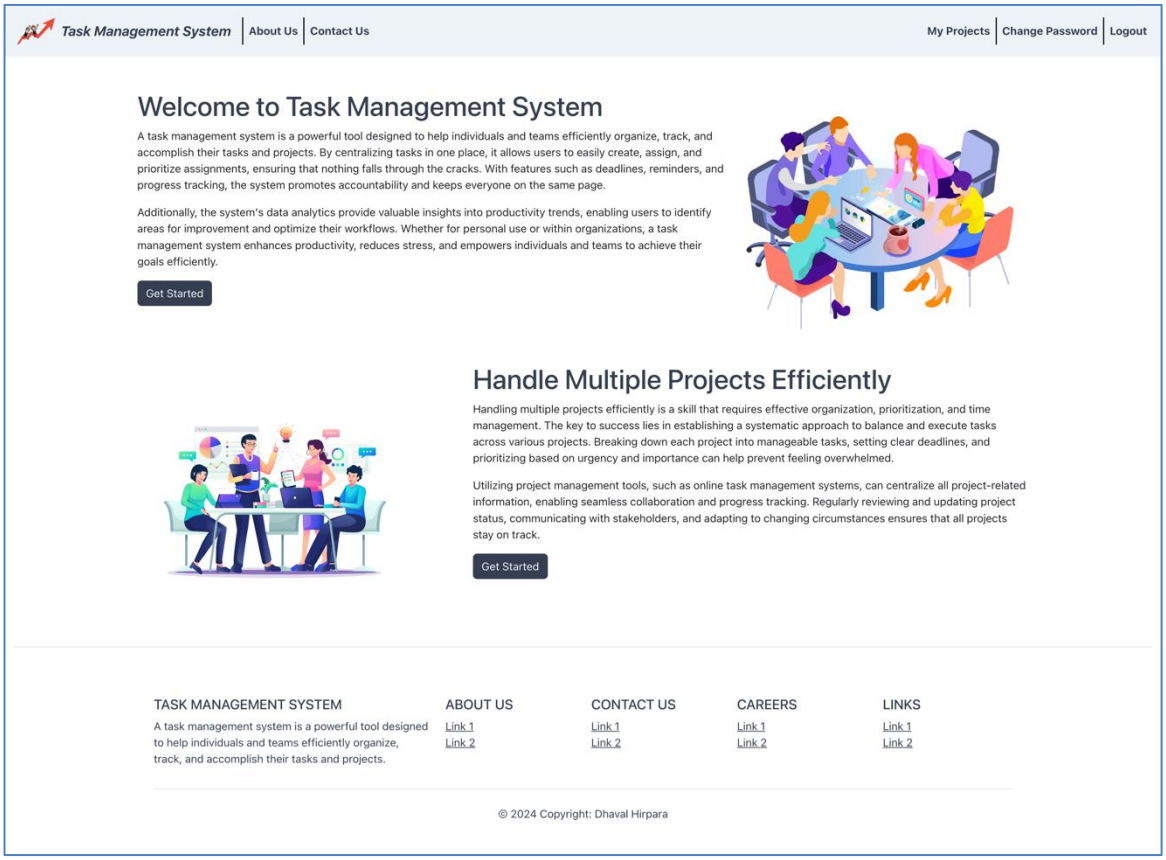

Figure 21. Employee – Home Page

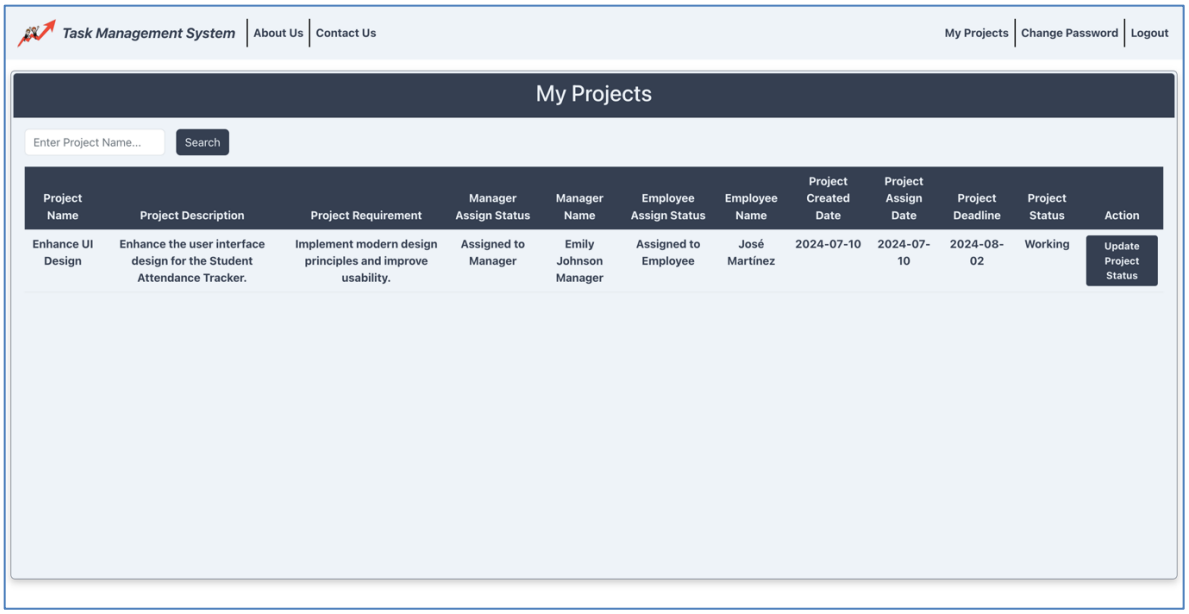

Figure 22. Employee – View/Manage All Assigned Projects

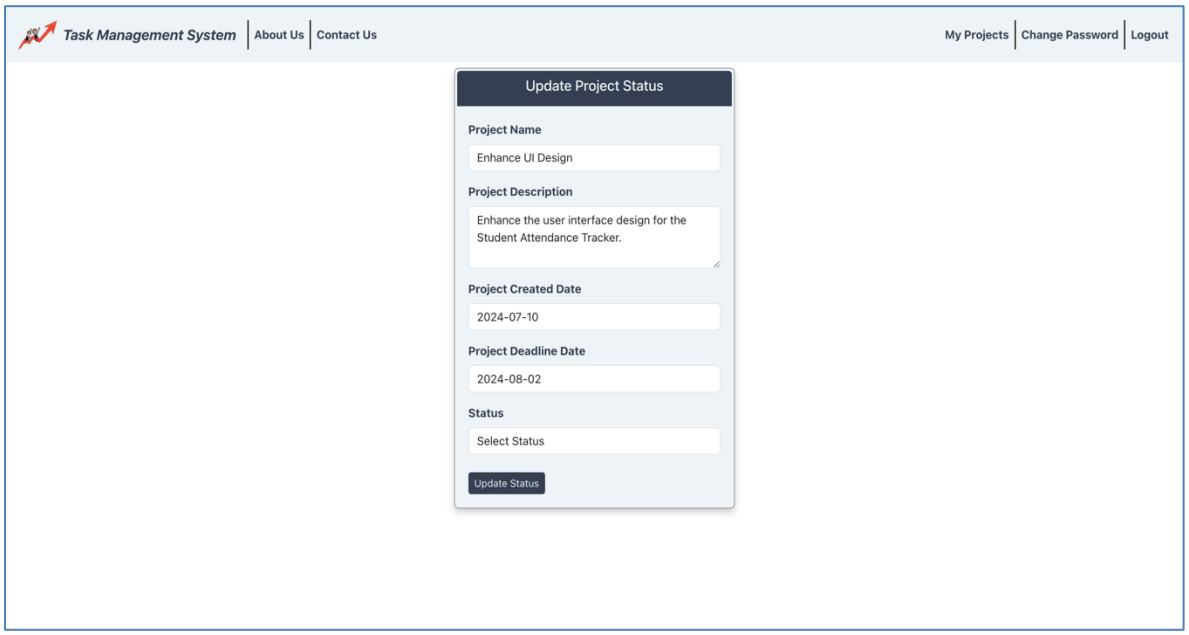

Figure 23. Employee – Update Project Progress

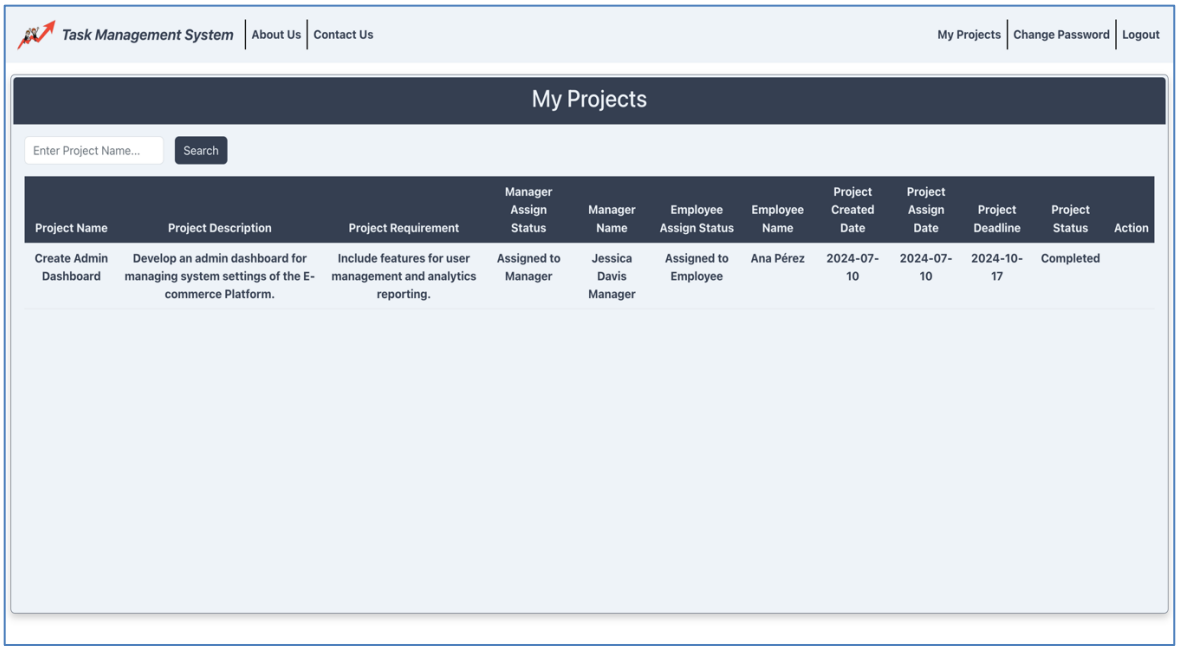

Figure 24. Employee – View All Completed Projects

CHAPTER EIGHT:

CONCLUSION

The Task Management Application is a powerful tool designed to manage and track tasks and projects across multiple hierarchies within a company. Its robust and scalable backend technology ensures smooth and efficient project management, allowing Administrators to oversee operations, Project Managers to assign and track tasks, and Employees to manage their assigned responsibilities effectively.

The application enhances productivity and communication by providing a clear structure and specific functionalities for each role. Its user-friendly interface ensures that all users, regardless of their role, can navigate the system with ease and efficiency.

By leveraging this modern technology, companies can streamline their workflow, improve task management, and enhance team collaboration. The Task Management Application is a valuable solution for organizations looking to optimize their project management processes and achieve their goals more efficiently.

CHAPTER NINE:

FUTURE ENHANCEMENT

While the current Task Management Application provides robust functionality for managing and tracking tasks and projects, several future enhancements could further improve its effectiveness and usability.

1. **Sub-Task Division:** One potential enhancement is the ability to divide a single project into multiple sub-tasks. This would allow for more granular tracking and management of project components, enabling more detailed progress monitoring and task assignment.
2. **Notification System:** Implementing a notification system for Project Managers when Employees update any progress on their projects would ensure that managers are always informed about the latest developments. This real-time communication can help in timely decision-making and maintaining project momentum.
3. **Rich Text Formatting and Document Attachments:** Allowing rich text formatting in the project description along with the ability to attach documents would enhance the detail and clarity of project documentation. This would provide a more comprehensive view of project requirements and progress, improving overall project management.
4. **Team Management:** Introducing a feature for Project Managers to create and manage teams within the system would enable more effective management of multiple teams and tracking of their progress. Employees

would also be able to track their teammates' progress, fostering better collaboration and teamwork.

By incorporating these enhancements, the Task Management Application can offer even greater flexibility and functionality, making it an indispensable tool for efficient project management and team collaboration.

APPENDIX A:

BASIC CODE

Figure 25 displays the Index.js file of the Task Management Application, serving as the root file in the frontend project built with React. Its component-based structure facilitates the execution of all child components according to specific user requirements.

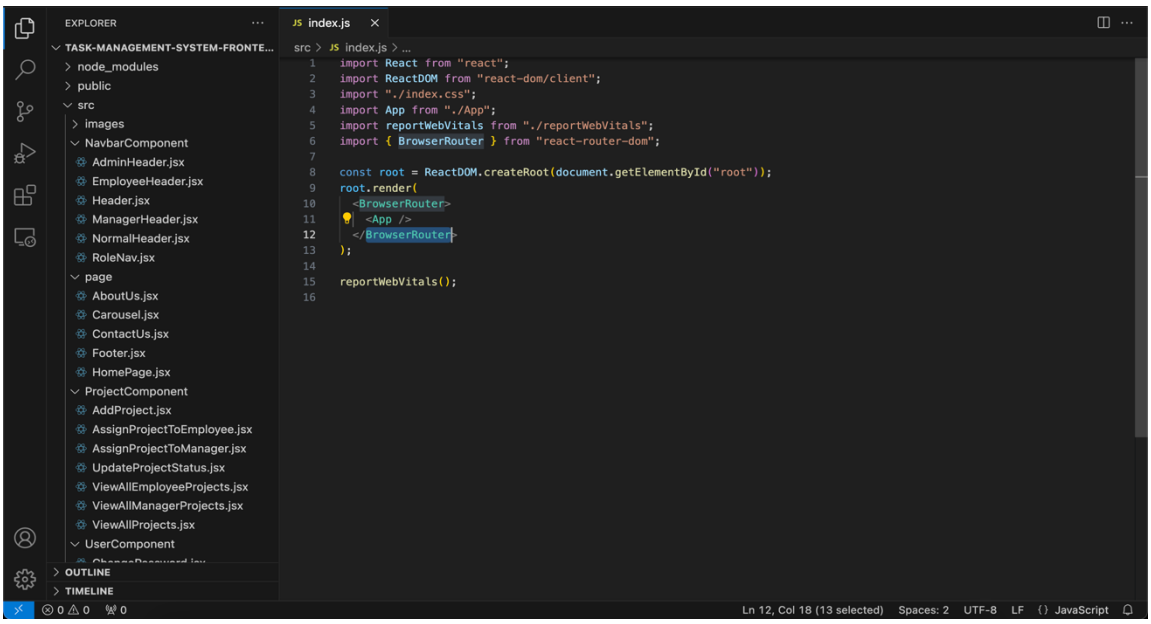

Figure 25. Frontend – Index.js File

Figure 26 showcases the TaskManagementSystemApplication.java file of the Task Management Application, serving as the root file in the backend project developed with Spring Boot. This file initializes and starts the server for the application.

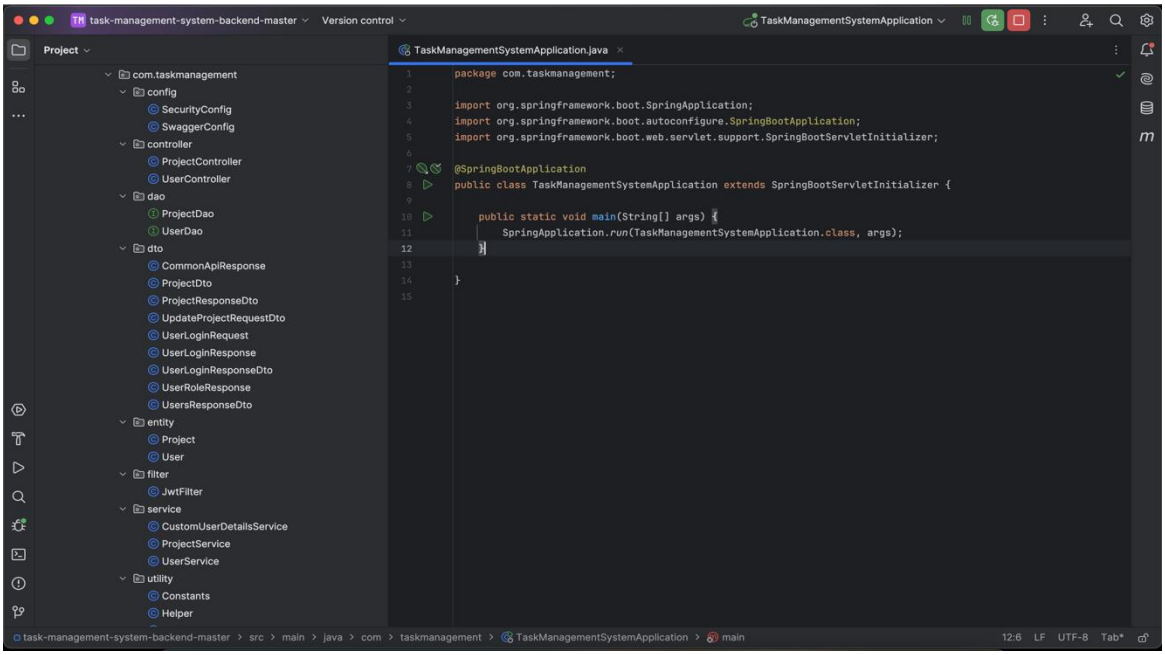

Figure 26. Backend – TaskManagementSystemApplication.java File

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