

PROJECT MANAGEMENT SYSTEM

INTERDISCIPLINARY PROJECT

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Technology in Information Technology

by

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**DEPARTMENT OF INFORMATION TECHNOLOGY
SCHOOL OF COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

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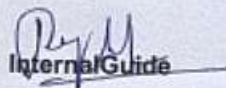
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **HARISH G (41120065)** who carried out the project entitled "**PROJECT MANAGEMENT SYSTEM**" under my supervision from **January 2024** to **May 2024**.

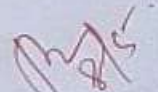

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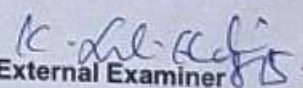
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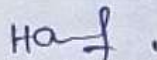

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DECLARATION

I, **HARISH G (41120065)** hereby declare that the Project Report entitled "**PROJECT MANAGEMENT SYSTEM**" done by me under the guidance of **Ms.T. G. RUBY ANGEL, M. Tech., Department of Information Technology**, is submitted in partial fulfillment of the requirements for the award of Bachelor of Technology degree in Information Technology.

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ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management of Sathyabama Institute of Science and Technology** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

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I wish to express my thanks to all Teaching and Non-teaching staff members of the **Department of Information Technology** who were helpful in many ways for the completion of the project.

CERTIFICATE OF COMPLETION



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This is to Certify that **G. HARISH (Reg No: 41120065)** student of Sathyabama Institute of Science and Technology, B. Tech Information Technology, has successfully completed the Internship at Hackwit Technologies from 22nd January to 30th January 2024.

During the internship, **G. HARISH** has closely worked as a part of the **React Full stack** by carrying out the project entitled "**PROJECT MANAGEMENT SYSTEM**".

He demonstrated good developing and learning skill with self-motivated attitude to learn new things. His contribution to implement the React Full stack was good. We wish him all the best for his future endeavors.

Best Regards,

Ravikumar S
CEO & Managing Director
Hackwit Technologies Pvt Ltd



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ABSTRACT

This study presents the development and implementation of a Project Management System (PMS) utilizing the MERN (MongoDB, Express.js, React.js, Node.js) stack. The PMS is designed to facilitate efficient project planning, monitoring, and collaboration within teams. Leveraging the MERN stack's robust capabilities, the system offers a comprehensive suite of features, including task management, resource allocation, milestone tracking, and real-time communication. The frontend, developed using React.js, provides a user-friendly interface for creating projects, defining tasks, and assigning responsibilities. Concurrently, the backend, powered by Node.js and Express.js, handles data processing, authentication, and API integration with MongoDB for seamless data storage and retrieval. Through the application of responsive design principles, the system ensures accessibility across various devices, enabling remote team members to participate in project activities seamlessly. Additionally, the integration of WebSockets enables instant messaging and updates, fostering efficient communication among team members. The system's architecture follows a modular approach, allowing for scalability and customization to accommodate diverse project requirements. Overall, the implementation of the PMS in the MERN stack demonstrates its potential to streamline project management processes, enhance team collaboration, and improve project outcomes in contemporary software development environments. Through rigorous testing and validation, the implemented PMS demonstrates its efficacy in streamlining project workflows, fostering collaboration, and enhancing overall project outcomes. This research contributes to the advancement of project management practices by leveraging cutting-edge technologies to address contemporary challenges and empower project teams with innovative tools for success.

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CHAPTER 1

INTRODUCTION

In today's dynamic business environment, effective project management is crucial for the success of any organization. As companies strive to deliver products and services efficiently while meeting stakeholder expectations, the need for robust project management systems has never been greater. Leveraging modern technology stacks like the MERN (MongoDB, Express.js, React, Node.js) stack, organizations can build powerful and scalable project management solutions tailored to their specific needs. A project management system developed using the MERN stack offers a comprehensive platform to plan, execute, monitor, and control projects from initiation to completion.

1.1 OVERVIEW OF THE MERN STACK

In a project management system built on the MERN (MongoDB, Express.js, React.js, Node.js) stack, various components interact seamlessly to facilitate efficient project coordination and execution. MongoDB serves as the database, offering a flexible and scalable storage solution for project data. Express.js provides a robust backend framework, enabling the creation of RESTful APIs for communication between the client-side and the server-side components. React.js, a powerful frontend library, offers a dynamic user interface with reusable components for enhanced user experience. Node.js powers the server-side logic, handling requests and responses, while also supporting real-time updates through technologies like WebSockets. Together, these technologies form a cohesive system where users can create, track, and manage projects, tasks, timelines, and team collaboration seamlessly. Features such as user authentication, task assignment, progress tracking, and reporting can be implemented to streamline project workflows and enhance productivity. Additionally, integrations with third-party tools and services can further extend the system's functionality, ensuring it meets the specific needs of project teams across various industries.

1.2 TECHNICAL COMPONENTS

In project management within the MERN (MongoDB, Express.js, React.js, Node.js) stack, technological components play a crucial role in enabling efficient planning, execution, and monitoring of projects. These are some of the key technical components you would typically find in a project management system built using the MERN stack.

MongoDB: As a NoSQL database, MongoDB is utilized for storing project-related data. It provides a flexible schema design, allowing project managers to store various types of data such as user information, project details, task assignments, and progress updates. MongoDB's scalability and performance make it suitable for managing large volumes of project data.

Express.js: Express.js is a backend web application framework for Node.js, providing a robust set of features for building APIs and handling HTTP requests. In project management applications, Express.js is used to create RESTful APIs that facilitate communication between the client-side (e.g., React.js frontend) and the server-side (e.g., MongoDB database). Express.js handles routing, middleware integration, and authentication, ensuring seamless interaction between different components of the project management system.

React.js: React.js is a popular JavaScript library for building user interfaces. In project management applications, React.js is utilized to create a responsive and interactive frontend interface. Project managers can use React components to display project timelines, task lists, team member assignments, and real-time updates. React's component-based architecture simplifies UI development and enables the creation of dynamic interfaces that enhance user experience.

Node.js: Node.js serves as the runtime environment for executing JavaScript code on the server-side. In MERN stack project management applications, Node.js powers the backend logic, handling tasks such as data processing, business logic implementation, and API integration. Node.js enables asynchronous, non-blocking I/O operations, making it well-suited for building scalable and high-performance server applications. Project managers can leverage Node.js to implement features like user authentication, data validation, and real-time collaboration in their project management system.

Additional Technologies: Alongside the core MERN stack components, project management applications may incorporate additional technologies to enhance functionality and performance. For example, WebSocket technology can be employed for real-time communication between clients and servers, enabling instant updates on project progress. Redux or MobX can be integrated with React.js to manage application state efficiently. Additionally, technologies like GraphQL can be used to streamline data fetching and manipulation in the project management system.

1.3 SCALABILITY AND PERFORMANCE

Scalability and performance are pivotal considerations in project management within the MERN (MongoDB, Express.js, React.js, Node.js) stack, a popular choice for web development. Ensuring scalability involves designing systems that can handle increased workload and user demand without compromising performance. In the context of MERN, this might entail optimizing database queries in MongoDB, fine-tuning Express.js middleware, leveraging React.js for efficient client-side rendering, and utilizing Node.js for asynchronous, non-blocking I/O operations. Additionally, employing proper caching mechanisms, load balancing, and horizontal scaling techniques are essential for accommodating growing user bases and traffic spikes. Efficient project management involves anticipating scalability needs early in the development process, continuously monitoring performance metrics, and iteratively optimizing the application architecture and codebase to maintain responsiveness and reliability as the project evolves.

1.4 PROBLEM STATEMENTS

In project management within the MERN stack, several key problem statements often arise, requiring careful attention and strategic resolution. One common challenge revolves around ensuring seamless communication and collaboration among team members, especially when working remotely or across different time zones. Coordinating tasks, sharing updates, and maintaining alignment can become complex without effective tools and processes in place. Additionally, managing project scope and requirements can be daunting, particularly as stakeholder expectations evolve or new features are introduced. Balancing these changes while adhering to timelines and budgets demands robust project planning and prioritization. Furthermore, addressing technical debt and ensuring code quality throughout the development lifecycle presents another significant hurdle. Continuous integration, automated testing, and code reviews are essential practices to mitigate these risks and maintain a stable and scalable application. Overall, navigating these challenges in MERN stack project management requires a holistic approach, combining effective communication, strategic planning, and diligent technical oversight. These are just a few examples of the multifaceted problem statements that project managers face in MERN stack projects. Other issues may include resource allocation, risk management, and maintaining code quality and standards throughout the development lifecycle.

1.5 OBJECTIVES

In project management within the MERN stack (MongoDB, Express.js, React.js, Node.js), objectives are crucial for ensuring the successful execution of software development endeavors. Firstly, establishing clear objectives helps define the scope of the project, outlining what needs to be achieved and within what timeframe. This clarity aids in resource allocation, budgeting, and scheduling, ensuring that all team members are aligned towards common goals. Secondly, objectives provide a roadmap for development tasks, breaking down the project into manageable components. This facilitates better task delegation and allows for more accurate progress tracking.

By setting measurable milestones, such as completing specific features or reaching certain performance benchmarks, project managers can gauge progress and make informed decisions to keep the project on track. Moreover, objectives serve as a basis for risk management and contingency planning. By anticipating potential challenges and setting objectives that address them, project managers can mitigate risks and ensure smoother project execution. This proactive approach helps in maintaining project timelines and quality standards, even in the face of unforeseen obstacles. Additionally, clear objectives foster effective communication among team members and stakeholders. When everyone understands what needs to be accomplished and why, collaboration becomes more efficient, and misunderstandings are minimized. Regularly revisiting objectives and discussing progress ensures that everyone remains aligned and focused on achieving the project's overarching goals. Furthermore, objectives in MERN stack projects promote continuous improvement and adaptation. As technology evolves and market demands change, projects must remain flexible and responsive. Thirdly, real-time communication tools such as chat and notifications foster seamless collaboration among team members, enabling swift decision-making and problem-solving. Additionally, comprehensive reporting and analytics functionalities empower project managers to gain insights into project progress, resource allocation, and potential bottlenecks, facilitating informed decision-making and proactive adjustments. By regularly evaluating objectives and adjusting strategies as needed, project managers can ensure that the final product meets stakeholder expectations and remains competitive in the dynamic software development landscape. In summary, setting clear and achievable objectives is essential for successful project management in the MERN stack. These objectives provide direction, facilitate planning and communication, mitigate risks, and enable adaptability, ultimately contributing to the timely delivery of high-quality software solutions.

CHAPTER 2

METHODOLOGY

2.1 AIM AND SCOPE

In a project management system built on the MERN (MongoDB, Express.js, React, Node.js) stack, the aim and scope encompass a comprehensive approach to efficiently organize, track, and manage projects from inception to completion. The primary aim is to streamline project workflows, enhance collaboration among team members, and ensure timely delivery of tasks and milestones. The scope of such a system involves several key components. Firstly, it includes features for project planning and scheduling, allowing users to create project timelines, assign tasks, and set deadlines. Secondly, the system facilitates communication and collaboration through real-time messaging, file sharing, and commenting functionalities. Thirdly, it offers tools for task management, enabling users to prioritize tasks, track progress, and monitor resource allocation. Moreover, the system incorporates reporting and analytics capabilities, providing insights into project performance, resource utilization, and overall productivity. Additionally, it may include integration with third-party tools and services for enhanced functionality, such as version control systems, issue tracking, and time tracking applications. Furthermore, the aim extends to adaptability and scalability, ensuring that the system can accommodate projects of varying sizes and complexities. It should be customizable to meet the specific needs and preferences of different project teams and organizations. Additionally, the system aims to enhance transparency and accountability by providing stakeholders with visibility into project status, progress, and dependencies. Overall, the aim and scope of a project management system in the MERN stack are to empower teams with the tools and functionalities needed to effectively plan, execute, and monitor projects, thereby maximizing efficiency, productivity, and ultimately, project success.

2.2 ARCHITECTURE OVERVIEW

The project management system is designed to streamline and optimize the process of planning, executing, and monitoring projects within an organization. At its core, the architecture of this system is built upon several key components. Firstly, there's the user interface layer, which provides an intuitive platform for users to interact with the system. This layer encompasses various interfaces, including web-based portals, desktop applications, and mobile apps, catering to the diverse needs of project stakeholders. Beneath the user interface layer lies the application layer, where the business logic of the project management system resides. This layer orchestrates the functionalities of the system, such as project scheduling, task assignment, resource allocation, and progress tracking. It encompasses modules for project planning, collaboration, document management, and reporting.

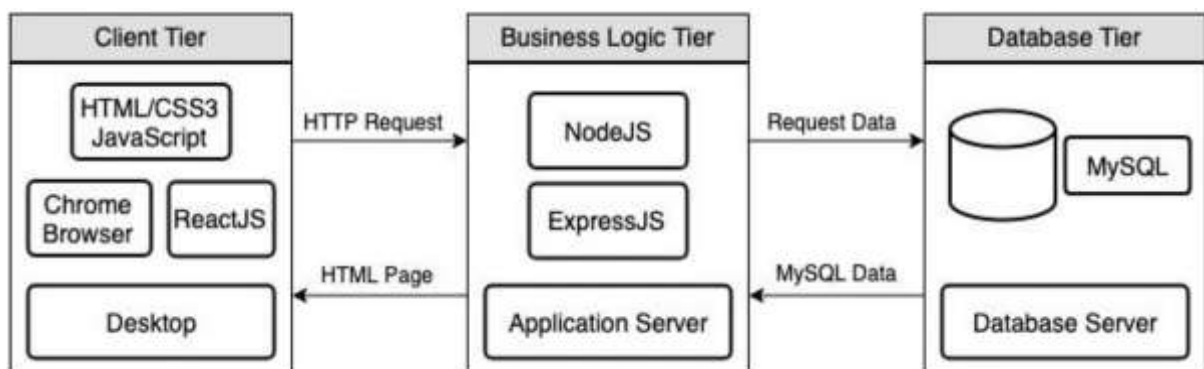


Fig: 2.2: TIER ARCHITECTURE

2.2.1 Frontend (React.js)

The frontend architecture of our project management system is designed to ensure seamless user interaction and efficient data presentation. At its core, the system is built using a modular component-based approach, where each feature is encapsulated within reusable components, promoting code reusability and maintainability. The architecture follows a Model-View-Controller (MVC) pattern, with React.js serving as the primary framework for rendering views and managing state.

Explanation

The frontend architecture of our project management system comprises a modular structure, utilizing components for various functionalities such as task management, user authentication, and project visualization. These components interact seamlessly, facilitating a smooth user experience. Additionally, we employ a state management system like Redux to manage application state efficiently, ensuring data consistency and responsiveness across the platform. This architecture fosters scalability and maintainability, allowing for easy integration of new features and enhancements as our system evolves.

2.2.2 Backend (Node.js and Express.js)

The project management system backend is designed with a modular architecture, employing microservices for scalability and flexibility. It comprises components for user authentication, task management, resource allocation, and data storage. RESTful APIs facilitate communication between frontend and backend, ensuring seamless integration. Robust security measures, including encryption and access controls, safeguard sensitive data. Furthermore, the system incorporates logging and monitoring functionalities for performance tracking and troubleshooting. Overall, the architecture prioritizes reliability, scalability, and maintainability to support efficient project management operations.

Explanation

The project management system's backend architecture comprises several key components seamlessly working together. At its core lies a robust database management system, housing project data and user information. A scalable application server handles business logic and orchestrates data flow between the database and client interfaces. APIs facilitate smooth communication between different system modules and external integrations. Authentication and authorization mechanisms ensure secure access to sensitive data.

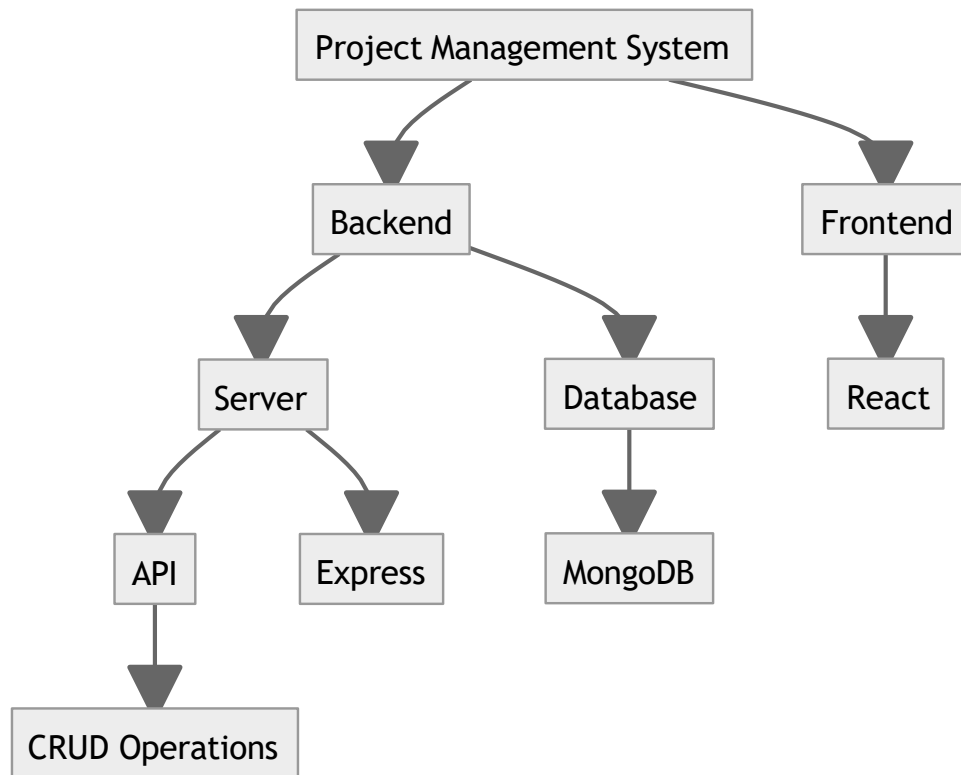


Fig: 2.2.2: PROJECT MANAGEMENT TREE

2.2.3 Database (MongoDB)

Our MERN stack-based Project Management System comprises a front-end built with React.js for dynamic user interfaces, a Node.js and Express.js backend for server-side logic, and MongoDB as the database for storing project data. The system facilitates seamless communication between the client and server, ensuring efficient management of projects and tasks.

Explanation

In this architecture, React.js handles the presentation layer, allowing for a responsive and interactive user interface. Node.js and Express.js power the backend, managing HTTP requests, routing, and business logic implementation. MongoDB, a NoSQL database, stores project-related data, offering flexibility and scalability.

2.2.4 Authentication and Security

The project management system built on the MERN stack ensures robust authentication and security measures throughout its architecture. Utilizing industry-standard practices, user authentication is implemented using secure protocols like JWT (JSON Web Tokens), ensuring encrypted transmission of sensitive data during login and session management. Additionally, role-based access controls are integrated to regulate user permissions, safeguarding sensitive project information. Encryption techniques such as SSL/TLS are employed to secure data transmission between the client and server, fortifying against potential threats like data interception. Regular security audits and updates are conducted to mitigate emerging vulnerabilities, ensuring continuous protection of user data and system integrity.

Explanation:

In the MERN stack project management system, authentication and security are paramount considerations. Utilizing modern practices, user authentication is implemented through robust mechanisms such as JSON Web Tokens (JWT) or OAuth, ensuring secure access to the system. Encryption techniques like bcrypt are employed to safeguard sensitive user data, mitigating the risks of unauthorized access or data breaches. Additionally, role-based access control (RBAC) is implemented to manage permissions, restricting user actions based on their roles within the system. Regular security audits and updates are conducted to address emerging threats and vulnerabilities, maintaining the integrity and confidentiality of user information. Moreover, comprehensive logging and monitoring systems are in place to track user activities and detect any suspicious behavior, enabling swift responses to potential security incidents.

2.2.5 Deployment

Deployment in the MERN (MongoDB, Express.js, React.js, Node.js) stack project management system involves a streamlined process ensuring efficient distribution of the application onto a production environment. Utilizing containerization technologies like Docker, the system packages all components into portable units, facilitating easy deployment across various hosting platforms. Continuous Integration/Continuous Deployment (CI/CD) pipelines automate testing and deployment phases, ensuring code quality and reliability before deployment. Scalability is achieved through cloud-based services such as AWS or Heroku, allowing seamless expansion of resources based on demand. Monitoring tools like Prometheus and Grafana provide real-time insights into system performance, enabling proactive maintenance and optimization. Finally, robust security measures, including HTTPS encryption and token-based authentication, safeguard data integrity and user privacy throughout the deployment process.

Explanation:

Deployment involves the process of making the project management system accessible to end-users. This typically includes deploying the application to a server or cloud platform where it can be accessed over the internet. It involves setting up the necessary infrastructure, configuring the environment, and ensuring smooth deployment of the MERN stack components, including the MongoDB database, Express.js backend, React frontend, and Node.js runtime. Deployment strategies may include using platforms like AWS, Heroku, or Docker containers to streamline the process and ensure scalability and reliability. Continuous integration and continuous deployment (CI/CD) pipelines may also be implemented to automate deployment processes and facilitate rapid updates.

2.3 MODULES

The project management system built on the MERN (MongoDB, Express.js, React, Node.js) stack typically consists of several modules that handle different aspects of project management.

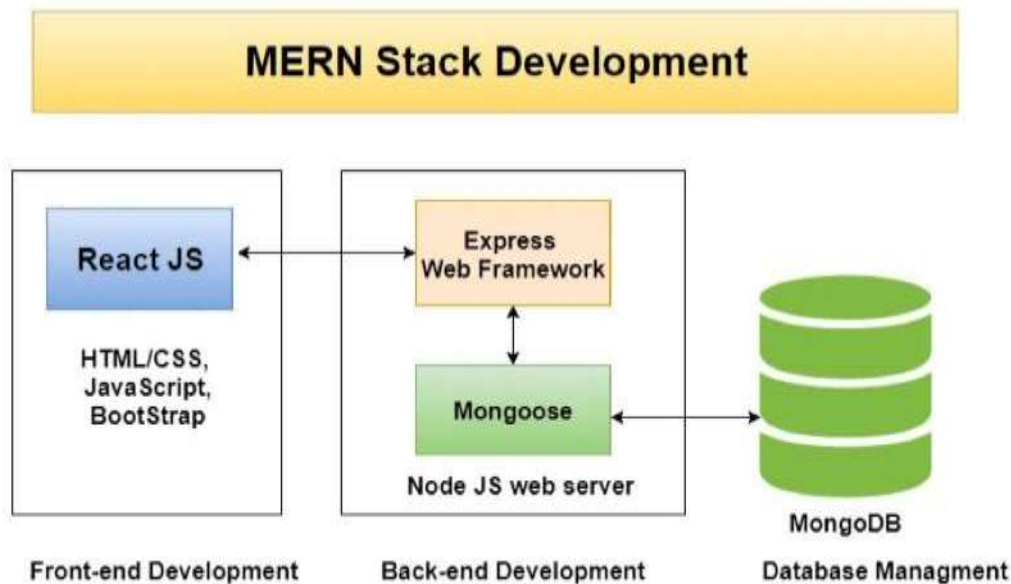


Fig: 2.3: MERN STACK MODULE

In a MERN (MongoDB, Express.js, React.js, Node.js) stack-based project management system, a crucial module would be the task management module. This module encompasses the functionalities required for creating, assigning, tracking, and updating tasks within a project. Tracking progress is another key aspect, with features like status updates (e.g., "in progress," "completed"), task comments, and attachments facilitating collaboration and providing visibility into each task's state. Overall, the task management module serves as the backbone of the project management system, facilitating organized, transparent, and efficient collaboration among team members to achieve project goals.

2.3.1 AUTHENTICATION MODULE

In a MERN stack project management system, the authentication module plays a crucial role in ensuring secure access to the application's features and data. Leveraging MongoDB for data storage, Express.js for server-side logic, React.js for the user interface, and Node.js for backend operations, the authentication module typically involves several key components. Firstly, user registration functionality allows new users to create accounts by providing necessary details like username, email, and password. These details are securely stored in the database, often hashed and salted to enhance security. Secondly, the login system authenticates users by verifying their credentials against those stored in the database. Upon successful authentication, the system generates a token, such as a JSON Web Token (JWT), which is then used to authenticate subsequent requests from the client. This token is typically sent in the headers of HTTP requests to authenticate and authorize access to protected routes and resources on the server. Express.js can be used to create API endpoints for user authentication operations like registration, login, and logout. These endpoints would interact with the MongoDB database to create, retrieve, update, or delete user information as necessary. For user interface components, React.js can be utilized to create forms and pages for user registration, login, and profile management. React Router can be employed to manage client-side routing and ensure that users can only access certain pages when they are authenticated. Node.js, as the backend runtime environment, would handle the authentication logic, including generating JSON Web Tokens (JWTs) upon successful login, verifying JWTs for protected routes, and managing user sessions. Additionally, implementing middleware functions in Express.js can help secure routes by checking for valid JWTs or session tokens before allowing access to protected resources. This ensures that only authenticated users can perform certain actions within the project management system. Overall, by incorporating authentication into the MERN stack project management system, you can enhance security, protect sensitive data, and provide users with a seamless and secure experience while using the application.

2.3.2 PROJECT MANAGEMENT MODULE

In a MERN (MongoDB, Express.js, React.js, Node.js) stack-based project management system, the "Project Management" module plays a crucial role in overseeing and coordinating various aspects of project development. This module typically encompasses functionalities such as project creation, task allocation, progress tracking, team collaboration, and resource management. Users, including project managers and team members, can initiate new projects, define project goals, and set timelines within this module. Task allocation involves assigning specific tasks to team members, along with deadlines and priorities. Progress tracking features enable stakeholders to monitor the status of tasks and milestones, facilitating effective project oversight. Collaborative tools within the module facilitate communication among team members, allowing for real-time updates, discussions, and file sharing. Additionally, resource management functionalities assist in allocating and managing project resources such as manpower, budget, and materials.

2.3.3 COLLABORATION AND COMMUNICATION MODULE

In a MERN (MongoDB, Express.js, React.js, Node.js) stack project management system, the Collaboration and Communication module serves as the lifeblood of efficient teamwork and project progress tracking. This module encompasses a range of features designed to facilitate seamless interaction among team members, enhance transparency, and streamline the flow of information throughout the project lifecycle. At its core, the Collaboration and Communication module integrates real-time messaging capabilities, allowing team members to engage in instant communication, share updates, and discuss tasks within the context of specific projects or tasks. This fosters collaboration and enables quick decision-making, reducing delays and ensuring that everyone stays aligned with project objectives. Additionally, the module may include features such as task assignment and notification systems, enabling project managers to delegate responsibilities effectively and keep team members informed about new tasks, deadlines, or changes in project requirements.

2.3.4 RESOURCE MANAGEMENT MODULE

In a MERN (MongoDB, Express.js, React.js, Node.js) stack project management system, integrating a resource management module is essential for efficient project planning and execution. This module serves as a centralized hub for managing various project resources such as human resources, equipment, materials, and finances. At its core, the resource management module allows project managers to allocate resources effectively based on project requirements and constraints. It provides functionalities for resource scheduling, assigning tasks to team members, tracking resource utilization, and forecasting future resource needs. With real-time updates and notifications, stakeholders can stay informed about resource availability, project progress, and potential bottlenecks. Additionally, the module can generate reports and analytics to evaluate resource utilization trends, optimize resource allocation, and make data-driven decisions.

2.3.5 REPORTING AND ANALYTICS MODULE

In the MERN (MongoDB, Express.js, React.js, Node.js) stack, the Reporting and Analytics module serves as a critical component within a project management system. This module is designed to provide users with comprehensive insights into various aspects of their projects, enabling informed decision-making and strategic planning. Leveraging MongoDB for data storage, Express.js for handling server-side logic, React.js for building dynamic user interfaces, and Node.js for server-side scripting, this module collects, processes, and presents data in a visually appealing and easy-to-understand manner. Through customizable dashboards, users can track key performance indicators (KPIs), monitor project progress, analyze resource allocation, and identify trends or patterns. Advanced reporting functionalities such as data visualization, trend analysis, and predictive modeling empower users to forecast outcomes, mitigate risks, and optimize project outcomes. Additionally, integration with third-party tools or APIs enhances the module's capabilities, enabling seamless data exchange and extending its functionality.

2.4 ALGORITHM USED

The algorithm used in the project management system (MERN stack) could vary depending on the specific functionalities and requirements of the system.

2.4.1 AUTHENTICATION AND AUTHORIZATION

In a project management system built on the MERN (MongoDB, Express.js, React, Node.js) stack, robust authentication and authorization mechanisms are crucial for ensuring data security and user privacy. Authentication verifies the identity of users, typically through methods like username/password combinations or OAuth tokens, granting them access to the system. Authorization, on the other hand, determines what actions a user can perform within the system based on their authenticated identity and assigned permissions. Implementing authentication and authorization involves features such as user registration, login/logout functionality, session management, role-based access control (RBAC), and secure transmission of data through techniques like HTTPS. By incorporating these measures, the project management system can safeguard sensitive information, control user access to resources, and maintain the integrity of the platform. Allow users to create accounts by providing necessary information like username, email, and password. Use encryption techniques like bcrypt to securely store passwords in the database. Implement a login mechanism where users can authenticate themselves using their credentials. Verify the provided credentials against the stored credentials in the database. Authentication is the process of verifying the identity of users, typically through credentials such as usernames and passwords. In the MERN stack, this can be implemented using technologies like JSON Web Tokens (JWT) or session-based authentication. Authorization, on the other hand, determines what actions authenticated users are allowed to perform within the application. This involves defining roles and permissions for different types of users or user groups.

2.4.2 SCHEDULING

In a project management system built on the MERN stack, scheduling plays a critical role in organizing tasks, allocating resources, and meeting project deadlines efficiently. Leveraging MongoDB for data storage, Express for handling server-side operations, React for building dynamic user interfaces, and Node.js for server-side runtime environment, the system enables users to create, view, and manage project schedules seamlessly. Through intuitive user interfaces, stakeholders can input task details, assign responsibilities, set deadlines, and track progress in real-time. The system employs various scheduling algorithms to optimize resource utilization, minimize bottlenecks, and enhance project productivity. Integration with calendar functionalities enhances coordination and communication among team members, ensuring alignment with project milestones and objectives. Real-time updates and notifications keep all stakeholders informed about schedule changes, fostering collaboration and enabling timely decision-making. Ultimately, the scheduling component of the MERN-based project management system streamlines project workflows, enhances efficiency, and contributes to successful project delivery.

2.4.3 RESOURCE OPTIMIZATION

In a project management system built on the MERN (MongoDB, Express.js, React.js, Node.js) stack, resource optimization is crucial for ensuring efficient project execution. Utilizing MongoDB for data storage allows for flexible document-based storage, facilitating the management of various project resources such as tasks, schedules, and team member information. Express.js, serving as the backend framework, enables the creation of robust APIs for seamless communication between the client-side React.js interface and the server-side components. React.js, on the frontend, offers a dynamic user interface that enhances user experience and allows for real-time updates, streamlining resource allocation and tracking. Node.js provides the runtime environment for scalable and high-performance server-side code execution, enabling efficient handling of resource-intensive tasks.

2.4.4 TASK ALLOCATION

In a project management system built on the MERN stack, task allocation is a pivotal aspect facilitating efficient workflow management. Leveraging MongoDB for data storage, Express.js for server-side logic, React for dynamic user interfaces, and Node.js for runtime environment, task allocation involves assigning responsibilities to team members based on project requirements and individual capabilities. Through the system's interface, project managers can create tasks, specify details such as deadlines and priority levels, and assign them to relevant team members. Real-time updates ensure transparency and accountability, allowing team members to track their assigned tasks, update progress, and communicate seamlessly within the platform. Task allocation in a MERN-based project management system optimizes resource utilization, enhances collaboration, and fosters project success.

2.4.5 PROGRESS TRACKING

In a MERN (MongoDB, Express.js, React.js, Node.js) stack-based project management system, progress tracking is integral for ensuring efficient workflow management. The system typically incorporates features like task assignment, status updates, and milestone tracking to monitor project progress. Utilizing MongoDB for flexible data storage, Express.js for handling server-side logic, React.js for dynamic user interfaces, and Node.js for backend development, the system enables real-time updates and collaborative work environments. Through intuitive UI components and RESTful APIs, team members can view task statuses, update progress, and receive notifications, fostering transparency and accountability throughout the project lifecycle. Moreover, integration with additional tools like Gantt charts or Kanban boards can enhance visualization and further streamline progress monitoring, facilitating timely decision-making and successful project completion.

2.5 DEVELOPMENT AND DEPLOYMENT SETUP

In setting up the development and deployment environment for a project management system using the MERN stack (MongoDB, Express.js, React, Node.js), it's crucial to establish a streamlined workflow that ensures smooth development and efficient deployment. The development and deployment setup for our project management system in the MERN stack begins with establishing the necessary infrastructure. We utilize MongoDB as our database backend, ensuring robust data storage and retrieval capabilities. Express.js serves as the backend framework, providing a seamless interface between the frontend and the database. For the frontend, we employ React, enabling us to create dynamic and responsive user interfaces. Node.js powers our server environment, facilitating the execution of server-side logic and handling client requests. Throughout the development process, we leverage tools like Git for version control and npm for package management, ensuring collaboration and code quality. Continuous integration and deployment (CI/CD) pipelines are established using platforms like Jenkins or GitLab CI to automate testing and deployment processes, enhancing productivity and maintaining code stability. Additionally, containerization with Docker and orchestration with Kubernetes may be implemented to streamline deployment and scalability. Overall, this setup fosters a cohesive development environment, allowing for efficient collaboration. In terms of deployment, there are various options depending on the project's requirements and budget. For small to medium-sized projects, platforms like Heroku, Netlify, or Vercel offer simple deployment solutions, especially for applications with minimal backend requirements. These platforms often provide seamless integration with Git, making deployment as easy as pushing code to a repository. For larger projects requiring more control and scalability, deploying on cloud infrastructure providers like AWS (Amazon Web Services), Google Cloud Platform, or Microsoft Azure might be more suitable. These platforms offer services like EC2 (Elastic Compute Cloud) for hosting backend servers, S3 for storing static assets, and managed database services like MongoDB Atlas for the database layer.

CHAPTER 3

RESULTS AND DISCUSSION

SIGNUP PAGE

The signup page allows new users to register for an account by providing necessary information such as username, email, and password. Client-side validation ensures that users provide valid and secure credentials before submitting the form. Upon successful submission, the user's information is sent to the backend API, where it is validated and stored in the MongoDB database. Users receive feedback confirming successful registration and are redirected to the signin page to access their newly created account.

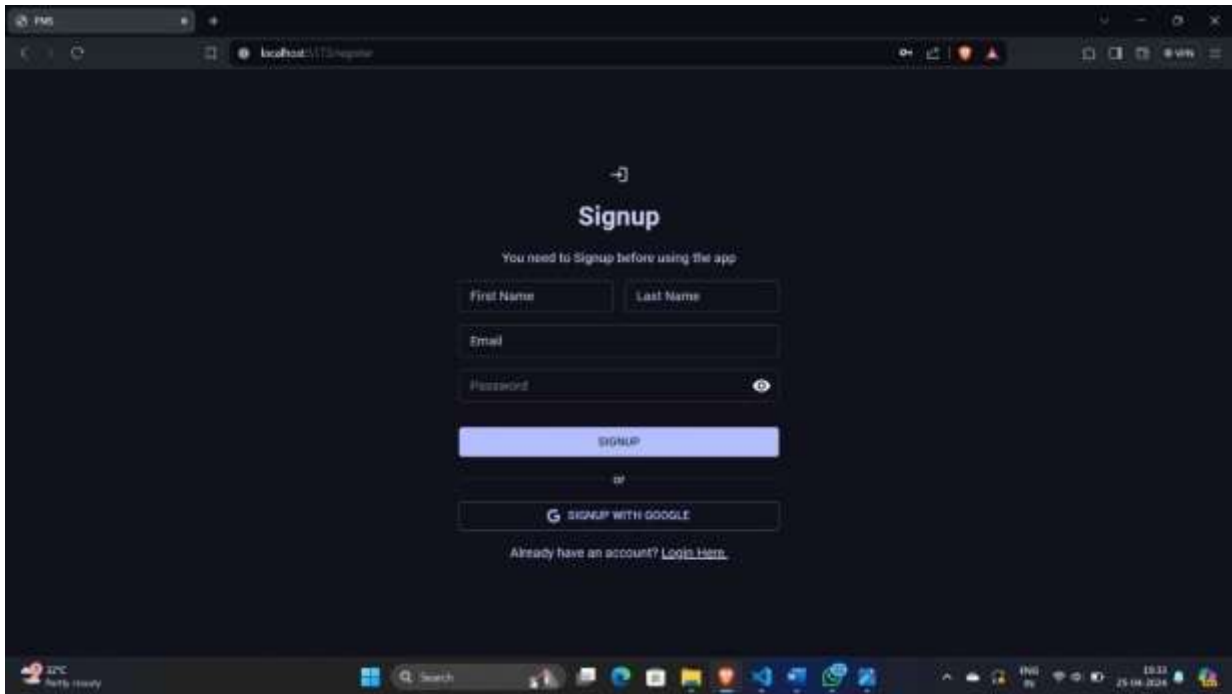


Fig: 3.1:SIGNUP PAGE

LOGIN PAGE

Provides a form for existing users to enter their credentials (username/email and password) to access their account. Implements client-side validation to ensure required fields are filled and proper format is maintained. Utilizes server-side authentication to verify user credentials against those stored in the database. Generates and manages authentication tokens (e.g., JSON Web Tokens - JWT) to maintain user sessions securely. Redirects authenticated users to the dashboard or the desired page within the application upon successful login. Handles error cases gracefully, displaying appropriate error messages for incorrect credentials or other login failures. the login page caters to existing users, providing a straightforward interface to authenticate themselves by entering their credentials—typically username or email and password.

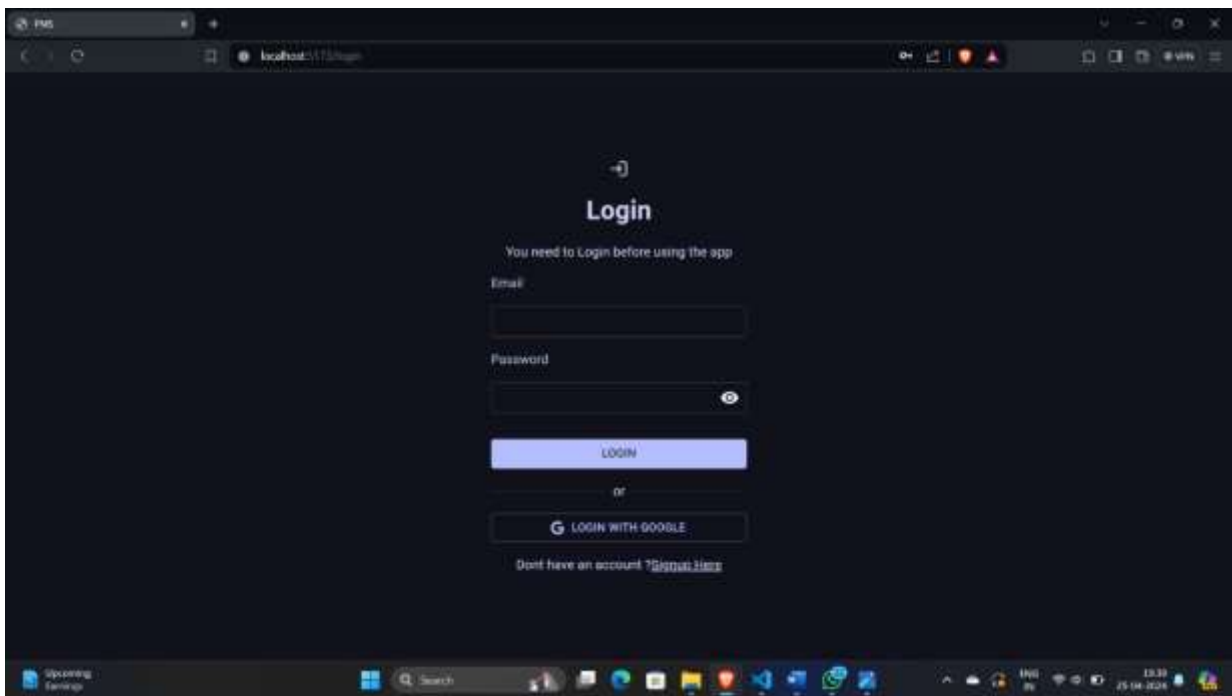


Fig: 3.2: LOGIN PAGE

PROJECT INITIATION

The project initiation page for the MERN stack-based project management system serves as the entry point for launching the application development process. This page outlines the foundational aspects of the project, including its objectives, scope, stakeholders, and initial requirements. It provides a comprehensive overview of the project's goals, such as improving team collaboration, enhancing task management efficiency, and facilitating project tracking and reporting. Additionally, the initiation page may include details about the technology stack chosen for development, highlighting the use of MongoDB for the database, Express.js for the backend framework, React for the frontend framework, and Node.js for the runtime environment. It sets the tone for project planning and execution, establishing clear expectations and laying the groundwork for subsequent phases of development, including design, implementation, testing, and deployment.

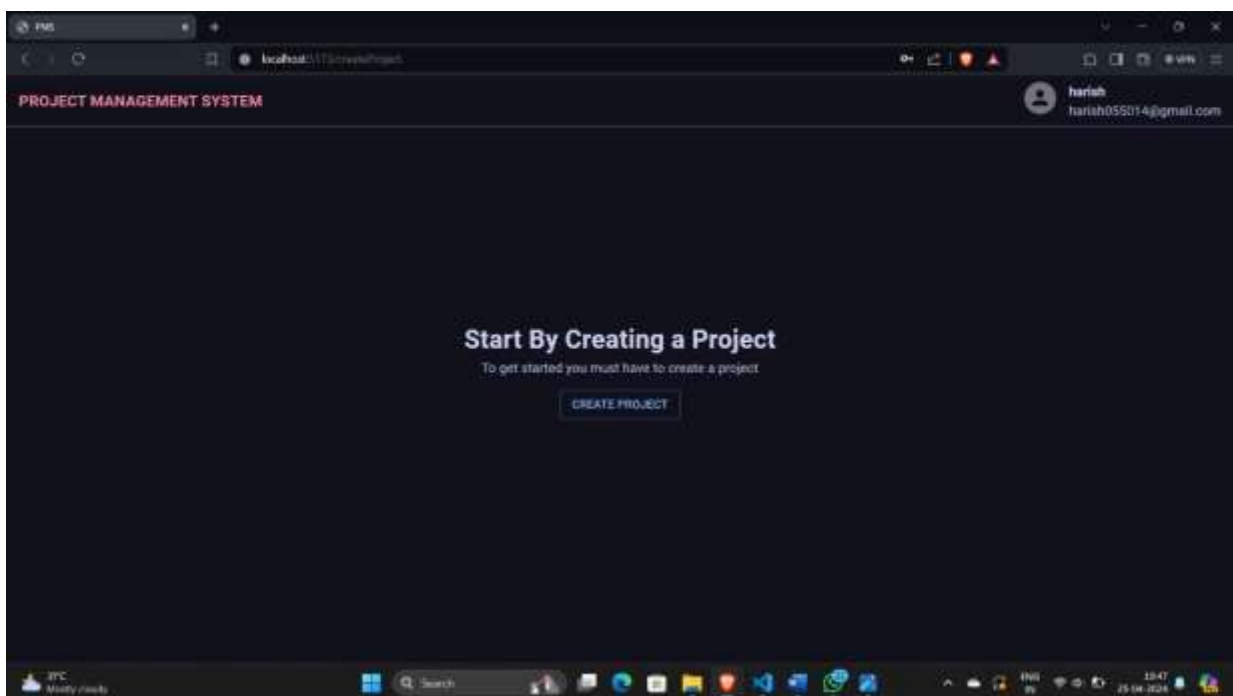


Fig: 3.3: PROJECT INITIATION

DASHBOARD

The dashboard for the project management system developed using the MERN stack serves as a centralized hub for users to efficiently monitor and manage various aspects of their projects. It provides a comprehensive overview of project progress, task statuses, team collaboration, and key metrics. The dashboard typically includes intuitive data visualizations such as charts, graphs, and tables to represent project timelines, milestones, and resource allocation. Users can access real-time updates on project activities, track task dependencies, and prioritize assignments based on deadlines and importance. Additionally, the dashboard may feature interactive elements such as drag-and-drop interfaces for task management, filtering options for viewing specific project components, and customizable widgets to tailor the dashboard layout according to individual preferences.

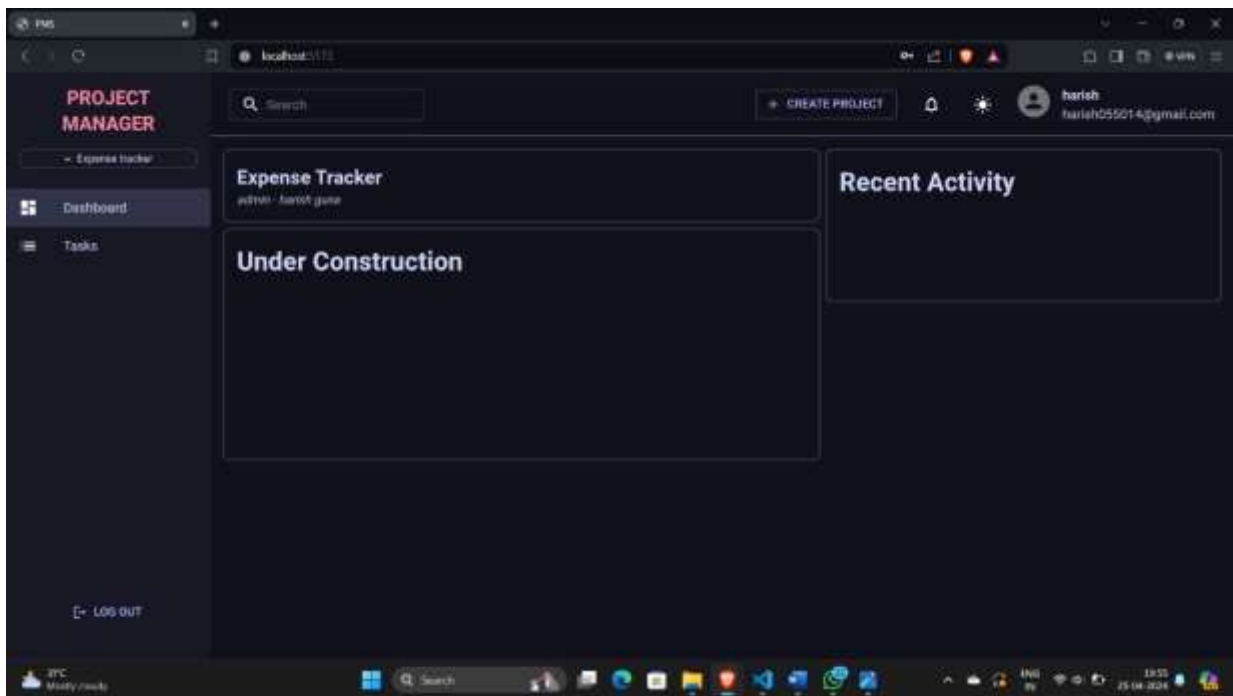


Fig: 3.4: DASHBOARD

TASKS PAGE

The task page in the MERN stack project management system serves as a central hub for organizing, tracking, and managing tasks within projects. Users can create new tasks, assign them to team members, set deadlines, and monitor progress. The page typically displays a list of tasks categorized by project, with relevant details such as task name, description, due date, priority level, and assigned user. Users can easily update task statuses, mark tasks as complete, or reassign them as needed. Additionally, the task page may feature filters and search functionality to streamline navigation and facilitate efficient task management. Integration with other components of the system, such as calendars or notifications, ensures seamless coordination and communication among team members. Overall, the task page plays a pivotal role in facilitating project execution and ensuring timely completion of tasks within the MERN stack project management system.

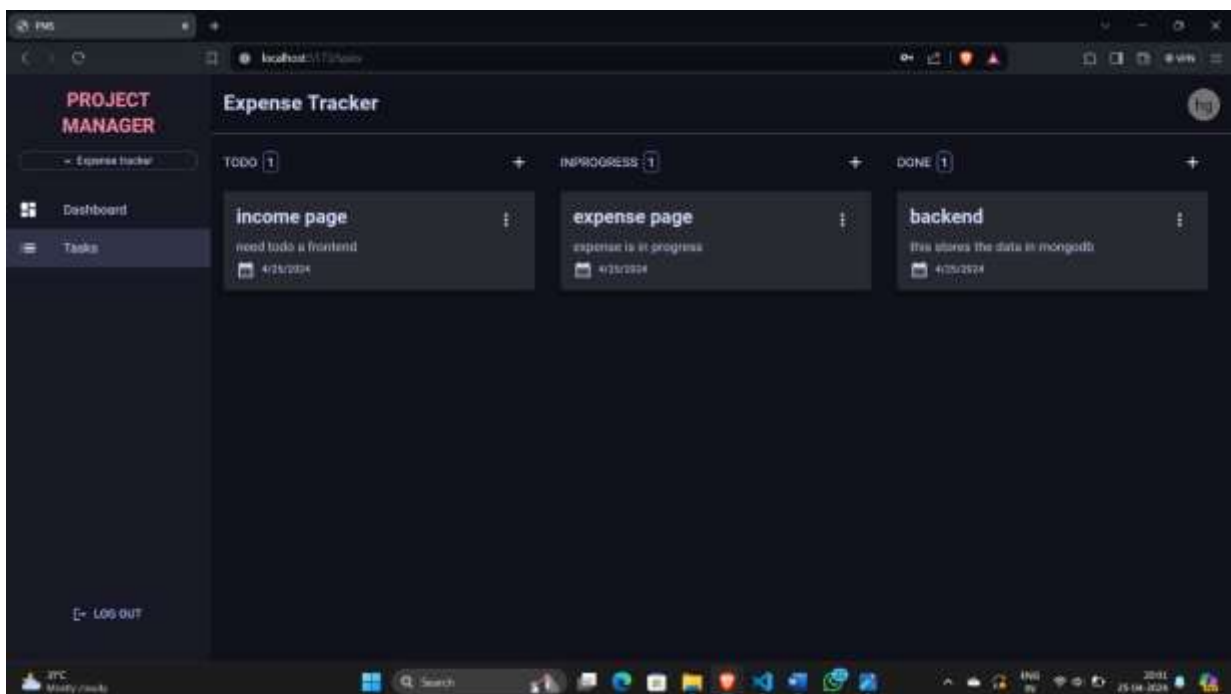


Fig: 3.5: TASKS PAGE

DATABASE AND ENCRYPTION

In the context of our Project Management System (PMS) built on the MERN stack, the management of data through a robust database architecture is paramount. MongoDB, a NoSQL database, serves as the cornerstone of our data storage, offering flexibility and scalability crucial for handling the diverse and dynamic nature of project-related information. Leveraging MongoDB's document-oriented structure, we can efficiently store and retrieve various project artifacts, including tasks, milestones, and user data, ensuring seamless interaction and data management within the application.

Moreover, security is of utmost concern, especially when dealing with sensitive project data. To fortify our PMS against unauthorized access and data breaches, we implement encryption mechanisms at multiple layers. Utilizing industry-standard encryption algorithms such as AES (Advanced Encryption Standard) and TLS (Transport Layer Security).

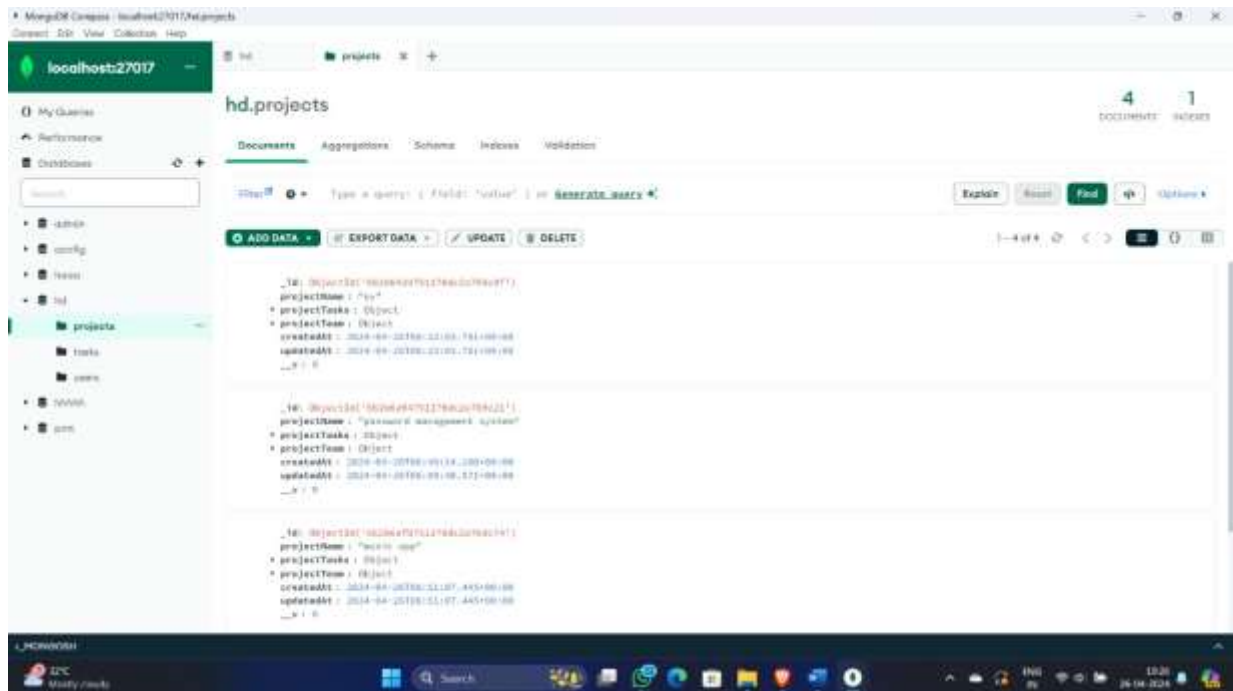


Fig: 3.6: PROJECT'S DATA(MONGO DB)

CHAPTER 4

CONCLUSION AND FUTURE WORK

4.1 CONCLUSION

The project management system built on the MERN stack represents a culmination of comprehensive development efforts aimed at providing robust project management capabilities within a modern web application framework. In its conclusion, the project management system stands as a testament to the versatility and power of the MERN (MongoDB, Express.js, React, Node.js) stack in enabling the creation of dynamic and feature-rich web applications. Leveraging MongoDB as the database ensures flexibility in handling diverse data structures and seamless integration with the Node.js backend, facilitating efficient data storage and retrieval operations. Express.js, serving as the backend framework, offers a minimalist yet powerful platform for building RESTful APIs. On the frontend, React emerges as the cornerstone, offering a component-based architecture that fosters modular and reusable UI elements. This not only enhances development efficiency but also facilitates a responsive and interactive user experience. It also entails the evaluation of project performance against predefined metrics, allowing for valuable insights into areas of improvement for future endeavors. Moreover, the conclusion phase underscores the importance of collaboration, communication, and adaptability throughout the project lifecycle, laying the groundwork for continued success in MERN stack development projects. With MongoDB as the database, project data can be stored in a flexible and scalable manner, accommodating diverse project structures and requirements. Express.js provides a robust backend framework, facilitating the development of RESTful APIs for seamless communication between the frontend and backend components. React.js offers a dynamic and interactive user interface, enabling users to visualize project data, track progress, and manage tasks effectively. Node.js powers the backend server, providing a non-blocking, event-driven architecture that ensures high performance and scalability.

4.2 FUTURE WORK

Future work for the project management system in the MERN stack could include:

Enhanced Collaboration Features: Implementing real-time collaboration features such as live chat, collaborative document editing, and task assignment notifications to improve team communication and productivity.

Advanced Reporting and Analytics: Developing comprehensive reporting and analytics tools to provide insights into project progress, team performance, resource utilization, and project metrics. This could involve integrating data visualization libraries and advanced analytics algorithms.

Mobile Application Development: Creating mobile applications for iOS and Android platforms to allow users to access and manage projects on the go. This would involve designing responsive UI/UX interfaces and optimizing performance for mobile devices.

Integration with Third-Party Tools: Integrating with popular third-party tools and services such as Slack, Google Drive, Jira, and GitHub to enhance functionality and streamline workflow processes.

Security Enhancements: Implementing advanced security measures such as encryption, role-based access control (RBAC), and two-factor authentication (2FA) to ensure data privacy and protect against potential security threats.

Scalability and Performance Optimization: Optimizing the application architecture and database design to handle large-scale projects and a growing user base efficiently. This may involve implementing caching mechanisms, load balancing, and horizontal scaling techniques.

User Feedback and Iterative Improvements: Gathering user feedback through surveys, user testing, and analytics tools to identify areas for improvement and prioritize feature enhancements. Iteratively updating the system based on user needs and market trends.

Localization and Internationalization: Adding support for multiple languages and cultural preferences to make the application accessible to a global audience.

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APPENDICES

A. SAMPLE CODE

i) Main.jsx:

```
import React from "react";
import ReactDOM from "react-dom/client";
import App from "./App.jsx";
import { store } from "./store.js";
import { Provider } from "react-redux";
import { PersistGate } from "redux-persist/integration/react";
import { persistStore } from "redux-persist";

ReactDOM.createRoot(document.getElementById("root")).render(
  <React.StrictMode>
    <Provider store={store}>
      <PersistGate loading={null} persistor={persistStore(store)}>
        <App />
      </PersistGate>
    </Provider>
  </React.StrictMode>
);
```

ii) App.jsx

```
import "./App.css";
import { useMemo } from "react";
import {
  BrowserRouter as Router,
  Routes,
  Route,
  redirect,
} from "react-router-dom";
import { CssBaseline, ThemeProvider, createTheme } from "@mui/material";
import { themeSettings } from "./theme.js";
import { useSelector } from "react-redux";
import { Dashboard } from "./pages/DashBoard.jsx";

import ConditionalRoute from "./router/ConditionalRoute.jsx";
import Login from "./pages/Login.jsx";
import Register from "./pages/Register.jsx";
import CreateProjectPage from "./pages/CreateProjectPage.jsx";
import TaskBoard from "./pages/TaskBoard.jsx";

export default function App() {
  const mode = useSelector((state) => state.theme.mode);
  const theme = useMemo(() => createTheme(themeSettings(mode)), [mode]);
  const user = useSelector((state) => state.auth.user);
  const currentProject = useSelector((state) => state.project.currentProject);
  return (
    <div className="app">
      <Router>
        <ThemeProvider theme={theme}>
          <CssBaseline enableColorScheme />
          <Routes>
            <Route
              path="/"
              element={
                <ConditionalRoute condition={Boolean(user)} redirectTo="/login">
                  <ConditionalRoute
                    condition={Boolean(user?, projects?.length !== 0)}
                    redirectTo="/createProject"
                  />
                <Dashboard />
              </ConditionalRoute>
            </ConditionalRoute>
          </Routes>
        </ThemeProvider>
      </Router>
    </div>
  );
}
```

ii) App.jsx

```
        >
        <TaskBoard />
      </ConditionalRoute>
    </ConditionalRoute>
  }
  />
<Route
  path="/createProject"
  element={
    <ConditionalRoute
      condition={Boolean(user)}
      redirectTo="/login"
    >
      <CreateProjectPage />
    </ConditionalRoute>
  }
  />
<Route
  path="/login"
  element={
    <ConditionalRoute condition={Boolean(!user)} redirectTo="/">
      <Login />
    </ConditionalRoute>
  }
  />
<Route
  path="/register"
  element={
    <ConditionalRoute condition={Boolean(!user)} redirectTo="/">
      <Register />
    </ConditionalRoute>
  }
  />
</Routes>
</ThemeProvider>
</Router>
</div>
  );
}
```

iii) App.js:

```
const express = require("express");
const helmet = require("helmet");
const cors = require("cors");
const morgan = require("morgan");
const path = require("path");
require("dotenv").config();
const app = express();

const authRoutes = require("./routes/auth");
const projectRoutes = require("./routes/project");
const taskRoutes = require("./routes/task");
const userRoutes = require("./routes/user");
const verifyToken = require("./middleware/auth");
const { findUser, refreshUser } = require("./controllers/auth");
const corsOptions = {
  origin: true,
  credentials: true,
};
// setting cors at one place for all the routes
// putting cors as first in order to avoid unnecessary requests from unallowed origins
app.use(morgan("common"));
app.use(function (req, res, next) {
  cors(corsOptions)(req, res, next);
});
app.use(helmet());
app.use(express.json());
app.use(express.urlencoded({ extended: true }));
app.use(express.static(path.join(__dirname, "public")));
app.use("/test", (req, res) => {
  res.send("Hello form the server");
});
app.use("/auth", authRoutes);
app.use("/project", verifyToken, projectRoutes);
app.use("/user", verifyToken, userRoutes);
app.use("/task", verifyToken, taskRoutes);
app.get("/refreshUser", verifyToken, refreshUser);

module.exports = app;
```

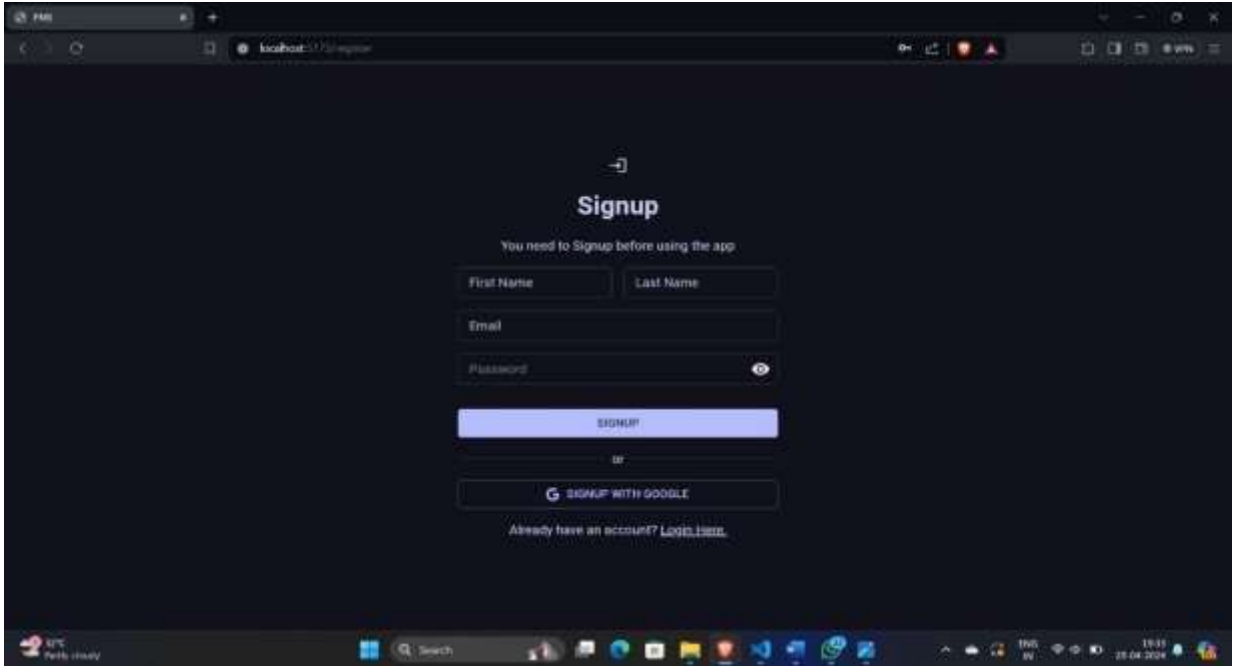
iv) Server.js:

```
import React from "react";
import ReactDOM from "react-dom/client";
import App from "./App.jsx";
import { store } from "./store.js";
import { Provider } from "react-redux";
import { PersistGate } from "redux-persist/integration/react";
import { persistStore } from "redux-persist";

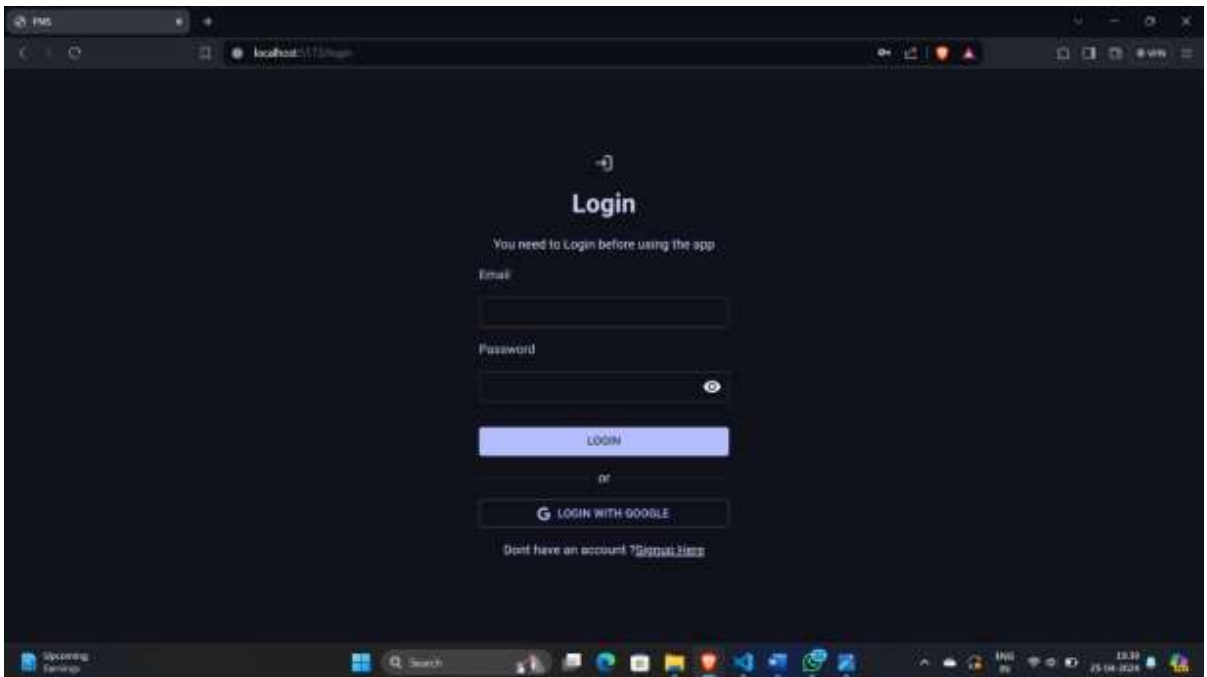
ReactDOM.createRoot(document.getElementById("root")).render(
  <React.StrictMode>
    <Provider store={store}>
      <PersistGate loading={null} persistor={persistStore(store)}>
        <App />
      </PersistGate>
    </Provider>
  </React.StrictMode>
);
```

B. SCREENSHOTS

i) SIGNUP AND LOGIN

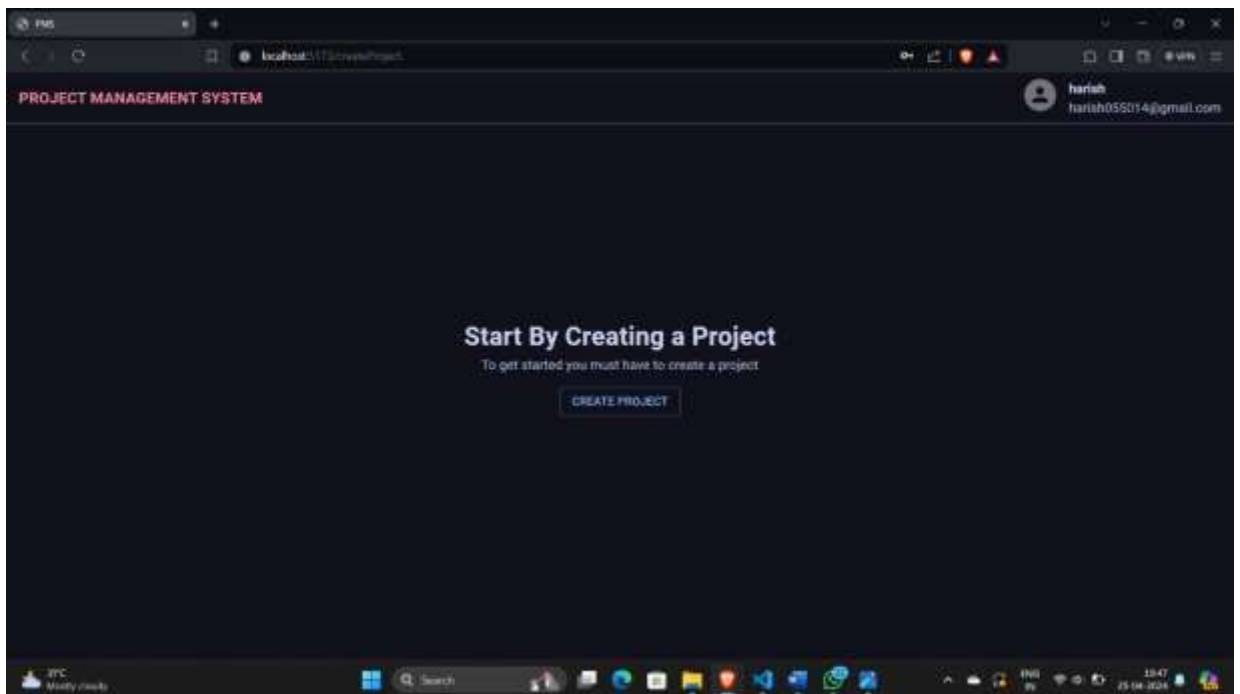


The screenshot shows a web browser window with the URL `localhost:5173/signup`. The page has a dark theme and features a 'Signup' heading with a subtext 'You need to Signup before using the app'. Below the heading are input fields for 'First Name', 'Last Name', 'Email', and 'Password'. A 'SIGNUP' button is positioned below these fields. An 'OR' separator is followed by a 'SIGNUP WITH GOOGLE' button. At the bottom, there is a link that says 'Already have an account? [Login here.](#)'.

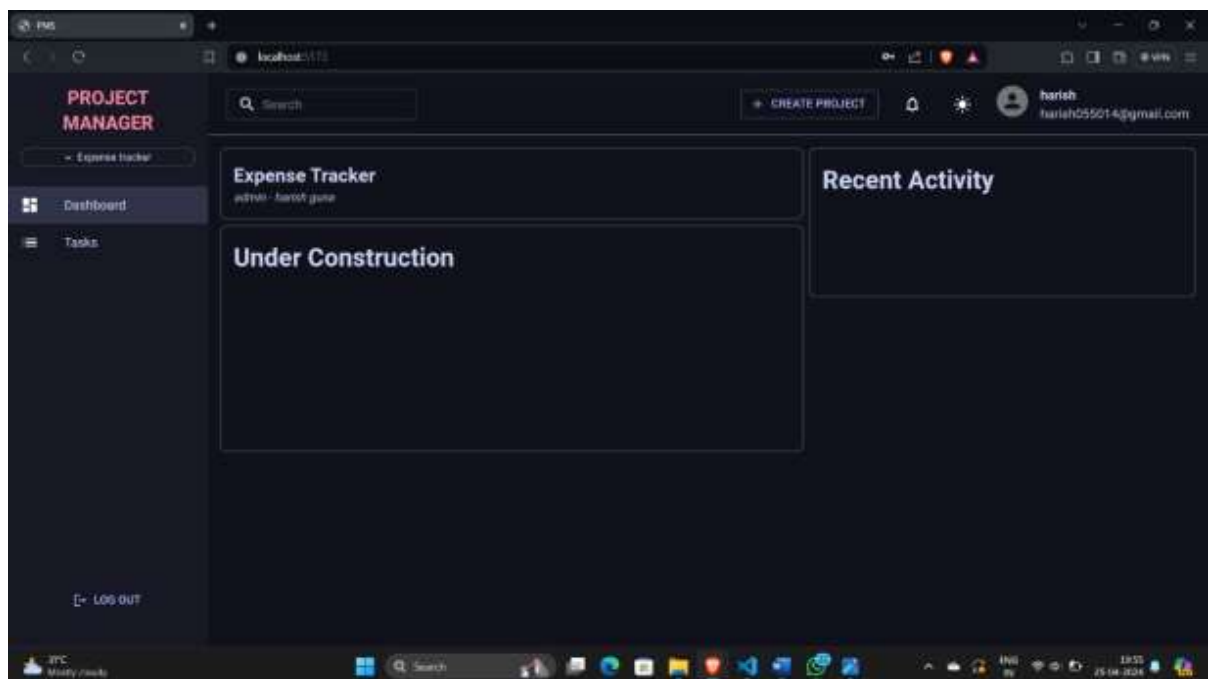


The screenshot shows a web browser window with the URL `localhost:5173/login`. The page has a dark theme and features a 'Login' heading with a subtext 'You need to Login before using the app'. Below the heading are input fields for 'Email' and 'Password'. A 'LOGIN' button is positioned below these fields. An 'OR' separator is followed by a 'LOGIN WITH GOOGLE' button. At the bottom, there is a link that says 'Don't have an account? [Signup here.](#)'.

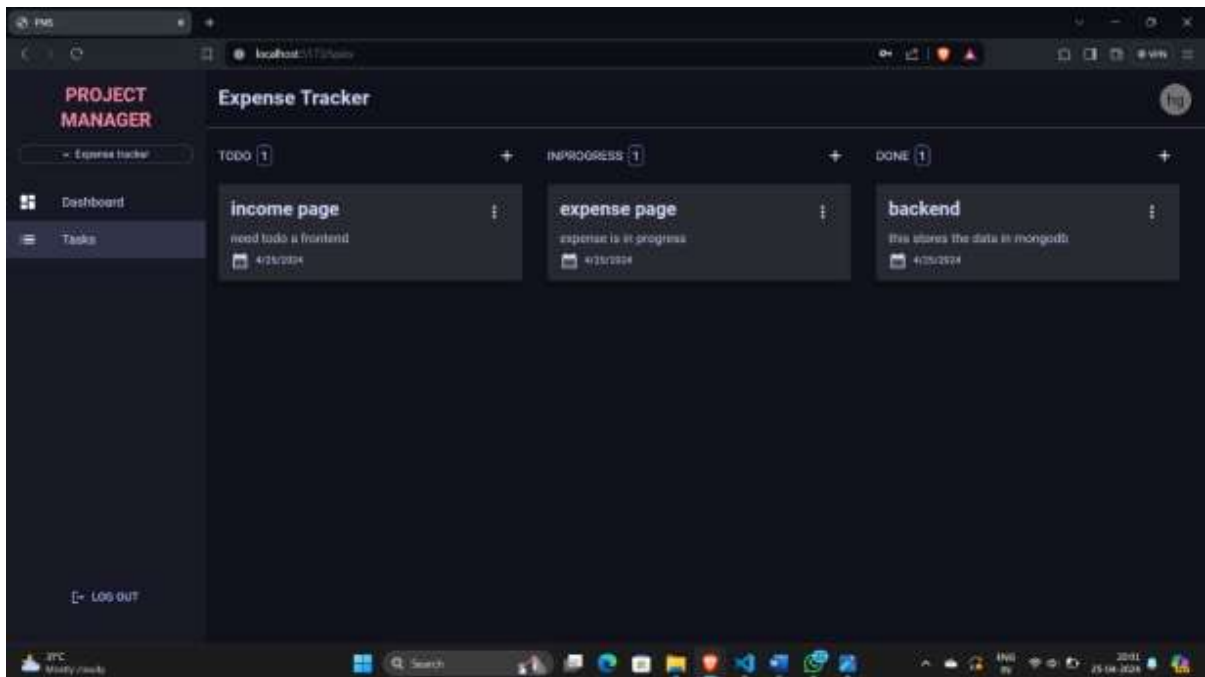
ii) PROJECT INITIATION



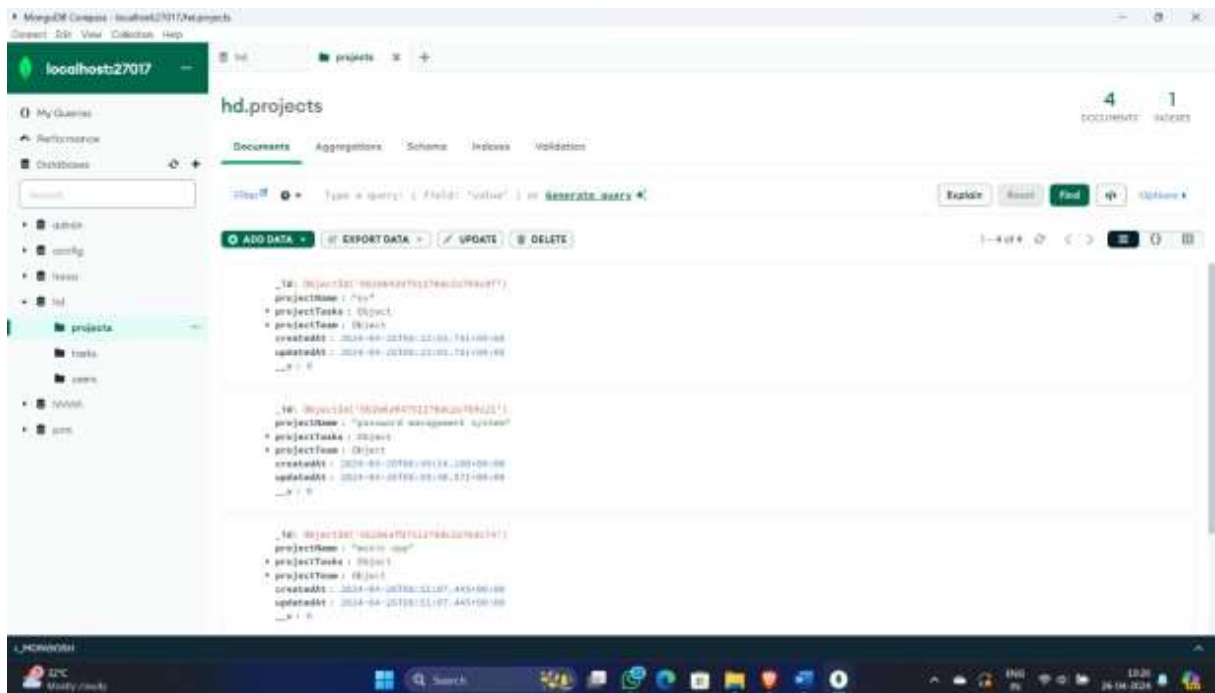
iii) DASHBOARD



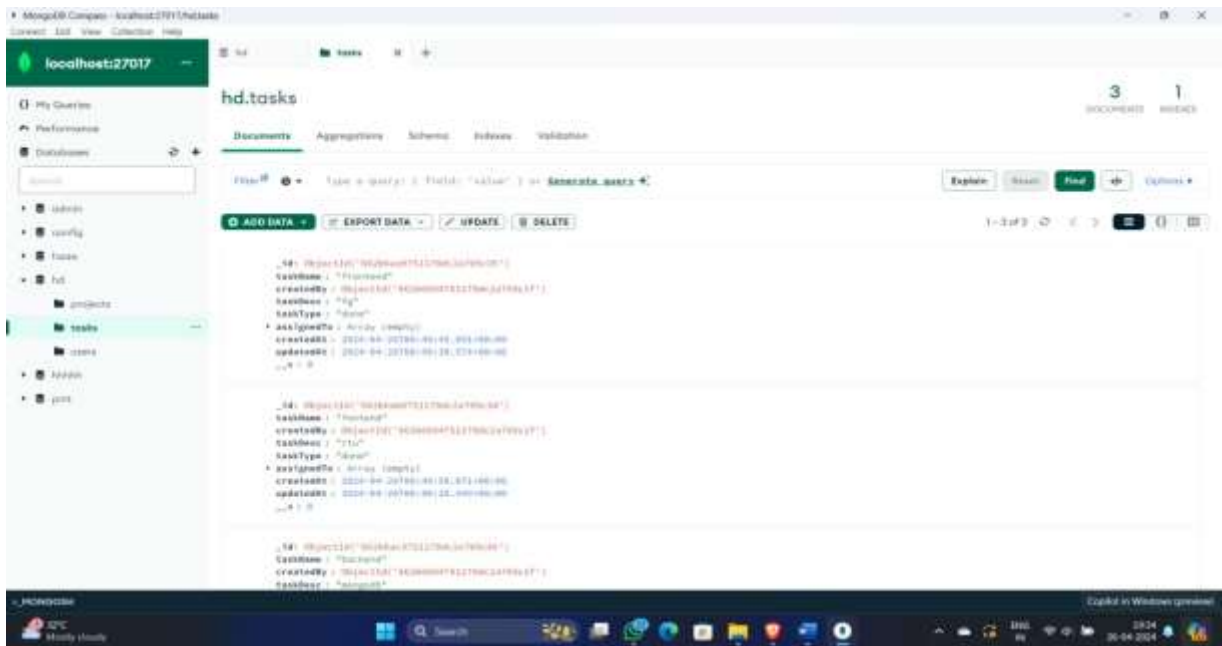
iv) TASK'S PAGE



v) PROJECT'S DATA(MONGO DB)



vi) PROJECT'S DATA(MONGO DB)



vii) USER'S DATA(MONGO DB)

