Collaborative Real-Time Project Management System for Efficient Team Coordination

Akash Modanwal, Dilip, Rajat Rawat

Department of Computer Science and Engineering (Artificial Intelligence)

IIMT College of Engineering, Greater Noida

Emails: akashmodanwal88.am@gmail.com , dilip.zz7523@gmail.com,

rajatrawat0312@gmail.com

II. ABSTRACT

Efficient task coordination and real-time communication are crucial for the success of modern projects, especially in remote and hybrid work environments. This paper presents a collaborative, real-time project management solution that allows users to create projects, assign tasks, track progress, and enhance productivity through interactive tools. The system leverages modern web technologies to offer real-time synchronization, task tracking, user collaboration, and progress analytics. Key features include task boards, deadline tracking, user roles, notification systems, and integrated chat support. Through this platform, teams can minimize project delays, enhance accountability, and foster transparency. The paper explores system architecture, technology stack, implementation strategy, and evaluates performance through simulated user scenarios.

III. INTRODUCTION

In the digital age, organizations increasingly rely on project management software to maintain workflow efficiency and ensure timely project delivery. However, many traditional systems lack real-time collaboration features, leading to miscommunication and workflow bottlenecks.

To bridge this gap, this research introduces a collaborative, real-time project management platform tailored for distributed teams. The system empowers users to create projects, assign tasks, set deadlines, track task status, and collaborate seamlessly. With real-time synchronization and instant notifications, teams can stay aligned and informed throughout the project lifecycle.

This paper outlines the design, implementation, and benefits of a modern, responsive web application for real-time project management. The system integrates real-time communication, drag-and-drop task boards, team analytics, and user role management for a comprehensive team collaboration experience.

IV. RELATED WORK

Numerous tools exist for task and project management, such as Trello, Asana, and Jira. These platforms offer task tracking and collaboration but often come with limitations in customization or require expensive subscriptions.

Ahmed et al. [1] proposed a real-time collaborative tool that integrates chat and task boards but lacked robust permission control and analytics. Li and Park [2] developed a task prioritization system based on machine learning, yet it lacked real-time features.

More recent work by Khatri et al. [3] introduced a real-time Kanban board using Firebase for synchronization but noted scalability issues with large teams. Finally, Sharma and Gupta [4] explored open-source project management systems and emphasized the need for lightweight, responsive interfaces.

Building on this prior work, our system incorporates real-time task handling, efficient user management, and scalability, aiming to enhance both user experience and team performance.

V. REFERENCES

A. Ahmed, K. Rizwan, "Design and Development of a Real-Time Collaborative Platform for Academic Projects", Int. J. Comput. Sci., vol. 30, no. 4, 2022.

J. Li, S. Park, "Task Prioritization System Using Machine Learning in Agile Teams", ACM Conf. Softw. Eng., 2021.

D. Khatri, P. Kumar, "Real-Time Kanban Task Board Using Firebase and React", IEEE Int. Conf. Smart Comput., 2023.

R. Sharma, P. Gupta, "Comparative Study of Open-Source Project Management Tools", J. Softw. Eng. Appl., vol. 13, 2020.

VI. METHODOLOGY

A. System Architecture

The platform follows a MERN (MongoDB, Express.js, React.js, Node.js) architecture. Real-time capabilities are powered by Socket.IO to synchronize task updates, comments, and user status across all connected clients.

B. User Flow

Project Creation – Users can create new projects and invite team members.

Task Assignment – Tasks can be added with priority levels, deadlines, and assigned users.

Progress Tracking – Task cards can be dragged between status columns: To-Do, In Progress, Done.

Real-Time Chat – Each project has a built-in chat module to facilitate instant discussion.

Notifications – Real-time notifications alert users of new tasks, deadlines, and changes.

C. Implementation Details

Backend: Built with Node.js and Express, with REST APIs and WebSocket support.

Frontend: React with TailwindCSS for responsive UI and drag-and-drop task boards.

Database: MongoDB used for storing users, projects, and task data with real-time updates.

VII. RESULTS AND DISCUSSION

The system was tested with multiple users accessing and updating the same project concurrently. The real-time update mechanism ensured consistent task states across all clients with minimal latency (~200ms). Key observations:

Scalability: The app handled up to 100 concurrent users in a single project room with stable performance.

Usability: Users reported increased clarity in task delegation and better visibility into project timelines.

Challenges: Maintaining data consistency during simultaneous edits was mitigated using WebSocket-based locking mechanisms.

Future work includes integrating AI-powered task prioritization, calendar views, and Gantt charts to enhance functionality further.