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SECURE INTEGRATED PROJECT MANAGEMENT SYSTEM

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Abstract— **In modern organizational environments, efficient project coordination, task tracking, issue management, and timely notifications are essential for successful project execution. This paper introduces the design and implementation of an Integrated Project Management (IPM) web application developed using the Python Django framework. The proposed system consolidates project management, work-item (granular tasks) tracking, ticketing, and automated reminders into an integrated and secure platform. Users can create and manage projects, create and assign work items with priorities and deadlines, raise and resolve tickets, and receive automated notifications, thereby improving transparency, accountability, and collaboration. The system follows a modular, three-tier architecture comprising a presentation layer, an application layer, and a data layer supported by MySQL for persistent storage. IPM incorporates role-based access control, interactive dashboards, data visualization, accessibility support, and reporting features. Functional evaluation demonstrates improved task traceability, reduced response delays, and effective project monitoring.**

Keywords— **Integrated Project Management (IPM) System, Dashboard Analytics, Traceability, Accessibility, Ticketing, Work Item Tracking, Automated Alerts, Authorization, Web Application Hardening.**

I. INTRODUCTION

Project management in modern academic, research, and enterprise environments increasingly depends on digital platforms to coordinate tasks, track issues, and ensure timely project completion. As projects become more complex and collaborative, the absence of an integrated system often leads to fragmented workflows, reduced visibility, and delays caused by unmonitored tasks. Many existing tools focus on isolated functionalities such as task tracking or ticket handling, but lack a integrated approach that combines project management, fine-grained work items, notifications, and reporting within a single secure platform. This paper presents a web-based Integrated Project Management (IPM) system developed using the Python Django framework to address these limitations. The proposed system integrates project management, work item tracking, ticketing, and automated reminders into a centralized application. It enables users to create and manage projects, assign tasks with priorities and deadlines, raise and resolve tickets, and receive automated notifications, thereby improving transparency, accountability, and team collaboration. The system follows a modular three-tier architecture consisting of presentation, application, and data layers, supported by a MySQL database. Role-based access control, dashboards, data visualization, accessibility support, and security mechanisms further enhance usability and reliability.

The objectives of this study are:

- To design a scalable and modular architecture for an IPM system.
- To implement secure functional modules for project, work item, ticket, and reminder management.
- To evaluate system effectiveness in improving task traceability and monitoring.

II. RELATED WORK

Several studies have explored Project Management Information Systems (PMIS):

- Rebuglio et al. (2025) conducted a systematic review of PMIS research, highlighting the importance of integration in complex projects.
- Ghorbani and Shafaghat (2020) proposed a conceptual model for integrating PMIS in project-based organizations.
- TaDaa (Feng et al., 2022) applied machine learning for ticket assignment in support systems.
- Slack supports reminders and notifications through bots but lacks native ticket and work-item management.

- Existing commercial tools such as Jira, Trello, and Asana provide ticketing and task tracking but often lack seamless integration of reminders or atomic work items.

The proposed IPM introduces a modular architecture that natively integrates ticketing, granular work-item management, and automated reminders within a single platform, extending functionality beyond conventional project management implementations. In contrast to JIRA and Slack, which predominantly depend on platform-level security mechanisms, the proposed system embeds application-level controls such as session management, rate limiting, and privilege enforcement directly into its core workflow logic

III. SYSTEM ARCHITECTURE

The system is designed as a three-tier architecture that separates concerns, supports scalability, and facilitates maintainability:

3.1 Presentation Layer

The user interface provides interactive dashboards for ticket navigation, task breakdown, progress monitoring. User interface implemented using HTML 5, bootstrap5, CSS3, JavaScript and django crispy-forms, it supports responsive interaction and real-time updates. The web-based dashboard facilitates the management of tickets, work items, and reminders. Its functionalities include the ability to create projects, teams, and project teams. Additionally, users can create, assign, and update the status of tickets as well as work items. The dashboard also provides real-time reminders and notifications.

3.2 Application Layer

The Application Layer encapsulates the core business logic, workflow management, and application-level security of the IPM system. This layer is implemented using the Python Django framework and follows the Model–View–Template (MVT) architectural pattern, which ensures clear separation between data models, business logic, and presentation. It manages all functional operations related to project execution and coordination. The system supports comprehensive project management by enabling the creation, configuration, and monitoring of projects, assignment of team members, and tracking of overall progress. Work item management functionality allows tasks to be decomposed into granular units with defined priorities, deadlines and progress tracking. The ticket management component supports the creation, categorization, assignment, progress tracking and resolution of issues and service requests. In addition, a reminder module provides automated, schedule-based notifications to ensure timely completion of tasks and deadlines. Authentication and authorization are enforced through role-based access control, supporting roles such as Administrator, Project Manager, Team Lead, and Team Member. The application layer also includes reporting and analytics capabilities, generating interactive dashboards and visual insights using Chart.js. Robust security mechanisms are incorporated, including two factor authentication, session management, rate limiting through django defender, CSRF protection, reCAPTCHA integration, secure password hashing, and fine-grained permission enforcement to protect application data and operations.

3.3 Data Layer

The Data Layer is responsible for persistent data storage, data integrity, and efficient retrieval of data. The system utilizes MySQL 8.x as the relational database management system, seamlessly integrated with Django's Object–Relational Mapping (ORM) to ensure secure, optimized, and maintainable database interactions. This layer stores all critical operational data, including user profiles and authentication and authorization details, project metadata and configurations, work items, tickets, reminders and system activity logs. The database schema is normalized to minimize redundancy and maintain consistency across entities, while indexing and query optimization techniques are employed to enhance performance and scalability. A logical schema structure includes entities such as Users, Projects, Tickets, WorkItems, Reminders and Teams, each capturing essential attributes required for system functionality. Audit logging plays a vital role in maintaining traceability, compliance, and accountability by recording significant user actions and system events, thereby supporting monitoring, debugging, and security analysis.

3.4 External Integrations

To support real-world deployment and usability, the system integrates with external services including:

- Email Services (SMTP): Used for all task notifications, ticket updates, reminders, account activation, and password recovery.
- Excel Export (openpyxl): Generates formatted Excel reports for work items and tickets using the openpyxl library.
- Accessibility Tools: Integration of accessibility widgets to support users with disabilities.
- Visualization Libraries: Chart.js for interactive dashboards and reporting.

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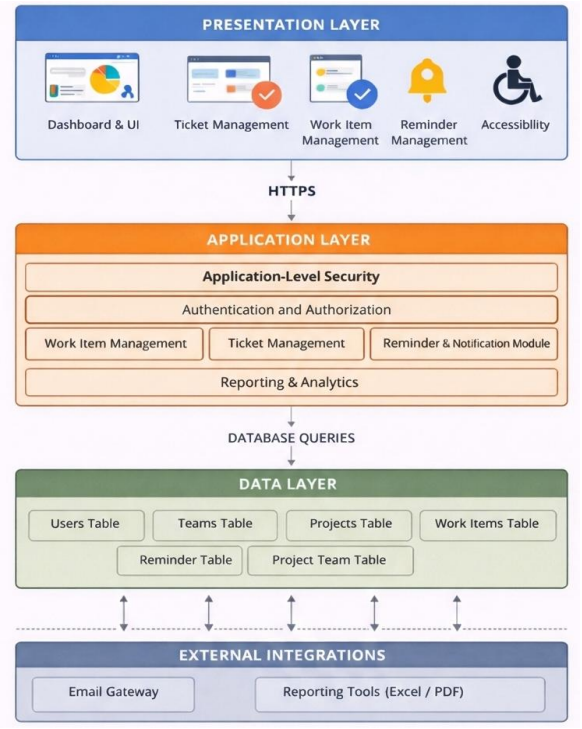

Fig 1. System Architecture Diagram

IV. IMPLEMENTATION

The IPM was implemented using a full-stack approach:

- Frontend: Developed with Bootstrap 5 to provide dynamic dashboards and responsive interaction.
- Backend: Django framework.
- Database: MySQL 8 serves as the robust relational data store.

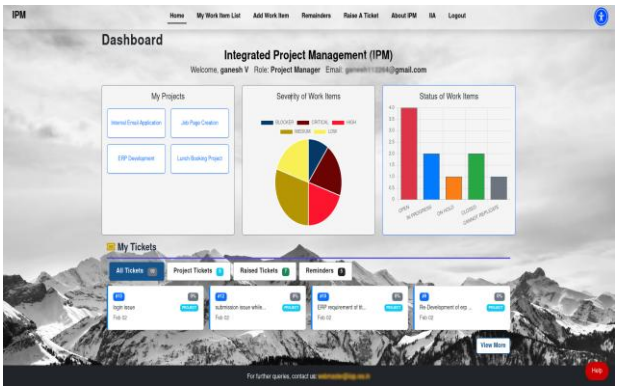

Fig 2. Role-based dashboard

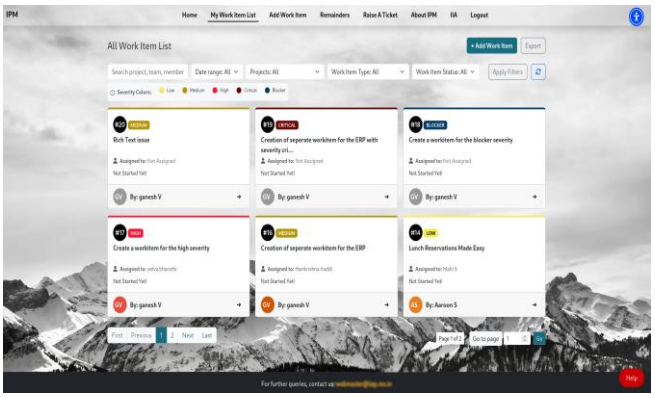

Fig 3. List of work items

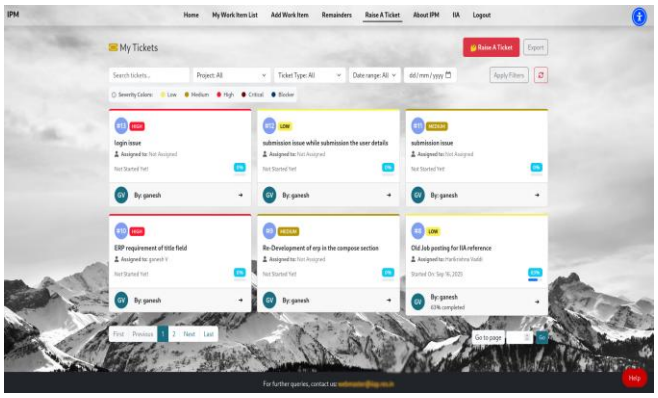

Fig 4. List of tickets

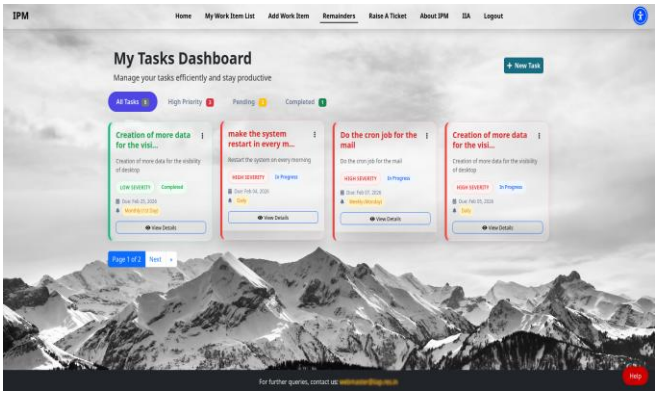

Fig 5. Reminders

V. EVALUATION

5.1 Functional Evaluation

Modules were tested with 20 sample tasks; the success rate was 100% for task creation, dashboard loading, and reminder triggering.

5.2 Usability Evaluation

A small usability study was conducted with 5 users over a period of 2 weeks. Users interacted with the system and completed a feedback survey on a 1–5 scale (1 = Poor, 5 = Excellent).

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5.3 Performance Evaluation
Performance evaluation was conducted using Apache JMeter on Fedora Linux with increasing user loads. Login and dashboard request flows were simulated, and response times were recorded. From actual test runs:

- 100 users (Ramp-up 50): Avg = 82 ms
- 200 users (Ramp-up 100): Avg = 83 ms
- Error Rate: 0% for all tests
- Throughput: ~58 requests/second

Metric	Average Score
Ease of Use	4.6
Clarity of Dashboard	4.8
Reminder Effectiveness	4.4

Table 1: Usability Survey Results

Concurrent Users	Avg Ticket Creation Time(ms)	Reminder Trigger Time (ms)
5	70	40
10	72	45
20	75	48
50	78	50
100	82	55
200	83	58

Table 2: Performance Results

VI. FEATURES

The proposed IPM System is developed as a single, modular web application that integrates project coordination capabilities. It incorporates accessibility support and enhanced security mechanisms at the application layer.

6.1 Granular Work-Item Management and Ticketing System
The IPM system breaks projects into granular, manageable work items with priorities, deadlines, and progress tracking, improving visibility and coordination. It also provides a centralized ticketing system to record, assign, and track issues with defined priorities, statuses, ownership, and detailed descriptions throughout their lifecycle.

6.2 Automated Reminder and Notification System
The IPM system includes an automated reminder and notification mechanism based on predefined schedules, task deadlines, and status updates. Notifications are delivered through integrated email services using SMTP, ensuring users receive timely reminders for pending work items, tickets, and task reminders, thereby reducing delays and missed deadlines.

6.3 Dashboard, Visual Analytics and Reporting
The IPM system provides role-based dashboards that offer real-time visibility into project progress, work-item status, ticket resolution, and pending reminders using visual components such as pie charts, bar charts, and task lists. Interactive data visualizations and charts enable users and administrators to efficiently monitor project health and support informed decision-making. Built-in reporting and Excel export functionality supports detailed analysis and documentation.

6.4 Role-Based Access Control (RBAC), Secure Authentication and Authorization
The platform implements secure authentication mechanisms including encrypted password storage, session management, and optional two-factor authentication using time- based onetime passwords (TOTP). Authorization checks are enforced at the application level to prevent privilege escalation and unauthorized access.

6.5 Accessibility and Usability Support
The system incorporates accessibility features such as keyboard navigation support, screen reader compatibility, and UI customization options to ensure inclusive usage for users with different abilities. Responsive design principles further enhance usability across devices.

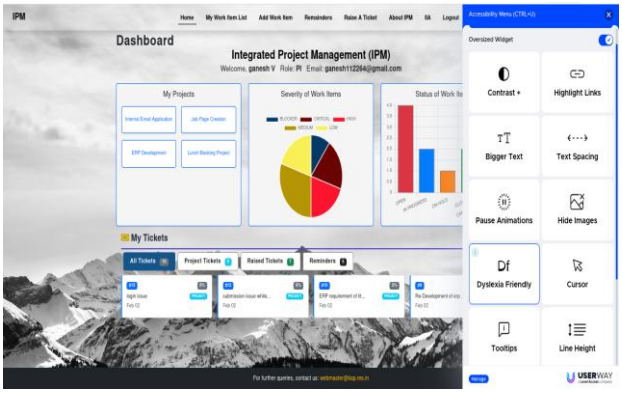

Fig 6. Accessibility widget

6.6 Data Integrity and Audit Logging
All critical system activities, including ticket updates, work item changes, assignments, and user actions, are recorded through audit logging. This ensures traceability, accountability, and compliance with organizational and security requirements, while also supporting system monitoring and debugging.

VII. CONCLUSION AND FEATURE WORK

This paper describes the development and validation of an integrated project management platform that enhances operational visibility and responsiveness. The implemented system demonstrates improvements in task traceability and stakeholder coordination. Future enhancements will explore AI-driven task prioritization, collaborative real-time editing, and predictive analytics for risk forecasting.

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