VIVEKANAND EDUCATION SOCIETY'S INSTITUTE OF TECHNOLOGY

An Autonomous Institute Affiliated to University of Mumbai

Department of Computer Engineering

Project Report on

M/S Sk Gurbaxani Pvt Ltd.
Construction Management System App

In partial fulfillment of the Fourth Year, Bachelor of Engineering (B.E.) Degree in Computer Engineering at the University of Mumbai Academic Year 2024-25

Submitted by

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(2024-25)

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Certificate

This is to certify that ***Aditya Mangtani(D17A 40), Hiten Kataria(D17A 27), Tejas Ghodke(D17C 19), Malhar Pande(D17C 49)*** of Fourth Year Computer Engineering studying under the University of Mumbai have satisfactorily completed the project on ***M/S Sk Gurbaxani Pvt Ltd. Construction Management System App*** as a part of their coursework of PROJECT-II for Semester-VIII under the guidance of their mentor ***Mrs. Vidya Zope*** in the year 2024-25.

This thesis/dissertation/project report entitled ***M/S Sk Gurbaxani Pvt Ltd. Construction Management System App*** *by* ***Aditya Mangtani, Hiten Kataria, Tejas Ghodke, Malhar Pande*** is approved for the degree of ***B.E. Computer Engineering***.

Programme Outcomes	Grade
PO1,PO2,PO3,PO4,PO5,PO6,PO7, PO8, PO9, PO10, PO11, PO12 PSO1, PSO2	

Date:

Project Guide:

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M : 09158886645 GSTIN - 27ABNFS4362F1ZW

Ref. No. Date ....

Certificate of Appreciation

This Certificate is Presented To

Aditya Mangtani
Hiten Kataria
Tejas Ghodke
Malhar Pande
Vivekanand Education Society Institute Of Technology, Chembur, Mumbai

In Recognition of Your Outstanding Achievement

This certificate is awarded in recognition of your successful development of the **Mobile Operations App** for our organisation. Your innovative approach, commitment, and professionalism have met our expectations and significantly contributed to our technological progress. We appreciate your work and wish you continued success in your future endeavours.

Date: 29/03/25
Place: Nagpur

Authorized Signatory:

M/s. S. K. Gurbaxani

Company Seal

Project Report Approval
For
B. E (Computer Engineering)

This thesis/dissertation/project report entitled ***M/S Sk Gurbaxani Pvt Ltd. Construction Management System App*** *by* ***Aditya Mangtani, Hiten Kataria, Tejas Ghodke, Malhar Pande*** is approved for the degree of **B.E. Computer Engineering.**

Internal Examiner

External Examiner

Head of the Department

Principal

Date:

Place:

Declaration

We declare that this written submission represents our ideas in our own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

(Aditya Mangtani - D17A- 40)

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(Malhar Pande - D17C - 49)

Date:

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We wish to express our profound thanks to all those who helped us in gathering information about the project. Our families too have provided moral support and encouragement at several times.

Computer Engineering Department

COURSE OUTCOMES FOR B.E PROJECT

Learners will be to,

Course Outcome	Description of the Course Outcome
CO 1	Able to apply the relevant engineering concepts, knowledge and skills towards the project.
CO2	Able to identify, formulate and interpret the various relevant research papers and to determine the problem.
CO 3	Able to apply the engineering concepts towards designing solutions for the problem.
CO 4	Able to interpret the data and datasets to be utilized.
CO 5	Able to create, select and apply appropriate technologies, techniques, resources and tools for the project.
CO 6	Able to apply ethical, professional policies and principles towards societal, environmental, safety and cultural benefit.
CO 7	Able to function effectively as an individual, and as a member of a team, allocating roles with clear lines of responsibility and accountability.
CO 8	Able to write effective reports, design documents and make effective presentations.
CO 9	Able to apply engineering and management principles to the project as a team member.
CO 10	Able to apply the project domain knowledge to sharpen one's competency.
CO 11	Able to develop a professional, presentational, balanced and structured approach towards project development.
CO 12	Able to adopt skills, languages, environment and platforms for creating innovative solutions for the project.

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Abstract

The Construction Management System App is developed to address the critical challenges in managing road construction projects, particularly in Maharashtra, India. Despite the vital role of the construction sector in economic development, it continues to suffer from inefficiencies caused by fragmented communication, lack of real-time data access, inadequate workflow tracking, and delayed safety reporting. These challenges often lead to cost overruns, project delays, and compromised quality and safety standards.

The proposed mobile application acts as a centralized platform where workers, supervisors, managers, owners, and government officials can collaborate seamlessly. Key features of the app include real-time attendance tracking, task management, hazard reporting, and secure communication channels, all aimed at improving coordination, transparency, and safety on construction sites.

The system leverages modern cross-platform technologies like Flutter for the frontend and Firebase for backend services, ensuring real-time synchronization of data and scalability for future expansion. The intuitive user interface and role-based access ensure that users with varying technical expertise can navigate and use the app effectively.

By fostering transparency, minimizing administrative bottlenecks, and ensuring rapid decision-making, the app reduces the risk of cost escalations and enhances safety compliance. The Construction Management System App not only modernizes operational workflows but also supports broader industry goals such as accountability, efficiency, and high-quality infrastructure delivery.

Chapter 1: Introduction

1.1. Introduction:

The construction industry, especially in infrastructure projects like road building, plays a critical role in the economic development of a region. However, it is often plagued by inefficiencies that arise from poor communication, fragmented workflows, and a lack of centralized data management. These issues can result in project delays, increased costs, and compromised safety standards. M/s S. K. Gurbaxani Pvt Ltd, a leading civil engineering firm in Nagpur, Maharashtra, aims to address these challenges with a mobile-based solution. The Construction Management System App is designed to streamline communication, improve transparency, and enable real-time data sharing among all stakeholders, from workers on-site to government officials. By leveraging modern technologies, the app is expected to transform the management of road construction projects, ensuring high-quality and timely completion of infrastructure.

1.2. Motivation:

The motivation for developing the Construction Management System App stems from the need to overcome critical challenges that the road construction industry faces today:

- **Communication Barriers:** Misunderstandings and misaligned objectives between on-site workers, supervisors, and management can lead to project delays and errors.
- **Lack of Real-Time Data Sharing:** The absence of a system to share real-time updates leads to slow decision-making and difficulties in tracking project progress.
- **Cost Overruns and Delays:** Inefficient workflows and inadequate oversight often result in projects exceeding their budgets and timelines.
- **Safety Concerns:** Safety management is vital on construction sites, but manual processes can delay the reporting and addressing of hazards.

By introducing a centralized platform that enables real-time communication, efficient task management, and improved safety reporting, this app aims to address these issues directly. The motivation is also fueled by the company's desire to maintain its reputation for excellence in infrastructure development by using modern technological solutions.

1.3. Problem Definition:

M/s S. K. Gurbaxani faces several challenges in managing road construction projects effectively. These include:

- **Poor Communication:** Stakeholders, including workers, supervisors, managers, and government officials, often struggle with communication gaps. This leads to misunderstandings and misalignment of goals, affecting project outcomes.
- **Lack of Transparency:** The current processes lack mechanisms for real-time data access and sharing, making it difficult for all stakeholders to monitor progress accurately.
- **Coordination Challenges:** With multiple stakeholders involved, coordination becomes a bottleneck, resulting in workflow inefficiencies and delayed decision-making.
- **Safety Risks:** Reporting safety hazards is currently a manual process, leading to delays in addressing issues and increasing risks on the construction site.

The problem statement highlights the urgent need for a solution that can centralize communication, enhance transparency, and enable better coordination and safety management. The proposed app aims to resolve these challenges by providing a digital platform for seamless collaboration.

1.4. Relevance of the Project:

The Construction Management System App is highly relevant in the context of the construction industry in Maharashtra, especially for M/s S. K. Gurbaxani, which is a major player in road construction. The industry's demand for precision, timely execution, and safety is ever-increasing, and the app aligns perfectly with these requirements:

- **Improving Industry Standards:** By introducing a technology-driven approach to project management, the app sets a new standard for managing large-scale infrastructure projects.
- **Supporting Government Initiatives:** It supports transparency and accountability, which are often key goals in government-funded infrastructure projects.
- **Enhancing Safety and Efficiency:** The app's features, like real-time hazard reporting and task management, directly contribute to safer and more efficient construction practices.
- **Economic Impact:** By reducing delays and cost overruns, the app can positively impact the company's profitability and the broader economic growth of the region by ensuring timely delivery of infrastructure projects.

This project is not only a response to the company's internal needs but also a step toward modernizing the construction management processes in the industry as a whole.

Chapter 2: Literature Survey

1. Case Study on an Android App for Inventory Management System with Sales Prediction for Local Shopkeepers in India

The paper by Tejal Tandel et al. focuses on addressing the needs of local shopkeepers in India who face challenges with inventory management and sales prediction due to lack of access to expensive proprietary software. The paper proposes a cost-effective solution through a mobile application that serves both as a Point-of-Sale (PoS) system and a tool for sales prediction using data mining techniques. The proposed Android app enables shopkeepers to manage their inventory by adding, updating, and deleting products, and also generates sales reports and predictions using regression analysis. The app integrates key functionalities like barcode scanning via phone cameras, third-party payment portals, and sales forecasting based on historical data. The system aims to empower local shopkeepers by improving their product selection, reducing financial losses from overstocking irrelevant items, and maximizing profits through data-driven insights. This solution is particularly relevant in India, where a large percentage of shopkeepers operate offline and are expected to benefit from the increasing smartphone penetration. The paper also emphasizes the scalability of the app, with potential future enhancements such as cloud-based processing to improve performance[1].

2. Project Management in Construction: Software Use and Research Directions

The paper titled ″Project Management in Construction: Software Use and Research Directions″ (2001) by Matthew J. Liberatore et al. explores the usage patterns of project management (PM) software in the construction industry, based on a survey of professionals. The study reveals that construction professionals tend to work on larger projects with more activities compared to other industries and are heavy users of PM software, particularly Primavera, for planning and control tasks. Key techniques employed include critical path analysis, resource scheduling, and earned value analysis, especially for managing project timelines and budgets. The research highlights the construction industry’s preference for full-featured software, contrasting with other sectors' more frequent use of Microsoft Project. The paper emphasizes the need for future research in resource scheduling, net present value (NPV) options for project cash flow, and improved

software integration with other systems. These findings underscore the growing reliance on PM tools in construction and the demand for advanced features to enhance project planning and execution[2].

3. Impact of Project Management software on construction projects

The paper focuses on the impact of project management software (PMS) in construction projects. Project management software is designed to streamline the planning, organization, and management of resources and timelines in projects. The review highlights the evolution of these tools from their origins in early scheduling methods like Gantt charts to modern, IT-driven applications that facilitate a wide range of tasks such as scheduling, budgeting, communication, and risk management. The study emphasizes that PMS is especially critical in the construction industry due to the complex nature of construction projects, which often involve multiple phases and stakeholders. Construction projects benefit significantly from PMS as it helps in planning, scheduling, budgeting, team collaboration, and project tracking. The literature identifies key types of PMS including Microsoft Project, Building Information Modeling (BIM), and Computer-Aided Design (CAD). Each of these tools offers specific functionalities tailored to the needs of construction managers, from detailed project timelines to 3D modeling of structures. Additionally, the review points out that the use of PMS in construction can lead to enhanced project performance by improving time management, reducing costs, and providing a comprehensive overview of project progress. The software aids in decision-making processes, allowing project managers to adjust plans based on real-time data and minimize risks. The integration of these tools into daily project management practices has shown a positive impact on project deliverability and efficiency, making PMS an indispensable component in modern construction projects[3].

Chapter 3: Requirement Gathering for the Proposed System

In this chapter we are going to discuss the resources we have used and how we analysed what the user actually needs and what we can provide. We will also discuss the functional and non-functional requirements and finally the software and hardware used.

3.1. Introduction to Requirement Gathering:

Requirement gathering is a critical initial phase in the software development life cycle (SDLC) that involves systematically collecting information about the expectations and needs of stakeholders. In the context of the Construction Management System App for M/s S.K. Gurbaxani Pvt. Ltd., this phase played a pivotal role in ensuring that the final product aligns with real-world construction site workflows and addresses the practical challenges encountered during road construction projects.

The requirement gathering process began with interviews and consultations with various stakeholders such as site workers, supervisors, project managers, and administrative staff. These interactions helped uncover the gaps in the current management system, including:

- Fragmented communication across departments.
- Manual attendance tracking and task reporting.
- Delays in hazard identification and mitigation.
- Inefficiencies in payment processing and documentation.

To ensure a holistic understanding, the team also conducted a literature survey and analyzed existing construction management tools. This helped identify industry best practices and inspired features that would make the app more efficient and user-centric.

Several techniques were used during the requirement gathering phase:

- Questionnaires and Surveys: Used to gather input from a larger group of users regarding their daily pain points.
- Observation: On-site visits were conducted to observe the current workflow and identify improvement areas.
- Use Case Analysis: Specific user scenarios were developed to understand user roles and their interactions with the system.

3.2. Functional Requirements:

- Real-time attendance tracking for workers.
- Task assignment and progress monitoring.
- Hazard reporting system for safety issues.
- Communication tools for direct interaction between stakeholders.
- Secure data management for sensitive project information.

3.3.Non-Functional Requirements:

- Scalability to handle multiple projects and users.
- User-friendly interface for ease of navigation.
- High availability and performance to ensure real-time updates.
- Data security for protecting user information and project details.
- Compatibility across Android and iOS devices.

3.4.Hardware, Software, Technology and Tools Utilised:

- **Hardware:** Laptops/desktops with 8GB RAM for development; various Android/iOS devices for testing.
- **Software:** Dart, Flutter SDK, Firebase services, Visual Studio Code, Git for version control.

3.5Technology and Tools :

- **Client-Side:** Flutter for cross-platform app development.
- **Server-Side:** Firebase for backend services including real-time database and authentication.
- **Development Tools:** Visual Studio Code, Git, Android Studio/Xcode emulators.

3.6. Constraints:

- Internet dependency for real-time data synchronization.
- Potential compatibility issues with older devices.
- Managing user expectations and feedback for continuous improvement.

Chapter 4: Proposed Design

This chapter provides a comprehensive design of the application, focusing on both conceptual and modular architecture. It begins with the architectural design through block diagrams, detailing the system's core components and their interactions. The chapter concludes with a Gantt chart, showcasing the project's timeline, scheduling, and task tracking.

4.1. Block Diagram of the proposed system:

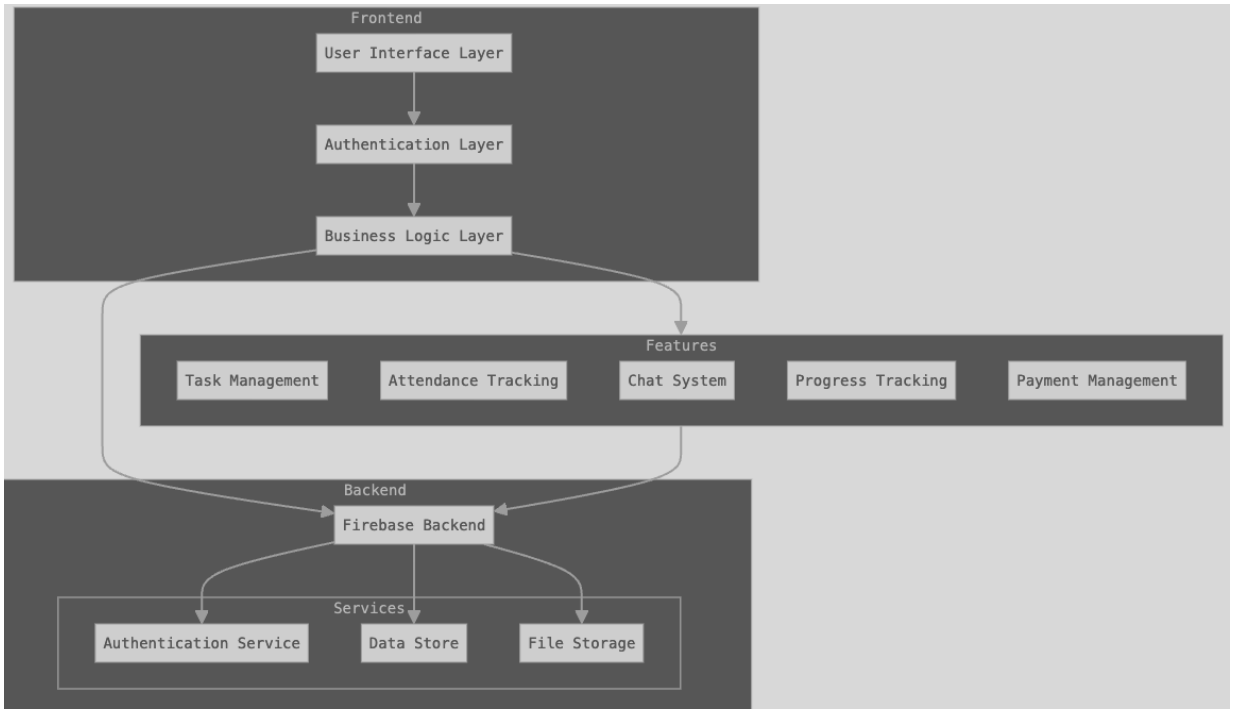

Fig 4.1. Block Diagram of the Application

The block diagram above represents the architecture of a Construction Management System App. It consists of three primary layers: Frontend, Features, and Backend.

- Frontend Layer: This layer includes the User Interface (UI), where users interact with the system. The Authentication Layer ensures secure access, while the Business Logic Layer manages the core application processes, routing user requests to appropriate services.
- Features Layer: This middle layer encapsulates the main functionalities of the app, such as Task Management, Attendance Tracking, Chat System, Progress Tracking, and

Payment Management. These features allow users to manage construction activities, monitor progress, and communicate effectively within the app.

- Backend Layer: The backend is powered by Firebase, which provides real-time data synchronization and cloud storage. It includes the Authentication Service for user management, a Data Store for storing user and project information, and File Storage for managing documents and media

4.2. Modular diagram of the system:

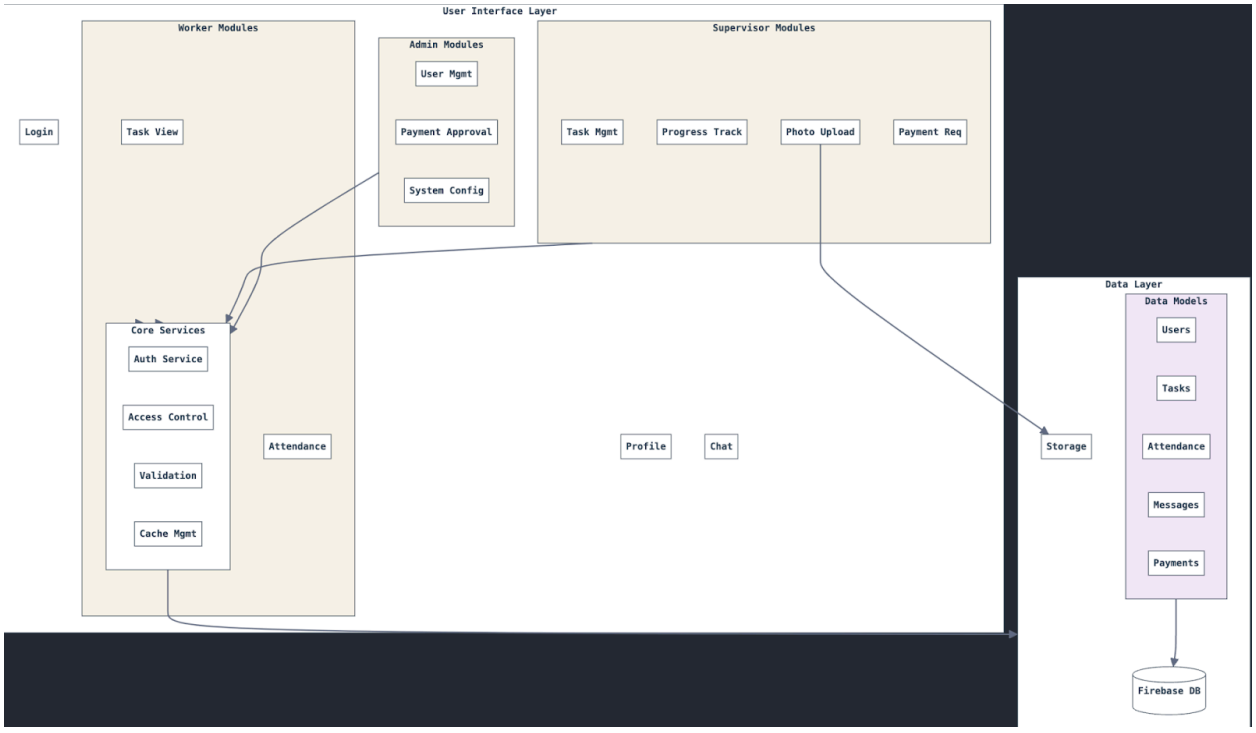

Fig 4 2. Modular Diagram of Application

The modular diagram outlines the core architecture of the system, divided into the User Interface Layer, Core Services, and Data Layer.

- **User Interface Layer:** This is where users interact with the system. It consists of different modules for different user roles such as *Workers*, *Supervisors*, and *Administrators*. Workers have access to task views and attendance tracking, while supervisors manage tasks, track progress, upload photos, and submit payment requests. Administrators handle system configurations, user management, and payment approvals.
- **Core Services:** This layer supports the system's critical functionalities, including *Authentication Services* for secure login, *Access Control* to regulate user permissions, *Validation* for input verification, and *Cache Management* to enhance performance by temporarily storing frequently accessed data.
- **Data Layer:** The data is managed and stored here using Firebase's database. It contains essential data models such as *Users*, *Tasks*, *Attendance*, *Messages*, and *Payments*. Data from the user interactions is stored and retrieved in real-time from Firebase, ensuring that the system remains synchronized and updated across all users.

4.3.System Design

a. Data Flow Diagrams

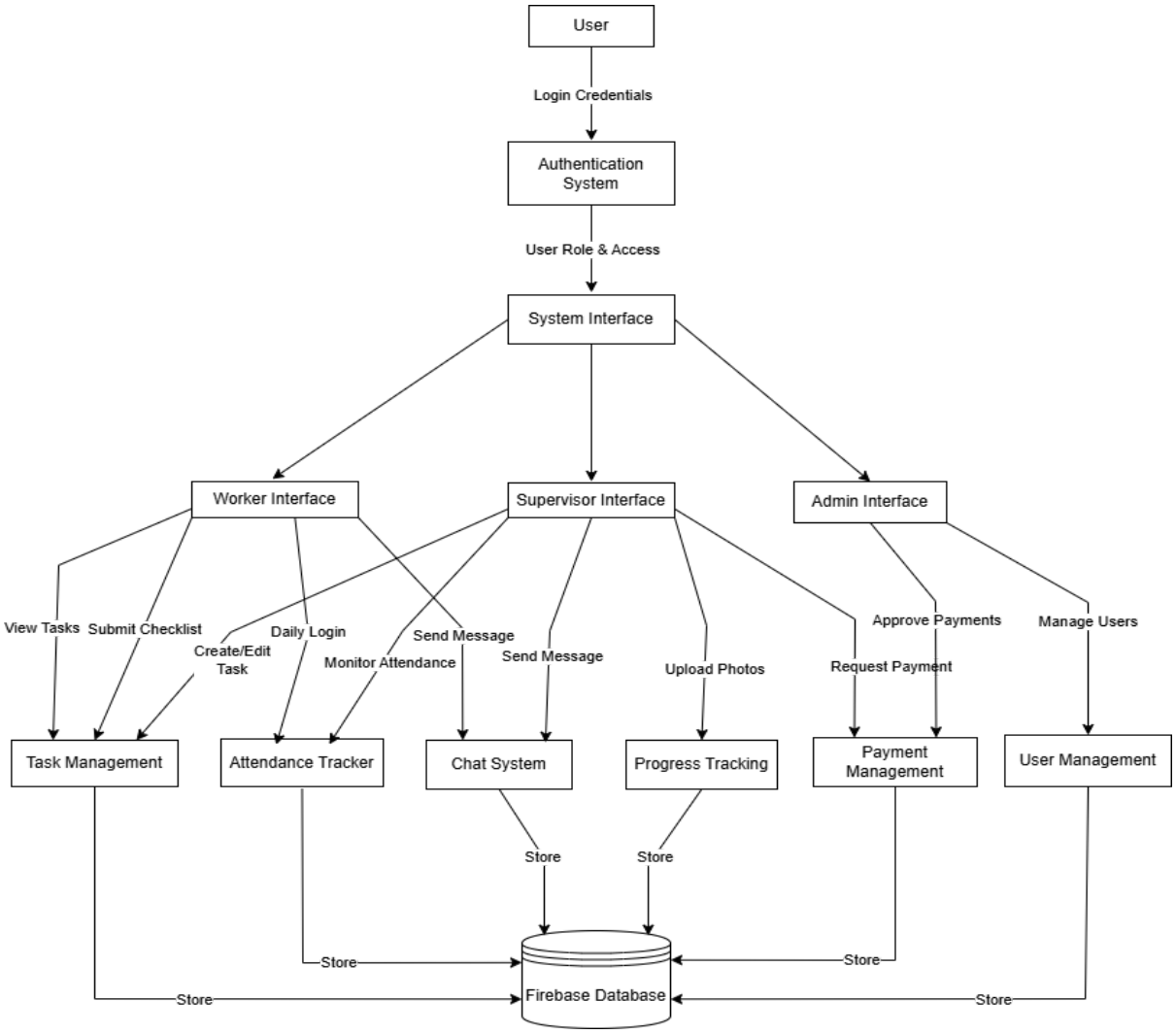

Fig 4.3.a. Data Flow Diagram of the Application

The data flow diagram illustrates the flow of data between the users, system interfaces, and Firebase database. It highlights three key user interfaces: Worker Interface, Supervisor Interface, and Admin Interface.

- Users authenticate via the Login Credentials system, which routes them through the Authentication System for secure access.
- Once authenticated, users interact with the System Interface based on their roles, enabling access to specific functionalities.
    - Worker Interface allows workers to view and manage tasks, submit checklists, and track attendance through the Task Management and Attendance Tracker modules.
    - Supervisor Interface manages task assignments, uploads photos, tracks progress, and sends messages via Progress Tracking, Chat System, and other modules.
    - Admin Interface oversees user management and payment approvals through User Management and Payment Management modules.
- Each interface stores data, such as tasks, attendance, messages, and payments, in the Firebase Database, ensuring real-time synchronization of user activities and system states

b. Flowchart

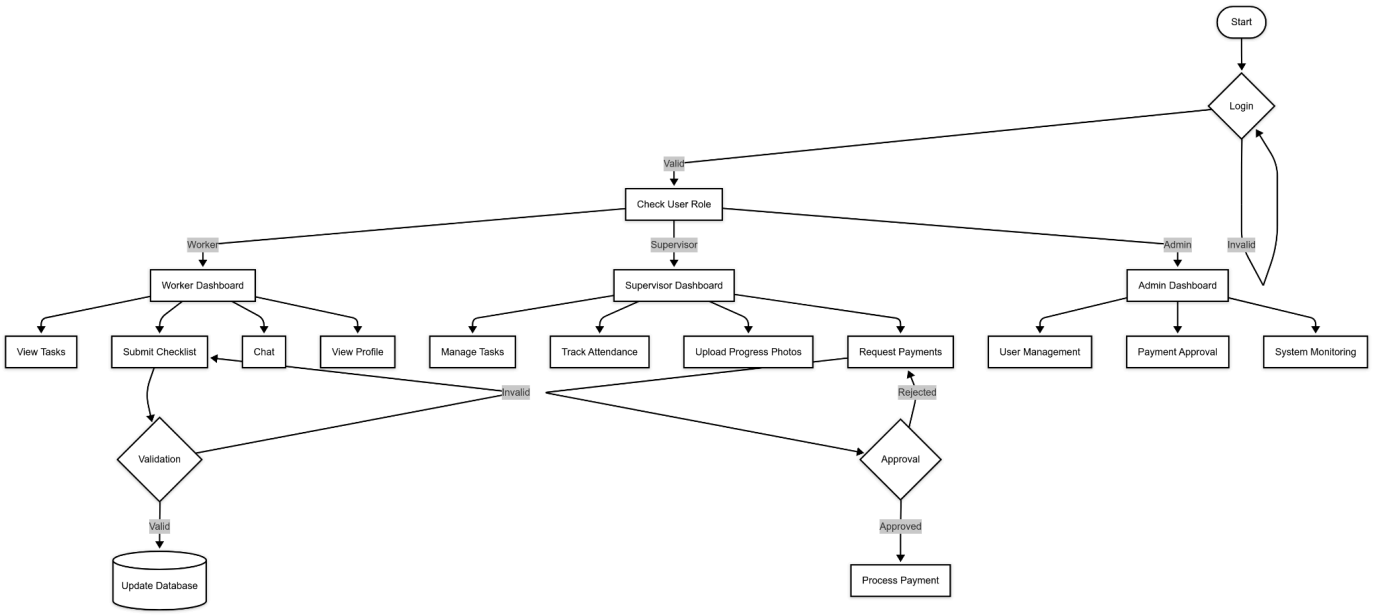

Fig 4.3.b. Flowchart

The flowchart outlines the logical flow of actions based on user roles (Worker, Supervisor, and Admin) within the system. The process begins with the user logging in, followed by a role validation check.

- If the login is invalid, the flow ends. If valid, the system checks the user's role:
    - **Worker**: Navigates to the *Worker Dashboard*, allowing actions such as viewing tasks, submitting checklists, chatting, and updating their profile. The data is validated before being stored in the database.
    - **Supervisor**: Accesses the *Supervisor Dashboard*, where tasks can be managed, attendance tracked, photos uploaded, and payment requests made. Invalid actions are looped back for correction.
    - **Admin**: Redirects to the *Admin Dashboard*, where user management, payment approvals, and system monitoring are conducted. Payment requests undergo an approval process; approved payments are processed, and rejected requests are sent back for review.This flowchart visualizes the decision-making and task execution processes based on user roles in the system.

State Transition Diagram

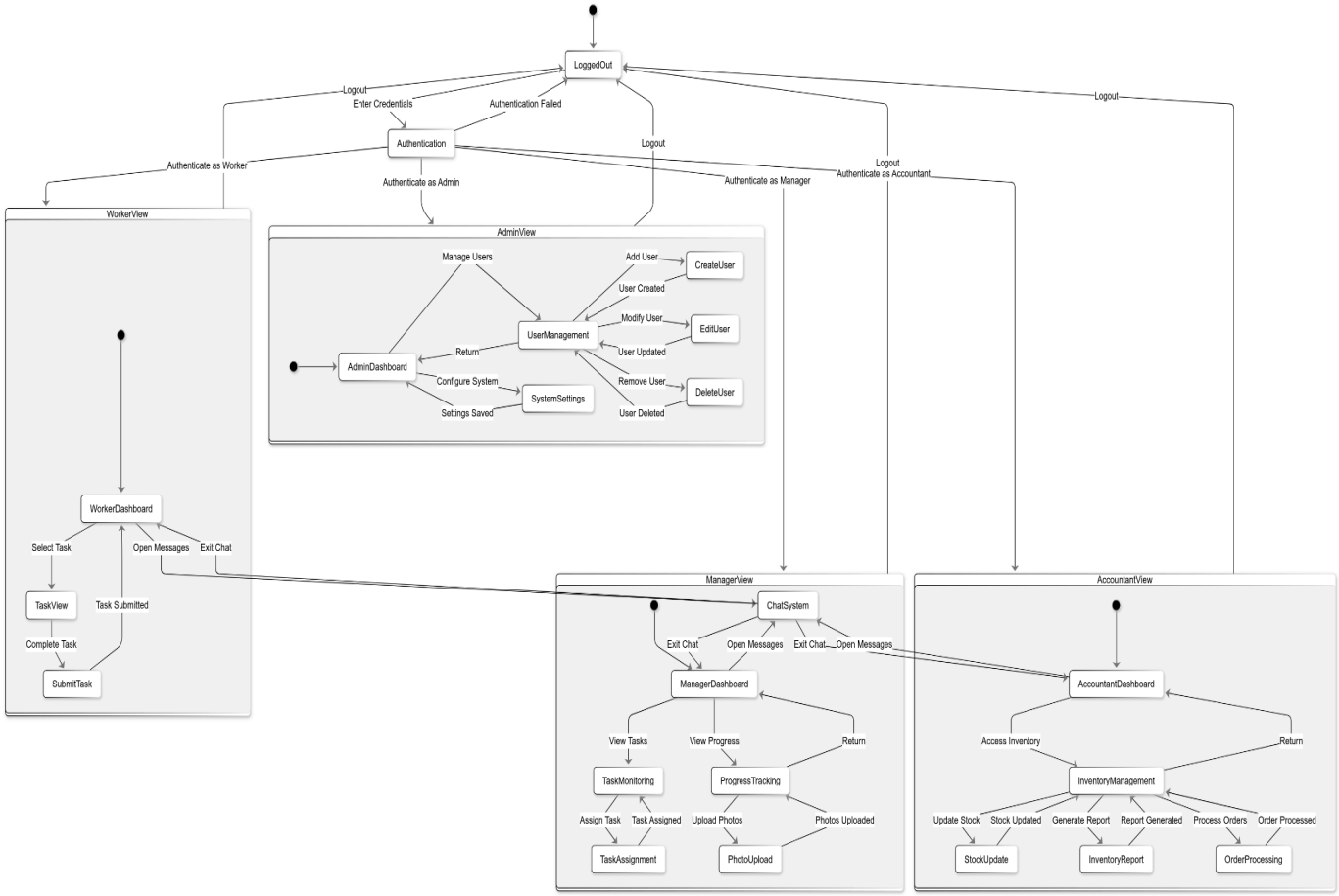

Fig 4.3.c. State Transition Diagram of the Application

The image depicts a task management system's workflow, illustrating the various stages tasks go through and the roles involved. Users, likely categorized as workers, submit tasks for review by supervisors or admins. Tasks progress through stages like pending, in progress, completed, and verified. Supervisors play a crucial role in overseeing tasks, approving their completion, and potentially managing payments. Additional features might include attendance tracking, communication tools like chat, and profile management for both workers and supervisors.

Task Stages: Tasks progress through stages like pending, in progress, completed, and verified.

Roles: Involves workers who submit tasks and supervisors who review and approve them.

Features: Includes additional features like attendance tracking, chat, and profile management.

Payment Management: Supervisors may also be involved in approving payments for completed tasks.

4.4 Project Schedule and Tracking (Gantt Chart)

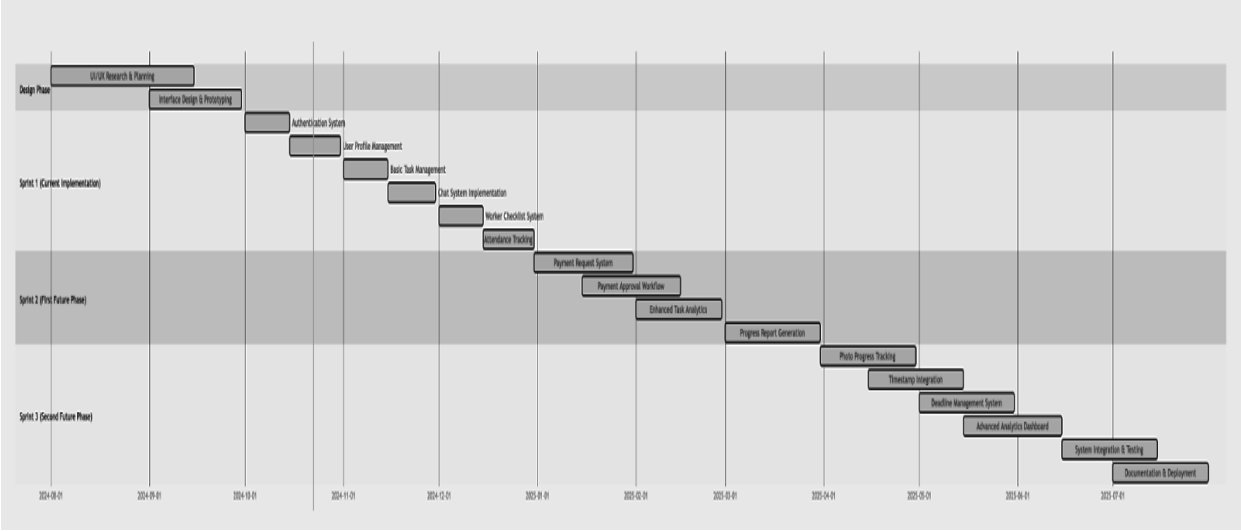

Fig 4.4. Gantt Chart

Gantt chart, a popular tool for project management that visually represents a project timeline, tasks, and their dependencies.

Key elements:

- Timeline: The horizontal axis represents time, often divided into days, weeks, or months.
- Tasks: Each row represents a specific task or activity within the project.
- Duration: The length of each bar indicates the estimated duration of the task.
- Dependencies: Arrows or lines connecting tasks indicate dependencies, meaning one task must be completed before another can start.

In this particular Gantt chart:

- Project Phases: The chart seems to be divided into different phases, such as "Design & Planning," "Sprint 1," "Sprint 2," and "Sprint 3."
- Tasks: Tasks within each phase are listed, with their durations and dependencies visualized.
- Milestones: Specific points in time, marked by diamonds or other symbols, might represent important milestones or deadlines.

4.5 Users and Roles

User	Roles
Worker	- Login/Authentication - View assigned tasks - Update task status (Pending → In Progress → Completed) - Chat with Supervisor
Manager	- Login/Authentication - Task Monitor and Assignment - Create/Assign/Edit/Delete Tasks - Verify Completed Tasks - Chat with Workers and Admin
Admin	- Login/Authentication - Manage Users (Add/Remove/Modify) - System Settings - Send Group Broadcast Notifications - View all chats if needed (moderator access)
Accountant	- Login/Authentication - Inventory Management - Stock Update - Order Processing

Table 1: List of Users and Their Roles

Chapter 5: Implementation of the Proposed System

5.1 Methodology employed for development :

The development of the Construction Management System App was carried out using the Agile Software Development Life Cycle (SDLC), which emphasizes adaptability, customer feedback, and incremental progress. This approach was particularly well-suited for the project as it allowed the team to continuously refine the application based on stakeholder input from M/s S.K. Gurbaxani Pvt. Ltd.

Key Phases in the Agile Methodology:

- Requirement Analysis: The team conducted interactive sessions with engineers, supervisors, and managers from the company to gather and document core functional requirements.

- Sprint Planning: The development cycle was divided into multiple sprints, each lasting 2–3 weeks. Each sprint focused on delivering a specific feature or module, such as login authentication, attendance tracking, or task management.

- Design & Development:

    - The Flutter SDK was used for building the frontend due to its cross-platform capabilities and expressive UI toolkit.

    - Firebase was selected as the backend solution for its real-time database, authentication services, cloud storage, and serverless functions.

- Daily Scrum Meetings: Brief daily discussions were held to align on goals, track progress, and remove roadblocks.

- Testing and Review: At the end of each sprint, functional testing and user feedback sessions were conducted, allowing for rapid iteration and bug fixes.

Benefits of Agile in This Project:

- Allowed incorporation of dynamic requirements as suggested by actual users from the field.
- Enabled faster detection and resolution of bugs and logic errors.
- Promoted team collaboration and modular development, which improved project management and documentation.

Overall, Agile empowered the team to deliver a more stable, user-focused, and scalable product.

5.2 Dataset Source and utilization :

Unlike traditional machine learning applications, this project doesn't rely on external datasets. However, it generates and utilizes real-time operational datasets as part of its core functionalities:

- User Data: Captured during registration and login, including roles, permissions, and profiles.
- Attendance Logs: Timestamped entries when workers check in/out.
- Task Records: Contain task descriptions, status updates, deadlines, and assigned personnel.
- Safety Reports: Submitted by workers and reviewed by supervisors.
- Payment Records: Include requester details, task links, and approval status.

All data is stored and managed in Firebase Cloud Firestore and Realtime Database, ensuring fast retrieval and real-time synchronization across all users. Firebase Authentication ensures secure access, and Firebase Storage manages file uploads like site images or documentation.

Chapter 6: Testing of the Proposed System

6.1.Introduction to Testing :

Testing is an essential phase in the software development lifecycle that validates whether an application meets its design specifications and user requirements. For the Construction Management System App, testing serves to uncover defects early, ensure reliability in real-world environments, and guarantee that critical workflows—such as attendance logging, task updates, and hazard reporting—operate without interruption. By systematically exercising each module against both expected and unexpected inputs, testing builds confidence that the app will behave correctly under a variety of conditions. Moreover, a rigorous testing regimen helps to identify performance bottlenecks, security vulnerabilities, and usability issues before deployment, thereby reducing the risk of costly rework once the app is in production. Ultimately, a well-structured testing strategy not only safeguards the integrity of the application but also enhances stakeholder trust and adoption by delivering a polished, dependable tool for all user roles.

6.2.Types of tests Considered:

To achieve comprehensive coverage, we consider several test categories that span from low-level code correctness to high-level user acceptance. Unit tests verify individual functions and components—such as the attendance-tracking logic and task-assignment routines—by isolating them from external dependencies. Integration tests then assess the seamless interaction between modules, for instance, ensuring that task updates made in the Flutter UI propagate correctly to Firebase Cloud Firestore and trigger real-time listeners. System tests validate end-to-end workflows, simulating complete user journeys across the worker, supervisor, and admin dashboards. Beyond functional testing, performance tests evaluate how the app handles concurrent users and large datasets, while security tests examine authentication flows and data encryption to protect sensitive project information. Finally, User Acceptance Testing (UAT) engages real stakeholders in the field—workers, site supervisors, and project managers—to confirm that the application meets operational requirements and delivers a user-friendly experience.

6.3.Various test case scenarios considered:

a. Authentication and Authorization

- Valid Login: User enters correct email/username and password → should successfully land on their role-specific dashboard.
- Invalid Login: Wrong credentials → should display an appropriate error message without revealing sensitive details.
- Password Reset: User requests password reset via email link → link validity, expiration handling, and successful password update.
- Role-Based Access Control:
    - Workers should not be able to access supervisor/admin screens (e.g., payment approval).
    - Supervisor should not have admin-only privileges (e.g., user management).

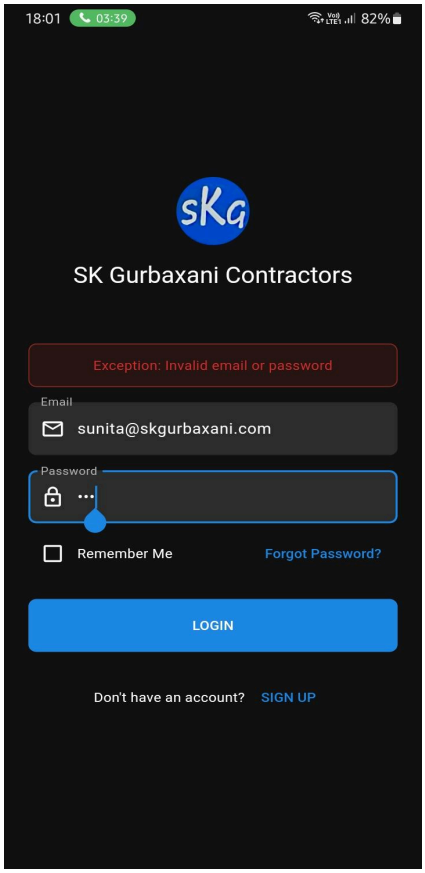

Fig 6.1.a. Invalid Login

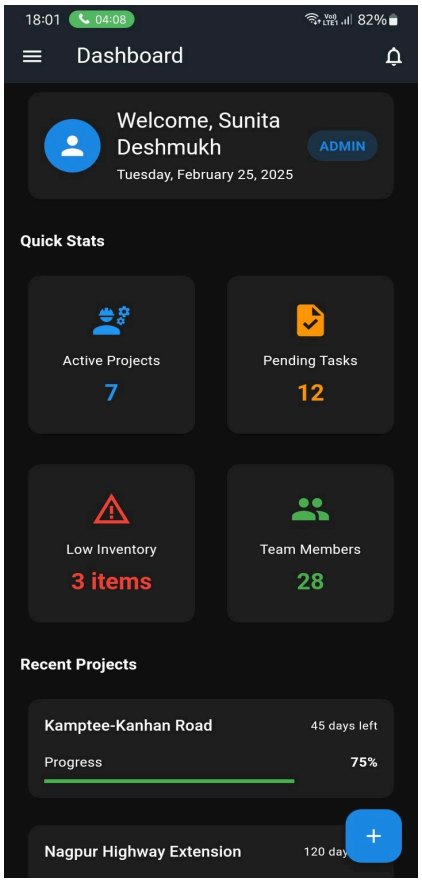

Fig 6.1.. Valid Login

b. Attendance Tracking

- Standard Check-In / Check-Out: Worker taps “Check In” at start and “Check Out” at end of shift → timestamps recorded correctly in Firebase.
- Duplicate Check-In: Worker attempts to check in twice without checking out → system alerts “Already checked in” and prevents duplicate entry.
- Out-of-Order Actions: Worker tries to “Check Out” before a “Check In” → error prompt and no record created.
- Offline Mode Synchronization: Worker performs check-in/out with no network → local storage captures event and synchronizes correctly when connectivity is restored.

c. Task Management

- Create Task: Supervisor creates a new task with valid title, description, assignee, and due date → task appears in both supervisor and worker views.
- Invalid Task Data: Missing mandatory fields (e.g., no assignee or blank title) → form-level validation errors.
- Status Transitions:
    - “Pending” → “In Progress”: Worker marks task as started.
    - “In Progress” → “Completed”: Worker submits completion checklist.
    - Supervisor verifies and moves “Completed” → “Verified.”
- Concurrent Edits: Two supervisors attempt to update the same task simultaneously → last-write-wins consistency or conflict resolution prompt.
- Delete Task: Supervisor deletes a task in “Pending” state → removed from all user views and archived appropriately.

d. Hazard Reporting

- New Hazard Submission: Worker reports a hazard with description, severity level, and optional photo → entry logged with timestamp and sends notification to supervisors.
- Edit / Close Hazard: Supervisor updates hazard status (e.g., from “Open” to “Resolved”) and adds comments → status update reflected for all stakeholders.

- Invalid Submission: Missing severity or description → validation prevents submission.
- Media Handling: Upload large image file (>5 MB) → app warns if too large or compresses before upload; verifies proper display in report detail.

e. Chat and Notifications

- One-to-One Messaging: Worker initiates chat with supervisor → messages stored in correct chat thread, timestamped, and push-notified.
- Group Broadcast: Admin sends announcement to all users → appears in each user's notification feed.
- Network Interruptions: Send message during connectivity loss → queued locally and sent once back online without duplication.
- Message Ordering: Under high message volume, ensure chronological ordering in UI.

f. Payment Approval Workflow

- Submit Payment Request: Supervisor uploads invoice and enters amount/reason → new payment request appears in admin's pending queue.
- Approve / Reject:
    - Admin approves → status updates to "Paid" and triggers notification to supervisor.
    - Admin rejects → requires rejection reason and notifies requester.
- Invalid Amount: Negative or zero amount → form validation error preventing submission.

Chapter 7: Results and Discussions

7.1.Screenshot of Use Interface(UI) for the system:

Manager:

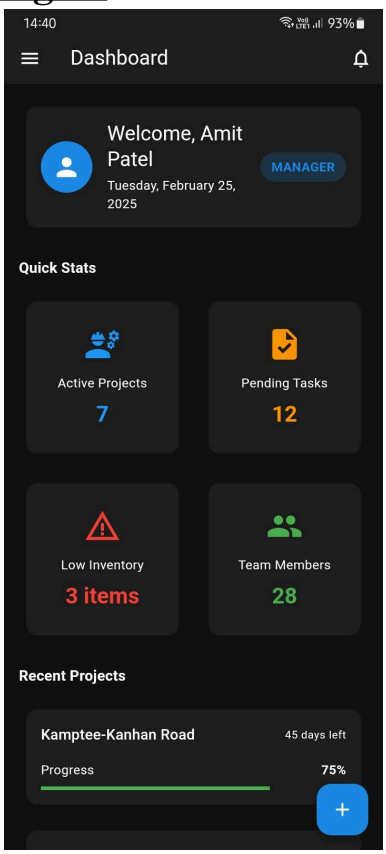

Fig 7.1: Dashboard Screen for Manager View

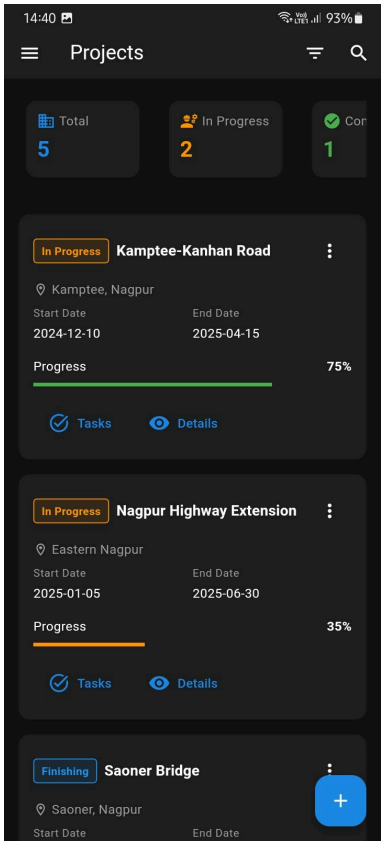

Fig 7.2:Projects Overview Screen

Fig 7.1 provides a quick overview of the manager's active projects, pending tasks, low inventory items, and team members. It displays a personalized welcome message, real-time project progress, and upcoming deadlines to facilitate efficient project supervision and task prioritization.

Fig 7.2 lists all ongoing and completed projects with key details such as project name, location, start and end dates, and progress percentage. It enables managers and supervisors to monitor multiple projects simultaneously and access task lists and detailed project information easily.

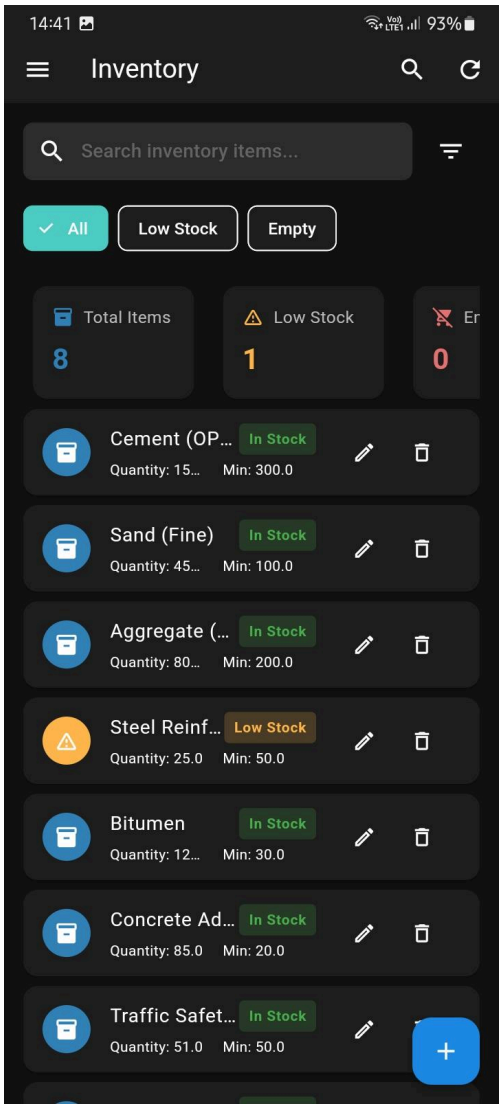

Fig 7.3: Inventory Management Screen for Manager

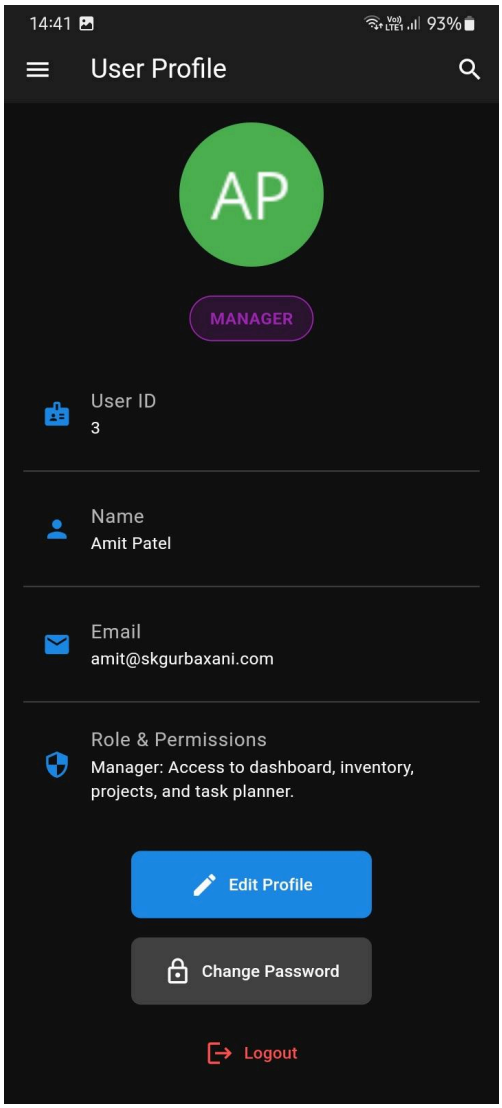

Fig 7.4: User Profile Screen for Manager

Fig 7.3 displays the inventory management module where the manager can view the status of all construction materials. It highlights items that are in stock, low stock, or out of stock. Managers can edit inventory details, add new items, or filter inventory based on stock status to ensure smooth material management across projects.

Fig 7.4 shows the detailed user profile of the logged-in manager, including their user ID, name, email address, and assigned role. It also provides options to edit profile details, change the password, and logout securely. The role description clarifies the manager's access permissions across different modules such as dashboard, inventory, projects, and task planner.

Admin:

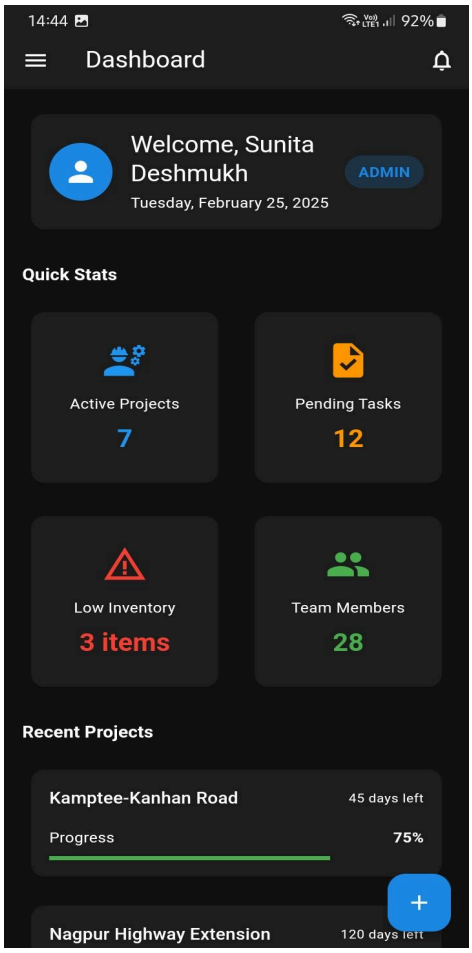

Fig 7.5:Admin Dashboard Screen

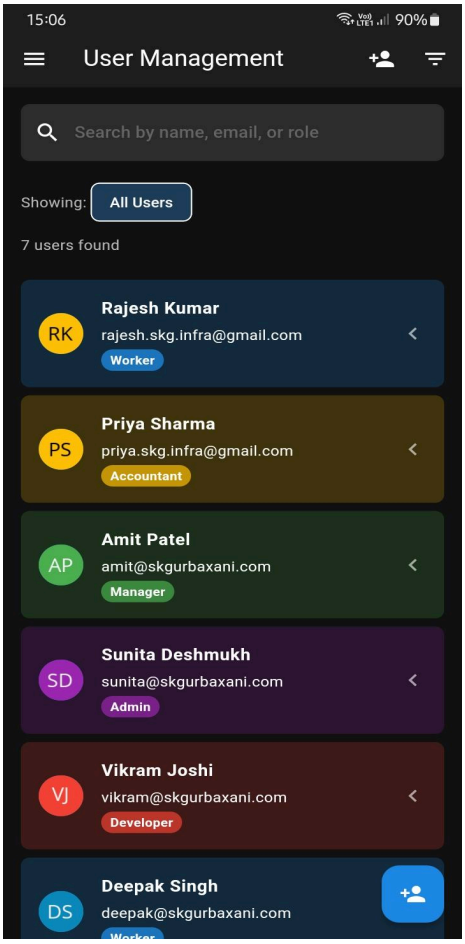

Fig 7.6:User Management Screen for Admin

Fig 7.5 displays the Admin's dashboard, offering a summary view of active projects, pending tasks, low inventory items, and total team members. The dashboard greets the logged-in admin, Sunita Deshmukh, and provides quick access to project progress details. This centralized view helps the admin oversee project statuses and workforce engagement effectively.

Fig 7.6 showcases the user management module accessible only to the admin. It lists all registered users along with their roles (e.g., Worker, Accountant, Manager, Developer). The admin can search for users by name, email, or role, and manage user profiles, ensuring proper access control, team structure, and security within the system.

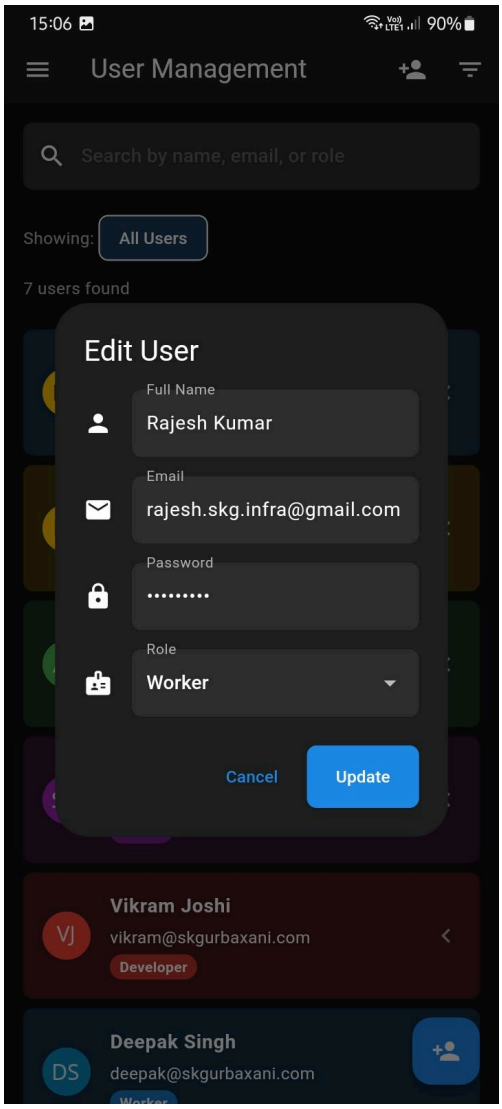

Fig 7.7: Edit User Screen for Admin

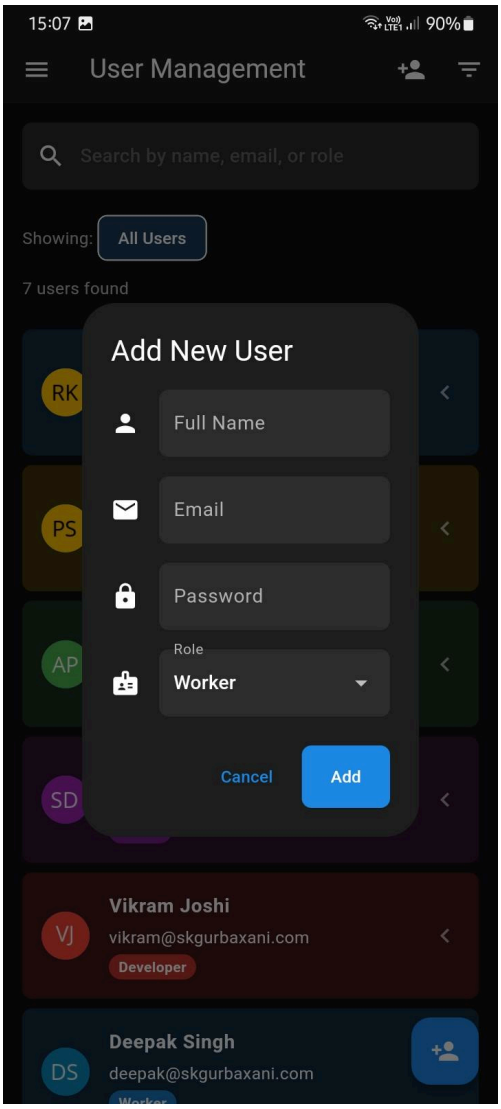

Figure 7.8: Add New User Screen for Admin

Fig 7.7 allows the admin to edit an existing user's details, including their full name, email address, password, and assigned role (e.g., Worker, Manager). It ensures that user information remains up-to-date and maintains proper role-based access control across the system.

Fig 7.8 enables the admin to create a new user account by entering basic details such as full name, email, password, and selecting a role. This functionality simplifies onboarding new team members and managing workforce expansion securely and efficiently.

Worker:

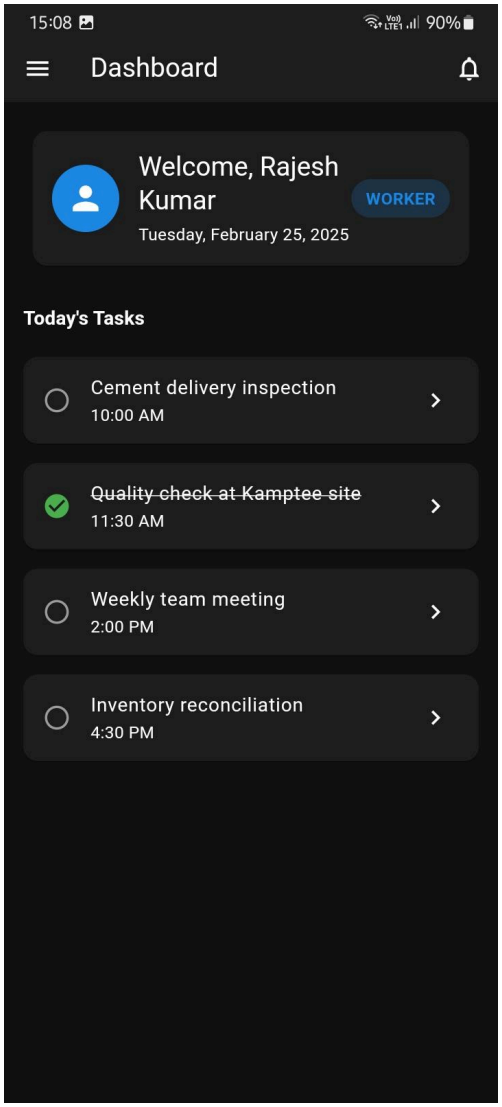

Figure 7.9: Worker Dashboard Screen

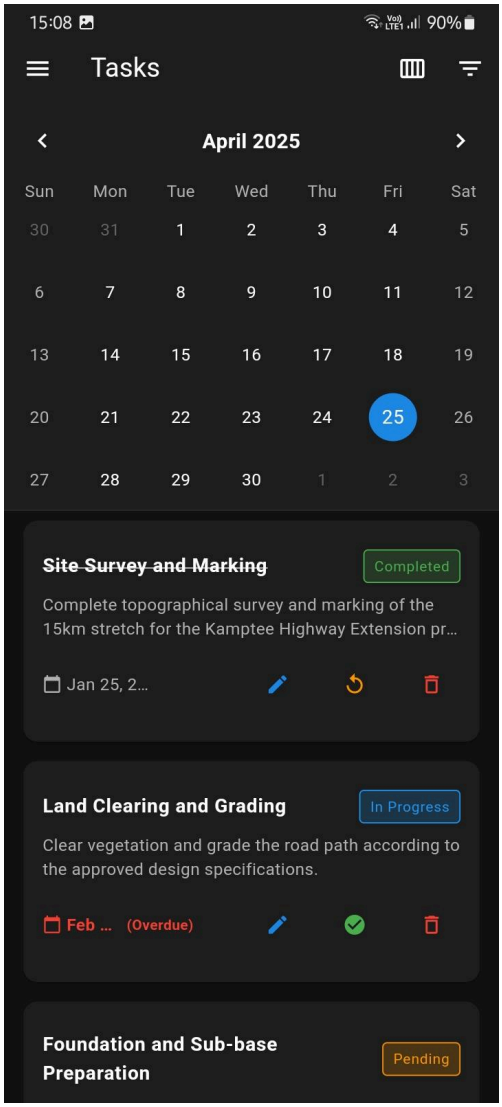

Fig 7.10: Worker Task Management Calendar Screen

Fig 7.9 shows the Worker's personalized dashboard, listing the tasks scheduled for the day. Each task displays the task name, time, and status (completed or pending). It provides workers with a clear view of their daily responsibilities and ensures timely task execution.

Fig 7.10 displays a monthly calendar view of tasks assigned to the worker. Each task is labeled with its current status such as Completed, In Progress, or Pending. Workers can easily track deadlines, view overdue tasks, and manage their workflow effectively through this organized task management interface.

Accountant:

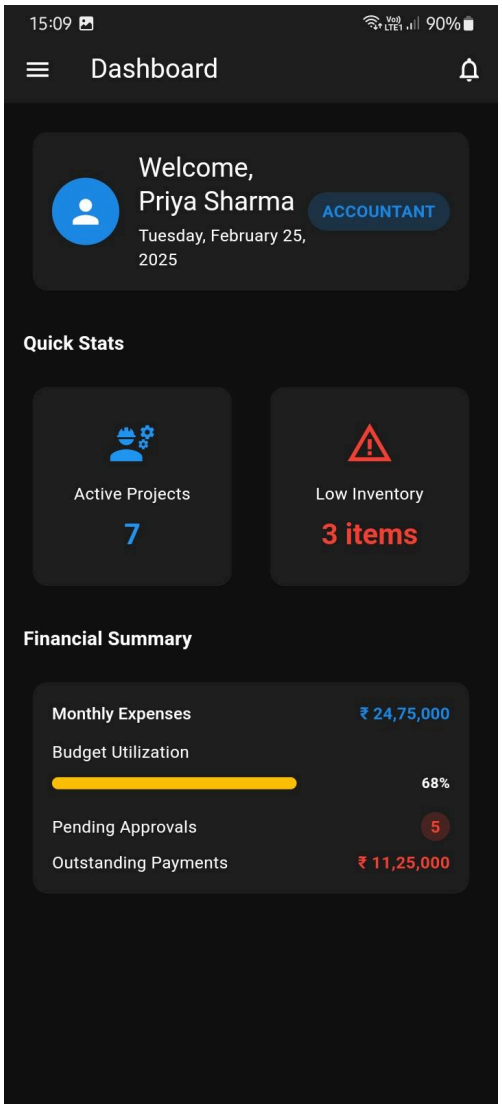

Figure 7.11: Accountant Dashboard Screen

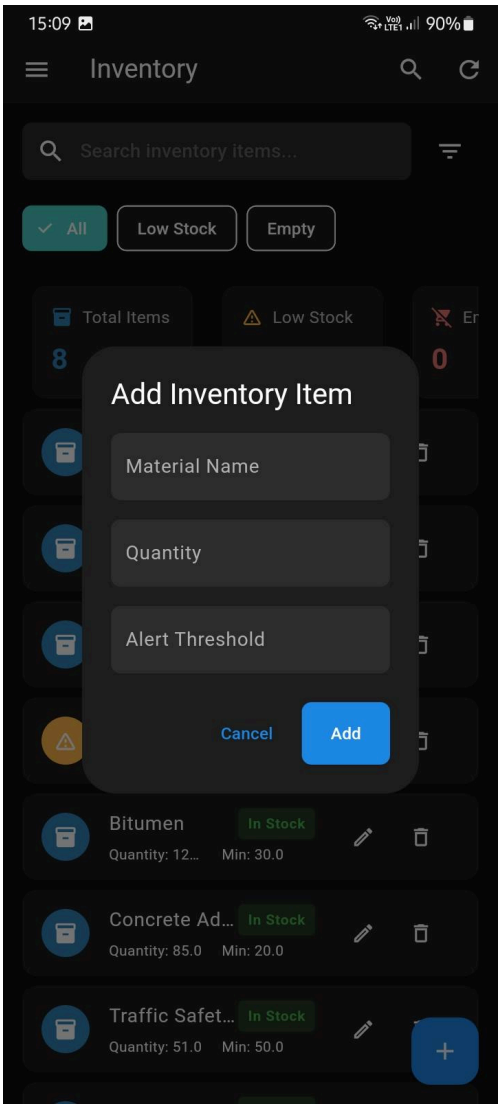

Figure 7.12: Add Inventory Item Screen for Accountant

Fig 7.11 shows the Accountant's dashboard, offering a financial overview including monthly expenses, budget utilization, pending approvals, and outstanding payments. It also displays quick stats about active projects and inventory alerts. This dashboard enables accountants to monitor project finances and inventory health effectively.

Fig 7.12 shows the Accountant to add new inventory items by specifying the material name, quantity, and alert threshold. It supports proactive inventory management by helping track materials and ensuring timely replenishment to avoid project delays.

Chapter 8: Conclusion

8.1.Limitations:

- Limited Offline Functionality

  While basic offline operations like attendance marking are supported, full offline capabilities (e.g., task creation, hazard reporting with media) are restricted and may lead to data loss if connectivity is not restored promptly.
- Scalability Constraints with Firebase

  Firebase's real-time database and Firestore are excellent for small to mid-scale applications but may face performance bottlenecks as the number of users, tasks, or concurrent updates significantly grows.
- Role Management is Rigid

  The current role-based access (worker, supervisor, admin) is hard-coded, limiting flexibility to introduce new roles or modify permissions dynamically without changing the backend logic.
- Lack of Advanced Analytics

  The system lacks integrated dashboards for advanced analytics or reporting on project progress, worker productivity, or safety trends, which are often crucial for large-scale construction management.

8.2.Conclusion:

The Construction Management System App marks a significant step toward digitizing and streamlining field operations in the construction industry, particularly for companies like M/S S.K. Gurbaxani involved in infrastructure projects across Maharashtra. By integrating key functionalities such as attendance tracking, task assignment, hazard reporting, messaging, and payment workflows into a single cross-platform mobile application, the project addresses long-standing challenges related to communication gaps, manual errors, and project delays. The use of Flutter and Firebase ensures rapid development, real-time synchronization, and scalability for small to medium-sized project teams. Throughout the development lifecycle, agile methodologies and continuous testing were employed to enhance system reliability and usability. While the application demonstrates a robust foundation, it also opens doors for future enhancements like advanced

analytics, GPS tracking, and integration with project management tools. Overall, the project successfully lays the groundwork for improved efficiency, accountability, and transparency in day-to-day construction management.

8.3.Future Scope:

- Integration with GPS and Geofencing

  Incorporate GPS-based location tracking and geofencing to ensure workers are on-site during check-in and to enhance safety compliance.
- Advanced Analytics and Reporting

  Develop dashboards and visual reports for project progress, worker productivity, safety incidents, and cost tracking to support data-driven decision-making.
- Multi-Language Support

  Add support for regional languages to improve accessibility and usability for on-site workers across diverse linguistic backgrounds.
- Integration with ERP and PM Tools

  Enable seamless data exchange with ERP systems (like SAP) and project management tools (like Primavera or MS Project) for end-to-end workflow management.

References

[1] L. Lin, D. Peng and C. Fei, "The Objective Evaluation of Road Construction Project," 2007 International Conference on Wireless Communications, Networking and Mobile Computing, Shanghai, China, 2007, pp. 5224-5227, doi: 10.1109/WICOM.2007.1279.

[2] Liberatore, Matthew & Pollack-Johnson, Bruce & Smith, Colleen. (2001). Project Management in Construction: Software Use and Research Directions. Journal of Construction Engineering and Management-asce - J CONSTR ENG MANAGE-ASCE. 127. 10.1061/(ASCE)0733-9364(2001)127:2(101).

[3] Bashir Aliyu Yakasai . “Impact of Project Management software on construction projects”, 2021.

Appendix

1. Progress review sheet 1 and 2

Inhouse/ Industry Innovation/Research:

Sustainable Goal:

Class: D17 A/B/C

Project Evaluation Sheet 2024 - 25

Group No.: 26

Title of Project: Industry Project: M/s SK Gurubarani Pvt Ltd construction Management system App.

Group Members: Aditya Manglani(D17A-40), Hiten Kataria(D17A-27), Tejas Ghodke(D17C-19), Malhar Pande(D17C-49)

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life - long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (5)	**Total Marks (50)**
4	4	4	2	5	2	2	2	2	2	3	3	3	3	–	41

Comments: Scope for Research paper is nil as its client based product.

Name & Signature Reviewer1

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life - long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (5)	**Total Marks (50)**
4	4	4	2	5	2	2	2	2	2	3	3	3	3	Not possible due to (MoU)	41

Comments: Keep the prototype ready (Dummy data)

Date: 1st March, 2025

Vidya S Zope

Name & Signature Reviewer 2

41

Inhouse/ Industry _Innovation/Research: Industry

Class: D17 A/B/C

Sustainable Goal:

Project Evaluation Sheet 2024 - 25

Group No.: 26

Title of Project: M/S sk Gurbanani Pvt Ltd. construction Management system APP

Group Members: Aditya Mangtani (D17A-40), Hiten Kodaria (D17A-27), Malhar Pancle (D17C-49), Tejas Ghadke (DNC 19)

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life - long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (5)	Total Marks (50)
4	4	4	3	4	2	2	2	2	2	3	3	3	3	—	40

Comments: No research work done. Changing requirements of client is a challenge.

Name & Signature Reviewer1

Engineering Concepts & Knowledge (5)	Interpretation of Problem & Analysis (5)	Design / Prototype (5)	Interpretation of Data & Dataset (3)	Modern Tool Usage (5)	Societal Benefit, Safety Consideration (2)	Environment Friendly (2)	Ethics (2)	Team work (2)	Presentation Skills (2)	Applied Engg&Mgmt principles (3)	Life - long learning (3)	Professional Skills (3)	Innovative Approach (3)	Research Paper (Paper not ready) (5)	Total Marks (50)
4	4	4	3	5	2	2	2	2	2	3	3	3	3	—	41

Comments: Design prototype finalized by company. Incorporate all suggestions given.

Date: 1st April,2025

Vidya S. Zope

Name & Signature Reviewer 2