DesynFlow

Interior Design management system

Final Project Report

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IT Number	Student Name	Student E-mail Address	Contact Number
IT 23 5883 32	Helitha Y M Y	it23588332 @my.sliit.lk	071 478 2539
IT 23 5485 96	Inothma Y M A	it23548596 @my.sliit.lk	074 134 4117
IT 23 6947 12	U A K Lakshan	it23694712 @my.sliit.lk	077 970 3991
IT 23 7353 92	Madhumal A A	it23735392 @my.sliit.lk	074 194 1615
IT 23 7729 22	Ranepura R D L S I	it23772922 @my.sliit.lk	076 693 9924

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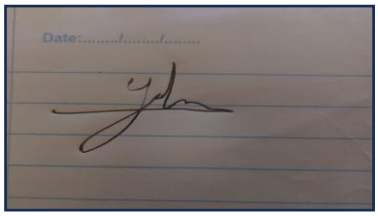
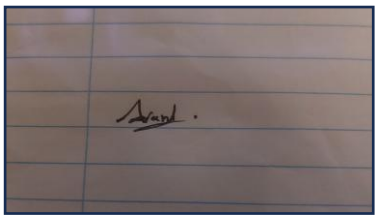
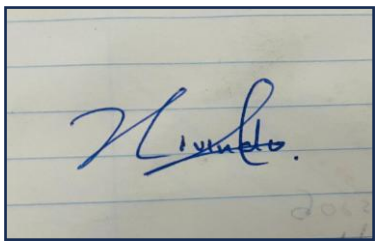
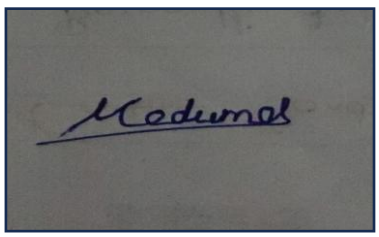
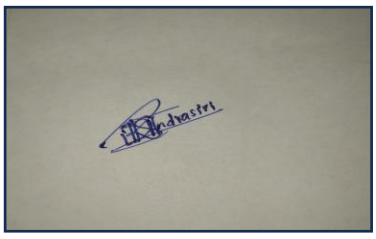
Declaration

This project report is our original work and the content is not plagiarized from any other resource. References for all the content taken from external resources are correctly cited. To the best of our knowledge, this report does not contain any material published or written by third parties, except as acknowledged in the text.

Authors:

Author SID	Author name	Signature
IT 23 5883 32	Helitha Y M Y	
IT 23 5485 96	Inothma Y M A	
IT 23 6947 12	U A K Lakshan	
IT 23 7353 92	Madhumal A A	
IT 23 7729 22	Ranepura R D L S I	

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Abstract

The Interior Design Management System (DesynFlow) is a complete web-based solution designed to automate and integrate an interior design firm's many processes. Inefficiencies in handling client requests, project scheduling, supplier coordination, inventory monitoring, and financial procedures, all of which were previously done by hand or with disjointed tools were addressed by the system's architecture.

DesynFlow is a centralized platform that facilitates smooth communication and workflow management by bringing together important stakeholders, including clients, project managers, team leaders, suppliers, finance managers, and warehouse managers. Through a dedicated client site, clients may see 3D drawings, submit inspection requests, and track the status of their projects. Meanwhile, staff members use role-specific dashboards to handle internal work.

The system follows a modular architecture built using the **MERN stack** (MongoDB, Express.js, React.js, Node.js) and is containerized using **Docker** for consistent deployment. Key functionalities include project and task management, supplier handling, finance and warranty tracking, warehouse stock monitoring, and user authentication and authorization.

Through rigorous testing and user validation, the system demonstrated improved operational efficiency, transparency, and data accuracy across all departments. By integrating all business processes into a unified platform, DesynFlow not only enhances collaboration but also provides a scalable digital foundation for future expansion.

This project highlights the successful application of modern full-stack web development methodologies to solve real-world business challenges in the interior design industry.

Acknowledgement

We would like to express our sincere gratitude to all those who have supported and guided us throughout the development of our project, *Interior Design Management System (DesynFlow)*.

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1 Chapter 1 – Introduction

1.1 Background

Interior design service acts a crucial role in transformation of residential, commercial and office space into functional, aesthetically related environment that suit with client requirements and preferences. previously, for engaging with interior design company, has excessive stages of process such as in-person consultations, inspections and multiple physical meetings. In some scenarios, these conventional methods present substantial challenges for both service providers and clients, peculiarly when there are cost, time and distance restrictions.

For many clients, finding a trustworthy interior design service providers in their local area can occasionally be difficult and some service providers handle the complicated process. In some cases, eligible service providers are located far from the client's location, requiring clients to travel long distance to induct and manage their projects. This not only increase the overall cost of the project but consume considerable time and efforts. In addition, clients may be uncertain of the reliability of service providers in new areas which could cause them to postpone or cancel their interior design project entirely.

From the service provider's stance, managing client's projects over long distance is really challenging. Organizing initial site inspection, gathering accurate property details and ensuring effective communication with the client can be inefficient except the proper digital tools. many current solutions concentrate on specific part of the process, including online consultation or virtual design previews but do not provide fully functional an integrated platform that cover the entire workflow from project inspection.

For solutions to these challenges, we introduce a comprehensive, web-based application **"Interior design management system"** that enable client to manage and track their interior design projects remotely through the system. In this system, we provide the services as client can register, submit project requirements, property details, request inspection form, upload necessary documents, directly communicate with customer service representative and assigned project manager except to travel the distance. The system integrates several departments which are able to cover the entire workflow through the system. These departments are user management, inspection scheduling, project management, inventory management, supplier management and finance department into a one platform to ensure smooth coordination between all stakeholders.

one strategy that has been considered about reducing travel cost, distance-enforced restrictions and wastage of time is based on overcoming the physical barriers by maintaining quality of services and client trust of this process. This integrated system provides an efficient accessible and cost-effective method for clients by enabling them to submit requirement digitally, remote track project progress in

real time. These solutions benefit not only for the clients also service providers, manage their internal workflow more effectively, improve their services and expand the system to ability to reach the clients beyond local boundaries.

1.2 Problem and Motivation

In the field of interior design, especially when the construction site is far from the design firm, the need for frequent visits to construction site before designing the interior leads to increase both cost and time. Tradition process requires designers, project managers and clients to engage on multiple site meetings to share ideas, take measurements, finalize design and signing contracts. These frequent meeting leads only to create scheduling challenges, travel expenses and delays in initiating project. Moreover, most of coordination such as budget approval, material planning and client confirmations is done manually or via tools like WhatsApp, E-mail or PDFs, which often leads to mismanagement and reduce customer satisfaction.

This ineffective method is further aggravated when multiple departments (inspection, planning, designing, financial, procurement and construction) rely on different communication system without having a unified system to synchronized their tasks. When dealing with client, lack of real time, transparent system can lead to missing deadlines, miscommunication about design expectation which leads to increase client frustration and weaken their trust.

Another common challenge arises when clients require a visual preview for customization or finalizing the design for construction. Traditional workflow often uses 2D-sketches or in-person consultation are used. This method not only time consuming but also most client fails to understand what firm is actually trying to do. Furthermore, accounting and procurement often manage outside from system using spreadsheets. This separation may increase the risk of over- ordering or delays in securing required materials.

To come across these challenges, our project **DesynFlow** aims to provide a unified digital platform that streamlines the entire interior design workflow. By reducing the need for frequent on-site visits, the platform helps minimize travel-related costs and delays. Designers, project managers, and clients can collaborate remotely, sharing ideas, measurements, and approvals through real-time tools without the need for repeated physical meetings.

With centralized coordination, all departments including inspection, planning, design, finance, and procurement - can work together on a single platform, avoiding communication breakdowns and reducing project delays. This integration ensures that tasks are synchronized, approvals are tracked, and responsibilities are clearly defined across teams.

The platform also supports real-time communication between clients and designers, reducing the chances of misunderstandings and enhancing transparency. Clients can review 3D models instead of static sketches, allowing them to clearly visualize proposed changes and provide feedback instantly. This not only improves design clarity but also builds stronger trust and satisfaction.

Material planning and budget management are also enhanced through automated tracking and system-based approvals. Instead of relying on external spreadsheets or manual coordination, procurement and financial operations are handled within the platform. This reduces the risk of mismanagement, over-ordering, and delays in securing materials, resulting in a more efficient and organized workflow.

DesynFlow ultimately empowers all stakeholders - clients, staff and suppliers - with a transparent, interactive, and efficient digital environment that simplifies project execution and improves overall service quality

1.3 Literature Review

The digital transformation of the interior design industry has led to the emergence of numerous management and visualization tools aimed at enhancing communication, project tracking, and design presentation. However, despite these advancements, many existing solutions address only isolated parts of the workflow rather than offering an integrated system that unites clients, designers, suppliers, and management teams.

Early project management tools such as **Trello**, **Asana**, and **Basecamp** ([1]) introduced task-based collaboration and progress tracking but lacked customization for industry-specific needs such as design approvals, material requests, and site inspections. In contrast, **Building Information Modeling (BIM)** platforms (Eastman et al., 2020 [2]) advanced construction and architectural coordination by enabling real-time 3D modeling [3] and visualization. However, BIM tools primarily focus on architectural detailing rather than the operational management required in interior design projects.

Studies by **Liu & Lee (2019)** [4] emphasize the importance of centralized data management in construction and design projects to avoid communication breakdowns among stakeholders. Systems integrating multiple functions—like scheduling, supplier coordination, and cost management—show improved performance in project completion times. However, existing enterprise-level tools such as **Autodesk Construction Cloud** or **Procore** are often too complex and costly for medium-scale interior design firms, leading to limited adoption.

Furthermore, **web-based management systems** built using modern technologies such as the MERN stack (MongoDB, Express, React, Node.js) have proven effective in providing scalability, modular design, and cloud connectivity (Patel & Singh, 2022 [5]). These technologies enable real-time data synchronization, secure authentication, and seamless integration of multiple user interfaces, which are essential in multi-role environments like design firms.

Research on **workflow automation in creative industries** (Huang et al., 2021) highlights that effective systems should reduce manual dependencies, provide intuitive dashboards, and ensure clear communication channels between teams. In interior design firms, the integration of modules such as inspection management, supplier coordination, and warranty tracking within a single platform remains an underexplored area.

Therefore, the *DesynFlow* system is designed to fill this technological gap by integrating diverse operational aspects—client interaction, inspection scheduling, project tracking, and supply management—into one unified platform. It leverages cloud-based data storage, modular architecture, and user-role-based access control to address inefficiencies identified in prior systems and to support a more streamlined design and construction workflow.

1.4 Aim and Objectives

1.4.1 Aim

The primary goal of this project is to design and implement an advanced web-based Interior and Exterior Design Management System named DesynFlow that removes the inefficiencies, communication barriers, and logistical limitations typically faced by design firms and their clients especially when dealing with construction sites located too far from the firm's physical office. In present industry landscape, frequent physical site visits and manual coordination among designers, inspectors, clients, and other stakeholders have resulted in increased travel costs, project delays, and fragmented communication.

DesynFlow pursues to transform this process by offering a centralized platform that integrates remote client interaction, virtual inspection management, digital budgeting, 3D design visualization, and centralized task coordination. The goal is to minimize the reliance on in-person meetings while enhancing project transparency, decision-making efficiency, and overall client satisfaction. By streamlining critical stages of the project lifecycle such as site data collection, material planning, quotation approval, and client confirmation, DesynFlow aims to modernize the way interior and exterior design projects are executed, particularly in regions where site accessibility is limited

1.4.2 Objectives

- To develop a user-friendly web application that that enables clients to submit project requests and monitor design development from anywhere and anytime.
- To implement an inspection management feature that assigns inspectors based on availability and location proximity, while allowing them to upload site images, measurements, and notes digitally.
- To provide project managers with a centralized workspace to review inspection data, approve or reject project intake, and assign appropriate team members and deadlines.
- To integrate a 3D model viewing tool that enables clients to engage with design proposals and approve or request modifications without requiring repeated physical meetings.
- To design a finance management module for generating project budgets, quotations, and tracking payment milestones based on real-time cost inputs.
- To connect inventory and supplier modules that streamline material requests and monitor delivery timelines in alignment with project requirements.
- To ensure all modules function within a secure, scalable, and responsive system architecture with role-based access control.

1.5 Solution Overview

To address the identified challenges, **DesynFlow** introduces a unified, web-based **Interior Design Management System** that centralizes all operational and communication activities within a single digital ecosystem. The system bridges the gap between clients, designers, project managers, suppliers, and construction teams, ensuring real-time collaboration and efficient project execution without requiring constant on-site meetings.

The solution is developed using a **modular architecture**, where each core function—such as inspection management, project management, warehouse and supplier coordination, and financial operations—is managed through dedicated modules integrated under one platform. This ensures scalability, flexibility, and smooth collaboration across departments.

At the foundation of DesynFlow lies a cloud-connected backend powered by the **MERN stack (MongoDB, Express.js, React.js, and Node.js)**. This architecture provides seamless synchronization of data between users and ensures that updates made by one stakeholder are reflected in real-time across the entire system. Through **role-based access control**, each user—whether client, team leader, or finance manager—interacts only with features relevant to their responsibilities.

A key aspect of the solution is the **Inspection Management module**, which digitizes the on-site data collection process. Instead of relying on physical visits, inspectors can submit detailed reports, upload images, and define client preferences directly through the platform. These digital records are then automatically linked with project management modules for task planning, design allocation, and cost estimation.

The **Project Management and Team Leader Dashboards** facilitate efficient task allocation, progress tracking, and collaboration among staff. Project managers can assign team members, monitor performance, and visualize milestones through interactive dashboards. This ensures accountability and transparency throughout the project lifecycle.

In addition, **clients gain access to their own interactive dashboard**, where they can monitor project progress, view 3D previews, make payments, and submit feedback—all within a secure environment. This real-time visibility eliminates miscommunication and builds stronger trust between clients and the design firm.

On the operations side, **Warehouse and Supplier Management** modules streamline material procurement and stock handling. Automated approval flows, inventory tracking, and integrated reporting ensure that the right materials are available at the right time without manual coordination or duplication of efforts. Similarly, the **Finance & Warranty Management** module handles estimates, quotations, and client payments through a transparent approval process, ensuring traceability and accuracy in financial operations.

By bringing together all stakeholders and automating the flow of information, **DesynFlow** minimizes manual dependencies, reduces project turnaround time, and enhances overall efficiency. The platform not only simplifies project execution but also lays the foundation for a more **data-driven, transparent, and customer-centered** approach to modern interior design management.

1.6 Methodology

For the **DesynFlow** project, the **Agile methodology** is adopted to support incremental development, iterative improvement, and continuous stakeholder engagement. Agile ensures that system features are developed and delivered in short sprints, allowing the project team to incorporate client and supervisor feedback quickly and maintain flexibility throughout the development process.

1.6.1 Requirement Gathering and Analysis

The system requires regular collaboration with multiple stakeholders, including clients, designers, warehouse managers, suppliers, and financial officers. To capture requirements effectively, a combination of **use case diagrams**, **context diagrams**, **onion diagrams**, and **prototyping techniques** was used. These models helped visualize system boundaries, user roles, and key interactions between different departments, ensuring a clear understanding of both functional and non-functional requirements.

1.6.2 System Design

The project follows a **Monolithic Modular + Layered Architecture** design approach. Each management area—such as **Inspection**, **Project**, **Warehouse**, **Supplier**, and **Finance**—is structured as an independent module within the same application. This modular design ensures better maintainability, team-based parallel development, and simplified deployment while keeping all business logic under a unified backend.

The layered structure follows:

- **Presentation Layer (Frontend)** – Developed with **React.js**, managing user interfaces and interactions for both staff and clients.
- **Business Logic Layer (Backend)** – Implemented using **Express.js** and **Node.js**, handling application logic, workflows, and API processing.
- **Data Access Layer** – Managed with **MongoDB**, storing all persistent data such as inspection records, project details, and financial transactions.
- **Technology Stack**

The system is implemented using the **MERN stack**, which provides a seamless JavaScript-based development environment across all layers:

- **MongoDB** – NoSQL database for flexible and scalable data management.
- **Express.js** – Middleware framework for handling backend logic and RESTful API requests.
- **React.js** – Frontend library for building dynamic, reusable user interfaces.
- **Node.js** – Runtime environment for executing server-side code efficiently.

Additionally, **Docker** is used for containerized development, ensuring a consistent environment across all team members and simplifying integration and deployment. This approach minimizes setup issues and allows smooth collaboration even when multiple developers work on different modules.

1.6.3 Integration and Security

Integration across departments is achieved through RESTful APIs, ensuring that all modules communicate efficiently within the monolithic framework. Authentication and authorization are implemented using **JWT (JSON Web Tokens)** to secure endpoints and enforce role-based access control. Sensitive data such as financial reports and client payments are protected through environment-based configurations and encrypted database connections.

1.6.4 Testing and Quality Assurance

Testing is a core part of the development lifecycle. The team performs:

- **Unit Testing** using **Jest** to verify that each individual module (e.g., task creation, inspection submission, supplier approval) behaves as expected.
- **Integration Testing** using **Postman** to validate API endpoints and ensure that data flows correctly between modules.
- **Manual UI Testing** to ensure a smooth and error-free user experience across dashboards and forms.
- **Version Control and Collaboration**

The entire project is managed under a **GitHub repository** using a **branching strategy** for modular development. Each team member is responsible for their assigned management module, working within separate feature branches that merge into the main branch after successful review and testing.

By combining Agile methodology, modular layered design, containerized environments, and robust testing strategies, **DesynFlow** ensures a reliable, scalable, and efficient solution to streamline interior design management workflows.

1.6.5 Gnatt Chart

Table 1-1 Gnatt chart for DesynFlow project

TimeLine	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12
Project Planning & Analysis . Collect requirements . Create architecture . Finalize features												
System Design . Design system architecture . Define database schema . Create UI wireframes												
Development - Backend Implementation . Implement core logic . Generate API endpoints												
Development - Frontend & UI Design . Build web dashboards . Implement user functionalities . Set up admin panel & access control												
System Integration - Integrate finance and inspection for calculate payment and payment verification - Integrate Project module, Inspection module -Integrate Project module and warehouse module -Integrate Warehouse and supplier -Integrate Warehouse, finance, project and supplier module												
Reporting & Alerts System . Generate reports(daily, monthly) . Implement notification system (Email/SMS)												
Final Documentation & Review · Prepare system user manuals . Conduct final system testing with all actors												

1.6.6 Link For Git Repo

Link - https://github.com/Yohan-Helitha/DesynFlow

1.7 Structure of the Report

This report is organized into five main chapters, followed by supporting appendices, to provide a clear understanding of the project development process and outcomes.

Chapter 1 – Introduction:
This chapter introduces the background and motivation behind the project, highlighting the challenges faced by traditional interior design workflows. It defines the project's aim and objectives, provides a brief overview of the proposed solution, explains the chosen methodology, and outlines the overall structure of the report.

Chapter 2 – Requirements:
This chapter presents the stakeholder analysis, functional and non-functional requirements, and requirement modeling. Diagrams such as use case diagrams, context diagrams, and onion diagrams are used to describe user roles, interactions, and system boundaries clearly.

Chapter 3 – Design and Development:
This chapter details the system design and implementation process. It covers the architecture of the system, including the modular monolithic design, layered architecture, and data models. It also includes diagrams representing system components, workflows, and database relationships, followed by explanations of the technologies used during the development phase.

Chapter 4 – Testing:
This chapter focuses on the verification and validation of the system. It explains the acceptance criteria for key modules, outlines test case designs, and presents the test results. Both functional and integration testing outcomes are discussed to ensure that the system meets the intended requirements.

Chapter 5 – Evaluation and Conclusion:
This chapter evaluates the overall performance and user satisfaction of the system based on test results and stakeholder feedback. It summarizes how the project objectives were achieved and presents key conclusions and future improvement suggestions.

2 Chapter 2 – Requirements

2.1 Stakeholder Analysis

Table 2-1 Stakeholder Analysis

Stakeholder	Role / Responsibility	Interest in the System	Level of Influence	Expectations from the System
Client	Initiates interior design requests, provides site details, approves designs, and monitors project progress.	High – relies on system for transparency and timely updates.	High	Real-time access to project status, clear communication, digital approval of designs and payments.
Customer Service Representative (CSR)	Acts as a liaison between clients and the company; handles inspection requests and client queries.	Medium	Medium	Easy client registration, inspection request tracking, and communication tools for resolving client issues.
Inspector (Investigation Officer)	Conducts site visits, records on-site data, uploads reports and photos, and communicates findings to the project manager.	High	Medium	Mobile-friendly inspection forms, ability to upload reports, and efficient scheduling system.
Project Manager	Oversees all projects, assigns teams, monitors progress, and manages overall workflow.	High	Very High	Centralized project dashboard, task assignment tools, progress tracking, and meeting scheduling.
Team Leader	Manages assigned team members, divides work, sets task weights, and reports progress to project manager.	High	High	Role-based dashboard for task management, progress visualization, and materials request submission.

Team Member	Executes assigned design and construction tasks under team leader supervision.	Medium	Low	Simple task dashboard to view assignments, mark progress, and communicate updates.
Warehouse Manager	Manages inventory, approves/rejects material requests, and tracks stock movement and disposal.	High	High	Real-time stock monitoring, automated alerts for low stock, and report generation tools.
Procurement Officer	Handles supplier registration, material ordering, and communication with suppliers.	High	Medium	Supplier management dashboard, automated restock alerts, and order tracking.
Finance Manager	Oversees budget approvals, quotation generation, and financial reporting.	High	High	Secure access to financial data, budget approval workflows, and payment tracking system.
Supplier	Provides required materials and updates order status (Accepted, Rejected, Dispatched, Delivered).	Medium	Low	Clear order notifications, ability to update order progress, and performance feedback visibility.
System Administrator (Internal)	Maintains system integrity, manages user roles, and ensures data security.	High	Very High	Admin access to manage roles, monitor logs, and handle technical configurations.

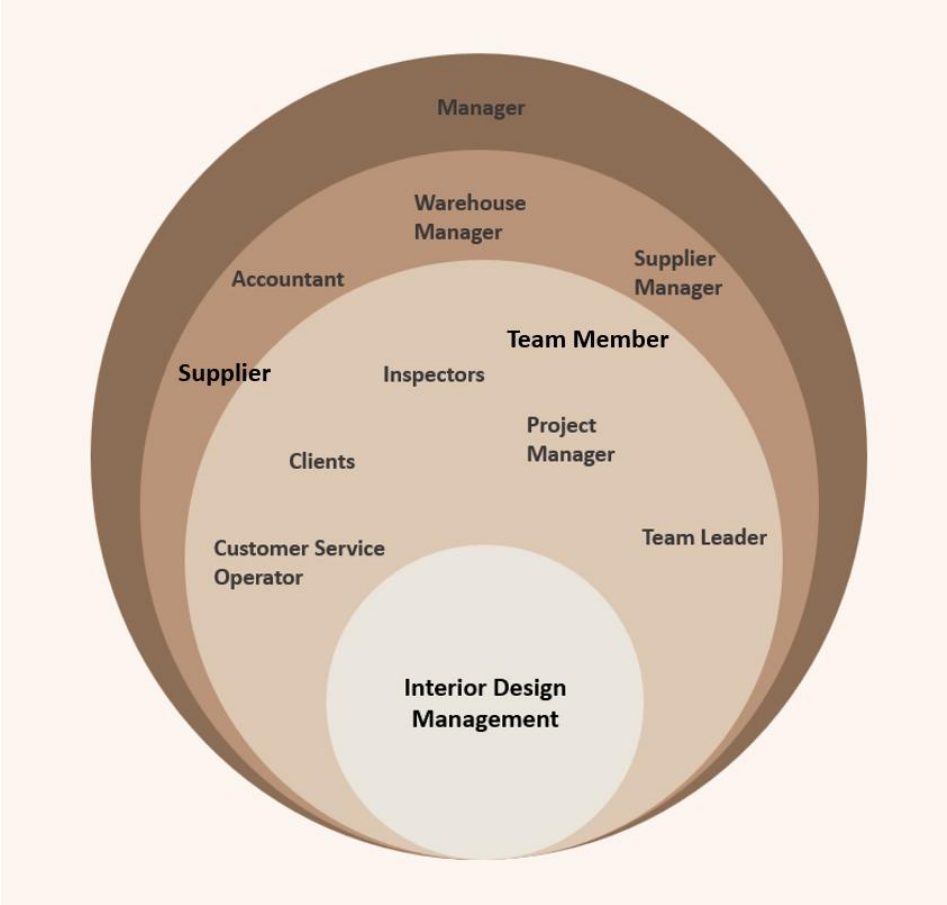

Figure 1 Stakeholder Analysis - Onion Diagram

2.2 Requirements Analysis

2.2.1 Authentication & Authorization and Inspection Management

Functional requirements

- The system shall allow user to create an account.
- The system shall support secure login, profile customization, reset password and even change their phone numbers any time if user needs.
- The system shall allow clients to fill on investigation request form with property details.
- The system shall send investigation payment notification email to the client.
- The system shall allow clients to view notification send by the system.
- The system shall allow finance manager to verify the payment and notify the customer service representative and assign investigator upon confirmation.
- The system shall allow customer service representative to send the email of payment confirmation details to the clients.
- The system shall allow customer service representative to view investigator live location and assign nearest available one.
- The system shall allow investigator to update their live location via their dashboard.
- The system shall allow investigator to update their required on-site data such as dimension, materials and client preferences.
- The system shall allow investigator to decline investigation request by providing valid reason.
- The system shall allow investigator to upload on-site data to system and generate an investigation report.
- The system shall notify the project manager once a new investigation report is submitted.

Non – Functional Requirements

- Clients & Investigators
- Security
    - User passwords must be hashed and stored securely.
    - Only authenticated users can access dashboards.

    - Email verification is mandatory before the user can request inspection.
    - For the purpose of preventing unauthorized access, session timeout is enforced to automatically log out inactive users.
- Usability
    - All users should be able to register, log in to the system and update password, username, phone number without technical assistance.
    - The inspection request form includes required fields and should be easy to understand.
- Performance
    - Customer service representative should load the inspection dashboard to check the availability within minimum delay.
    - Customer service representative should be able to load the emails of client without loss.
- Reliability
    - System should not loss any inspection request or user data.
- Traceability
    - Customer service representative updating investigators availability and send the payment details, approving payment details and inspection request confirmation emails.
- Notification
    - Client must receive real-time alerts of the process of inspection.

2.2.2 Project Management

Functional Requirement

- System shall notify the project manager once a new investigation report is submitted.
- System shall allow investigators to decline investigation request by providing a valid reason.
- System shall allow project manager to review inspection details and check for available project teams.
- System shall allow PM to schedule a project discussion meeting with client using Zoom/Teams/Google Calls.
- System shall allow PM to upload and send contract documents to client via the system.
- System shall allow clients to upload signed contracts confirmation.
- System shall allow PM to assign tasks to selected team members and display them in the member dashboard.
- System shall allow Team Leader to assign tasks via their personal dashboard.
- System shall allow team leader to track progress and project timeline within the system.
- System shall display progress tracking information to clients in their dashboard for transparency.
- System shall allow Team leader to upload the completed 3D model of the interior design.
- System shall allow Team Leader to schedule a final review meeting with client through the system.
- System shall allow team leader to submit a final materials list to the Finance manager for budget estimation.

Non – Functional Requirement

1. Security
    - Only authenticated and authorized users can access modify project data.
    - Securely store and restrict the access for contract document or project files.
    - User should not be allowing to get the screen shots or video of the video.
    - Communication link must be shared privately to avoid unauthorized access.
2. Usability
    - Project manager manage to the team and project.
    - Uploading document should be simple, guided and downloadable.(contract)
3. Performance

- Task assignment and project status syncs must reflect in dashboard instantly or near real-time.

4. Scalability
    - Easy to add new user role(designers)
5. Reliability
    - Communication link (Zoom, Teams), the system should allow easy re-sending or rescheduling.
6. Scalability
    - Should handle the file upload (3D model) except the system crashes or data loss.
7. Notification and Alerts
    - Project manager contract signed and uploaded.
    - Client when contract is sent or meeting are scheduled.
8. Transparency - Client must see real-time updates of the projects progress.

2.2.3 Warehouse Management

Functional Requirement

- Warehouse manager should be able to log in and securely access the inventory dashboard.
- Warehouse manager should be able to view real-time material quantities, stock status.
- Warehouse manager should be able to filter and monitor materials by category, location or status.
- Warehouse manager should be able to monitor graphical trends for showing stock trends, and top-used materials.
- Warehouse manager should be able to approve or reject stock requests.
- Warehouse manager should be approved and record stock corrections of damage and lost materials.
- Warehouse manager should be able to record new stock from verified suppliers received from the supplier manager.
- Warehouse manager should receive notifications about the stock resets from the supplier manager
- Warehouse manager should be able to view logs and audit all stock adjustments.
- Warehouse manager should be able to view material requests submitted by the team leaders
- Warehouse manager should be able to approve or reject requests based on the availability of materials and urgency of the project.
- The system can automatically deduct approved materials from stock.
- Warehouse manager should be able to update threshold levels for urgent materials
- Warehouse manager should be able to monitor stock below reorder level and trigger order.
- Warehouse manager should be able to view stock usage and change records.
- Warehouse manager should be able to filter items, date, action type or user.
- Warehouse manager should be able to maintain unchangeable logs for security and confidentiality.
- Warehouse manager should be able to approve damaged or overstock items for disposal.
- Warehouse manager should be able to set disposal reasons and maintain logs about disposal history.
- Warehouse manager should be able to support for two-step disposal approval required.
- Warehouse manager should be able to export disposal reports to the manager for reviewing.
- Warehouse manager should be able to receive and manage alerts regarding low stock, expired items, request approvals and etc…

- Warehouse manager should be able to choose delivery method of the notification (email, through site notification)
- Warehouse manager should be able to request a transfer request to the manager and receive response.
- Warehouse manager should be able to confirm and log dispatch and receipt of transferred materials.
- Warehouse manager should be able to maintain a complete record of transfer actions, including materials moved, source and destination, time and reason with the details of the vehicle transferred and the employee responsible for the transfer.

Warehouse manager should submit the detailed transfer report to the manager and notify project managers about the stock within the warehouses.

Non -functional requirement

1. Security
    - Secure login with strong authentication
    - Only warehouse manager can approve/reject requests and perform stock updates
    - Password re-entry for sensitive operations
    - Secure handling and storage authentication tokens
2. Performance
    - Real time dashboard updates
    - Fast and responsive UI for approving/rejecting requests and viewing stock data
    - Quick search and filter functionality
3. Reliability and availability
    - A strong reliable system to guarantee continuous inventory data access
    - Scheduled background details like alerts, report generation without impacting performance.
4. Usability
    - Inbuilt and clear dashboard for monitoring stock levels, request and alerts.
    - Easy to navigate through interfaces
    - Clear visual indicators
5. Auditability
    - Logs of all approval/rejection actions, stock updates and notifications
6. Data integrity
    - Validations of all inputs related to approvals, stock adjustments and material data
    - Double confirmation of manager for inter-warehouse stock exchange
7. Scalability

- Ability to handle increasing volumes of material data and requests.
- Support for multiple warehouse locations

8. Complications and privacy
    - Logs and export details

2.2.4 Supplier Management

Functional Requirements

- The system shall allow the supplier management officer to register new suppliers with details such as company name, contact info, material types, and delivery regions.
- The system shall allow inventory module to trigger material restock alerts when stock goes below threshold.
- The system shall allow procurement officer to raise material requests and assign them to one or more registered suppliers.
- The system shall allow procurement officer to forward material requests to finance manager for budget approval.
- The system shall allow finance manager to approve or reject the material request and update the approval status in the system.
- The system shall allow suppliers to receive material requests through their dashboard including item names, quantities, and delivery deadlines.
- The system shall allow suppliers to update their request status as Accepted, Rejected, In Progress, or Dispatched.
- The system shall allow suppliers to upload sample submission files for quality verification.
- The system shall allow supplier management team to approve or reject submitted samples based on predefined criteria.
- The system shall notify the inventory officer once the material status is updated to Delivered.
- The system shall allow procurement officer to update material delivery status upon receipt.
- The system shall allow supplier management team to rate suppliers after delivery based on timeliness, quality, and communication.
- The system shall automatically calculate supplier rating using a weighted scoring method and update their profile.
- The system shall flag suppliers with low ratings for review by supplier management team.
- The system shall allow admin to view supplier records, request statuses, ratings, and logs through centralized dashboard.

Non-Functional Requirements

Security

1. Only authenticated users (officers and suppliers) can access dashboards.
2. Passwords must be hashed and stored securely.
3. Role-based access control must be enforced across all modules.
4. Session timeout should be implemented to prevent unauthorized access.

Usability

1. All users must be able to use their dashboards and update their status without technical support.
2. Material request forms must be simple, clear, and contain required validations.
3. Ratings system should be visible and easy to interpret for management.

Performance

1. Material request assignment and approval updates must reflect in real time.
2. Supplier dashboards should load request details instantly with minimal delay.

Reliability

1. System must not lose any material request or rating data under concurrent usage.
2. Sample submission and approval records should be persistently stored and retrievable.

Traceability

1. System must log all actions performed by procurement, finance, and supplier management officers.
2. All status changes (requests, approvals, deliveries, ratings) should be timestamped and traceable.

Notification

1. Suppliers must receive real-time alerts when a new material request is assigned.
2. Procurement and inventory officers must receive notifications for delivery status updates and approvals.

2.2.5 Finance Management & Warranty Management

Finance Management

Functional Requirements

- The Finance Manager shall be able to securely log in.
- The Finance Manager shall be able to access a financial dashboard that provides a real-time overview of project budgets, cost summaries, and pending financial actions.
- The Finance Manager shall generate a site inspection estimate based on the distance to the site, review the client's uploaded payment receipt, approve it, and notify Customer Service of the approval status.
- The Finance Manager shall be able to create detailed cost estimates for each project.
- The cost estimates shall include labor costs, material costs, service fees, and contingency allocations.
- Each cost estimate shall be saved with version history and linked to the associated project.
- The Finance Manager shall be able to generate formal project quotations based on the created cost estimates.
- The system shall allow sending the generated quotation to the Project Manager for client presentation.
- The Finance Manager shall be able to revise quotations based on client-negotiated changes.
- The system shall log all quotation versions and maintain a complete version control history.
- Once confirmed, quotations shall be locked and restricted from further editing.
- The Finance Manager shall be able to track client payments.
- The system shall allow filtering of payments by project, client, or date.
- The complete payment history shall be auditable and exportable.
- The Procurement Manager shall be able to submit material purchase requests to the Finance Manager.
- The Finance Manager shall record the financial loss associated with damaged goods reported by the Warehouse Manager.
- The Finance Manager shall review each purchase request against the current project budget.
- The Finance Manager shall be able to approve or reject each request with comments.
- All approved requests shall be automatically forwarded to the Procurement Manager.
- The system shall log every decision with timestamp and justification.
- The Finance Manager shall be able to log all approved project-related expenses including labor, procurement, and transport.
- Each expense shall be categorized and linked to specific project cost centers.
- The Finance Manager shall be able to generate detailed monthly project financial reports.

- The reports shall be filterable by project, time range, cost category.
- The system shall allow exporting financial reports in PDF and Excel formats.
- The system shall maintain secure and auditable records of all quotations and their revisions.
- The system shall maintain records of client payments and outstanding balances.
- The system shall maintain records of approved material purchase requests.
- The system shall maintain records of profit and loss summaries.
- All financial records shall be immutable and prepared for auditing.
- The system shall notify the Finance Manager of new material purchase requests needing approval.
- The system shall notify the Finance Manager of client payments received or due.
- The system shall notify the Finance Manager of budget threshold breaches.
- The system shall notify the Finance Manager of requests to revise existing quotations.

Warranty Management

- View a real-time dashboard showing project budgets, cost summaries, and pending actions for instant financial performance monitoring. (Auto-Start Warranty Tracking)
- Create and review cost estimates for site inspections, review client payment receipts, and approve them to avoid financial delays. (Submit Warranty Claims)
- Prepare detailed cost breakdowns covering labor, materials, services, and contingencies to ensure accurate project budgeting. (Search and Monitor Warranties)
- Save and manage multiple versions of cost estimates linked to specific projects for financial transparency and version tracking. (Manage Warranty Claims)

Non – functional Requirement

1. Security
    - The system shall use secure authentication for Finance Manager login.
    - Sensitive data such as client payments and financial records shall be encrypted in storage and during transmission.
    - Role-based access control (RBAC) shall restrict access to financial modules only to authorized users.
2. Performance
    - The financial dashboard shall be loaded within 3 seconds under normal network conditions.

- Exporting reports (PDF/Excel) shall be completed within 10 seconds for files up to 10MB.

3. Auditability

- All user actions such as approval, rejection, revision of estimates/quotations shall be logged with timestamp and user ID.

4. Availability & Reliability

- The system should be available during business hours.

5. Usability

- The system should have a user-friendly.
- Tooltips and input validations shall guide Finance Managers during data entry.
- The interface should be simple and clear, allowing users to easily submit claims and monitor their progress.
- Warranty details must remain consistent and protected from unauthorized edits or deletions.

6. Maintainability

- The system should be modular and easy to update for adding new warranty types or claim workflows.

2.3 Requirement Modeling – Use Case Diagram

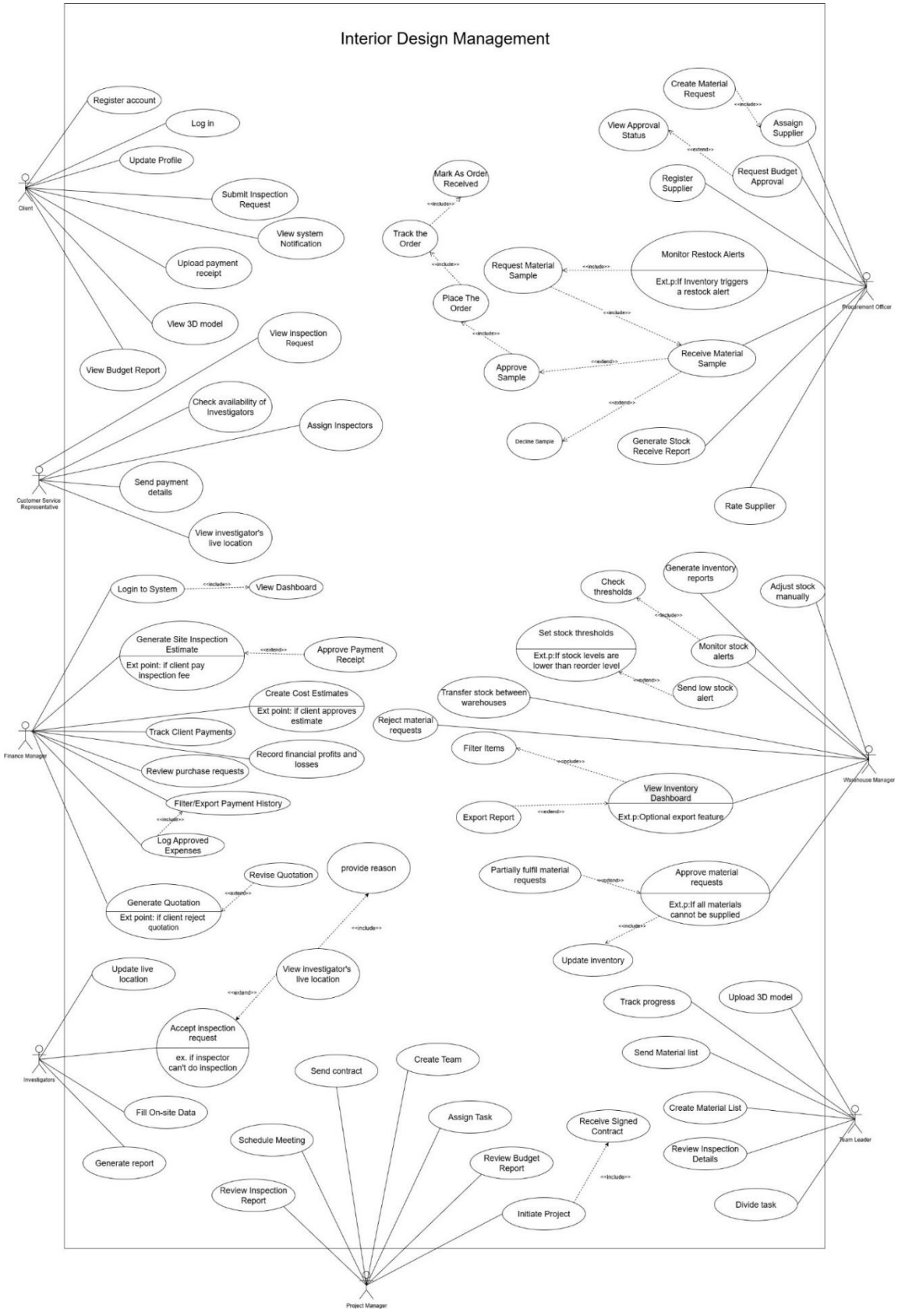

Figure 2 Use Case Diagram

3 Chapter 3 - Design and Development

3.1 System Architecture Diagram

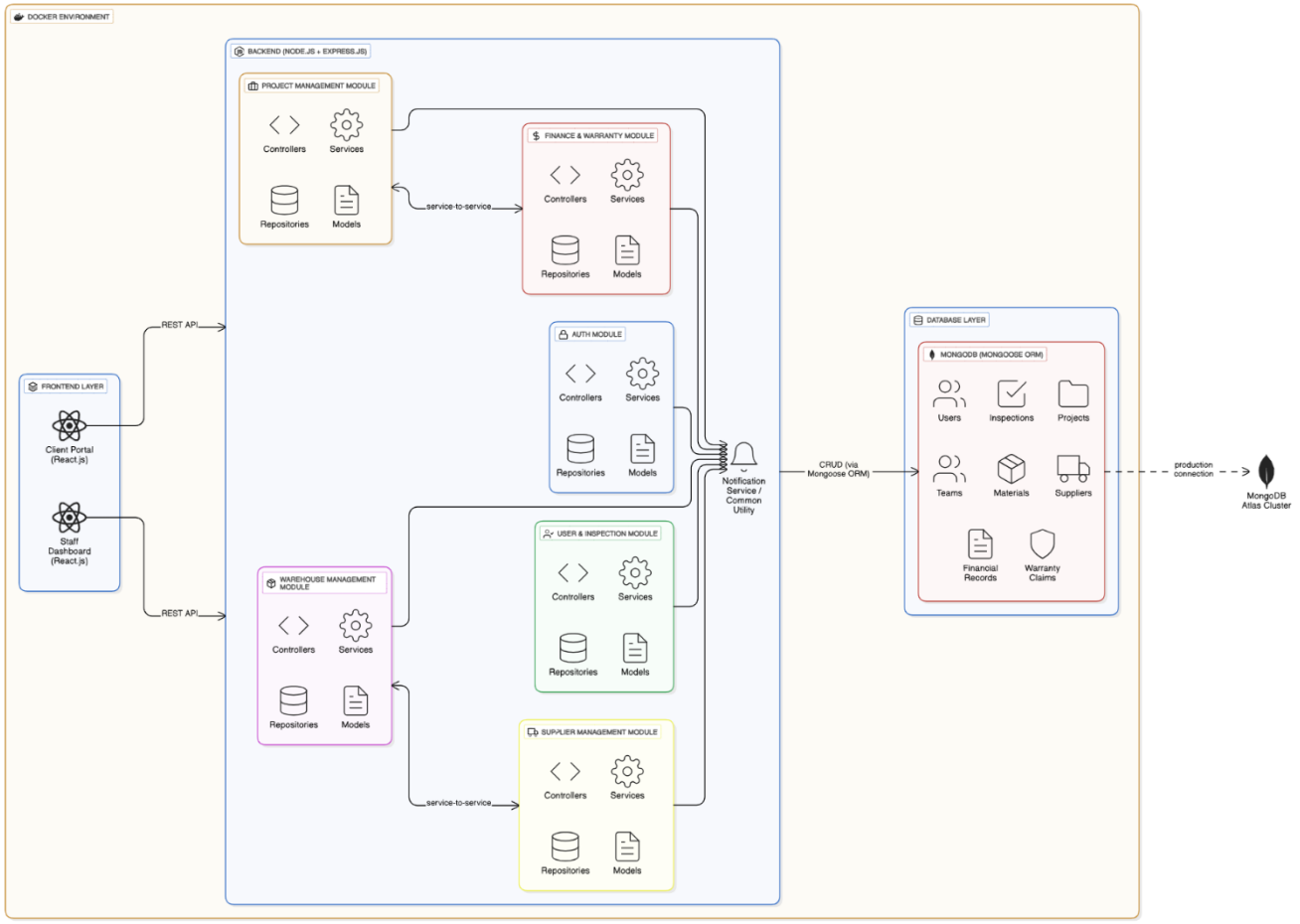

Figure 3 System Architecture Diagram

3.2 Component Diagrams

3.2.1 Authentication & Authorization

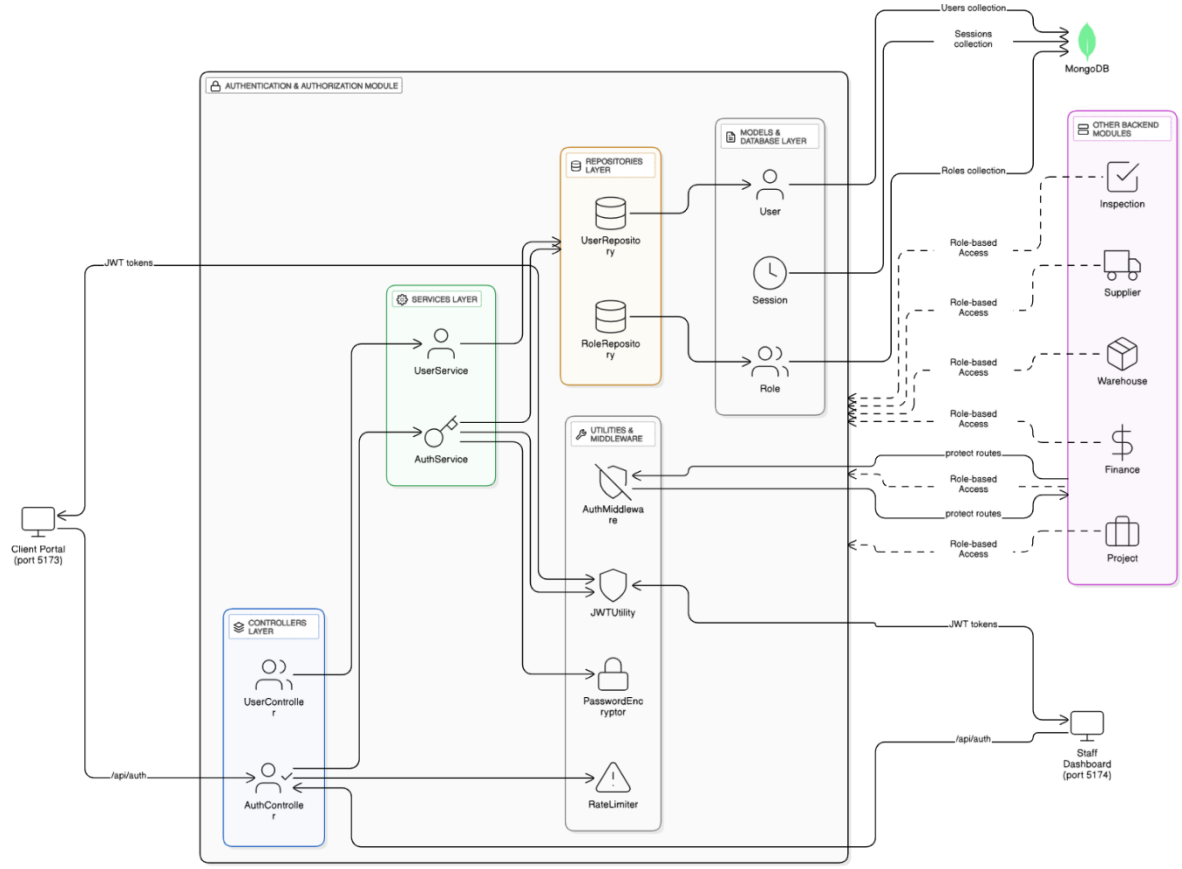

Figure 4 Component Diagram - Authentication & Authorization

3.2.2 Inspection Management

If clients have an idea to get the services of our system, the client need complete the initial stage of property investigation. Through user management, client can create account, manage the login credentials and log in securely and receive role-based dashboard access. In inspection scheduling, client may need to submit the investigation request with property details and payment proof details. Payment details are verified by the finance department and notify the client by customer service representative. Customer service representative plays a role as a coordinator of the clients, investigators and finance department. The customer service representative assigns the nearest available investigator using live location tracking. Investigator can update their location, collect on-site data and generate the report of related investigation. This report sends to the project manager to start the next phase of project.(Link - inspection_component.png)

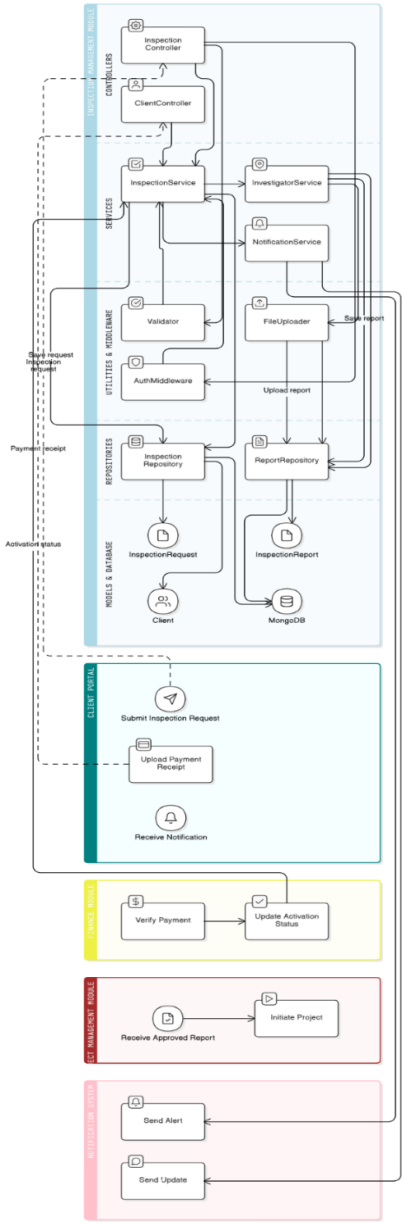

Figure 5 Component Diagram - Inspection Diagram

3.2.3 Project Management

Once the investigation report is submitted via the system, the Project Management module takes over. The project manager reviews the submitted report and evaluates the current workload to decide whether the project can be proceeded or not. If the project is accepted, project manager will schedule a meeting with a client to finalize the design requirements via the system. After signing the agreement, an available team will be assigning via the system. The team leader will handle the task distribution and progress tracking while the finance manager prepares the budget. Project manager oversees everything include deadline, approval and team coordination to ensure project will be delivered successfully.

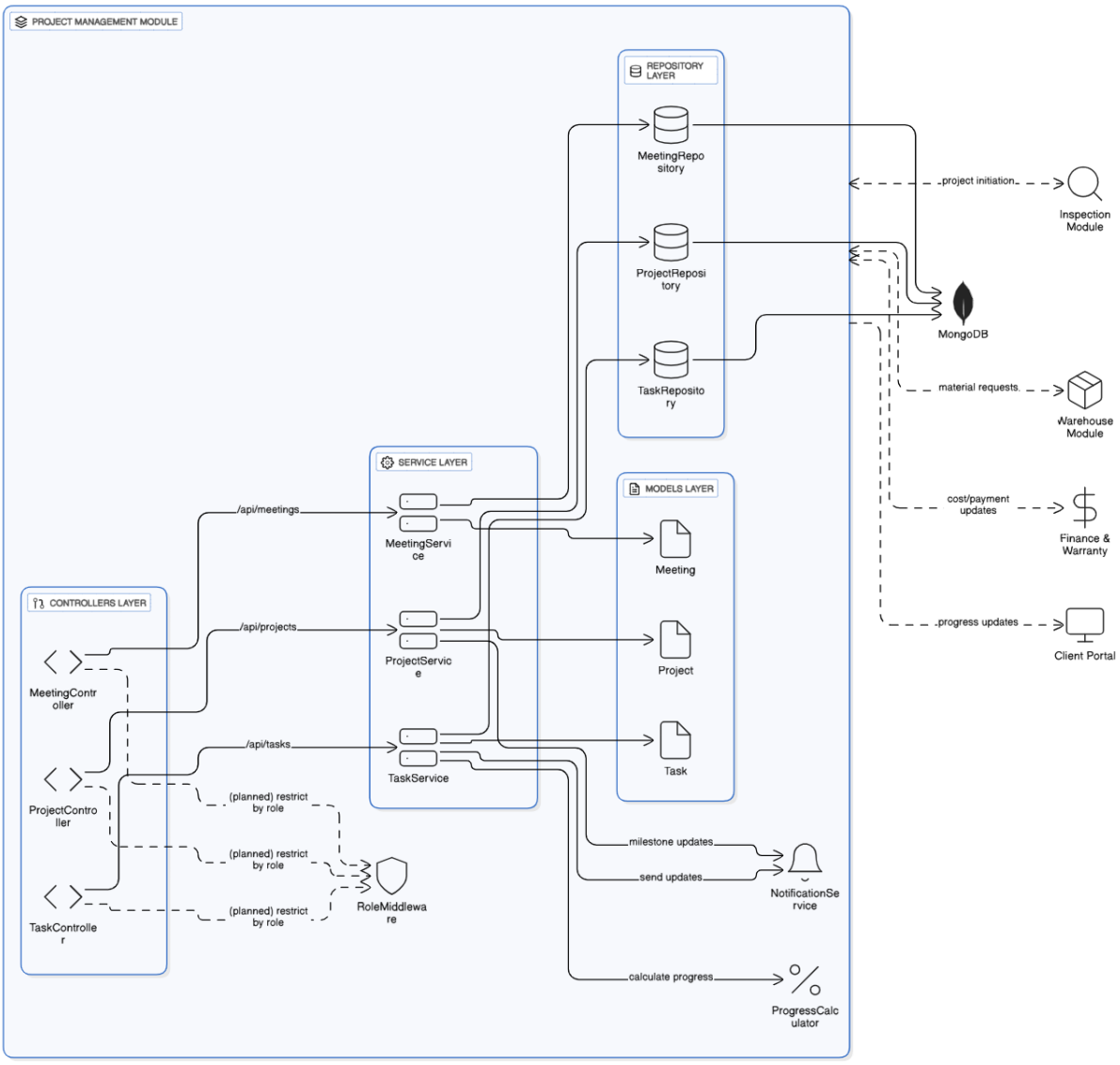

Figure 6 Component Diagram - Project Management

3.2.4 Warehouse Management

If the Warehouse Manager wants to perform operations within the system, he should first complete a successful login into the system. Through the dashboard, the project manager can view the real time inventory levels, review material requests and approve or reject material requests based on the urgency and the availability of the materials. The system ensures that only the Warehouse Manager is able to perform sensitive actions like stock approvals, updates and send stock reorder requests which require authentication using password reconfirmation.

The Warehouse Manager can filter materials by category, type or location and check on low stock alerts. Warehouse manager receives notifications or emails regarding stock requests, low inventory warnings and stock reorder request confirmations.

When the Team Leader or Project Manager sends stock requests, the Warehouse Manager checks the material availability and confirms or rejects the requests. The Warehouse Manager is also responsible for logging all the stock movement and logging the materials that are stored in remote warehouses.

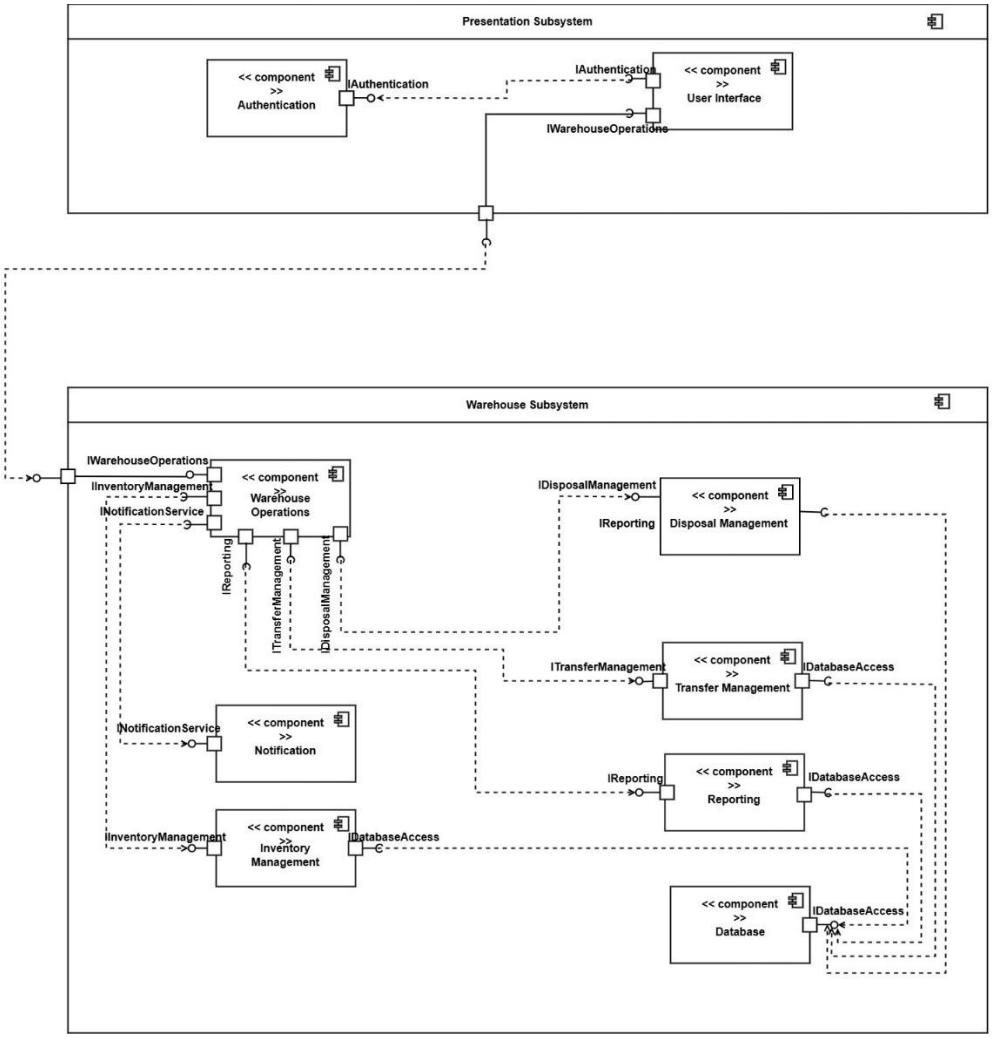

Figure 7 Component Diagram - Warehouse Managemen

3.2.5 Supplier Management

The Supplier Management module facilitates efficient coordination between the inventory system, procurement officers, finance department, and suppliers. When materials run low, the inventory system triggers restock alerts and raises material requests to the supplier management team (procurement officers). The supplier management team then forwards them to the finance department for approval. Once approved, the request is assigned to suitable suppliers based on availability, rating, and delivery regions. Suppliers can respond to requests, upload required samples, and update the status in real time. The supplier management team monitors these interactions, verifies sample quality, and rates suppliers based on delivery accuracy, material quality, and responsiveness. This ensures a reliable supply chain and smooth integration with inventory and procurement operations.

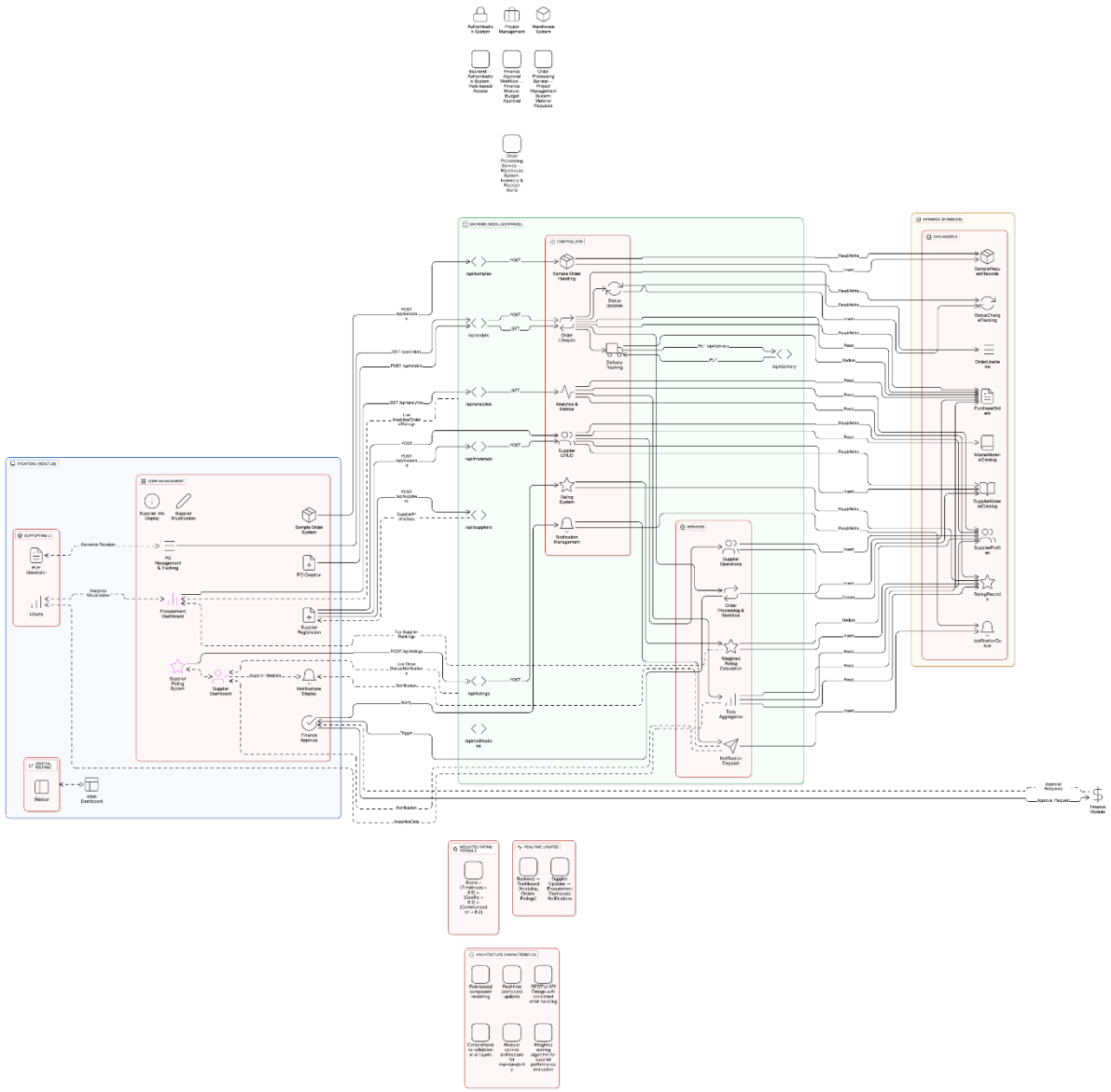

Figure 8 Component Diagram - Supplier Management

Link - supplier_component.png

3.2.6 Finance Management

Finance manager should be able to successfully login into the system securely before he performs operations in the system. Finance manager can real time budget tracking, quotation management, payment oversight, and expenses recording through the dashboard. The module includes a live financial dashboard displaying cost summaries, pending actions, and alerts. It allows the Finance Manager to create inspection cost estimates based on site distance, review uploaded payment receipts, and notify Customer Service upon approval. Project cost estimates include labor, materials, service fees and contingencies and are saved with version control. Finance manager can generate formal quotations based on estimates, revised as needed and locked once confirmed. Payments are tracked by client, project, or date, and full transaction histories are exportable. The system also manages purchase requests from the Procurement Manager, which can be approved or rejected with comments after budget checks by finance manager. Expense logs, financial reports, profit/loss summaries, and budget alerts are all maintained with immutability and transparency in mind. Overall, this finance management ensures financial clarity and security.

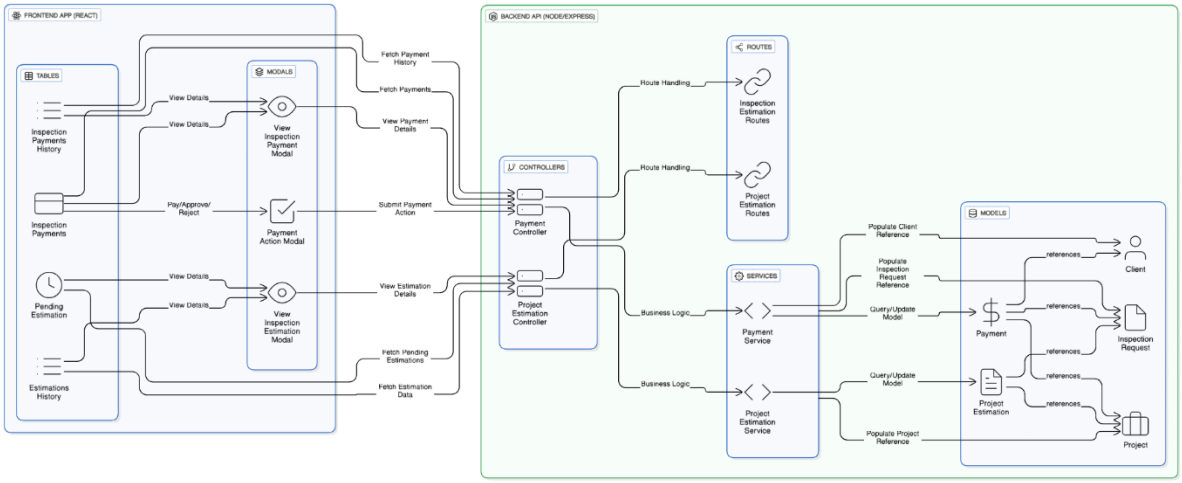

Figure 9 Component Diagram - Finance Management

Link - [finance_component.png]

3.3 Process Flow Design

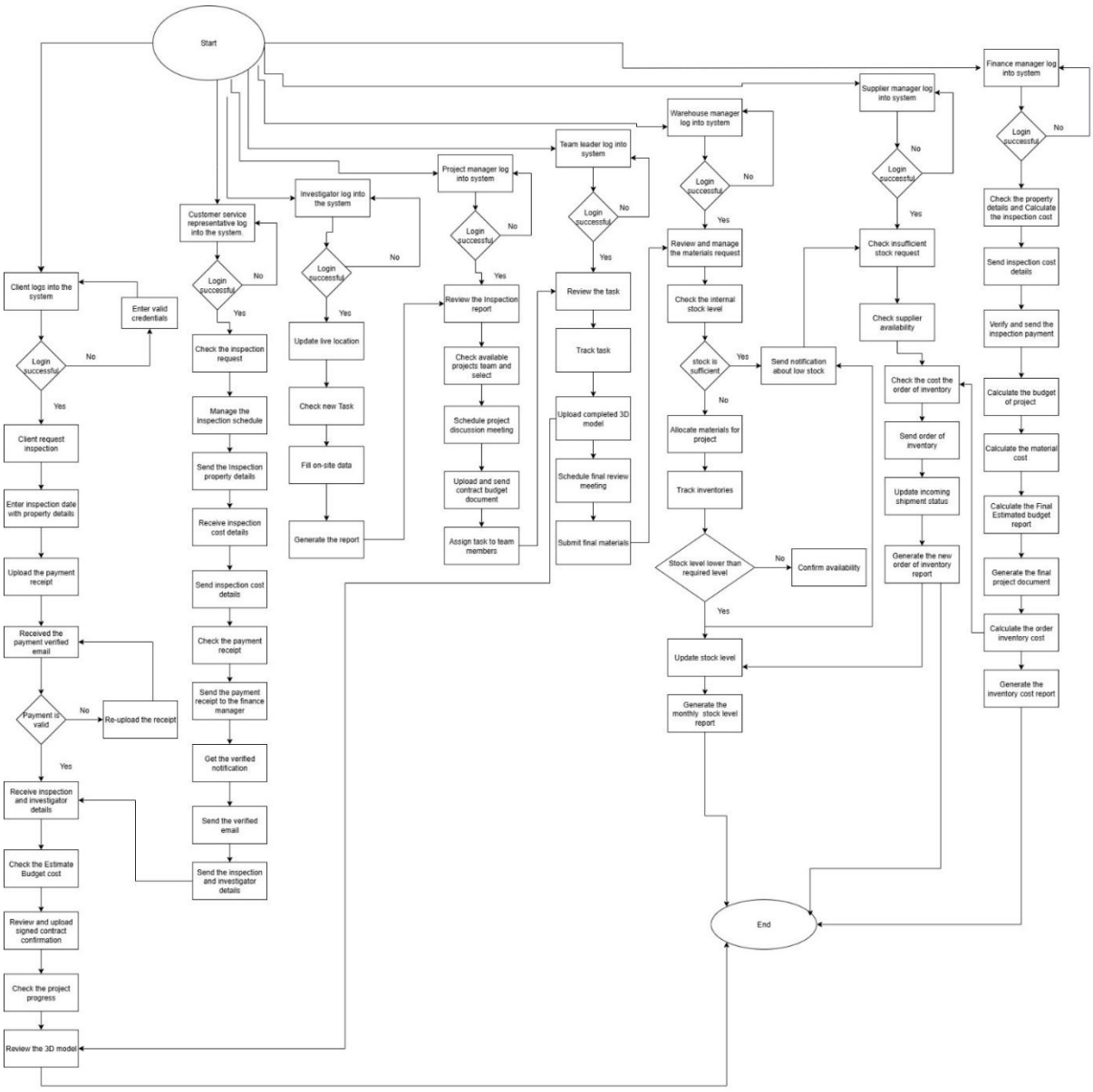

Figure 10 Component Diagram - Process Flow Diagram

Link - [flow chart.jpg]

3.4 Database Design – Normalized Schema

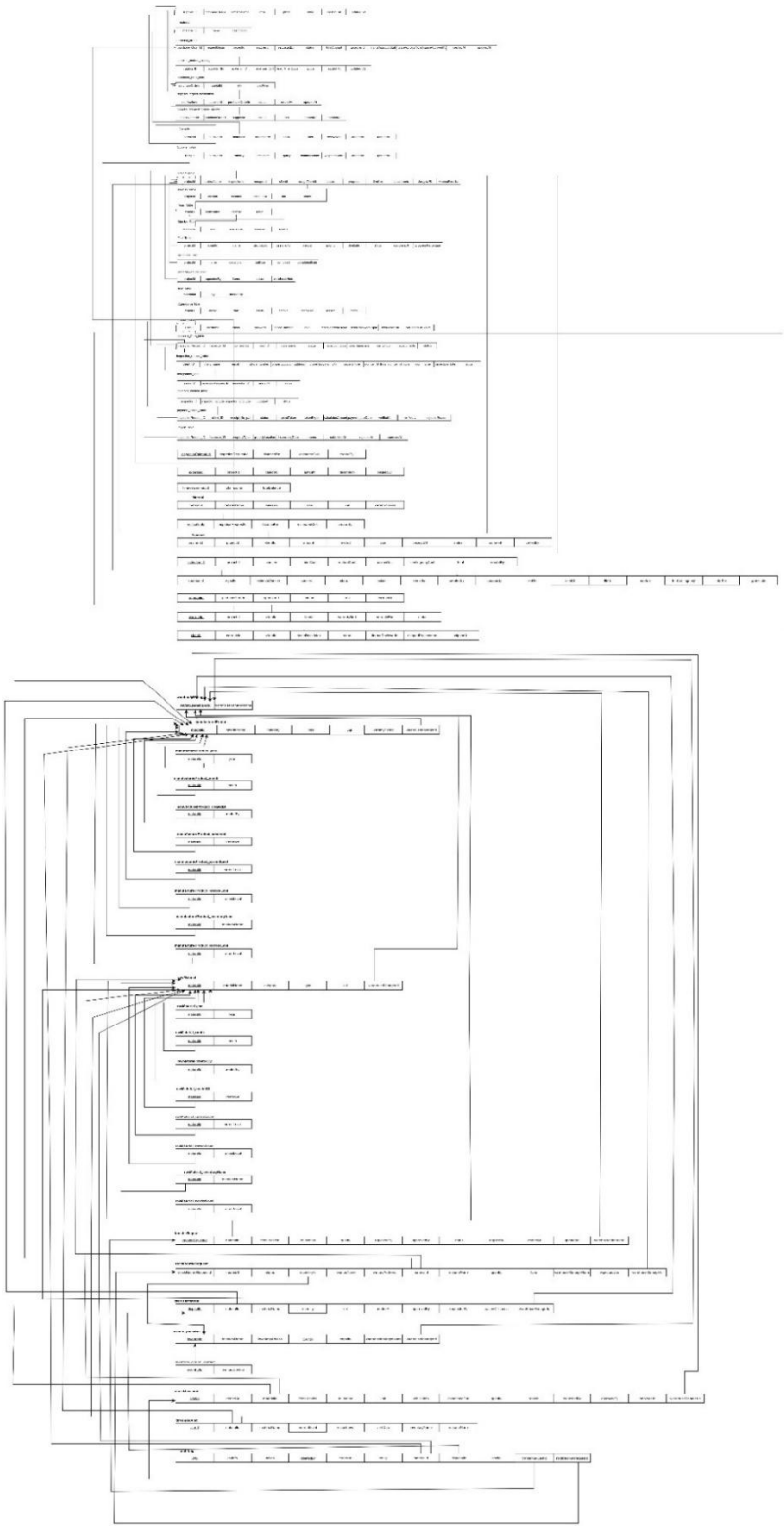

Figure 11 Normalized Schema

Link - NormalizedSchema.jpg (If the image is not clear yet - NormalizedSchema2.drawio)

3.5 Workflow Diagram – Flowchart Diagram

3.5.1 Authentication & Authorization

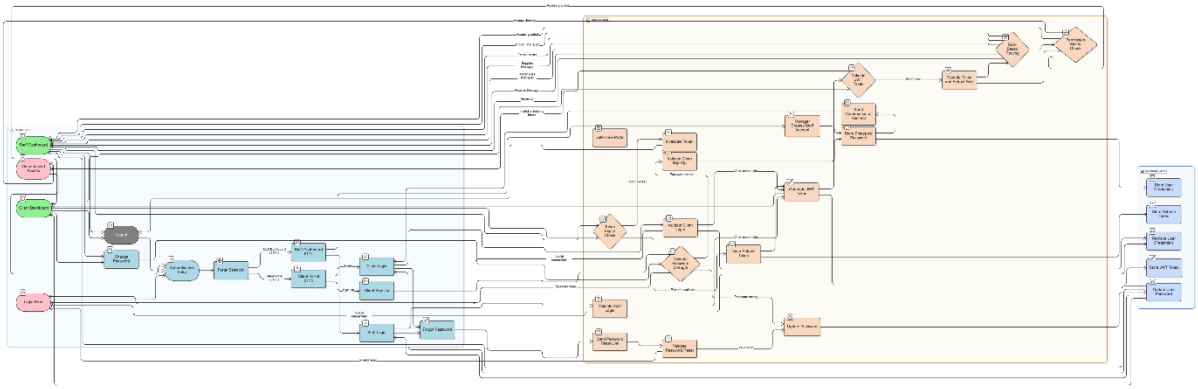

Figure 12 Flowchart - Authentication & Authorization

Link - Flowchart_user.png

3.5.2 Inspection Management

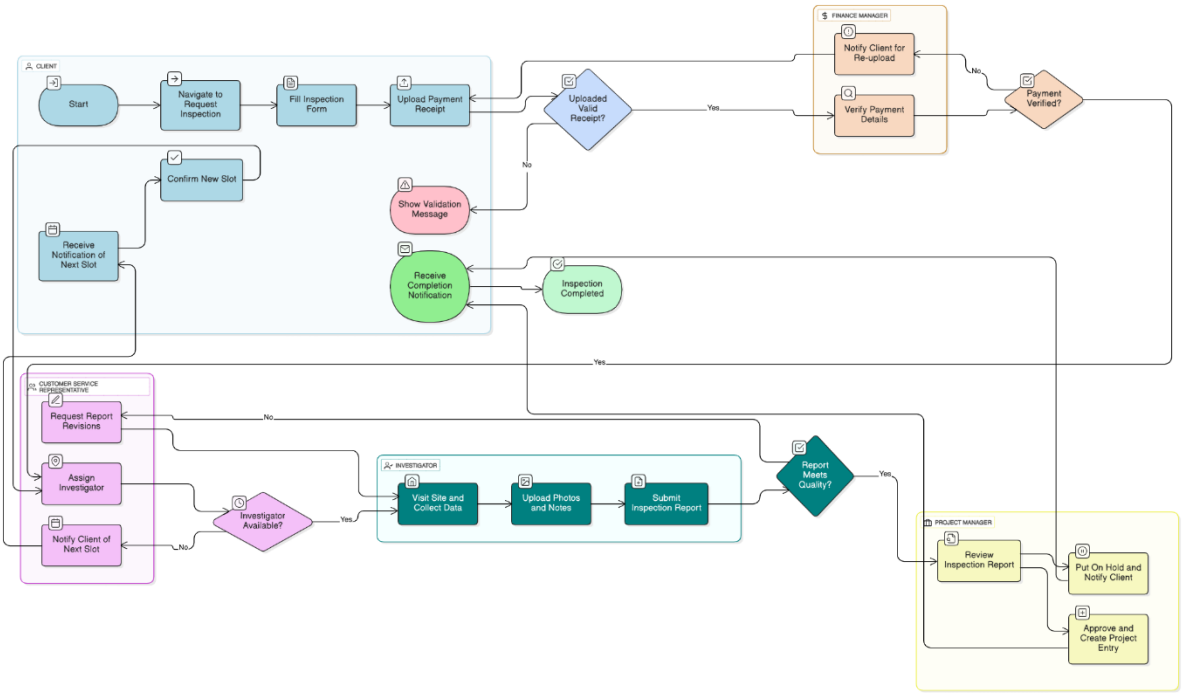

Figure 13 Flowchart - Inspection Management

Link - inspection_flow.png

3.5.3 Project Management

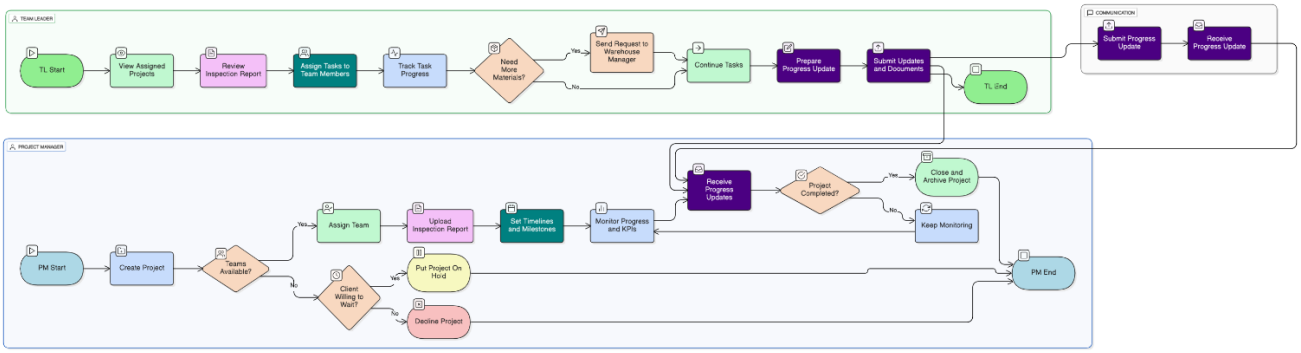

Figure 14 Flowchart - Project Management

Link - [flowchart_projectManager.png]

3.5.4 Warehouse Management

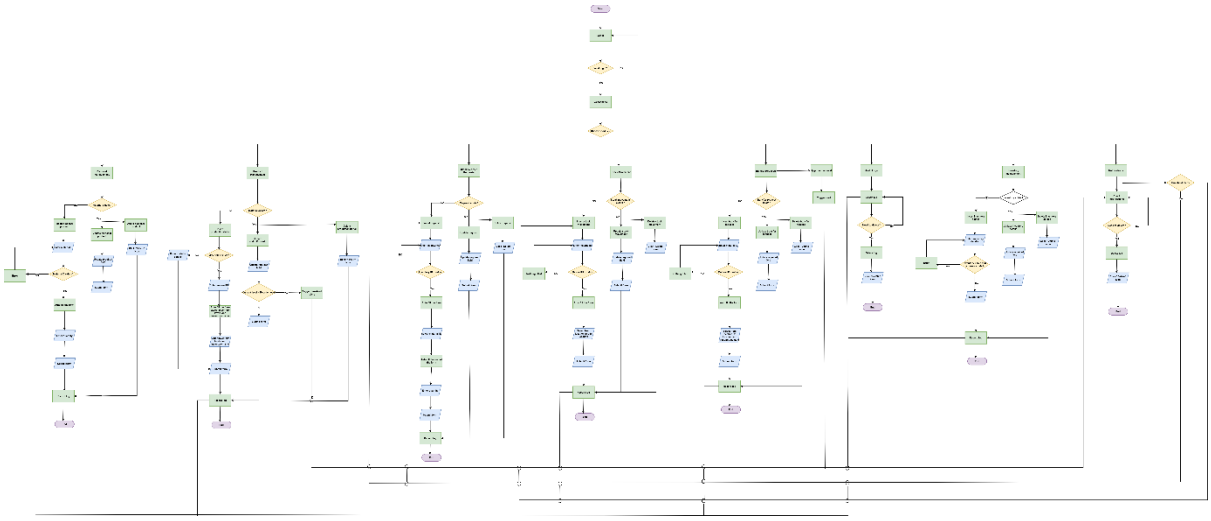

Figure 15 Flowchart - Warehouse Management

Link - [Warehouse ER-Page-4.drawio.png]

3.5.5 Supplier Management

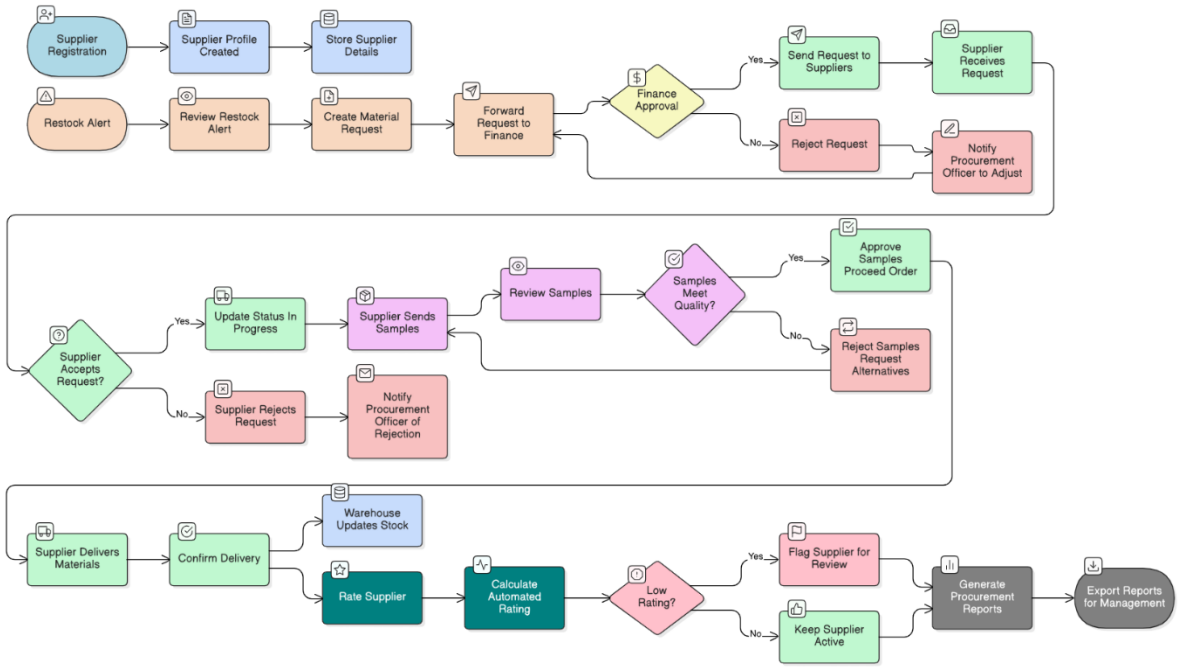

Figure 16 Flowchart - Supplier Management

Link - [flowchart_Supplier.png]

3.5.6 Finance Management

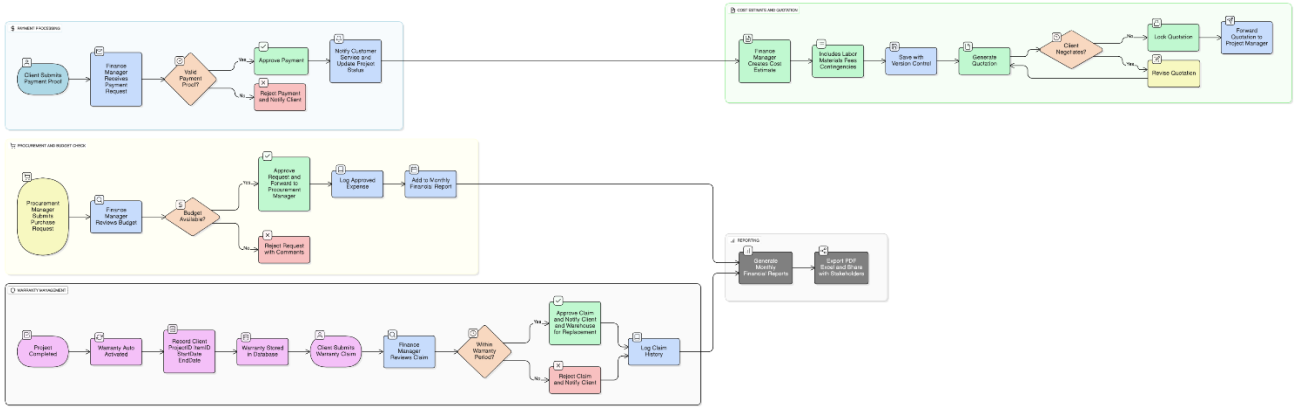

Figure 17 Flowchart - Finance Management

Link - [flowchart_finance.png]

3.6 Development Tools

The development of **DesynFlow** was carried out using a modern full-stack JavaScript environment to ensure high scalability, maintainability, and flexibility. The system follows a **Layered Modular Monolith architecture**, combining both frontend and backend in a unified yet structured setup, with clear separation of concerns.

For the **frontend**, the team used **React.js** to build an interactive and responsive user interface, supported by **TailwindCSS** for efficient styling and layout design. **Axios** was used to handle HTTP requests between the frontend and backend, ensuring seamless API communication and real-time data updates.

The **backend** was developed using **Node.js** and **Express.js**, enabling the creation of RESTful APIs that connect the client with the database. **JWT (JSON Web Tokens)** was implemented for secure authentication and authorization, while **Mongoose** served as the Object Data Modeling (ODM) tool for managing MongoDB collections with schema-based validation.

The **database layer** utilized **MongoDB**, hosted as a **cloud cluster** for production and accessed through **Dockerized instances** for local testing. This setup allowed each developer to work independently while maintaining consistent configurations across environments.

For **version control**, **Git and GitHub** were used, following a clear **branching strategy** to manage individual contributions and ensure smooth integration during collaborative development. **Jira** was used for **Agile project management**, helping the team organize tasks, plan sprints, and track progress efficiently.

Additional supporting tools included **Postman** for API testing and validation, **Docker** for containerized deployment, **Eraser.io** for architecture and workflow diagrams, and **Figma** for UI/UX prototyping and design visualization.

This combination of tools provided a cohesive development ecosystem that supported continuous integration, efficient debugging, and smooth collaboration throughout the project lifecycle.

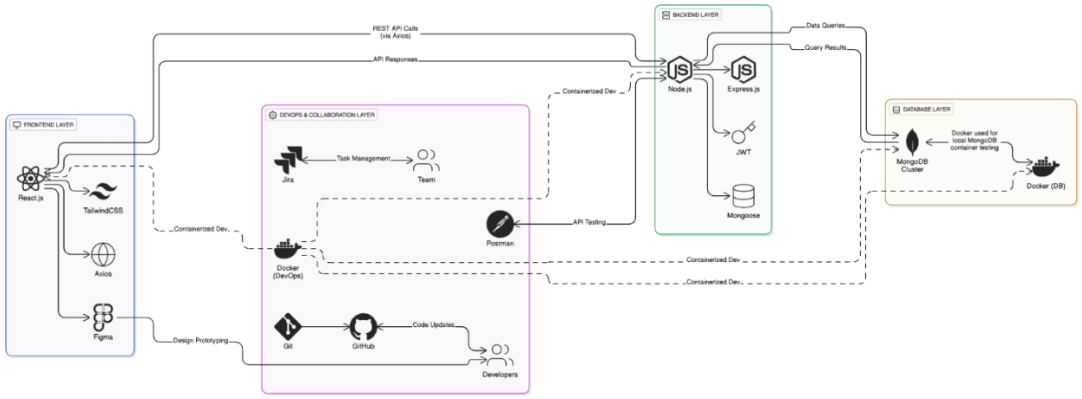

Figure 18 Development tool diagram

Link - Tool_diagram.png

4 Chapter 4 – Testing

4.1 Testing Approach

Describe **how** testing was carried out (methods, tools, and environments).
Include:

- **Type of testing** performed:
  - Unit Testing (e.g., Jest for backend services)
  - Integration Testing (API + database)
  - UI Testing (frontend interactions)
  - Acceptance Testing (against user requirements)
- **Testing tools used:**
  - Postman (for REST API testing)
  - Jest / Mocha (for backend logic testing)
  - Browser DevTools (for frontend validation)
  - MongoDB Compass (for database verification)
- **Environment:**
  - Dockerized environment using Node.js + React + MongoDB
  - Example: Node 22.17.1, MongoDB 8.0.12, React 18

4.2 Acceptance Criteria

Table 4-1 Acceptance Criteria

Module	Acceptance Criteria	Status
Authentication & Authorization	Users can register, log in, and access only permitted modules using JWT.	Passed
Project Management	Team leaders can create, update, and view their assigned projects only.	Passed
Inspection Management	Inspectors can log reports and upload files successfully.	Passed
Supplier Management	Procurement team can request materials, and suppliers can respond.	Passed
Warehouse Management	Stock requests update inventory and trigger restock alerts if below threshold.	Passed
Finance & Warranty	Payment approvals and warranty claim tracking function as expected.	Passed

4.3 Test Cases

4.3.1 Authentication & Authorization

Table 4-2 Authentication Test Cases

Test Case ID	Module	Test Scenario	Preconditions	Test Steps	Expected Result
AUTH-01	Authentication	User registration with valid data	User not registered	1. Go to signup page 2. Enter valid email, NIC, password, phone 3. Submit form	User account created successfully; confirmation/respons e message shown
AUTH-02	Authentication	User registration with duplicate email	Email already exists in DB	1. Try registering with existing email 2. Submit form	System shows "Email already exists" error
AUTH-03	Authentication	User login with valid credentials	User already registered	1. Enter correct email & password 2. Submit	Login successful, JWT token generated, redirect to dashboard
AUTH-04	Authentication	User login with wrong password	User exists	1. Enter valid email but wrong password 2. Submit	Error message "Invalid credentials" shown, login denied

AUTH -05	Authentication	Session expiration	User logged in	1. Login successfully 2. Wait until token expiry time 3. Try accessing dashboard	System auto-logs out, redirect to login
AUTH -06	Authorization	Role-based dashboard access	User with role = Team Leader	1. Login as Team Leader 2. Try accessing Finance Manager dashboard URL directly	Access denied (403 Forbidden)
AUTH -07	Authorization	Unauthorized API call	User not logged in	1. Directly call /api/project s without JWT token	API returns 401 Unauthorized
AUTH -08	Password Security	Change password with old password	User logged in	1. Enter old password + new password 2. Submit	Password updated, user notified
AUTH -09	Logout	User logs out	User logged in	1. Click logout button 2. Confirm action	JWT/session invalidated, redirect to login

4.3.2 Inspection Management

Table 4-3 Inspection Test Cases

Test Case ID	Module	Test Scenario	Preconditions	Test Steps	Expected Result
INSP-01	Inspection	Submit inspection request	Client logged in	1. Fill inspection form (property details, site location, floors, etc.) 2. Upload payment proof 3. Submit	Inspection request created, finance notified
INSP-02	Inspection	Invalid property details	Client logged in	1. Leave mandatory fields empty (e.g., site location) 2. Submit	Validation error shown "Site location required"
INSP-03	Inspection	Floor/Room preference handling	Client selects 3 floors	1. Enter number of floors = 3 2. Fill form for floor 1 and add multiple rooms 3. Save & continue	System generates forms for each floor with room preferences
INSP-04	Inspection	Add duplicate room preferences	Client adds room2 same as room1	1. Add room1 details 2. Click "+" duplicate button for room2 3. Submit	Room2 inherits preferences of room1 (with option to override size/photos)

INSP-05	Inspection	Remove a room preference	Client added multiple rooms	1. Add 3 rooms 2. Remove room2 3. Submit	Room2 deleted, only room1 & room3 stored
INSP-06	Inspection	Save progress mid- way	Client filling form	1. Fill partial details for floor1 2. Click “Save” 3. Reopen form	Saved data is restored for editing
INSP-07	Inspection	Inspector receives assignment	CSR assigns inspector	1. CSR assigns inspector to new request 2. Inspector logs in	Inspector dashboard shows assigned request
INSP-08	Inspection	Inspector uploads report	Inspector logged in	1. Inspector uploads on-site photos & notes 2. Submit report	Report visible to Project Manager for review
INSP-09	Inspection	Invalid file upload	Inspector logged in	1. Upload non-image file in photo section 2. Submit	Validation error “Invalid file type”
INSP-10	Inspection	Finance approval workflow	Client submitted payment proof	1. Finance Manager reviews payment 2. Approve/Reject	Status updated, client notified

4.3.3 Project Management

Table 4-4 Test Cases for project Management

Test Case ID	Module	Test Scenario	Preconditions	Test Steps	Expected Result
PM-01	Project Management	Verify project creation by Project Manager	User logged in as Project Manager; at least one inspection approved	1. Navigate to "Create Project" page 2. Fill in project name, client, and deadline 3. Assign a team and click "Create"	New project is saved in the database and visible in Project Manager dashboard
PM-02	Project Management	Verify team assignment to project	A project exists; teams are already registered	1. Open project details 2. Select "Assign Team" 3. Choose team leader and members 4. Click "Save Assignment"	Team assigned successfully; notification sent to assigned members
PM-03	Project Management	Verify project details update	Project must exist	1. Open project details 2. Click "Edit Project" 3. Modify project deadline or description 4. Click "Update"	Changes are saved and reflected in dashboard

PM-04	Project Management	Verify task creation by Team Leader	Project assigned to Team Leader	1. Navigate to “Tasks” tab 2. Click “Add Task” 3. Enter task name, weight, and deadline 4. Click “Create Task”	Task is successfully created and appears in team task list
PM-05	Project Management	Verify project progress calculation	At least one task exists with progress updates	1. View “Project Progress” dashboard 2. System auto-calculates percentage from completed tasks	Progress bar updates accurately based on task completion
PM-06	Project Management	Verify project status update (Active → Completed)	All project tasks are completed	1. View project dashboard 2. Check if system auto-updates status or manually change to “Completed”	Project marked as Completed successfully
PM-07	Project Management	Verify access control for Project Manager	Multiple roles exist in the system	1. Login as Project Manager 2. Try to access another module (e.g., Finance)	Access denied; only authorized routes are accessible
PM-08	Project Management	Verify project view by Team Leader	Team assigned to at least one project	1. Login as Team Leader 2. Navigate to “My Projects”	Only projects assigned to that Team Leader are visible

PM-09	Project Management	Verify deletion of a project	Project exists and user has admin privileges	1. Select a project 2. Click “Delete Project” 3. Confirm deletion	Project removed from system and database
PM-10	Project Management	Verify integration between Project and Task modules	Both modules implemented	1. Create project 2. Assign tasks 3. Update task completion 4. Check project overview	Project progress reflects accurate task completion percentage

4.3.4 Warehouse Management

Table 4-5 Test cases for Warehouse Management

Test Case ID	Feature	Pre-condition	Steps	Expected Result
TC01	Add new manufactured product	Logged in as a warehouse manager	1. Go to manufactured product page 2. Click “Add Product” 3. Select “New Product” as product type 4. Enter the details of the manufactured product 5. Click “Add Product”	New manufactured product is added with a new material ID.
TC02	Add existing manufactured product	Logged in as a warehouse manager	1. Go to manufactured product page 2. Click “Add Product” 3. Select “Existing Product” as product type 4. Enter the details of the manufactured product 5. Click “Add Product”	Existing manufactured product is added with an existing material ID.
TC03	Update manufactured product details	Logged in as a warehouse manager	1. Go to manufactured products page 2. Click “Update Product” 3. Update details of the location 4. Click “Update Product”	Updated details are added and visible along with the material ID
TC04	Add new raw material	Logged in as a warehouse manager	1. Go to raw materials page 2. Click “Add Product” 3. Select “New Product” as product type 4. Enter the details of the raw material 5. Click “Add Product”	New raw material is added with a new material ID.
TC05	Add existing raw material	Logged in as a warehouse manager	1. Go to raw material page 2. Click “Add Product” 3. Select “Existing Product” as product type 4. Enter the details of the raw material 5. Click “Add Product”	Existing raw material is added with an existing material ID.
TC06	Update raw material details	Logged in as a warehouse manager	1. Go to raw materials page 2. Click “Update Product”	Updated details are added and visible along with the material ID

			3. Update details of the location 4. Click “Update Product”	
TC07	Add new inventory location	Logged in as a warehouse manager	1. Go to inventory location page 2. Click “Add Location” 3 Enter the details of the inventory location 3. Click “Add Location”	Inventory location is added and visible in inventory list
TC08	Update inventory location details	Logged in as a warehouse manager	1. Go to inventory location page 2. Click “Update Location” 3. Enter the details of the inventory location 4. Click “Update Location”	Inventory location is updated and visible in inventory list
TC09	Add new stock movement	Logged in as a warehouse manager	1. Go to stock movement page 2. Click “Add Movement” 3. Enter the details of the stock movement 4. Click “Add Movement”	Stock movement is added and visible in the list
TC10	Update stock movement	Logged in as a warehouse manager	1. Go to stock movement page 2. Click “Update Movement” 3. Enter the details of the stock movement 4. Click “Update Movement”	Updated stock movement details are added and visible in the list
TC11	Add new transfer request	Logged in as a warehouse manager	1. Go to transfer request page 5. Click “Add Request” 6. Enter the details of the transfer request 5. Click “Add Request”	Transfer request is added and visible in the list with “Pending” status
TC12	Update transfer request	Logged in as a warehouse manager	1. Go to transfer request page 2. Click “Update Request” 3. Enter the details of the transfer request 4. Click “Update Request”	Updated details of transfer request are visible in the list
TC13	Add new stock reorder request	Logged in as a warehouse manager	1. Go to stock reorder request page 2. Click “Add Request” 3. Enter the details of the stock reorder request 4. Click “Add Request”	New stock reorder request is added and visible in the stock reorder request list

				with “Pending” status
TC14	Update stock reorder request	Logged in as a warehouse manager	1. Go to stock reorder request page 2. Click “Update Request” 3. Enter the details of the stock reorder request 4. Click “Update Request”	Updated stock reorder request is visible in the stock reorder request list
TC15	Add new disposal material	Logged in as a warehouse manager	1. Go to disposal material page 2. Click “Add Material” 3. Enter the details of the disposal material 4. Click “Add Material”	Disposal material is added and visible in the list
TC16	Update disposal material	Logged in as a warehouse manager	1. Go to disposal material page 2. Click “Update Material” 3. Enter the details of the disposal material 4. Click “Update Material”	Updated details of disposal material are added
TC17	Update audit log	Logged in as a warehouse manager	1. Insert/update/delete details of a manufactured product/raw material/stock movement/transfer request/stock movement/disposal materials lists	Changes made to the specific lists are recorded
TC18	Receive threshold alerts	Logged in as a warehouse manager	1. Go to manufactured materials/raw materials page 2. Click “Update” icon 3. Update the current level equal or lower than the reordering level 4. Click “Update material”	Receive a notification in the notifications page

TC19	Receive notifications	Logged in as a manager	1. Approves transfer request	Receive notification in the notifications page when the manager approves the request
TC20	Download PDF	Logged in as a warehouse manager	1. Navigate to the required page 2. Click on “Download” icon	PDF is downloaded

4.3.5 Supplier Management

Table 4-6 Test Cases for supplier management

Test Case ID	Feature	Test Scenario	Preconditions	Test Steps	Expected Result
SUP-001	Supplier Registration	Register a new supplier	Procurement officer logged in	1. Go to "Register Supplier" 2. Enter company details, material types, delivery regions 3. Submit	Supplier is saved in database and visible in supplier list
SUP-002	Supplier Registration	Attempt duplicate supplier registration	Supplier already exists	1. Enter same company name and contact info 2. Submit	System rejects with "Supplier already exists" error
SUP-003	Restock Alert	Receive restock alert	Inventory below threshold	1. System triggers low stock alert 2. Procurement officer views notification	Procurement officer receives restock alert on dashboard
SUP-004	Material Request	Create material request	Procurement officer logged in	1. Create material request with item, quantity, deadline 2. Submit	Material request is created with "Pending Finance Approval" status
SUP-005	Finance Approval	Approve purchase request	Finance manager logged in	1. View pending requests 2. Approve with comments	Request status updated to "Approved" and forwarded to supplier

SUP-006	Finance Approval	Reject purchase request	Finance manager logged in	1. View pending requests 2. Reject with reason	Request marked as “Rejected” and procurement notified
SUP-007	Supplier Notification	Supplier receives request	Supplier account exists	1. Supplier logs in 2. Check dashboard	Supplier sees request details with item, qty, deadline
SUP-008	Request Status Update	Supplier updates request	Request assigned to supplier	1. Supplier updates status to “In Progress” / “Dispatched”	Status updated and procurement notified
SUP-009	Sample Submission	Supplier submits material sample	Request requires sample	1. Supplier uploads sample details 2. Submit	Sample is stored and visible to procurement for review
SUP-010	Sample Approval	Approve or reject sample	Procurement logged in	1. Open submitted sample 2. Approve / Reject	Status updated accordingly, supplier notified
SUP-011	Delivery Confirmation	Procurement confirms delivery	Supplier marked “Delivered”	1. Procurement officer reviews delivered items 2. Confirms delivery	Stock updated in warehouse, request closed
SUP-012	Supplier Rating	Rate supplier performance	Completed order exists	1. Procurement officer opens supplier profile 2. Enter rating for timeliness, quality, communication	Rating saved and performance report updated
SUP-013	Automated Rating	System calculates average rating	Supplier has multiple ratings	1. System runs scheduled job 2. Compute weighted score	Supplier profile updated with calculated rating

SUP-014	Flag Low-Rated Supplier	System flags poor suppliers	Supplier rating < 2.5	1. System checks ratings 2. Flags low-rated supplier	Supplier appears in flagged list for review

4.3.6 Finance & Warranty Management

Finance Management

Table 4-7 Finance Management Test cases

Test Case ID	Test Scenario	Test Steps	Test Data	Expected Result	Status
FM-01	Calculate inspection estimate	1.Submit a project request from client. 2. Trigger inspection estimate calculation.	Client location, project details, standard rate	System calculates inspection cost based on distance and standard rate	Pass/Fail
FM-02	Create budget estimate	1. Receive inspection data. 2. Enter labor, material, service, contingency costs. 3. Save budget estimate.	Labor, material, service, contingency values	Budget estimate is saved and linked to the project	Pass/Fail
FM-03	Approve and lock budget	1. Send budget to Project Manager. 2. Project Manager approves the budget. 3. Try editing locked budget.	Approved budget	System locks the budget and prevents changes	Pass/Fail
FM-04	Record project expenses	1. Enter project-related expense. 2. Link expense to project.	Expense amount, project ID	Expense is recorded and tracked under the project	Pass/Fail

FM-05	Verify client payments	1. Enter client payment. 2. Match payment to outstanding balance.	Payment receipt	System verifies payment against balance and updates record	Pass/Fail
FM-06	Generate financial reports	1. Request monthly summary or profit-and-loss report.	Project data, payments, expenses	System generates report instantly with correct data	Pass/Fail
FM-07	Approve/reject material purchase	1. Submit purchase request. 2. Finance Manager approves/rejects.	Purchase request details	Request is approved or rejected, recorded in audit log	Pass/Fail
FM-08	Audit log tracking	1. Perform budget creation, expense entry, or approval. 2. Review audit log.	Action data	System logs actions with comments and timestamp; log is tamper-proof	Pass/Fail

Warranty Management

Table 4-8 warranty management Test cases

Test Case ID	Module	Test Scenario	Preconditions	Test Steps	Expected Result
WAR-001	Warranty Management	Verify automatic warranty initiation	Project must be marked as completed	1. Mark project as completed 2. Check warranty records	Warranty auto-created with correct start date and project link
WAR-002	Warranty Management	Validate warranty claim submission	Warranty must exist for the project	1. Open "Submit Claim" page 2. Enter issue details 3. Submit form	New claim created and unique claim ID generated
WAR-003	Warranty Management	Verify warranty claim search functionality	One or more claims must exist	1. Open "Claims" page 2. Search by client or project ID	Matching warranty claims displayed in results
WAR-004	Warranty Management	Validate claim approval workflow	Claim must be submitted and pending	1. Open claim 2. Click "Approve" 3. Add comment	Claim status updated to "Approved" and notifications triggered
WAR-005	Warranty Management	Verify claim rejection process	Claim must be in pending state	1. Open claim 2. Click "Reject" 3. Enter reason	Claim status updates to "Rejected" and client notified

WAR-006	Warranty Management	Check notification trigger for approved claims	Notification service active	1. Approve a claim 2. Check client and warehouse notifications	Email/in-app notifications received successfully
WAR-007	Warranty Management	Verify warranty search by item	Warranties exist for multiple items	1. Go to “Warranty List” 2. Search by item name	Displays warranties related to searched item
WAR-008	Warranty Management	Validate audit log entries for warranty actions	User must have Manager role	1. Approve or reject a claim 2. View activity log	Audit entry recorded with timestamp and user info
WAR-009	Warranty Management	Verify secure warranty data access	Unauthorized user logged in	1. Attempt to open warranty record	Access denied and “Unauthorized” message shown
WAR-010	Warranty Management	Verify backup and recovery of warranty data	Backup process configured	1. Simulate data loss 2. Perform system restore	All warranty data recovered successfully

5 Chapter 5 – Evaluation and Conclusion

5.1 Evaluation

The *DesynFlow Interior Design Management System* was thoroughly tested to verify its reliability, security, usability, and accuracy across all major modules — including User Authentication & Authorization, Inspection Management, Project Management, Supplier Management, Procurement Dashboard, Finance & Warranty Management, and Warehouse Management. Each module underwent multiple test scenarios, combining both functional and non-functional testing approaches to ensure compliance with the system's objectives and requirements.

5.1.1 User Authentication and Authorization

The authentication module was evaluated to ensure secure and controlled user access. Test cases confirmed that registration, login, logout, and password change functionalities worked correctly. The system accurately prevented duplicate registrations and invalid credentials, displayed appropriate validation messages, and restricted unauthorized access to protected routes. Session management was validated to ensure users' login states were maintained securely. These results confirmed that authentication and authorization met the expected data protection and access control standards.

5.1.2 Inspection Management

The Inspection Management module, handled mainly by Customer Service Representatives and Inspectors, was tested for end-to-end workflow accuracy — from client inspection requests to on-site report uploads. Functional tests confirmed that clients could successfully submit inspection requests, view payment updates, and track live inspector locations. The Customer Service Representative was able to assign available inspectors efficiently, while inspectors updated their progress and uploaded reports. Validation mechanisms prevented incomplete submissions, and notification triggers performed as intended. Overall, inspection workflows operated smoothly, enabling real-time coordination between clients, staff, and inspectors.

5.1.3 Project Management

The Project Management module was tested for functionality, accuracy, and performance across different roles. Project Managers were able to create new projects, assign teams, and monitor ongoing progress through visual dashboards. Team Leaders could create, update, and track task completion statuses, while the system automatically calculated project progress percentages. Role-based visibility was confirmed — each Team Leader could only view and manage projects assigned to them. Integration with task and inspection data worked correctly, providing synchronized and consistent project progress tracking. The module's interface supported quick navigation and clear status updates, confirming its reliability and user-friendliness.

5.1.4 Supplier Management and Procurement Dashboard

The Supplier Management and Procurement modules were tested comprehensively to validate data accuracy, workflow consistency, and real-time system updates.Supplier registration, request creation, and approval workflows were executed successfully. The supplier rating logic accurately calculated performance based on timeliness, quality, and communication factors. Notifications and logs worked

correctly, ensuring traceability and accountability.The Procurement Dashboard displayed real-time supplier and material request data, confirming proper system integration and secure role-based access. Users appreciated the responsive design and clear layout, enabling efficient operational oversight. Feedback from Procurement Officers and Finance Managers confirmed that the modules improved coordination, reporting, and supplier transparency.

5.1.5 Finance Management

The Finance Management module was evaluated for financial accuracy, transparency, and audit compliance. All financial workflows — including budget estimation, quotation generation, and payment tracking — functioned correctly. The financial dashboard loaded real-time project budgets and cost summaries, while approval workflows and version control ensured data integrity. Notifications and secure record handling were validated, preventing unauthorized access and maintaining financial accountability. The system successfully generated accurate and auditable reports, supporting decision-making and compliance needs.

5.1.6 Warranty Management

The Warranty Management module was tested to verify proper warranty tracking, claim submission, and approval processing. Automatic warranty initiation upon project completion was validated, and clients could submit claims seamlessly. Claim processing and notifications to clients and warehouse managers were handled as expected, ensuring transparency and responsiveness. Audit logs and access controls demonstrated high reliability and security, confirming compliance with operational and data traceability requirements.

5.1.7 Warehouse Management

The Warehouse Management System was tested to ensure efficient inventory operations, approval workflows, and data accuracy. Stock levels updated correctly in real-time following approved or rejected requests. Threshold alerts, notifications, and logging mechanisms functioned accurately, ensuring smooth communication between departments. The dashboard dynamically visualized analytics after every stock change, while reporting and export functionalities worked correctly. Validation checks prevented invalid inputs, and performance testing confirmed that the system remained stable under concurrent operations.

5.1.8 User and Stakeholder Feedback

Feedback sessions were conducted with representative users, including Project Managers, Team Leaders, Finance Managers, Warehouse Managers, and Clients. Users praised the system’s clean interface, real-time data visibility, and smooth inter-department coordination. Finance Managers highlighted improved transparency in financial workflows; Warehouse Managers noted efficiency in stock and request handling; Inspectors and Team Leaders appreciated live tracking and streamlined task management. Overall, stakeholders agreed that DesynFlow significantly improved operational efficiency, communication, and accountability across departments.

5.2 Conclusion

The main aim of *DesynFlow* was to design and implement a unified digital platform to streamline operations across the entire interior design project lifecycle — from inspection and project planning to supplier coordination, finance tracking, and warranty management.

Based on the comprehensive testing results and user feedback, it can be concluded that the system achieved its intended objectives successfully. Each module performed as designed, integrating seamlessly with others to create a complete, synchronized workflow.

- **Authentication & Authorization** ensured secure, role-based access and reliable data protection.
- **Inspection Management** improved coordination between clients, inspectors, and staff, reducing manual scheduling delays.
- **Project Management** provided effective task tracking and progress visualization, enabling Project Managers to oversee operations efficiently.
- **Supplier and Procurement Modules** enhanced transparency and accountability in supplier coordination and material handling.
- **Finance Management** ensured accurate budgeting, version-controlled quotations, and secure payment tracking.
- **Warranty Management** automated warranty creation and claim processing, improving client trust and after-service reliability.
- **Warehouse Management** provided real-time stock tracking, threshold alerts, and transparent approval processes, reducing waste and delays.

In conclusion, DesynFlow successfully met all functional and non-functional objectives, providing an end-to-end solution for interior design management. It enhances transparency, communication, and accountability across departments, creating a modern, efficient, and scalable workflow. The project demonstrates how integrating technology, automation, and collaborative tools can transform traditional design and construction workflows into an intelligent, unified management ecosystem.

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Appendix A

Table 0-1 Appendix A – Implemented modules

Member	Contribution
Helitha Y M Y IT 23 5883 32	• Implement Project Management Module • Implement features to create project based on inspection report submitted • Implement feature to create and manage teams • Implement Kanban style board for task management • Implement feature to schedule meeting with client • Implement Report generation for project weekly and also a Final Report • Implement 3D model rendering • Implement Project Manager, Team Leader and Team member dashboard
Inothma Y M A IT 23 5485 96	• Implement Authentication and Authorization Module • Implement Inspection Management Module • Implement features to User Registration and Login functionalities using JWT authentication. • Implement feature to User Logout and session handling to ensure secure sign-out and token invalidation. • Implement User profile management allowing users to view and update their personal details. • Implement feature to email verification and password reset for enhanced account security. • Implement features to inspection request form for client to request inspections. • Implement feature to customer service representative dashboard functionality to manage and assign inspectors for each request. • Implement feature to inspector availability management handled manually by customer service representative through the dashboard • Implement feature to create, read, update and delete to inspection form to fill the inspection details.

	• Implement features to update inspector live location. • Implement feature to handle the inspection payment and payment details. • Implement Report generation for completed inspection details to submit the project manager. • Implement client, customer service representative and inspector dashboard
U A K Lakshan IT 23 6947 12	• Supplier Registration & Profile Management – Register new suppliers with company name, contact info, material categories, and delivery regions. • Material Request Handling – Procurement officers can raise material requests and assign them to suppliers. • Quotation & Sample Submission – Suppliers can upload quotations and sample files for approval. • Sample Verification Workflow – Supplier management team can approve or reject submitted samples with remarks. • Supplier Rating System – System automatically calculates supplier performance based on quality, timeliness, and communication scores. • Dashboard Analytics – Procurement officers can view supplier statistics, ratings, and approval history. • Notifications & Activity Logs – Email and system notifications for request approvals, rejections, and sample updates.
Madhumal A A IT 23 7353 92	• Quotation & Cost Estimation – Generate, revise, and approve cost estimates for each project. • Payment Management – Track client payments, pending balances, and transaction history. • Financial Approvals Workflow – Finance managers approve or reject material requests and purchase orders before execution. • Budget & Expense Tracking – Monitor project budgets, expenses, and maintain audit logs for transparency.

	• Financial Reporting – Export detailed cost summaries, payment logs, and financial statements in PDF/Excel format. • Notification System – Alerts for pending approvals, overdue payments, and updated financial records. • Secure Record Maintenance – Role-based access for sensitive financial data and version-controlled record management. • Automatic Warranty Activation – System automatically generates warranty records upon project completion. • Warranty Claim Submission – Clients can submit warranty claims linked to their project or specific items. • Claim Review & Approval Workflow – Finance manager and warehouse manager can jointly verify and approve claims. • Warranty Tracking Dashboard – Filter and monitor active, expired, and pending claims in real-time. • Audit Logs & History – Record all claim actions with timestamps and responsible user details for traceability. • Notification & Communication – Automatic client notifications on claim status updates. • Report Generation – Export warranty reports for management or audit purposes.
Ranepura R D L S I IT 23 7729 22	• Implement Inventory Management module • Implement feature to view real-time inventory dashboard • Implement feature to approve or reject material requests • Implement feature to perform manual stock adjustments • Implement feature to set stock threshold levels and generate stock alerts • Implement feature to track and view stock usage history • Implement feature to manage disposal of damaged materials • Implement notification system for low stock levels and approvals

	• Implement PDF generation for all tables

Appendix B

Table 0-1 Appendix B – Individual contribution to final report

Member	Contribution
Helitha Y M Y IT 23 5883 32	• Literature Review • Contribute to methodology • Stakeholder Analysis • System Architecture Diagram • Functional, Non-Functional Requirements of Project Management • Flowchart of Project Management • Component diagram of Project Management • Finalizing and Formatting Final Report
Inothma Y M A IT 23 5485 96	• Background • Contribute to methodology • Process Flow chart • Functional, Non-Functional Requirements of Inspection Management and Authentication & Authorization • Flowchart of Inspection Management Authentication & Authorization • Component diagram of Inspection Management Authentication & Authorization
U A K Lakshan IT 23 6947 12	• Methodology • Aim & Objectives • Tool Diagram • Functional, Non-Functional Requirements of Supplier Management • Flowchart of Supplier Management • Component diagram of Supplier Management
Madhumal A A IT 23 7353 92	• Problem and Motivation • Contribute to methodology • Use case diagram • Functional, Non-Functional Requirements of Finance & Warranty Management

	• Flowchart of Finance & Warranty Management • Component diagram of Finance & Warranty Management
Ranepura R D L S I IT 23 7729 22	• Solution Overview • Contribute to methodology • Drawing Normalized schema • Functional, Non-Functional Requirements of Warehouse Management • Flowchart of Warehouse Management Component diagram of Warehouse Management