Interior Design Management System

(DesynFlow)

Information Technology Project (IT2080)

Group ID:

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Group Details:

Campus : Malabe

Group Number : ITP25_B2_46

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

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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.

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.

Aim and Objectives

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.

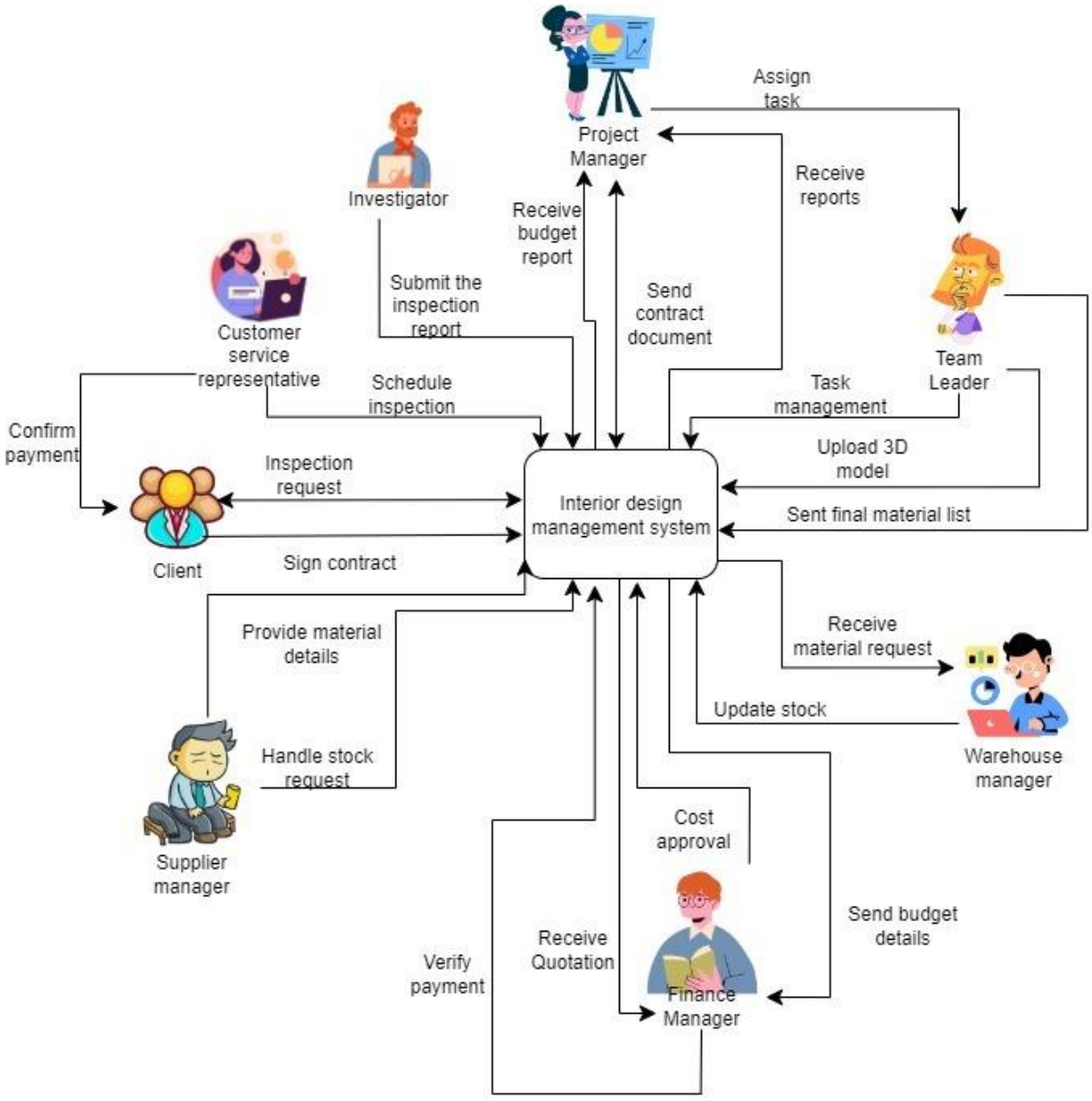
DesynFlow pursues to transform this process by offering a centralized platform that integrates remote client interaction, virtual inspection management, digital budgeting, 3D design visualization, and centralized task coordination. The goal is to minimize the reliance on in-person meetings while enhancing 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.

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.

System Overview



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.

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

1. 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.
2. 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.
3. 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.

4. Reliability

    • System should not loss any inspection request or user data.

5. Traceability

    • Customer service representative updating investigators availability and send the payment details, approving payment details and inspection request confirmation emails.

6. Notification

    • Client must receive real-time alerts of the process of inspection.

Technical requirements

1. Technology stack
    - Frontend - React.js
    - Backend – Node.js with Express.js for handle business logic and API
    - Database – MongoDB
2. Authentication and security
    - For secure session and role-base access control – JWT (JSON Web Token)
    - Password store with hashing for security.
3. Email services
    - For account verification, payment notification and confirmation – Nodemailer
4. File management
    - Validate file types and set a maximum upload size.
        - PDF
        - JPG

- PNG

5. Live location tracking
    - For inspectors to update and share location – HTML5 Geolocation API + OpenStreetMap (Leaflet.js)
6. Form handling and validation
    - Property details and inspection details form must have field validation on both and client and server sides.
7. Real-Time Notification
    - Use WebSocket for instant notifications to clients, Customer service representative and investigator when status change. – Socket.io
8. Reporting
    - Report should be exportable in PDF format.
9. Scalability and performance
    - Multiple inspection requests, concurrent logins, real time location changes should be supported by the system without any performance issues.

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.

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.

Technical Requirement

- Role – based Access Control – Clients, project managers, finance manager must have distinct role with specific permissions.
- Real – Time notification system – notify when tasks, schedule or report is submitted.
- Project Assignment System – assign task for each team members and design a UI to show them separately.
- Task Management Interface.
- Timeline and progress tracker – visual tracker to project monitor phases from both client and firm side.
- Document, 3D models upload management – upload signed contract, 3D models and related design document.
- Dashboard for showing active project and status of a project.

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.

When the Warehouse Manager receives low stock notification messages, he sends stock restock requests to the Supplier Manager.

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

Technical Requirement

1. Secure Authentication system – role-based access, password re-confirmation, encrypted token handling.
2. Real-Time Inventory Dashboard – Inventory tracking, low stock, restock inventory, top-used items.
3. Request approval module – UI for reviewing material request, approve or reject material request with urgency-level tags

4. Disposal and Transfer Management – Record all stock changes, maintain immutable audit logs with timestamp and user actions, support two-step approval for disposal of damaged or loss property.
5. Inter – warehouse coordination – manage multiple warehouses with separate data
6. Notification system – low stock alerts, request approval notification
7. Data Export & Report generating
8. Scalability & Modularity – to support an expanding number of materials and categories, efficient filtering and searching.

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.

Functional Requirements

1. 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.
2. The system shall allow inventory module to trigger material restock alerts when stock goes below threshold.
3. The system shall allow procurement officer to raise material requests and assign them to one or more registered suppliers.
4. The system shall allow procurement officer to forward material requests to finance manager for budget approval.

5. The system shall allow finance manager to approve or reject the material request and update the approval status in the system.
6. The system shall allow suppliers to receive material requests through their dashboard including item names, quantities, and delivery deadlines.
7. The system shall allow suppliers to update their request status as Accepted, Rejected, In Progress, or Dispatched.
8. The system shall allow suppliers to upload sample submission files for quality verification.
9. The system shall allow supplier management team to approve or reject submitted samples based on predefined criteria.
10. The system shall notify the inventory officer once the material status is updated to Delivered.
11. The system shall allow procurement officer to update material delivery status upon receipt.
12. The system shall allow supplier management team to rate suppliers after delivery based on timeliness, quality, and communication.
13. The system shall automatically calculate supplier rating using a weighted scoring method and update their profile.
14. The system shall flag suppliers with low ratings for review by supplier management team.
15. 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.

Technical Requirements

1. **Technology Stack**
    - Frontend: React.js
    - Backend: Node.js with Express.js
    - Database: MongoDB
2. **Authentication & Security**
    - JWT (JSON Web Token) for secure session management and role-based access
    - Bcrypt for password hashing
3. **File Management**
    - Allow suppliers to upload sample files (PDF, JPG, PNG) with file size validation
    - Save and link sample files with respective requests
4. **Email Services**
    - Use Nodemailer to send email alerts for material request notifications, approval results, and status updates
5. **Form Validation**
    - All request and registration forms must include client-side and server-side validation

6. **Reporting and Dashboard**
    - Allow admin to view downloadable reports of supplier ratings, request logs, and status summaries
    - Exportable reports in PDF format
7. **Real-Time Notification**
    - Use Socket.io for real-time updates and notification delivery to relevant users
8. **Scalability**
    - System should handle multiple concurrent request assignments, approvals, file uploads, and rating calculations without performance drop

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.

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.

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.

Technical Requirements

1. Authentication & security
    a. Secure login system with Role – based access specific to Finance Manager
    b. Sensitive Financial data (Payments, quotation, reports) must be encrypted both at rest and in transit.
2. Financial Dashboard
    a. A real-time dashboard must be able to display project cost summaries, pending approval and alerts also visually represent profit and loss summaries.
3. Quotation and Budget Estimation tools
4. Payment & Transaction management
    a. Finance manager should be able to see uploaded receipt by clients for verification.
    b. System must allow filtering payments by clients, project or time range.
    c. Complete payment history should be stored in structure and auditable format.
    d. Enable exporting full financial history into PDF or excel.
    e. Transaction entries must be immutable once confirmed.
5. Procurement & Expense Integration
    a. Validation system to cross-check purchase request against available budget.
    b. Approve or reject material purchase with optional message.

6. Report generation & Export
7. Notification System
8. Logging & audit Trails
    a. All critical actions (ex. Approve/reject quotes, confirm payments) must be logged with Timestamp, Action type, User ID
9. Data validation & integrity
    a. Validate all numeric inputs on client and server side.
    b. Prevent duplicate quotations, corrupted files, unauthorized budget overrides.

Literature Review

To validate our approach, we analyze several existing applications that address interior design process management and project coordination.

1. Houzz [1]

Pros:

- A massive marketplace with designer portfolio, products and client reviews.
- Offers inspiration boards and idea sharing between clients and professionals.
- Has a wide range of service providers and products.

Cons:

- Does not support end to end project management
- Focuses on B2C marketing than real-time project flow.

2. AutoDesk Revit with BIM 360 [2]

Pros:

- Professional grade 3D modeling and collaboration tool for architecture and construction.
- Enable real-time editing, modeling accuracy and version control.

Cons:

- High technical expertise required.
- Not build for client interaction.
- Very expensive for small to mid-scale companies.

3. Foyr Neo [3]

Pros:

- Cloud – based interior design platform with 3D visualization.

- Offers a user-friendly drag and drop interface.

Cons:

- Focused primarily on designing and rendering and doesn't provide any back-end featuring like budgeting, inspection or inventory tracking.
- Limited project coordination and team management tools.

4. Monday.com [4]

Pros:

- Excellent for task tracking, timeline visualization, and team collaboration.
- Highly customizable workflow.

Cons:

- Not designed to interior design or construction-specific workflow.
- No support for 3D visualization, site inspection or supplier handling.

Summary of literature review

While each of the above system offers specific strength such as strong visual design (Autodesk) with ease handling (Foyr) or workflow tracking (Monday.com) none of them provide an integrated solution for the complete interior design project life cycle.

We provide:

- Remote inspection coordination with live location tracking.
- 3D design finalization with client feedback loop.
- Budgeting, Inventory and supplier workflow.

DesynFlow is uniquely design to fill this gap by offering client-inclusive centralized web-application for interior design project execution.

Methodology

For our project "**DesynFlow"**, we will adopt the **Agile methodology**, which supports incremental development and rapid delivery of working software. Agile emphasizes continuous communication with stakeholders and allows flexible adjustments based on feedback.

An interior designing system involves regular interaction with clients, designers, and administrative staff. Therefore, to gather and refine the system requirements effectively, we will use a combination of methodologies such as **use** case diagrams, onion diagrams, Context diagrams and prototyping. These approaches will help us understand user expectations and functional needs accurately.

Both **high-level and low-level design techniques** will be used to build the system. High-level design will follow the **MVC** (Model-View-Controller) architecture to separate the user interface, business logic, and data layers clearly. For low-level design, we will use **Entity-Relationship (ER) diagrams** to model the system's data structure, ensuring smooth database integration

For implementation, we will use the **MERN stack** - MongoDB for the database, Express.js and Node.js for the backend, and React.js for the frontend. This technology stack is ideal for modern web applications due to its flexibility, scalability, and full JavaScript environment across the stack. **GitHub** will be used for version control and collaborative development.

Testing is an essential part of our methodology. We will conduct **unit testing** to verify individual modules such as inspection request forms, document upload components, and dashboard views. Integration testing will be performed to ensure that modules interact correctly.

Integration is also a critical component. For example, the **live location feature** of project investigators may use **OpenStreet with Leaflet.js**, and secure file uploads will be handled using encrypted file paths. To ensure secure authentication and user management, we implement **JWT (JSON Web Tokens)**. JWT tokens will be used to manage user sessions and role-based access control, protecting private content such as financial data, project reports, and design models. These integrations will help us deliver a complete, functional, and reliable system that supports the interior designing workflow end-to-end.

This methodology ensures **DesynFlow** will be interactive, scalable, secure, and aligned with the modern needs of a web-based interior designing platform.

Evaluation Method

The interior design management system will be assessed based on several key factors to make sure that it fulfills the purpose and provides good user experience.

1. **Use Interface (UI) –** The interface of the system should be clean, user friendly and easy to navigate so that users can use without any issues. It should be well-organized and a uniform design that will enhance usability.
2. **Functionality –** The system should support features like managing the inventory, handle material requests, user authentication, track project progress and generate reports.
3. **Integration –** The web application should support integration with services like email system for notifications that will ensure smooth and secure data exchange.
4. **Scalability –** The system should be able to handle without causing any performance problems when the number of users or design projects increase in number.
5. **Security –** The system should be able to protect sensitive data of the user as well as the project by using secure login features and role-based access to the system.
6. **Performance –** The system should load quickly, allow users to perform actions and allow handling multiple tasks without crashing.
7. **Mobile responsiveness –** The web application should unction in mobile devices irrespective of the screen sizes ensuring better accessibility and convenience to all the users.

By analyzing these factors, we can finally determine whether the interior design management system is safe, effective and can handle all processes within the system.

References

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External Reference sites

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