

An illustration of a construction site at night or dusk. In the background, a tall building is under construction. In the foreground, a yellow crane is lifting a large, dark rectangular block. To the left of the crane, a yellow backhoe loader is parked. The sky is dark blue with some clouds. The text is centered over the image.

Integrated Construction and Maintenance Management System CASE STUDY

INSY7315-WORK INTEGRATED LEARNING

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1. Project Title

Integrated Property Construction and Maintenance Management System for Dr Majoko Projects (Pty) Ltd

2. Background

Dr Majoko Projects (Pty) Ltd is a well-established South African company specialising in residential and commercial property development. Their services include construction project planning, resource allocation, on-site contractor management, post-completion inspections, and ongoing property maintenance. As their portfolio expands across multiple provinces, managing concurrent construction and maintenance projects has become increasingly complex.

Currently, operations rely on fragmented tools like spreadsheets, paper-based approvals, emails, and WhatsApp messages to coordinate between clients, contractors, site managers, and administrators. These manual processes have led to poor accountability, delayed task execution, and reduced client satisfaction. The need for a robust, centralised platform that integrates these workflows is critical for scaling operations and delivering efficient services.

3. Problem Statement

The current operational environment at Dr Majoko Projects is disjointed and reactive.

There is no integrated digital solution to:

- Monitor construction progress across multiple sites in real time
- Automate the reporting and resolution of maintenance issues
- Digitally assign, monitor, and evaluate contractors
- Track expenses against budget allocations by project phase
- Consolidate documentation such as building plans, permits, and contractor agreements

Without digital visibility and automation, projects frequently overrun their timelines and budgets. Clients are left frustrated with delays and lack of communication, while project managers and site coordinators struggle to enforce deadlines and document accountability. This impairs strategic decision-making and business growth.

4. Project Goal

To design and implement a responsive, AI-assisted web and mobile application that streamlines construction and maintenance project workflows, facilitates secure contractor communication, improves document control, and enables real-time analytics and reporting for internal and external stakeholders.

5. Project Objectives

The system will:

- Digitally onboard all user roles (admin, project managers, clients, contractors)
- Enable project setup with timeline phases, budgets, and site-specific documentation
- Allow clients to log maintenance issues with image/video attachments
- Automate contractor task assignment and track performance by deadline and quality
- Support secure uploads of blueprints, contracts, permits with download logs
- Provide quotation approval workflows and integrated invoice generation
- Notify stakeholders via SMS/email/app alerts at every stage of construction or maintenance
- Visualise progress and financials using interactive dashboards
- Deploy an AI assistant to estimate costs based on blueprints and predict potential risks or delays

6. Scope of the System

In-Scope:

- Online project creation with phases, deliverables, and budgets
- Maintenance issue ticketing, photo uploads, and tracking
- Role-based login and dashboards (Admin, Project Manager, Contractor, Client)
- Document uploads (PDF, DOCX, PNG, DWG) with access logs
- Quotation engine based on blueprint parsing and service request
- Invoice system with payment status and automated reminders
- Messaging between stakeholders with searchable logs
- AI Assistant for blueprint analysis, forecasting, and risk alerts

Not In Scope:

- Real-time GPS contractor tracking
- Integration with payroll or external procurement systems
- On-site biometric access or attendance monitoring

7. Expanded System Features Overview

7.1 Project Management Module

- Create construction projects with budgets, phases, and deadlines
- Monitor actual vs projected progress
- Allocate resources by phase

7.2 Maintenance Request Module

- Clients report issues with images and descriptions
- Admins assign contractors
- Track task status: Pending, In Progress, Completed

7.3 Contractor Portal

- View assigned tasks with deadlines
- Upload completion photos or reports
- Submit updates on task progress

7.4 Document Management

- Upload and store blueprints, contracts, and site reports
- Role-based secure access
- Download tracking logs

7.5 Communication & Notifications

- Messaging between users (admin ↔ project manager ↔ contractor ↔ client)
- Email/SMS alerts for project milestones, overdue tasks, and updates

7.6 Reporting & Dashboard

- Real-time KPIs: project status, budget vs actual, contractor ratings
- Visual charts: Gantt, Pie, Bar, and Line charts
- Quote approval and invoice tracking

7.7 Quotation Management

- Upload house plans (PDF/DWG/image)
- OCR/AI reads and parses plans for size, layout
- System generates cost breakdowns by material and labour
- Status: Draft, Sent, Accepted, Rejected

7.8 Invoice Management & Online Payment

- Convert approved quotations into invoices
- Enable EFT, PayFast, PayPal payments
- View payment status and automated reminders

7.9 AI-Powered Estimation & Risk Assistant

- Auto-generate cost breakdowns using blueprint analysis
- Predict future maintenance issues using past data
- Flag delayed projects, suggest rescheduling

8. User Roles with Tasks and Screen Templates

Role	Responsibilities	UI Screens
Admin	Oversee all operations, assign roles, generate reports, and manage communication	Admin Dashboard, Messaging, Reports Panel, Assignment Manager
Project Manager	Track construction and maintenance progress, approve documents, assign tasks	PM Dashboard, Timeline View, Contractor Tracker, File Review Screen
Contractor	View tasks, update status, upload photos/reports	Task List, Upload Center, Completion Report Form
Client	Submit maintenance requests, view progress	Client Dashboard, Request Form, Notification Panel

9. Deliverables (with Output Weightings)

Deliverable	Description	Weighting (%)
Portfolio of Evidence (PoE)	Diagrams, plans, database schema, UI mockups, GitHub repo	20%
Web Application	Role-based dashboards, full system integration	15%
Mobile App	Client and contractor app functionality (reporting, updates)	10%
REST API	Endpoints for maintenance, invoicing, messaging	10%
Quotation & Invoice System	Functional quote & invoice generation, upload support	10%
Security & Audit Logs	Authentication, logging, access control	5%
Presentation & System Demo	Live demonstration of working system	10%
Peer Collaboration & Evaluation	Contribution evidence, reflection logs	5%
User Experience Design	UX flows, responsive interface, clarity	5%
AI-Powered Assistant	Blueprint reader, risk predictor, maintenance forecaster	10%
Bonus Feature – Voice Feedback	Allow site managers/contractors to submit voice memos or instructions	+5% bonus