IDEA / APPROACH DETAILS

Idea / Solution Overview

Construction management system for Indian civil construction projects

Replaces paper registers, WhatsApp calls, and manual billing systems

Mobile friendly system for site engineers, web dashboard for management
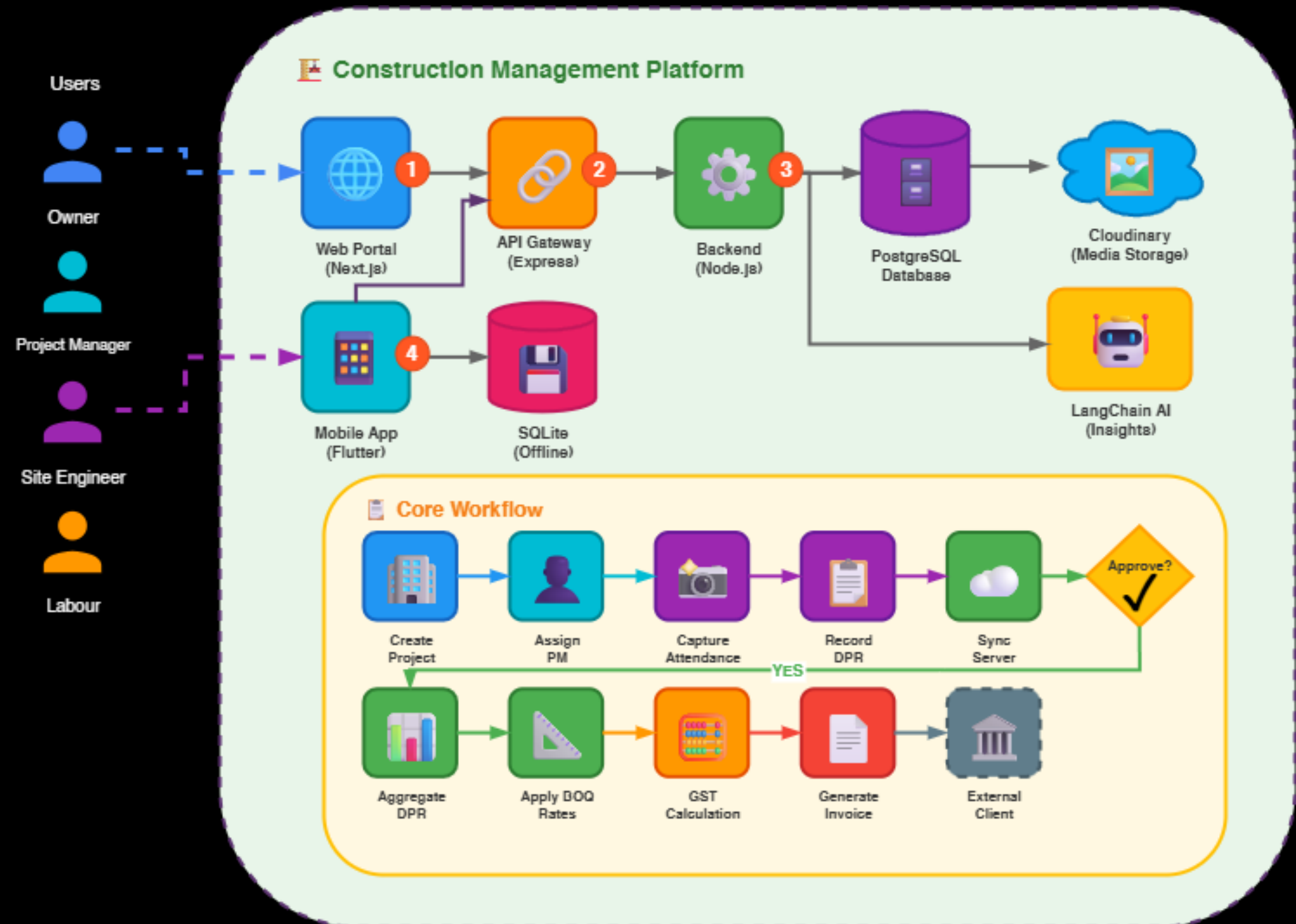
Problem Addressed

Lack of real-time visibility of progress on the sites

Errors and leakage due to manual recording of attendance and DPR entries

Billing system is not related to the execution of the website operation

Internet accessibility is a factor that may affect construction projects.
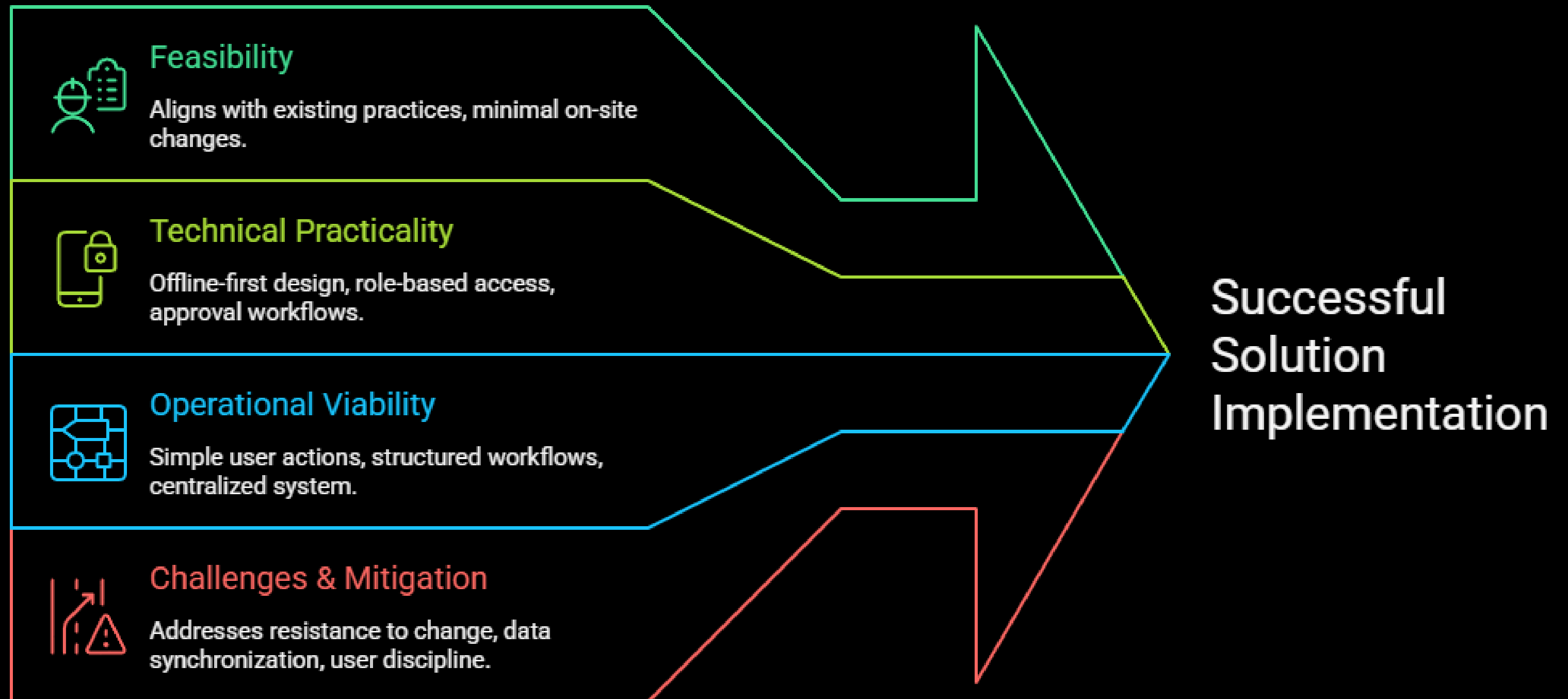
Solution Proposal

Digitized workflow aligned with the conventional workflow for the construction industry.

Offline-enabled mobile application for capturing site data

Approval-driven system for data accuracy and accountability

Quasar 4.0

TECHNICAL APPROACH

- Web Frontend (Owner & Project Manager)
Next.js (React), TypeScript, Tailwind CSS, Chart.js/Recharts

- Mobile Application (Site Engineer)
Flutter Application

- Backend
Node.js with Express, REST APIs

- Database & Offline Storage
PostgreSQL (central database), SQLite (mobile offline storage)

- Authentication & Access Control
JWT-based authentication with role-based access (Owner, Project Manager, Site Engineer)

- Cloud & AI
Cloudinary for image and media storage, LangChain for report summarization and intelligent insights

Users
Owner
Project Manager
Site Engineer
Labour

Construction Management Platform

Web Portal (Next.js) → API Gateway (Express) → Backend (Node.js) → PostgreSQL Database → Cloudinary (Media Storage)

Mobile App (Flutter) → SQLite (Offline)

LangChain AI (Insights)

Core Workflow

Create Project → Assign PM → Capture Attendance → Record DPR → Sync Server → Approve?

YES

Aggregate DPR → Apply BOQ Rates → GST Calculation → Generate Invoice → External Client

Quasar 4.0

FEASIBILITY & VIABILITY

Feasibility
Aligns with existing practices, minimal on-site changes.

Technical Practicality
Offline-first design, role-based access, approval workflows.

Operational Viability
Simple user actions, structured workflows, centralized system.

Challenges & Mitigation
Addresses resistance to change, data synchronization, user discipline.

Successful Solution Implementation

Quasar 4.0

IMPACT & BENEFITS

- Organized daily updates through **voice-based site reporting** enhances transparency between site management and execution.

- **Geo-based data validation** stops off-site or fraudulent entries, which lowers labor and material leakages.

- Accountability is ensured and post-approval data manipulation is prevented by **approval-locked records with audit trails.**

- In low-connectivity construction environments, **offline-first site operations** allow for continuous data collection.

- By identifying incomplete or inconsistent records, **early anomaly and bill-readiness** checks reduce billing risks.

RESEARCH & REFERENCES

1. Market & Strategy :

- India EPC Market Growth: Details the 8.87% $CAGR$ growth and mandatory BIM/digital-twin adoption in public tenders. [Link](#)
- Digitization Survival: Survey data showing 66% of Indian firms see digitization as the key to long-term sustenance. [Link](#)
- Site Management Challenges: Analyzes labor scarcity, project delays, and supply chain volatility in India. [Link](#) / [Link](#)

2. Technical Architecture (Flutter & PostgreSQL)Offline-First Blueprint :

- Best practices for making local databases the primary source of truth in Flutter apps. [Link](#)
- Bi-directional Sync (PowerSync): How to keep local SQLite/Drift databases in sync with remote PostgreSQL instances. [Link](#)
- Bandwidth Optimization: Techniques for image resizing, WebP/AVIF formats, and BlurHash placeholders for site photos. [Link](#)

3. Attendance & Labor Governance :

- Indoor Tracking (BLE vs. GPS): Evidence why Bluetooth beacons are superior for tracking in basements and high-rises. [Link](#)
- Biometric Face Recognition: Implementing AI-powered liveness detection to prevent "buddy punching" on-site. [Link](#)
- Financial Compliance & Logistics GST 2.0 Reforms: Information on reduced tax rates for materials like cement and AAC blocks. [Link](#)

4. RERA & ERP Automation :

- How automated documentation and financial tracking help satisfy RERA transparency mandates. [Link](#)
- PM Gati Shakti Integration: Accessing 230+ national geospatial data sets for site surveys and logistics planning. [Link](#)

5. AI-Powered FeaturesIndic Speech-to-Text :

- APIs for transcribing 11+ Indian languages to enable voice-driven field reporting. [Link](#)
- OCR Bill Reconciliation: AI tools to extract data from material bills and automatically match them to Purchase Orders. [Link](#)