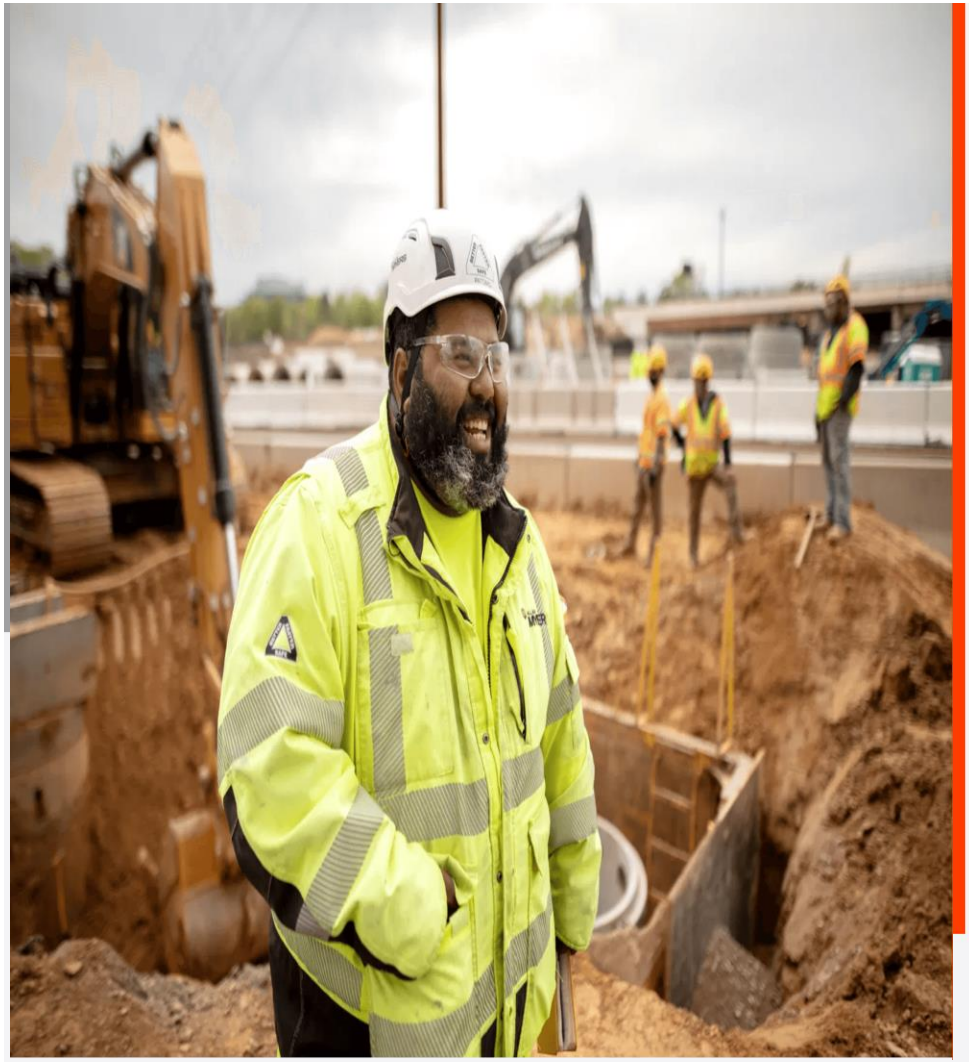


Contract Administration AI

Automating Daily Work Record Reconciliation to Drive Operational Efficiency

Namyun Kim Product Manager | AI Applications

Manual reconciliation creates significant operational delays and financial leakage

2-4 HOURS

Per Reconciliation

Contract Administrators lose 60-100 hours annually on low-value manual data processing.

3-4 WEEKS

Reporting Lag

Significant delay between work completion and record verification impacts cash flow.

15% ERROR

Average Error Rate

Current Manual Workflow

Contractor Submits DWR → Inspector Submits Logs → Manual Comparison

INSIGHT: CAs are trapped in "Data Entry" roles rather than "Strategic Oversight"

Inconsistent reporting between field and office leads to protracted disputes

Metric	Contractor Record	Inspector Record
Labor Hours	8 man-hours	37 man-hours
Equipment	2 machines	6 machines
Date Recorded	June 7, 2021	June 18, 2021

The Challenge

Identifying which record is accurate requires hours of investigation into field notes and logs, often weeks after the event.

Business Impact

Delayed approvals impact contractor cash flow and increase the risk of legal claims and project overruns.

Direct field observation identified "Reactive Administration" as the primary pain point

2 Years Field Immersion

Direct experience as a Field Inspector provided deep empathy for the workflow.

50+ Reconciliation Cycles

Observed and analyzed the end-to-end process of data collection and verification.

Stakeholder Interviews

Engaged with Project Managers and CAs to identify systemic bottlenecks.

> ***"By the time I finish reconciling June's work, it's already mid-July. I'm always behind, always reactive."***

Inefficiency is not just a process issue; it is a measurable financial drain

Time Waste

2-4 HOURS

Per DWR reconciliation.
Financial Impact: $3k - $6k lost productivity.

Operational Delay

30-DAY LAG

Extended reporting cycles make memory-based verification impossible and stall contractor payments.

Error Propensity

15% VARIANCE

Manual typing leads to formula errors, version control conflicts, and inaccurate financial reporting.

Verification Difficulty

HIGH FRICTION

Disputes are harder to resolve weeks after the event, leading to "settling" rather than accurate resolution.

Total Annual Financial Leakage: $6,000+ Per Administrator

Transitioning from manual entry to AI-assisted exception handling reduces effort by 85%

1

Ingest

Upload Contractor and Inspector PDFs directly to the system.

2

Extract

AI parses unstructured tables in <30 seconds with high precision.

3

Compare

Automated side-by-side variance analysis across all line items.

4

Flag

System highlights discrepancies >5% for immediate human review.

5

Resolve

CA reviews only flagged items, completing reconciliation in 15 min.

85%

Reduction in Manual Effort

From 4 hours of data entry to 15 minutes of strategic review

AI implementation delivers immediate ROI and shifts the team to a proactive stance

Processing Time	
Manual	2-4 Hours
AI-Assisted	15-30 Mins

Reporting Lag	
Manual	3-4 Weeks
AI-Assisted	Same-Day

Error Rate	
Manual	15%
AI-Assisted	<5%

Annual Cost (Per CA)	
Manual	$3K - $6K
AI-Assisted	$500

85%
Time Reduction

6 MONTHS
Payback Period

PROACTIVE
Team Stance

A modular stack prioritizes data security and extraction accuracy

Security Architecture

Zero-trust data handling: All processing occurs locally, eliminating external API dependencies and cloud risks.

Data Ingestion	**Docling + PyMuPDF** Robust table extraction and parsing from complex, unstructured construction PDFs.
Intelligence Layer	**Local LLM (Llama 3.2)** On-premise inference via Ollama ensures sensitive project data never leaves the network.
Quality Assurance	**Pydantic Validation** Multi-stage validation layers to catch hallucinations and ensure strict data formatting.
Persistence	**SQLite Database** Lightweight, searchable storage for historical reconciliation records and audit trails.

Choosing a Local LLM over Cloud APIs was a strategic decision for data governance

Option A

Cloud API (GPT-4)

- ✓ 98% Extraction Accuracy
- × $125K/Year Estimated Cost
- × Data Privacy Concerns
- × Requires Constant Internet

Selected

Option B

Local LLM (Llama 3.2)

- ✓ Zero Marginal API Cost
- ✓ Total Data Sovereignty
- ✓ Works Offline / On-Premise
- ⚠ 85% Raw Accuracy

The Mitigation

Implemented a multi-stage Pydantic validation framework to catch hallucinations and formatting errors, boosting final accuracy to 95%.

The Rationale

In construction, data sovereignty and cost-predictability are higher priorities than a marginal 3% accuracy gain from cloud providers.

A "Human-in-the-Loop" approach ensures 100% reliability in financial records

Layer 1	**Type Validation** Ensures all extracted quantities (hours, units, costs) are valid numerical data types before processing.
Layer 2	**Range Validation** Flags "impossible" or outlier values (e.g., 200% compaction or 150°F concrete) based on historical project bounds.
Layer 3	**Logic Validation** Cross-references related fields for internal consistency (e.g., if status is "Fail", compliance flag must be "False").
Layer 4	**Human Review** Final approval remains with the Contract Administrator; AI identifies discrepancies, but humans make the final decision.

ZERO **False negatives in identifying critical financial discrepancies**

Scaling the solution across the organization yields significant compounding returns

Initial Investment

Development (One-time)	$30,000
Deployment & Training	$5,000
Total Investment	**$35,000**

Annual Savings (Per CA)

Labor Efficiency (75 hrs)	$3,750
Error Reduction	$1,000
Total Per Admin	**$5,250**

Annual Savings

$52,500

For a 10-CA Organization

Payback Period

8 MONTHS

Rapid break-even point

5-Year NPV

$227,000

Net Present Value at 10%

Audit-Ready Records

Improved Contractor Relations

Reduced Litigation Risk

Successful AI products are built on deep user empathy and rigorous trade-off analysis

1

Start with User Pain

Two years of field observation ensured we solved the *right* problem, not just a technical one.

2

Prioritize Ruthlessly

Focused on high-variance change orders first to maximize early value and stakeholder buy-in.

3

Strategy as Design

Choosing Local vs. Cloud was a business strategy decision based on privacy and cost, not just tech.

4

Governance = Trust

Validation layers were the key to user adoption; AI only works when users trust the output.

5

Show, Don't Just Tell

Quantified results (85% time savings, 6mo ROI) are more compelling than qualitative promises.

6

Build with Stakeholders, Not for Them

Engaged CAs, contractors, and inspectors throughout design to ensure adoption. Technology alone doesn't drive change.

CORE LESSON: AI is the engine, but User Empathy is the steering wheel.

V1 proves the concept; V3 envisions a fully integrated field-to-office ecosystem

V1: Completed

Core Automation

- PDF Extraction Engine
- Multi-Stage Validation
- Manual Review Workflow
- SQLite Data Persistence

V2: 3-5 Months

Scale & Insights

- Batch Processing (100+ DWRs)
- Visual Analytics Dashboard
- Automated Discrepancy Alerts
- Historical Trend Analysis

V3: 10 Months

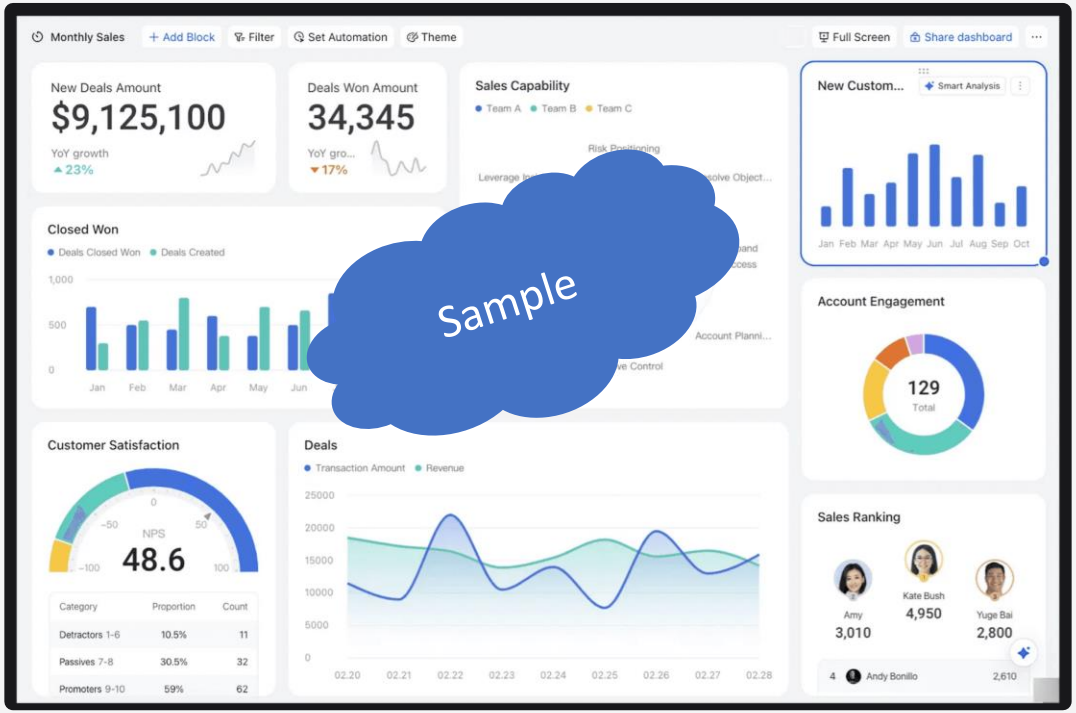
Full Integration

- Mobile Field Submission App
- Direct ERP/Accounting Sync
- Predictive Variance Modeling
- Smart Contract Integration

Product Vision

Eliminating manual data entry across the entire construction lifecycle to drive radical transparency and efficiency.

The interface focuses user attention where it matters most: the discrepancies



Side-by-Side View

Direct comparison of Contractor vs. Inspector data extracted from source PDFs.

Variance Indicators

Color-coded alerts (Red > 10%, Yellow > 5%) immediately highlight critical issues.

One-Click Drilldown

Instantly view the original document source for any flagged line item.

Designed for Speed & Clarity

“ I build AI products that solve real-world problems."

This case study demonstrates:

- User research methodology (2 years field observation)
- Strategic design trade-offs (governance, cost, accuracy)
- Business value delivery (85% efficiency, 8-month payback)

Namyun Kim

Namyun.kim@ue-Germany.de

www.linkedin.com/in/namyun-kim-730626182

https://github.com/Nami3777/contract_admin_AI