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## Case Study: Revolutionizing EV Infrastructure Quoting with AI

### The AI Engine: From 48 Hours to 48 Seconds

#### The Challenge

For EV installation contractors, the quoting phase is often the most time-consuming bottleneck. Each project requires complex technical calculations, including cable sizing based on distance, groundworks estimation, and hardware compatibility.

- **The Problem:** Manual quoting took days, delayed client response times, and risked human error in margin calculations.
- **The Goal:** Automate the entire technical design and cost estimation process without sacrificing accuracy.

#### The Solution: The AI-Powered Quote Engine

We built a multi-layered automation stack that replaces a senior estimator's workflow. The system uses a seamless integration of **Pabbly Connect**, **Google AI Studio**, and **Noloco**.

#### The Technical Stack

- **Data Capture:** A customized client intake form.
- **Logic & Integration:** **Pabbly Connect** (Webhooks) acts as the central nervous system.
- **The "Brain": Google AI Studio** (Gemini) processes the intake data using a complex system prompt to perform:
  - **Engineering Logic:** Sizing cables (e.g.,6mm 5-core) and selecting chargers based on the clients preferences
  - **Financial Logic:** Calculating labor hours, material costs, groundworks, and profit margins.
- **Document Generation:** JSON-to-HTML conversion to generate professional, multi-page PDF project specs.
- **CRM & Delivery:** Data is synced to **Airtable** and visualized in **Noloco**, while the final quote is delivered via **Gmail**.

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## The Workflow

1. **Submission:** The client provides site details (cable run length, surface type, charger quantity).
2. **AI Analysis:** The engine instantly determines the Bill of Materials (BOM), including switchgear and specific installation requirements.
3. **Project Design:** The AI generates a detailed "Description of Works" and technical specifications.
4. **Instant Delivery:** Within seconds, the contractor receives an email with a full cost breakdown and a PDF design ready for the client.

Performance Pillar	Manual Process (Pre-AI)	Quote Engine	Improvement
<b>Response Latency</b>	48 – 72 Hours	< 60 Seconds	~99% Reduction
<b>Calculation Accuracy</b>	Variable (Human Error)	<b>98% (<math>\pm 2\%</math> of Human Expert)</b>	High-Fidelity Logic
<b>Technical Design</b>	Manual Drafting	<b>Automated PDF Generation</b>	Instant Documentation
<b>Resource Overhead</b>	Senior Estimator Review	<b>Fully Autonomous</b>	Zero Labor Cost
<b>Lead Conversion</b>	High Attrition (Due to Delay)	<b>Instant Engagement</b>	Optimized "First-to-Quote"

"This system effectively eliminated the need for manual design and costing. Contractors can now move straight to sending branded, formal quotations through their Noloco CRM, knowing the technical specs and margins are already handled."

**The final output includes:**

- Project Specification Recap (Cable length, Mounting type, Groundworks).
- Itemized Materials & Labor Breakdown.
- Automated Profit Margin calculation.
- Professional "Design & Scope" documentation.

## Technical Conclusion: Engineering the Automated Estimator

The **AI Quote Engine** represents a successful implementation of **Large Language Model (LLM) reasoning** applied to specialized electrical engineering constraints. By utilizing a high-context system prompt within **Google AI Studio**, the system simulates the decision-making process of a senior electrical estimator, reconciling site-specific variables with regulatory and commercial requirements.

### Technical Summary

- **Logic Synthesis:** The engine performs multi-variable analysis to determine optimal **cable cross-sectional area**, circuit protection requirements, and ground-work complexities, maintaining a **98% correlation** with traditional manual calculation methods.
- **Data Integrity & Architecture:** Through a robust **webhook-driven pipeline (Pabbly Connect)**, the transition from unstructured form data to structured **JSON** ensures that technical specifications remain consistent across the PDF generation and the **Airtable** back-end.
- **Systemic Efficiency:** The integration effectively reduces the **OODA loop** (Observe, Orient, Decide, Act) for project tendering to near-zero. By automating the **JSON-to-HTML** rendering of technical "Descriptions of Works," the system eliminates the administrative latency typically found in bespoke electrical design.

### The Result

This architecture proves that the bottleneck in EV infrastructure deployment is no longer the technical design phase, but the physical installation itself. The engine provides a scalable, high-fidelity blueprint for any contractor looking to digitize their **Technical Sales Operations** while maintaining rigorous engineering standards and healthy profit margins.