

We've completed the takeoff portion and will add an api to pull this data into the user interface [git@github.com:jonathanbodnar/gclegacy.git](https://github.com/jonathanbodnar/gclegacy.git) so do not remake this. Scan current functionality so we don't replace it.

I need to build out the SAAS interface for user and admin login with the remaining functionality after the initial pdf is scanned and measurements extracted, this interface will pick up where it leaves off, taking data from the takeoff software and automating estimates, and completing the entire rest of the flow picking up at step 3.3 of high level flow. Integrate the current database (under the dev branch) [gondola.proxy.rlwy.net](https://gondola.proxy.rlwy.net) so after data is extracted from pdf our new interface uses that db to access the extracted information. Use a new postgres database (`postgresql://postgres:juuYZdLSolxwRSVmDkINLZskUwMqRSMO@postgres-oph1.railway.internal:5432/railway`) for this interface, do not touch the code/db for the current takeoff software.

Tell me what I need to add to env to connect to the existing takeoff database to pull in data from the takeoff database

Use the example estimate template and examples to know what template format the customer wants the final estimates in.

Push all new interface code to [git@github.com:jonathanbodnar/gcinterface.git](https://github.com/jonathanbodnar/gcinterface.git)

## 1) Goals & Non-Goals

### Goals

- Fully replace the traditional estimator role through AI-driven automation.
- Eliminate manual takeoffs, RFQs, and spreadsheet comparison.
- Auto-diagnose scope, price materials and labor, apply contingencies, and recommend alternates.
- Create auditable, consistent, and transparent preconstruction workflows.
- Deliver accurate and defensible estimates in a fraction of the time.

### Non-Goals (v1)

- Real-time field productivity tracking (integration only).
- Full BIM authoring (read-only for v1).

- PO/inventory management beyond exports.

## 2) Personas

- **Estimator (Legacy Role → Replaced):** All tasks automated.
- **Preconstruction Manager:** Reviews AI outputs, approves awards, oversees strategy and risk.
- **Procurement/Buyer:** Manages catalogs and vendors.
- **Vendor/Manufacturer Rep:** Receives and responds to email RFQs.
- **Executive/Owner:** Reviews cost, margin, risk, and forecast dashboards.

## 3) High-Level Workflow

1. **Create Project** → Upload plans/specs/scopes.
  - a. (current API built, needs finished <https://gclegacy-production.up.railway.app/>)
    - i. Notably it's not currently calculating vertical measurements for things like piping and materials like wiring
  - b. Set of plans and notes
    - i. Multiple files sometimes
2. **Scope Diagnosis (AI)** → Identify CSI divisions, assemblies, and materials.
  - a. CSI - Scope definitions
  - b. Specifications of what you need built (some have some don't)
    - i. Spec sheet not present you have to go off plans should have them
  - c. Materials also in notes or scope
    - i. Type of material
    - ii. Scale and takeoff of HOW MUCH of each material do you need
      1. Sometimes schedule of materials is on both list and each page
    - iii. Plans reference the schedule
      1. Sometimes the list of materials are wrong so you need to manually calculate to verify
  - d. vertical/elevations to calculate materials needed to reach that height
  - e. Fittings
    - i. Based on angles of pipes
    - ii. Connectors for the pipe runs
3. **Auto BOM Generation** → Quantities, alternates, confidence scores
  - a. Shooting for a confidence score of 80% - 90% on BOM before sending
4. **Labor & Equipment Modeling** → Auto labor hours & costs from productivity libraries.

- a. Move to after supplier
  - b. Admin center → add rules for material/labour
    - i. Generalized rules cost per linear foot of X
      - 1. Added by admin (pre-fill through ai scan of current wholesale rates)
    - ii. Fill in list of missing materials from new imports
  - c. Plus the markup → admin sets makeup per trade (M, E, P, etc)
- 5. **Cost Intelligence** → Fill missing costs, compare against historical averages, forecast price trends.
- 6. **Value Engineering** → Recommend alternates or substitutions for cost/schedule optimization.
- 7. **Risk & Contingency Engine** → Apply dynamic contingencies based on uncertainty & complexity.
- 8. **Vendor Match** → Map BOM to compliant products/vendors. (supplier)
  - a. Vendor/Sub Contractor interface are cards with vendor/contractor details, stats, etc, that admin can click or unclick or edit that vendor
  - b. Admin uploads a list/excel of all vendors
    - 1. Each vendor is known for specific types of materials based on trade
    - 2. ALL MATERIALS SHOULD BE ACCOUNTED FOR AFTER VENDOR SELECT
      - a. Show list of materials on the left needed, as you select vendor cards the list of materials needed that that vendor can supply is pulled off the list on the left, so the user sees remaining materials needed
    - ii. Mark or identify from list what trade vendor is in
  - c. Suppliers/vendors give material alternates that need to be noted during the vendor match step
  - d. Once project scope is approved by admin select which vendors you want quotes from
    - i. Proximity to project matters → so we need addresses and filter based on the project location
    - ii. Does the job call for required vendors for specific materials (sometimes inside the plan there are required vendors you must use)
- 9. **RFQ Generation & Emailing** → Auto send structured quote requests to selected vendors
- 10. **Quote Parsing & Comparison** → Ingest vendor emails, normalize data, compare quotes.

- a. Bid leveling (seeing it all in one place)
  - b. Select a bid
    - i. Emailed that you were awarded
    - ii. Vs not awarded - but looking forward to future work
      - 1. Admin adds these email templates
- 11. **Award & Subcontract** →, generate subcontracts for M/E/P.
  - a. **SAME quoting process as vendor**
    - i. List in the scope of work
      - 1. With materials
    - ii. Schedule of project
      - 1. Ghannt chart upload / pdf
  - b. List of subcontracts, based on location how close they are to the job, star rating
  - c. Have other sub contracts for other trades
    - i. Sheet rock, taping, paint, tile
- 12. **Scope Validation & Overlap Detection** → Identify missing or duplicated scopes across trades.
- 13. **Reporting & Intelligence** → Show cost variance, VE savings (value engineering), risk profile, and bid strategy outputs.
  - a. Supplier sends different VEs

## 4) Estimator-Level AI Modules

### 4.1 Cost Intelligence Module

- Learns from awarded projects and vendor quotes.
- Predicts material costs by trade/region.
- Displays trend graphs for inflation and market shifts.
- Auto-fills missing line-item pricing.

### 4.2 Labor & Productivity Module

- Includes regional wage data (union/non-union).
- Maps BOM to labor assemblies and crew types.
- Calculates hours and cost with productivity factors.

- Integrates RSMeans or internal productivity data.

### **4.3 Risk & Contingency Engine**

- Assigns risk score to each BOM item based on data confidence, complexity, and vendor reliability.
- Suggests contingency %, escalation %, and margin adjustments.
- Simulates cost variance scenarios.

### **4.4 Value Engineering (VE) Engine**

- Detects alternate materials and equivalent spec options.
- Compares lifecycle cost, lead time, and compliance.
- Flags “VE Opportunities” automatically.
- Recommends substitutions with cost/schedule impact.

### **4.5 Scope Coverage Validator**

- Cross-checks all CSI divisions for missing or overlapping scope.
- Detects trade overlaps (HVAC piping vs plumbing, etc.).
- Auto-generates clarifications/RFIs for scope gaps.

### **4.6 Constructability & Schedule Module**

- Imports project schedule or milestone dates.
- Highlights long-lead items or critical path conflicts.
- Suggests early procurement or alternates for schedule risk.

### **4.7 Bid Strategy & Profitability Dashboard**

- Historical win-rate analysis by client and project type.
- Margin recommendation engine (based on risk and competition).
- Auto-markup profiles by client/trade.
- Predictive win-probability model.

## 5) AI/NLP Enhancements

1. Multi-document contextual parsing (plans + specs + addenda).
2. Confidence → risk pipeline feeding contingency engine.
3. Pattern recognition for historical cost clusters.
4. Generative RFI composer (for low-confidence items).
5. Alternate suggestion based on spec similarity and prior project data.

## 6) UX Enhancements

- **Estimator Cockpit:** unified dashboard showing BOM accuracy, labor, VE options, risks, and margins.
- **Cost Intelligence Panel:** historical vs. forecasted pricing charts.
- **Risk Heatmap:** visualize risk/uncertainty across systems.
- **VE Explorer:** compare alternates with side-by-side cost/schedule impact.
- **Bid Strategy View:** slider-based margin and probability modeling.