

# AI Sourcing Agent – Detailed Requirement Document

## 1. Concept Overview: Attribute-Based SKU Matching via PIM

The **AI Sourcing Agent** is designed to **automate and optimize procurement** by dynamically **matching BOQ items to pre-filtered PIM data** while ensuring **traceability, accuracy, and efficiency**. Instead of performing product filtering, the AI **leverages structured PIM attributes** to match user requirements with **the most relevant SKU variations**.

### Key Features of Attribute-Based SKU Matching:

- ✅ **Extracts all product attributes from BOQ input** (structured BOQs, free-text queries, or tender-style descriptions).
  - ✅ **Retrieves attribute variations from PIM and only prompts for missing or ambiguous details.**
  - ✅ **Ensures category-wise group-level brand recommendations** to streamline multi-line procurement.
  - ✅ **Generates traceable draft quotations, linking original BOQ text to matched SKUs** without altering input data.
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## 2. System Architecture & Data Flow

The **AI Sourcing Agent** functions as an **intelligent layer over the PIM & backend system**, dynamically interpreting **filtered** data and structuring procurement queries.

### System Workflow:

1. **User Input (BOQ / Free-Text Query) → AI Classifies BOQ Type**
2. **AI Extracts Product Attributes → Fetches Attribute Variations from PIM**
3. **AI Detects Missing Specifications → Prompts Dynamic Clarifications via Multiple-Choice Questions**
4. **AI Matches Extracted Attributes to SKU Variations → Finds Best SKU**
5. **AI Groups Items by Category → Suggests Brands at the Category Level**
6. **AI Generates Category-Wise Draft Quotations → User Reviews & Finalizes**

System Components & Flow

Component	Function
BOQ Classification Engine	Detects whether BOQ is structured, tender-based, or hybrid.
Entity Extraction Module	Extracts product type, quantity, compliance, and specifications.
Attribute Fetcher	Fetches all possible variations from PIM for attribute-based SKU matching.
Clarification Engine	Generates dynamic multiple-choice questions for missing specifications.
Group-Level Brand Selection Module	Recommends brands for categories instead of per item.
SKU Matching Engine	Maps extracted attributes to the most relevant SKUs.
Draft Quotation Generator	Generates traceable draft quotations with BOQ text & SKU links.

3. Step-by-Step Workflow for AI Query Processing

Step 1: User Submits Requirement

Input Type	Examples	Processing Approach
Structured BOQ Upload	Excel, PDF BOQ with itemized product details.	Extract structured data directly.
Text-Based Tender BOQ	Free-text procurement descriptions.	NLP to extract product details.
Chat-Based Query	"I need 500M of 25mm pipes."	NLP to extract product type, quantity, specifications.

Step 2: BOQ Categorization & Attribute Extraction

- AI groups products by category (e.g., Electrical, Plumbing, Structural).
- Extracts attributes from BOQ input without modification.
- Fetches product attribute variations from PIM.

BOQ Item	Extracted Attributes from BOQ	Fetchd Variations from PIM
3.5 Core, 300 Sq.mm XLPE Cable	Core: 3.5, Size: 300 Sq.mm, Insulation: XLPE	Voltage: 1.1kV, 3.3kV, 6.6kV, 11kV
25mm GI Pipe	Size: 25mm	Class: Medium, Heavy; Galvanization: Hot-Dip, Pre-Galvanized

Step 3: Dynamic Clarification for Missing Attributes

BOQ Item	AI Clarification Required?	Why?	Prompt Example
3.5 Core, 300 Sq.mm XLPE Cable	❌ No	All attributes present in BOQ.	No prompt needed.
25mm GI Pipe	✅ Yes	No class (Medium/Heavy) mentioned.	"Select class for 25mm GI Pipe:" → Options: Medium / Heavy
250A MCCB	✅ Yes	No pole configuration (3P/4P) provided.	"Select MCCB configuration:" → Options: 3P / 4P

Step 4: Group-Level Brand Recommendation

Category	AI Suggested Brands (Based on PIM)	User Prompt
LT Cables & Earthing	Polycab, RR Kabel, KEI	"Would you like to obtain quotes from these brands for all LT cables?"
Plumbing Materials	Finolex, Supreme, Astral	"Would you like to source all plumbing materials from these brands?"

Step 5: SKU Matching via Attribute Mapping

BOQ Item	Extracted Attributes	Final Matched SKU (From PIM)
3.5 Core, 300 Sq.mm XLPE Cable	Core: 3.5, Size: 300 Sq.mm, Insulation: XLPE, Voltage: 1.1kV	SKU: <b>FRLS-3.5C-300-XLPE-1.1KV</b>
25mm GI Pipe	Size: 25mm, Galvanization: Hot-Dip, Class: Medium	SKU: <b>GI-25-HDG-M</b>
250A MCCB	Rating: 250A, Configuration: 3P	SKU: <b>MCCB-250A-3P</b>

Step 6: Draft Quotation Generation

- AI generates **category-wise draft quotations** linking **original BOQ text** to **matched SKUs**.

Example Draft Quotation Output:

```
json
CopyEdit
{
  "quotation_id": "RFQ-2025-PUNE-001",
  "categories": [
```

```

{
  "category": "LT Cables & Earthing",
  "selected_brands": ["Polycab", "RR Kabel", "KEI"],
  "items": [
    {
      "original_BOQ": "3.5 core, 300 Sq.mm XLPE Cable",
      "matched_sku": "FRLS-3.5C-300-XLPE-1.1KV",
      "brand": "Polycab",
      "quantity": 700,
      "unit": "M"
    }
  ]
},
{
  "status": "Draft"
}

```

## 4. Edge Case Handling for Advanced Query Parsing

Edge Case	AI Handling Mechanism
BOQ is missing a critical attribute (e.g., MCCB doesn't specify poles)	AI fetches variations from PIM and asks user to confirm.
BOQ is fully detailed and has all attributes defined	AI <b>does NOT</b> prompt for missing details and proceeds to SKU matching.
BOQ specifies full work-based procurement (e.g., "Supply & Installation of Fire Fighting System")	AI <b>breaks down scope</b> into <b>sub-components</b> and ensures all necessary parts are included.
User requests multi-brand quotes	AI <b>fetches available SKUs per selected brand</b> and generates a comparative quotation.

### Scenario 1: Multi-Category BOQ with Cross-Dependencies

- User Uploads BOQ
- AI Groups Items into Categories (Electrical, Plumbing, Structural).
- AI Suggests Category-Wise Brands Instead of Per Item.
- AI Prompts Clarifications for Missing Details.
- AI Identifies Dependencies (e.g., Fasteners for Steel Items).
- Draft Quotations Are Generated Per Category.
- User Reviews & Finalizes Quotations.

### Scenario 2: Tender BOQ (Text-Based)

- User Submits Free-Text Query.
- AI Extracts Product Names, Compliance, and Quantities.
- AI Asks Clarifications for Missing Details.

- **AI Groups Items into Categories.**
  - **User Selects Preferred Brands Per Category.**
  - **Draft Quotation Generated with Original Text References.**
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### **Scenario 3: Bulk Work-Based Procurement**

- **BOQ Specifies Full Work Item (e.g., Fire Fighting System).**
  - **AI Identifies Required Components (Pipes, Fittings, Valves).**
  - **AI Suggests Category-Level Brands.**
  - **AI Ensures All Components Are Included.**
  - **Draft Quotation Generated.**
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### **Scenario 4: Handling Associated Services & Bundled Items**

- **User Uploads BOQ with Service-Linked Items (e.g., Rebar Couplers).**
- **AI Detects Required Services (e.g., Threading, Installation).**
- **AI Suggests Complementary Items (e.g., Fasteners for Structural Steel).**
- **AI Generates Category-Based Quotations with Service Add-Ons.**
- **User Reviews, Modifies, and Finalizes Quotation.**