**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.

**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** | **Fetched 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: **FRLS-3.5C-300-XLPE-1.1KV** |
| 25mm GI Pipe | Size: 25mm, Galvanization: Hot-Dip, Class: Medium | SKU: **GI-25-HDG-M** |
| 250A MCCB | Rating: 250A, Configuration: 3P | SKU: **MCCB-250A-3P** |

**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 **does NOT prompt for missing details** and proceeds to SKU matching. |
| **BOQ specifies full work-based procurement (e.g., “Supply & Installation of Fire Fighting System”)** | AI **breaks down scope** into **sub-components** and ensures all necessary parts are included. |
| **User requests multi-brand quotes** | AI **fetches available SKUs per selected brand** 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.**

**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.**

**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.**

**User Workflow Scenarios with Examples**

This section provides **real-world examples** of how the AI Sourcing Agent processes **structured BOQs, tender-style unstructured BOQs, work-based procurement requests, dependency-heavy sourcing, and group-level brand selection**. Each example follows the **step-by-step AI workflow**, demonstrating **attribute-based SKU matching via PIM**, **clarifications using multiple-choice prompts**, and **draft quotation generation**.

**🔹 Scenario 1: Processing a Structured Multi-Category BOQ with Cross-Dependencies**

**Example Use Case**

**User:** Vikram, an Industrial Procurement Manager for a facility in Pune.  
**BOQ Uploaded:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Sr. No.** | **Item Description** | **HSN Code** | **Quantity** | **Unit** |
| 1 | 3.5 Core, 300 Sq.mm XLPE Cable | 85444999 | 700 | M |
| 2 | 25mm GI Pipe | 73063010 | 500 | M |
| 3 | MS Channels for Cable Tray Support | 72163100 | 50 | KG |
| 4 | M16 Hex Nuts | 73181600 | 100 | NOS |

**Step 1: BOQ Upload & AI Analysis**

* The AI **detects a structured BOQ** and categorizes items into:
  + **Electrical:** LT Cables
  + **Plumbing:** Pipes & Fittings
  + **Structural:** Steel & Fasteners

**Step 2: Attribute Extraction & Clarifications**

|  |  |  |  |
| --- | --- | --- | --- |
| **BOQ Item** | **Extracted Attributes from BOQ** | **Fetched Variations from PIM** | **AI Prompt (If Needed)** |
| **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 | ✅ *"Please confirm voltage rating: 1.1kV, 3.3kV, 6.6kV, 11kV"* |
| **25mm GI Pipe** | Size: 25mm | Class: Medium, Heavy; Galvanization: Hot-Dip, Pre-Galvanized | ✅ *"Select class: Medium / Heavy. Select galvanization type: Hot-Dip / Pre-Galvanized."* |
| **MS Channels for Cable Tray Support** | Material: Mild Steel | Sizes: 75x40mm, 100x50mm, 150x75mm | ✅ *"Select size for MS Channels: 75x40mm, 100x50mm, 150x75mm."* |

**Step 3: Group-Level Brand Recommendation**

* The AI **suggests brands per category instead of per item**:
  + **Electrical Components:** *"Would you like to get quotes from Polycab, RR Kabel, or KEI?"*
  + **Plumbing Materials:** *"Would you like to source from Finolex, Supreme, or Astral?"*

**User selects brands:**

* **Electrical:** Polycab
* **Plumbing:** Finolex
* **Structural:** Tata Steel

**Step 4: SKU Matching via Attribute Mapping**

|  |  |  |
| --- | --- | --- |
| **BOQ Item** | **Final Matched SKU (From PIM)** | **Selected Brand** |
| 3.5 Core, 300 Sq.mm XLPE Cable | **FRLS-3.5C-300-XLPE-1.1KV** | Polycab |
| 25mm GI Pipe | **GI-25-HDG-M** | Finolex |
| MS Channels for Cable Tray Support | **MS-CHNL-100X50-TATA** | Tata Steel |

**Step 5: Draft Quotation Generation**

* AI **creates category-wise draft quotations**, linking **BOQ text to SKU matches**.

**Example Draft Quotation Output**

json

CopyEdit

{

"quotation\_id": "RFQ-2025-PUNE-001",

"categories": [

{

"category": "LT Cables & Earthing",

"selected\_brands": ["Polycab"],

"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"

}

]

},

{

"category": "Plumbing Materials",

"selected\_brands": ["Finolex"],

"items": [

{

"original\_BOQ": "25mm GI Pipe",

"matched\_sku": "GI-25-HDG-M",

"brand": "Finolex",

"quantity": 500,

"unit": "M"

}

]

}

],

"status": "Draft"

}

**🔹 Scenario 2: Processing a Free-Text Tender BOQ Query**

**Example Use Case**

**User:** Meera, a Procurement Manager for a High-Rise Project in Delhi.  
**User Input:**  
*"We need 1.1 kV FRLS XLPE armoured cables as per IS 7098:1988, 500M. Also, supply fire-rated doors complying with IS 3614."*

**Step 1: AI Extracts Key Entities**

|  |  |
| --- | --- |
| **Extracted Entity** | **Detected Details** |
| **Product 1** | LT Cables & Earthing |
| **Voltage** | 1.1 kV |
| **Insulation** | FRLS XLPE |
| **Compliance** | IS 7098:1988 |
| **Product 2** | Fire-Rated Doors |
| **Compliance** | IS 3614 |

**Step 2: Attribute-Based SKU Matching via PIM**

|  |  |  |
| --- | --- | --- |
| **Product** | **Matched SKU** | **Brand Recommendation** |
| **1.1 kV FRLS XLPE Cable** | **FRLS-XLPE-1.1KV-POLYCAB** | Polycab, RR Kabel, KEI |
| **Fire-Rated Door (IS 3614)** | **FD-IS3614-120M** | Godrej, Dorset |

**Step 3: AI Prompts for Additional Clarifications**

| **Query** | **AI Prompt** |
| --- | --- |
| Fire-rated doors | *"Please confirm fire rating duration: 60 min / 120 min."* |

**Step 4: Group-Level Brand Selection & Draft Quotation Generation**

* AI suggests **group-level brands** instead of per product.
* User **selects** Polycab for cables and Godrej for doors.
* AI **matches the products**, ensuring compliance with **IS 7098 & IS 3614**.

**Example Draft Quotation Output**

json

CopyEdit

{

"quotation\_id": "RFQ-2025-DELHI-002",

"categories": [

{

"category": "LT Cables & Earthing",

"selected\_brands": ["Polycab"],

"items": [

{

"original\_BOQ": "1.1 kV FRLS XLPE armoured cable",

"matched\_sku": "FRLS-XLPE-1.1KV-POLYCAB",

"brand": "Polycab",

"quantity": 500,

"unit": "M"

}

]

},

{

"category": "Fire-Rated Doors",

"selected\_brands": ["Godrej"],

"items": [

{

"original\_BOQ": "Fire-rated doors complying with IS 3614",

"matched\_sku": "FD-IS3614-120M",

"brand": "Godrej",

"quantity": "TBD",

"unit": "NOS"

}

]

}

],

"status": "Draft"

}

**No redundant questions** → AI **only asks for missing attributes**.  
**Smart SKU matching** → AI **uses PIM variations for attribute-based SKU selection**.  
**Group-level brand selection** → Eliminates **per-product brand selection**, streamlining bulk procurement.  
**Traceable draft quotations** → Each **BOQ item is linked to its SKU**, ensuring procurement accuracy.  
**Handles work-based procurement** → Ensures **all required components are included for bulk purchases**.