

Smart Variants Agent - User Guide

This User Guide details the end-to-end process of using the **Smart Variants Agent** to transform existing Bill of Materials (BOM) configurations into structured **Variant Management** models within Aras Innovator.

Overview

The **Smart Variants Agent** is a purpose-built Task Assistant Agent within the **InnovatorEdge AI** framework.

It enriches the digital thread by analyzing the configuration relationships within a product's 150% BOM data to infer rules and automate the creation of governed Variant Management items.

What the Smart Variants Agent Does

The agent facilitates the configuration process by performing the following:

- **Direct System Access:** Reads BOM structures directly from Aras Innovator via the Edge API, requiring no manual document uploads.
- **Rule Extraction:** Sends a BOM representation to the AI Agents Service to derive variant rules through deterministic co-occurrence analysis.
- **Intelligent Visualization:** Displays a merged **150% BOM**, coupled (**AND**) rules, either/or (**XOR**) rules, and a **dependency matrix (Implies/Exclude)**.
- **Governed Commitment:** Creates Variant Management entities in Innovator only after the user executes the final import.

Purpose

- **Manual Reduction:** Reduces the engineering effort required to manually model variability from BOM data.
- **Verification Separation:** Separates the analysis phase from the import phase to ensure mandatory human validation before any data is committed to Innovator.
- **Digital Thread Integration:** Supports downstream configuration management with structured Variant Management objects.

Preparation



The quality of the AI-driven analysis is directly proportional to the integrity of the source data in Aras Innovator.

For optimal results, ensure:

- **Multiple Configurations:** The product must have multiple 100% BOM configurations. The agent compares these to determine which components are mandatory, optional, coupled, or mutually exclusive. Single-configuration products will not produce meaningful rules.
- **Standardized Naming:** Parts with identical keyed_name values across configurations are identified as the same component. Inconsistent naming can result in duplicate or missing rules.
- **Structural Depth:** The agent retrieves and analyzes structures up to **nine nesting levels** of Part_BOM navigation properties. Structures exceeding this limit may not be fully represented.
- **Clean Data:** Ensure relationships in the system of record are clearly defined, as missing or ambiguous links reduce the accuracy of inferred rules.

Product Selection and Analysis

The workflow begins in the **Select Product** interface, where users identify the target for configuration modeling.

1. **Identify Target Product:** Use the **Search products** field to filter the list by name, item number, or description.
2. **Select Target:** Click a row in the table to highlight a single product.



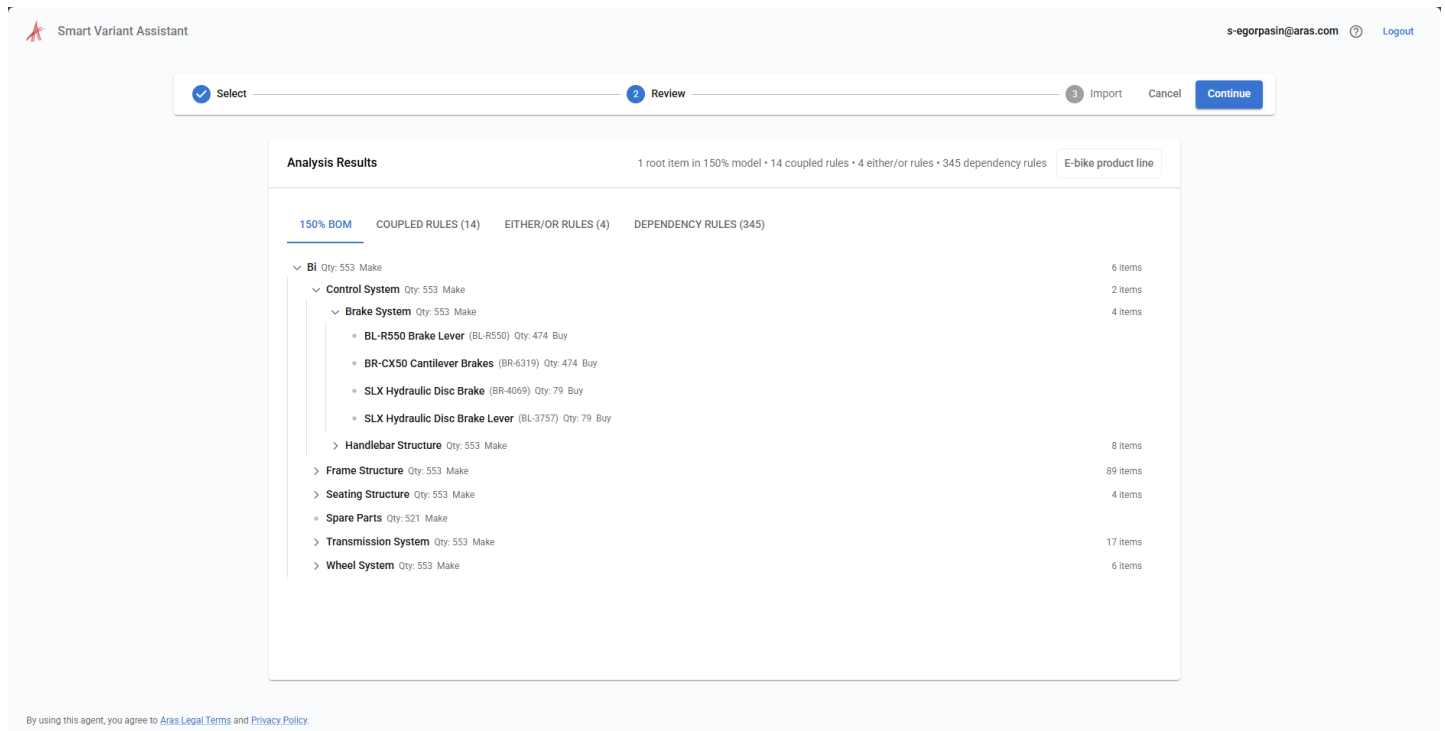
Validation and Review

Once analysis is complete, the agent moves to the **Review** step to present the **Analysis Results**. This environment allows domain experts to verify the AI's interpretation before system commitment.

The Review Interface Layout

The interface summarizes findings in a single line (e.g., "1 root item in 150% model • 14 coupled rules • 4 either/or rules • 345 dependency rules") and presents detailed data in four functional tabs:

- **150% BOM:** An expanded tree view showing the merged hierarchy across all configurations. Mandatory items are distinguished from optional items.



- **Coupled Rules:** A searchable table of parts that always appear together across analyzed configurations.



Smart Variant Assistant
s-egorpasin@aras.com
Logout

Select
Review
Import
Cancel
Continue

Analysis Results

1 root item in 150% model • 14 coupled rules • 4 either/or rules • 345 dependency rules E-bike product line

150% BOM
COUPLED RULES (14)
EITHER/OR RULES (4)
DEPENDENCY RULES (345)

#	Rule Elements (must all be selected together)
1	BR-CX50 Cantilever Brakes AND BL-R550 Brake Lever AND A Black Carbon blades, Aluminum Alloy Steerer Fork AND SMR3 Pro Black Carbon Saddle AND Carbon Seatpost AND Road Bike 700c Wheelset AND DHL-92 rear disc hub AND DHG-150 front disc hub AND 26" 100mm 32h AND Stainless Black Spoke AND Apache 700 X 25c AND Threaded 63mm Bottom Bracket AND SPD-SL Clipless Road Pedals AND 11-32 Nickel-Plated Cassette AND 11-42 Nickel-Plated Cassette
2	24.4" Aluminum Flat Bar AND A Black Steel Fork AND Fat Bike 26" Wheelset AND 26" 100mm 32h AND Stainless Black Spoke AND SL-1240 front disc hub AND DHL-197 rear disc hub AND Bulldozer 26" X 3.9" 72tpi AND Flat Steel Pedal AND 10-42 Chromoly Steel Cassette
3	30.7" Aluminum Riser Bar AND 150-170mm Travel Fast-Black Coated Aluminum Fork AND Mountain Bike 27.5" Wheelset AND Stainless Black Spoke AND M1900 Spline 27mm rim - 27.5" AND DHG-150 front disc hub AND DHL-92 rear disc hub AND Rail 27.5" X 1.95" 72tpi AND MTB SPD Pedals AND 10-50 Stamped Steel Cassette
4	X1 11-Speed Trigger Shifter AND SLX Hydraulic Disc Brake AND SLX Hydraulic Disc Brake Lever AND Mountain Bike Air Rear shock AND SMP Well Black Nylon Saddle AND SL Aluminum Switch, dropper, 30.9mm AND Aluminum 11-Speed Long Rear Derailleur AND Non-Threaded 73mm Bottom Bracket
5	EA90 Aluminum 3.5" Stem AND 3.5" EA90 Aluminum Tubing AND 8" Steerer Clamp AND 31.8mm Handlebar Clamp AND 4mm Steel Allen Bolt
6	170mm 11-Speed Carbon Fiber Standard Chaining C... AND 170mm Carbon Fiber Hollow Crank Arm AND Steel Spider Bolts AND X-GlideR 55T Chaining AND Aluminum Alloy Crank Spider
7	EA90 Aluminum 3.9" Stem AND 4mm Steel Allen Bolt AND 31.8mm Handlebar Clamp AND 3.9" EA90 Aluminum Tubing AND 8" Steerer Clamp

1-14 of 14
< 1 > >>
Rows per page: 50

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- Either/Or Rules:** A view identifying mutually exclusive groups where exactly one option is valid per configuration.



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Review
Import
Cancel
Continue

Analysis Results

1 root item in 150% model • 14 coupled rules • 4 either/or rules • 345 dependency rules E-bike product line

150% BOM
COUPLED RULES (14)
EITHER/OR RULES (4)
DEPENDENCY RULES (345)

Expand All
Collapse All
105 cols • 110 rows
Mutual implies
Implies
Mutual excludes
Excludes

	17.3" Alumi...	Bell	11 Speed S...	16.5" Alumi...	15.7" Alumi...	24.4" Alumi...	X1 11-Spee...	30.7" Alumi...	BR-CX50 Ca...	BL-R5
Bi										
Control System										
Handlebar Structure										
17.3" Aluminum Drop Bar										
Bell										
11 Speed STI Shifters										
16.5" Aluminum Drop Bar										
15.7" Aluminum Drop Bar										
24.4" Aluminum Flat Bar										
X1 11-Speed Trigger Shifter										
30.7" Aluminum Riser Bar										
Brake System										
BR-CX50 Cantilever Brakes										
BL-R550 Brake Lever										

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System Commitment

After clicking **Continue** in the review phase, the process moves to the final commitment step.

Create Variant Management Model

This screen allows you to configure the final import parameters:

1. **Review Entities to Create:** A summary panel lists the counts of entities to be generated, including **Variability Items**, **Features**, **Options**, **Variable Components**, **Usage Conditions**, and **Asset Links**.
2. **Define Identifiers:** Enter an **Item Number Prefix** (e.g., VM-eBike).
This is prepended to all generated item numbers.

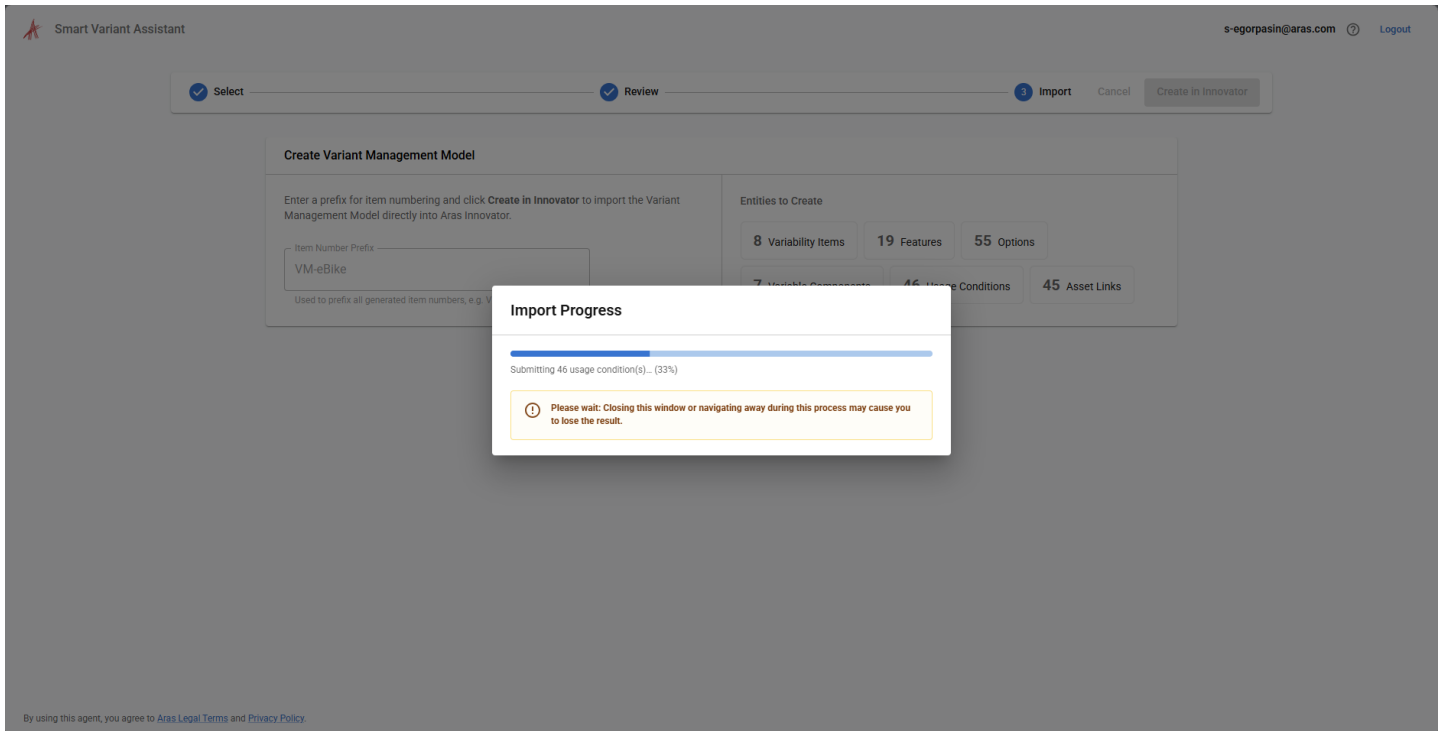


The screenshot shows the 'Smart Variant Assistant' interface. At the top, there is a navigation bar with the title 'Smart Variant Assistant' and a user profile 's-egorpasin@aras.com' with a 'Logout' link. Below the navigation bar is a progress bar with three steps: 'Select' (checked), 'Review' (checked), and 'Import' (active). To the right of the progress bar are 'Cancel' and 'Create in Innovator' buttons. The main content area is titled 'Create Variant Management Model'. It contains a text input field for 'Item Number Prefix' with a hint: 'Enter a prefix for item numbering and click **Create in Innovator** to import the Variant Management Model directly into Aras Innovator. Used to prefix all generated item numbers, e.g. VM-SUV-001'. To the right of the input field is a section titled 'Entities to Create' which displays a grid of entity counts: 8 Variability Items, 19 Features, 55 Options, 7 Variable Components, 46 Usage Conditions, and 45 Asset Links. At the bottom left, there is a small text link: 'By using this agent, you agree to [Aras Legal Terms](#) and [Privacy Policy](#)'.

3. Click **Create in Innovator**: This initiates the **Import Progress** modal, which executes in three phases:

- Phase 1: Core `vm_VariabilityItem` (including features and options).
- Phase 2: `vm_Usage` conditions.
- Phase 3: `vm_VariableComponent` and asset relationships.



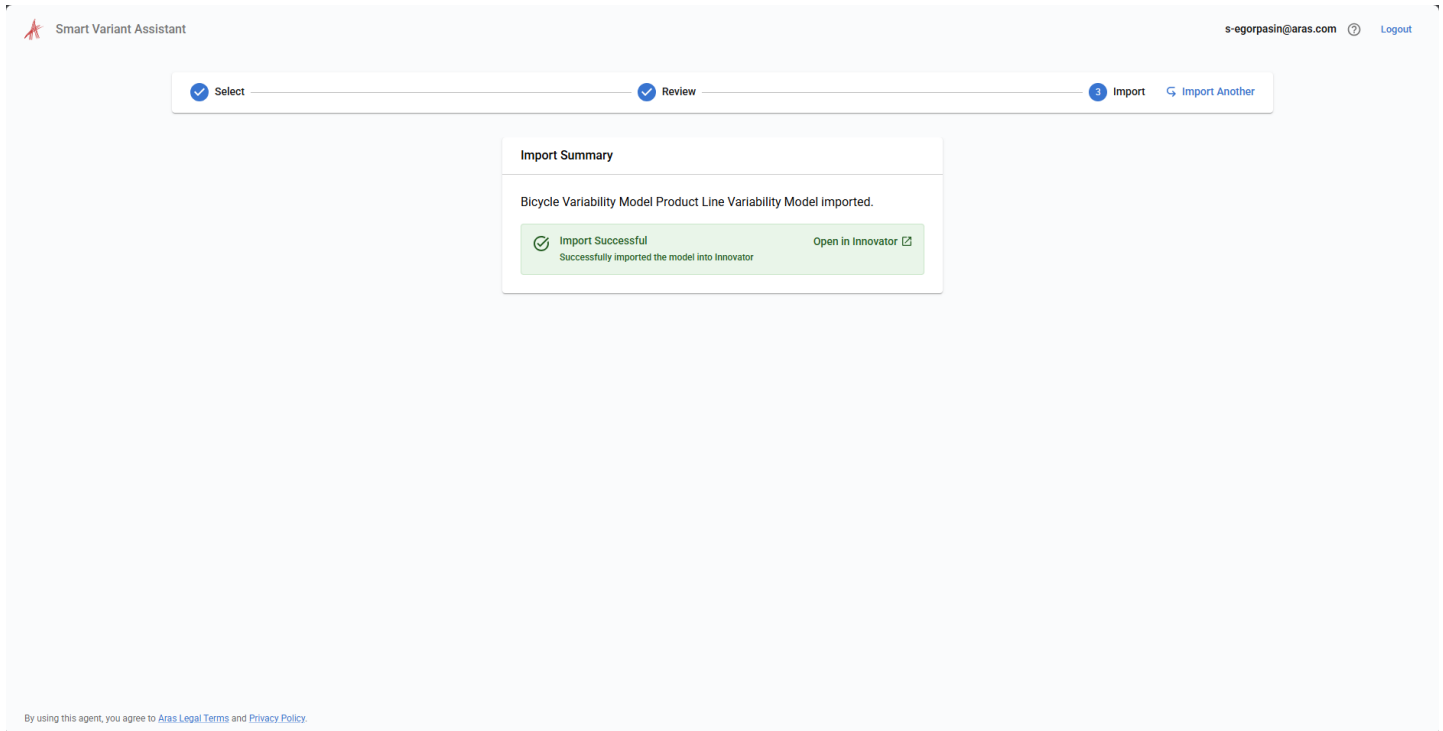


Import Summary

Upon successful commitment, an **Import Summary** is displayed.

- **Open in Innovator:** Click the provided link to open the **Root Variability Item** in the native Aras Innovator interface.
- **System Records:** In Innovator, you can navigate the resulting **Variability Structure** and **Usage Conditions** tabs to verify the generated model.
- **Continuous Workflow:** Select **Import Another** to return to the selection step for a different product.





Native Innovator Interaction

Once the model is committed to Aras Innovator, it becomes part of the authoritative digital thread. You can perform the following directly within the native interface:

- **Metadata Review:** View the generated **Number**, **Revision**, and **State** (defaulting to Preliminary).



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Search

VM-eBike-001 ...

VM-eBike-001 Bicycle Variability Model

Edit Refresh Promote Navigate Reports Share ...

Variability Item

Number: VM-eBike-001 Revision: A State: Preliminary Assigned Creator

Name: Bicycle Variability Model Designated User

Description: Variability model capturing optional components and configuration rules for a customizable bicycle.

Relevant Features 0 Variability Items 7 Variability Structure Usage Conditions

Features

Create Delete Row Search Clear Hidden Refine Display Share

Number	Name	Description [...]	Sequence
No results found			

Add new items or adjust your search criteria.

Page: 1 of 1 0 Results 10 25

Variability Items: shows a flat list for auditing all child entities, displaying their system-generated numbers, descriptions, and current lifecycle states. You can select individual entries to perform native Innovator actions such as edits or lifecycle promotions.

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Search

VM-eBike-001 ...

VM-eBike-001 Bicycle Variability Model

Edit Refresh Promote Navigate Reports Share

Variability Item

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Name: Bicycle Variability Model Designated User

Description: Variability model capturing optional components and configuration rules for a customizable bicycle.

Relevant Features 0 Variability Items 7 Variability Structure Usage Conditions

Variable Items

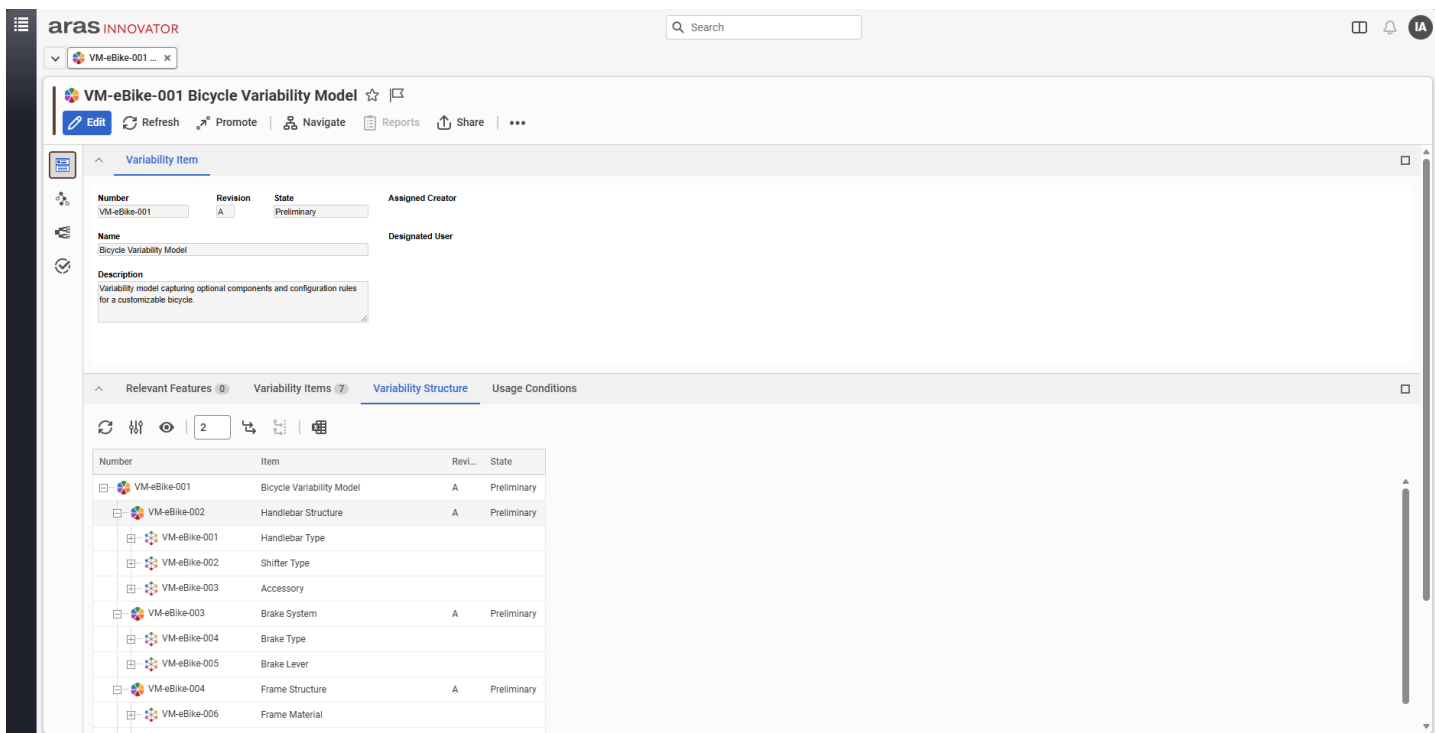
Create Delete Row Search Clear Hidden Refine Display Share

Number	Name	Rev...	State	Description [...]	Sequence
VM-eBike-002	Handlebar Structure	A	Preliminary	Options for handlebar types, shifters, and ...	10
VM-eBike-003	Brake System	A	Preliminary	Options for brake types and levers.	20
VM-eBike-004	Frame Structure	A	Preliminary	Options for frame material, size, and fork t...	30
VM-eBike-005	Seating Structure	A	Preliminary	Options for saddle and seatpost types.	40
VM-eBike-006	Wheel System	A	Preliminary	Options for wheelset and tire types.	50
VM-eBike-007	Transmission System	A	Preliminary	Options for drivetrain, crankset, cassette, ...	60
VM-eBike-008	Spare Parts	A	Preliminary	Optional spare parts for maintenance.	70

Done: 1 of 1 7 Results 10 25

- **Variability Structure:** Navigate the Variability Structure tab to see the multi-level hierarchy of items and features established by the agent.





Governance and Permissions

All items created by the agent are subject to standard **Aras Innovator Governance**.

This means:

- **User Permissions:** Your ability to see, edit, or delete the generated Variant Management items is strictly tied to your native Aras Innovator identity and assigned roles (e.g., Configuration Management Group).
- **Lifecycle Management:** Committed items follow native lifecycle transitions (e.g., Preliminary to In Review) and versioning rules established in your environment.

Guidelines & Best Practices

- **Ensure Multiple Configurations:** The agent identifies mandatory, optional, or mutually exclusive components by comparing different 100% BOMs. Products with only a single configuration will not produce meaningful rules.
- **Standardize Part Naming:** Components must use consistent keyed_name values across all variants to be identified as the same item. Inconsistent naming results in duplicate or missing configuration rules.



- **Adhere to Input Constraints:** To ensure reliable processing and retrieval, keep search field inputs under **100 characters** and item number prefixes to a maximum of **12 characters**.
- **Human-in-the-Loop Validation:** All AI-derived rules and the 150% BOM must be reviewed and confirmed by an engineer before committing the model to the system of record.
- **Maintain Active Session State:** Do not close the browser window or navigate away while the **Analyzing** or **Import Progress** modals are active to prevent the loss of session data.

Troubleshooting

Issue	Solution
No products found	Check search text; clear search. Confirm products exist and you have read permissions.
Analysis takes too long	Large BOMs require more time; keep the modal open to prevent session loss.
Analysis fails	Check your network; the AI Agents Service must be reachable.
Import errors	Read error messages in the dialog. Try a different prefix or check permissions.
Partial import failure	If a later phase fails, earlier phases may have committed data. Remediation in Innovator may be required.
Open in Innovator missing	Ensure VITE_INNOVATOR_URL is set in the configuration.
Rules seem incorrect	Verify the product has multiple BOM configurations and consistent part naming.
403 Error after Analyze	Rotated refresh tokens may be stale; ensure the authentication layer is synchronized.

