

Aras Accelerates Variant Management with Agentic AI

How Agentic AI Helps Manufacturers Tame Product Variant Complexity

Takeaways

The traditional engineer-to-order (ETO) model is hitting a breaking point. Relying on “clone-and-modify” practices does not scale; instead, it triggers a costly “variant explosion” where a lack of configuration visibility can cause, by some industry estimates, 30% to 50% engineering waste and constant duplication of existing parts and sub-assemblies.

While a transition to CTO is essential to combat variant complexity, most organizations are not ready for a disruptive, clean-sheet modular architecture overhaul. The messy reality consists of fragmented legacy BOMs, inconsistent product structures, and undocumented knowledge.

Companies can find immediate value in legacy data extraction. Using smart tools to generate 150% BOMs and configuration rules from existing silos establishes the foundation to automate digital threads while improving productivity.

Aras is positioning its Smart Variants Agent to support ETO to CTO transformation by analyzing existing product data and proposing reusable variant logic within governed workflows. Aras also frames this capability within a broader AI and digital-thread strategy centered on governed, human-reviewed agentic workflows across the lifecycle.'

Transitioning from ETO to CTO

Product complexity has fundamentally outgrown traditional clone-and-modify engineering practices. There is a strategic imperative across industries to shift from engineer-to-order (ETO) to configure-to-order (CTO) models.¹ Customer-centric product organizations often suffer from a variant explosion as the number of as-sold configurations continually grows. Over time, manufacturers accumulate years of ETO decisions, copied Bills of Materials (BOMs), local variants, and undocumented configuration logic.

Engineers end up duplicating existing structures simply because there is no clear record of which configurations are proven or prohibited, leading to engineering waste and part duplication that, by some industry estimates, reach 30% to 50%.

A complete transition to CTO as suggested in Figure 1, requires significant upfront investment in modular product architecture, and it naturally fits some product lines better than others. It is not an all-or-nothing

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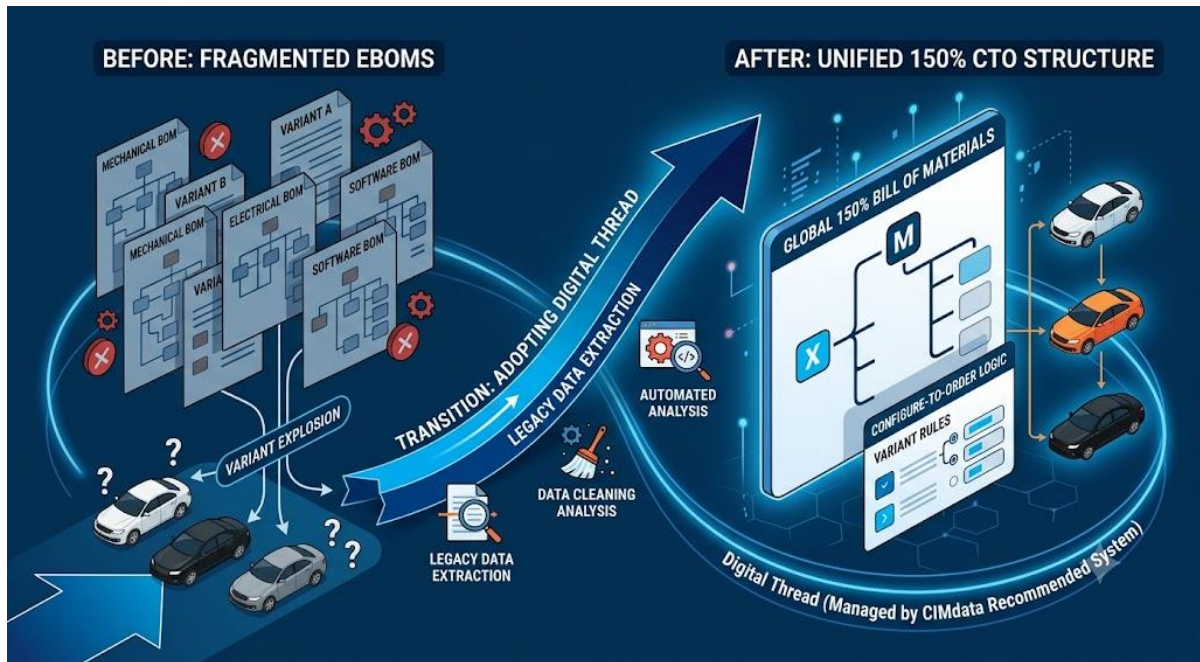


Figure 1: Building a 150% CTO Structure from Fragmented BOMs

proposition, as retaining some ETO allows companies to meet unforeseen and unique customer requirements. CIMdata's view is that while a more modular CTO-oriented architecture may be the long-term goal, most companies cannot pursue that transformation all at once. Organizations must start from where they are, utilizing existing and often inconsistent BOMs to create a practical, incremental roadmap to modularity.

Using Agentic AI to Transition from ETO to CTO

Agentic AI can significantly accelerate the discovery of reusable product logic. However, organizations cannot adopt any form of agentic AI without establishing deep trust and relying on strict governance, observability, and explainability to ensure recommendations are reliable and traceable. This requires a shift from passive, rigid data relationships to active semantic dependencies. These semantic layers understand engineering context, effectively serving as the active memory of product development.

The ETO to CTO migration presents a highly practical use case for these new technologies. Software agents can analyze groups of similar ETO BOMs, identify reusable modules, and propose an overloaded 150 percent BOM that represents all possible combinations. This approach helps gain organizational support for the 150 percent BOM concept, makes gaps in current product architectures visible, and rapidly generates baseline data for product configurators. It is CIMdata's perspective that utilizing agentic AI to mine legacy data for configuration rules is one of the most pragmatic and high-value initial use cases for AI in product development, as it directly attacks the root causes of engineering waste and bypasses the need for pristine initial data.

Aras's Approach: Adaptive PLM and the Smart Variants Agent

At the [ACE 2026 event](#), Aras highlighted the "Agentification of PLM" and introduced Adaptive PLM as the broader foundation for governed agentic workflows across the digital thread. Aras differentiates its approach by focusing heavily on governing their agents' output. It is important to clarify that current Aras agents, including the Smart Variants Agent, which is pertinent to this paper's topic, do not currently rely on a separate formal semantic knowledge graph. Instead, Aras Innovator's underlying data model is already highly relational and dependency graph-like. When the Smart Variants Agent is instructed to navigate this data using Aras InnovatorEdge APIs, it operates within a bounded network of declared product relationships, which constrains the agent to valid relationships and reduces the risk of hallucinations.

The Smart Variants Agent analyzes existing BOM structures, historical sales data, and previous engineering decisions to identify commonality, variation, and reusable modules. It then outputs a 150 percent BOM structure and candidate configuration rules into captured, managed, and editable Aras items. Crucially, engineers remain fully in control by reviewing, refining, and approving the agent's recommendations. Aras recently demonstrated this capability using data from the SICK company, showing how the agent combines digital thread context with technical feasibility to find viable product variants faster. Looking ahead, Aras's longer-term Adaptive PLM vision includes evaluating richer product knowledge representation and formal knowledge graph technologies to handle deeper industrial scale dependencies. CIMdata notes that AI models are only as good as the data they are built on. However, because CIMdata often works with companies struggling with low-quality data and poorly defined product architectures, Aras's ability to generate a baseline 150 percent BOM from existing structures provides a critical and immediate starting point for organizations to refine their outputs and accelerate their CTO journey.

What is Adaptive PLM?

Adaptive PLM is a new approach introduced by Aras that is designed to evolve alongside a company's data, processes, and business. Driven by the explosive growth in data and product complexity, it marks a shift away from traditional systems by building on existing data, learning and adapting as changes happen, and connecting data into a "live network." It actively utilizes AI to support complex decision-making and what-if analyses.

Adaptive PLM fundamentally shifts how data relationships are handled, moving away from traditional, passive data "connections" to an architecture built on dependency graphs.

Using the Smart Variants Agent

SICK, a leading global manufacturer of intelligent sensors and sensor solutions for factory, logistics, and process automation, has been an Aras subscriber since 2015. At the 2026 Hannover Messe event, Aras showcased a prototype built using SICK production data to demonstrate the capabilities of the Smart Variants Agent as shown in Figure 2. This workflow-driven process allows users to select an existing product family from which the agent ingests BOM structures through Aras InnovatorEdge APIs, retrieving multi-level assemblies, attributes, quantities, effectivity, and lifecycle states. The BOMs Analyzer agent analyzes the data set to identify mandatory components, conditional inclusions, and co-occurrence patterns using association rule and rare itemset analysis, resulting in a 150 percent BOM. The Variant Expert ingests derived configuration rules and additional knowledge from product catalogs, datasheets, and subject matter expert insights. Subsequently, the Smart Variants Agent maps BOM items to features and options. Finally, fully governed Aras items are created, representing the 150 percent BOM, along with necessary configuration objects, such as rules, features, and options, ensuring full traceability to the source information.

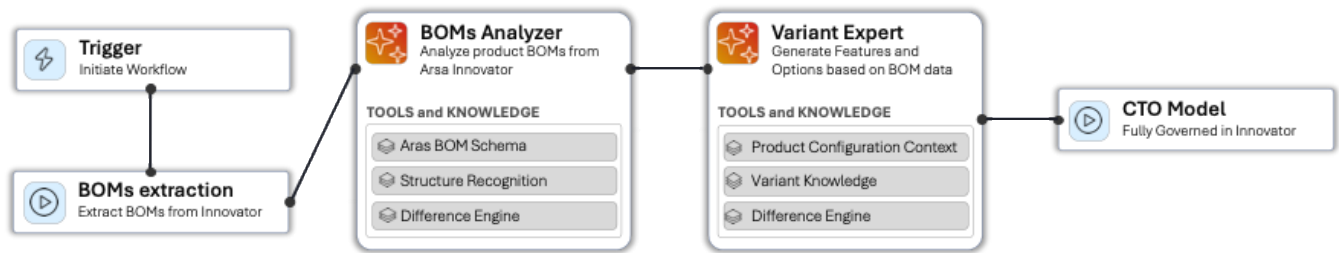


Figure 2: SICK's Smart Variants Agent Workflow

Conclusion

Transitioning to a configure-to-order business model, even if only for parts of a product line, has the potential to dramatically improve business performance especially as product complexity grows. Organizations stand to realize significant cost reductions from part reuse and commonality, alongside revenue increases from efficient product variant generation. While migrating legacy data from an ETO approach is historically difficult, agentic AI offers a powerful new method to help companies transform much faster.

Aras's open, flexible, and relationship-rich data model provides a governed foundation for agentic AI today. By transforming unstructured, legacy product data into a structured 150 percent BOM baseline, Aras delivers a practical and scalable foundation for companies looking to de-risk and accelerate their CTO transition. Furthermore, this architecture is positioned to evolve toward richer semantic and knowledge graph capabilities as part of Aras's broader Adaptive PLM vision. CIMdata concludes that Aras's strategy of pairing governed agentic AI with a flexible data model effectively addresses the technical debt that holds many manufacturers back. Aras provides a compelling path forward and should be included in enterprise evaluations for advanced PLM and variant management solutions.

To learn more about Adaptive PLM and the Smart Variants Agent, [contact Aras](#).

About CIMdata

CIMdata, a global strategic management consulting firm, provides services designed to maximize an enterprise's ability to design, deliver, and support innovative products and services. For more than forty years, CIMdata has provided industrial organizations, providers of digital technologies and services, and investment firms with world-class insight, expertise, and best-practice methods on a broad set of product lifecycle management (PLM) topics and the digital transformation they enable. CIMdata also offers research, subscription services, publications, and education through certificate programs and international conferences. To learn more, visit www.CIMdata.com or email info@CIMdata.com.