

Aras Innovator Variant Management

Making Variability a Competitive Advantage in the High-Tech & Electronics Industry

Key Takeaways

Product platforms, product variants, modular design, and software-defined features are common, proven strategies to efficiently meet diverse and changing customer demand improving top and bottom-line value in many industries, but especially in high-tech and electronics.

Ensuring product architecture, designs, and production methods share a common approach to managing product variability enables maximum efficiency and reduces risk of errors.

Software-defined products (i.e., products where features and options are implemented by enabling capabilities via software activation) are becoming more common and used to drive high-margin after-sales revenue.

Aras Innovator's approach delivers a unified product-centric variability definition and supporting technology stack, enabling consistent, efficient management of configurable products across sales, engineering, manufacturing, and service while supporting diverse strategies like configure-to-order, engineer-to-order, and hybrids.

Introduction

The high-tech and electronics (HTE) industry, a cauldron of rapid technological evolution, faces the daunting task of balancing relentless innovation with the imperative to deliver highly personalized products to an ever-changing market. In this arena, where product lifecycles are often measured in months rather than years, customer expectations for customization are at an all-time high, and, unfortunately, traditional product development and management approaches are proving increasingly inadequate.¹ HTE companies are grappling with the need to efficiently manage diverse customer requirements, intricate product architectures, and the accelerating complexity of software-defined features. To navigate these challenges while maintaining a competitive edge, HTE organizations must embrace sophisticated product variant management strategies, with a particular focus on the strategic deployment of configurators to support configure-to-order (CTO) strategies.

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This commentary explores the pivotal role of configurators in enabling HTE companies to transform their product development and delivery processes. This allows them to drive revenue growth and operational excellence by enabling the transition from engineer-to-order (ETO) to CTO. Additionally, it considers how a unified, product-centric variability definition, supported by robust technology like Aras Innovator, can empower HTE companies to effectively manage the complexities inherent in their market. By leveraging advanced configuration capabilities, HTE companies will not only be able to meet the demands of an increasingly discerning customer base but also streamline their internal operations, reducing costs and accelerating time-to-market.

The HTE market is a diverse, global ecosystem, encompassing a wide array of products ranging from high-volume, low-variability consumer electronics like smartphones and laptops to low-volume, high-variability telecommunications and semiconductor equipment and automation systems. Many variants are required to meet customer price, feature, and performance requirements within these product categories. Companies without a modular design approach must invest additional engineering resources to develop each variant. By implementing a modular design strategy and a flexible configurator, the resources required to meet customer requirements and seamlessly adapt to varying degrees of product complexity can be significantly reduced. Moreover, there is a burgeoning trend of software-defined products, where software activation enables features and functionalities, fundamentally reshaping the HTE landscape and driving additional CTO requirements. This shift creates new revenue streams through post-sales upgrades and subscriptions and fosters a continuous customer engagement model. For instance, consider the automotive sector, where manufacturers like Tesla leverage over-the-air updates to deliver new features and functionalities, transforming cars into platforms for ongoing revenue generation.

Business Issues

HTE companies are confronted with a multitude of business challenges that demand innovative solutions. Cost pressures, stringent quality control measures, and relentless time-to-market demands are constant concerns. The need to keep pace with rapidly changing customer trends and navigate the complexities of global trade further compounds these issues. Regulatory compliance, sustainability initiatives, and regionalization requirements necessitate highly flexible product configurations that can adapt to diverse market demands. For example, compliance with the Software Bill of Materials (SBOM) regulation is becoming increasingly critical for cybersecurity, requiring HTE companies to meticulously track and manage software components alongside hardware.

Effective configuration management is paramount for ensuring traceability and minimizing errors throughout the product lifecycle. Reusing product architectures, modular designs, and software services can significantly streamline development processes and reduce costs. For instance, a modular design strategy can enable HTE companies to rapidly create new product variants by combining existing modules, thereby reducing the need for extensive re-engineering. Moreover, robust supply chain management—encompassing alternate parts sourcing, obsolescence mitigation, and resilience planning—is crucial for maintaining operational agility in a rapidly changing market. For example, all products with embedded electronics are highly susceptible to supply chain disruptions and component obsolescence, necessitating robust configuration management to ensure continuity.

Aras Innovator for HTE

Aras Innovator has emerged as a powerful platform that addresses these challenges by delivering a unified product-centric variability definition environment and a comprehensive technology stack. As a

Product Innovation Platform, it offers a rich set of capabilities, including requirements management, change management, multiBOM support, and a wide range of computer-aided design (CAD), application lifecycle management (ALM), and other enterprise software integrations. Aras' deep expertise in configuration management, coupled with its robust supplier portal, fosters seamless collaboration and enhances operational efficiency throughout an organization's extended enterprise.

A key differentiator of Aras Innovator is its sophisticated configurator, which is found in the Variant Management application and designed to handle the intricate product configurations inherent in the HTE market. Aras ensures consistency across sales, engineering, manufacturing, and service domains by treating variability definition as a distinct entity. This approach enables the configuration of various structures, such as requirements documents, engineering product structures, technical documentation, and manufacturing process plans, using a shared variability definition and consistently applied rules. For example, a telecommunications company can use Aras Innovator to configure network hardware and software versions based on customer-defined specifications, ensuring consistency and accuracy.

By leveraging Aras Innovator's configurator to define and manage product variants with flexible component substitutions and robust rule management as shown in Figure 1, HTE companies can quickly adapt to material shortages or component obsolescence. Furthermore, the ability to generate accurate and up-to-date BOMs through a robust configurator ensures that procurement and manufacturing can respond swiftly to configuration changes. This agility is vital for maintaining production schedules, minimizing costly redesigns, and ensuring product availability in a market where time-to-market is paramount. Moreover, integrating configurator data with supply chain planning tools can enhance visibility and enable proactive risk mitigation, building resilience into the HTE company's operational framework.

The screenshot displays the Aras Innovator interface for managing variability rules. On the left is a navigation tree with categories like 'Application', 'Automated Programming', and 'Reach'. The central pane shows a rule editor with the expression: `IF Series = RS THEN Application = Assembling OR Application = Sealing OR Application = Handling`. Below this is a table listing 23 rules for 'Vi-1 Robot' with their respective rule numbers and expressions. On the right, a matrix shows the application of these rules across different series (RS, RW, RP) and applications (Assembling, Sealing, Handling, etc.), with checkmarks indicating where a rule is active.

Rule Number	Rule Name	Rule Expression
00000001		IF Series = RS THEN Application = Assembling OR Ap
00000002		IF Series = RW THEN Application = [Arc Welding]
00000003		IF [R-Series] = RD THEN Application = Palletizing
00000004		IF Series = RS OR Series = RW THEN [No of Axes] = 6
00000005		IF [R-Series] = RD THEN [No of Axes] = 5
00000006		IF [R-Series] = RS THEN [Payload] = [Light] OR [Payloa
00000007		IF Series = RW THEN [Payload] = [Light]
00000008		IF [R-Series] = RD THEN [Payload] = [Heavy]
00000009		IF [R-Series] = RS THEN [Reach] = [Short Reach] OR [R
00000010		IF Series = RW THEN [Reach] = [Short Reach] OR [Rea
00000011		IF [R-Series] = RD THEN [Reach] = [Extra Long Reach]
00000012		IF [Reach] = [Short Reach] THEN [Position Repeatabili
00000013		IF [Reach] = [Medium Reach] THEN [Position Repeata
00000014		IF [Reach] = [Long Reach] THEN [Position Repeatabili
00000015		IF [Reach] = [Extra Long Reach] THEN [Position Repe
00000016		IF Application = Palletizing THEN [Installation Methoc
00000022		IF [R-Series] = RS THEN Power = [2.0kVA] OR Power =
00000023		IF Series = RW THEN Power = [2.0kVA] OR Power = [5

Figure 1– Managing Variability Rules in Variant Management

Aras Innovator's low-code platform can also empower HTE companies to rapidly adapt to evolving market demands without resorting to extensive and costly customizations. Its flexible data model supports continuous improvement and seamless integration with electronic computer-aided design (ECAD) and a robust set of enterprise systems (e.g., ERP). InnovatorEdge, the recently released low code integration framework reduces the development and maintenance efforts required to connect the product digital thread broader engineering and enterprise ecosystem. The platform's upgradeability ensures that customers can leverage the latest features and capabilities without disrupting ongoing operations.

Furthermore, the platform's ability to support hierarchical configurations and automate the ETO process further enhances its versatility. By integrating ETO workflows into the configurator, HTE companies can efficiently address complex customer needs, drive continuous innovation, and support hybrid ETO-CTO operating models. Moreover, Aras Innovator's seamless digital thread integration enables end-to-end traceability, ensuring that all product data and configurations are readily accessible throughout the lifecycle. This capability is particularly valuable in regulated industries like medical devices, where traceability is paramount for compliance.

Conclusion

In the fiercely competitive HTE industry, leveraging product platforms, modular designs, and software-defined features is no longer a luxury but a necessity for achieving rapid customization and delivering exceptional customer experiences. A unified approach to managing product variability across architecture, design, and production is critical for streamlining processes and minimizing errors. Aras Innovator provides a robust platform for managing product variability, fostering collaboration across the entire product lifecycle, and empowering HTE companies to effectively deliver products that meet product line and customer requirements.

Software-defined products are fundamentally transforming the HTE landscape, enabling businesses to unlock new revenue streams through post-sale feature activation and personalized upgrades. Aras Innovator's ability to incorporate software-driven feature management and dynamic configuration needs with traditional configuration management sets it apart from traditional product lifecycle management (PLM) and enterprise resource planning (ERP) solutions.

HTE companies seeking to optimize their product configuration processes and drive customer-centric innovation should strongly consider Aras Innovator. Its comprehensive capabilities, including a robust configurator, low-code platform, and seamless digital thread integration, enable efficient management of complex product variants and ensure sustained competitiveness in a rapidly evolving market.

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.