Conquer High Tech Industry Complexity with a Holistic Approach to Variant Management

by Chamanvitha Gopalpur and Joe Dury

High-tech firms today make more than just discrete products. With a stronger focus on providing customers with full solutions, their product offerings now include systems, sub-systems, and hardware with embedded software.

With this evolution, high-tech firms – both those with manufacturing operations and those who outsource – must leverage an ecosystem of suppliers, manufacturers, design support, external test houses, distributors and customers in order to meet market demands.

This adds up to more market pressure. High tech companies must maintain a focus on faster time to market and innovation, but now must also address growing customer expectations around quality, variety of choice, and custom solutions. This drives the need for even quicker design and manufacturing cycles.

What’s Causing this Problem?

Product complexity is at the crux of this problem. All the variants and mass customization requirements are supported by different processes, hardware for testing and assembly, software for design and test, and external software and firmware. Bringing products to market across a variety of regions – all with specific test, quality and regulatory requirements – means even more the reliance on the ecosystem to produce, track and manage all these variants.

In this environment, engineering product records are likely siloed in product lifecycle management (PLM) systems, or in design (CAD) systems and manufacturing databases. When product records are siloed this way, it takes too much time to manage and update the correct information for each product in a generation. With
minimal visibility to engineering design decisions or the functional relationships of all the parts and systems, companies end up reinventing the entire product lifecycle for each variant.

How do leading companies cope in such demanding environments?

How can a product manager anticipate and satisfy customer requirements while simultaneously driving business growth by steering product development towards a larger vision?

How can a design architect and marketing manager create a product portfolio that is attractive to the target market, while remaining in sync with the development team that will validate the functional and business requirements?

The answer lies in the approach.

As high-tech companies discover, create and make products in this exceedingly complex environment, they must consider a more holistic view of the process – focusing on connections and sharing information across these connections to can remove time, effort and redundancy – from early concept planning through manufacturing.

**Driving Improvements Across the Product Development Process**

The product development cycle must be viewed holistically, with a focus on capturing insights, data and information from past, present and future states of a product. It’s all about closed-loop change – or a shift from controlling change to accommodating change – that makes this possible.

To enable a standardized workflow that accommodates changes and variants, consider improvements across the product development process, from discover to create to make.

The development process begins with the Discover phase and then moves to developing innovative and effective strategies (Create) to improve product and manufacturing performance (Make). This three-step approach enables leading companies to enable a standardized internal flow while showcasing a broad spectrum of variants to the customer.

**Discover**

In this phase, companies study customer and functional requirements and initiate projects to prove the feasibility of a new or derivative product.

To enable growth in the discover phase, go beyond gathering requirements and creating specifications. Combine immediate and future market needs data with both product and business KPIs like functional parameters, design marginality and process sensitivity, cost, yield and cycle time.

By leveraging data mining and advanced analytics, design and planning tools can predict and offer valid variant options – enhancing decision making for new product development. Analytics enables companies to develop new versions of products that diminish past problems and enhance customer experiences. Analytics provides historical insights at scale for features or capabilities that may be problematic in the field. Analytics also provides insights into the past trends of the company to accommodate changes and customizations.

Leading firms adopt analytics for operational performance metrics by gathering data from manufacturing sites, equipment, operators, programs and materials. This gives detailed insights into predictive maintenance, yield improvement and throughput, as well as visibility into BOMs across the global product and production site
portfolio.

For example, the same engineer-to-order variant may be offered multiple times to multiple customers across different manufacturing sites or business areas. By understanding the pattern and history of such customizations and combining this data with configuration management, a company might decide to promote the variant to a standard option, reducing cycle time redundancy.

Create

In this phase, companies work on multiple design cycles and perform verification and validation checks to narrow down to the final approved design.

To enable growth in this phase, keep flexibility in mind for new product development designs: build variants based on customer demands and future market needs. Consider when a product platform approach makes sense to address commonality, whether it’s functional or architectural, or it’s based in applications, hardware or software. Most high-tech companies have PDM systems with the capability for managing hardware and software parts. High-performing PLM systems have advanced configuration and variant management functionality that manages the interrelationships of hardware and software parts, allowing companies to easily create product variants that move up the stack.

This encourages the reuse of design or product libraries, reduces needless tests and qualifications, and offers a well-defined product portfolio – reducing cost and development cycles and driving up overall efficiency. Strive for a future where data re-use in the development environment becomes routine.

Make

In this phase, companies manufacture or fabricate approved designs - first for testing and qualification, followed by ramping up in volume for mass production.

Develop a modular product architecture to realize the PLM concept of DASAMASA (design anywhere, sell anywhere, manufacture anywhere, support anywhere). A standardized base platform covering core functionality allows rapid deployment of many variants into production without changing the production line.

A great example is the Modular Transverse Toolkit (aka Modularer Querbaukasten or MQB) concept adopted by Volkswagen. This toolkit delivers a shared platform with standardized modules that can be reused in different combinations to deliver 16 model series and 40 models (VW Golf, Audi A3, VW Tiguan SUV, etc.). A set of standardized components like the combustion engine, electric powertrain, and front axle is shared across all cars, and variants are then managed by moving up the stack with the wheel base, exterior, etc. This enables any platform-supported production facility to build different models or variants on the same assembly line, making design and manufacturing cycles smarter and more efficient.

The same concept can easily be applied to a high-tech environment.

Build a shared platform to address commonalities in the manufacturing process, technology or test equipment. When these are compatible across a broad range of sub-components or assemblies, companies can achieve a plug-and-play architecture for product variants. This provides flexibility to outsource all or part of the manufacturing process to multiple external partners in a cost-effective manner while facilitating a shift from the traditional safety-stock model to a build-to-order model.
Enabling the Shift from Discrete Products to Modular Solutions

With a collaborative, holistic and mindful approach to product development from planning through development and manufacturing, companies can emerge as leaders in the high-tech industry.

Engage development teams cross-functionally to optimize productivity and reduce errors. Harness data from the ecosystem and apply analytics to develop a product management system with a modular architecture. Deploy an effective and efficient configuration management system to facilitate end-to-end traceability and understanding of the complete product portfolio.

Companies that adopt a business process approach for configuration and variant management will more smoothly handle the paradigm shift as they transition from a discrete product firm to a solutions-based firm.

True innovation lies in understanding the needs of the future and acting upon them today. A thoughtful and smart approach is required to truly optimize value creation. Companies willing to embrace this notion have seen remarkable benefits across a wide spectrum of the business, including a more streamlined product portfolio, clear market segmentation, consistent and reliable solution offerings, and overall reduction of costs, spending and risk.

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Leveraging Digital Technologies in High-Tech

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