Volvo Group AB: A Modular Strategy for Growth and Transformation

The Volvo Group Rolls On – Toward Sustainability

Sweden's $50B+ (USD) Volvo Group is one of the top five manufacturers of non-consumer vehicles in the world. Serving 190 markets, with factories in 18 countries and more than 104,000 employees, only a handful of multinationals can match the scope and complexity of Volvo's global manufacturing operations. The company's brand name – Latin for "I roll" – originally referenced its first business, the design and manufacture of innovative ball-bearing technologies. Today, however, it perfectly captures the company's powerful momentum and forward-looking vision.

Since its founding in 1927, Volvo has earned a well-deserved reputation as an innovator in engineering, quality, and safety. More recently, however, the company has taken a strong leadership position in the development of sustainable solutions for its propulsion systems, including battery-based and other non-fossil technologies. For the 13 brands of trucks, busses, construction equipment, and marine and industrial engines that make up the business, the sustainability mission is foundational.

Given this technological priority, and its ever-expanding product portfolio, the company is experiencing mounting product complexity in the face of a growing cadre of fast-moving, nimble, and in many cases well-funded competitors – especially in the electric vehicle (EV) space. As Sylvi Laks, Volvo's Senior Vice President for Vehicle Engineering, put it in a recent interview with PTC, *"The competition is coming on fast, and we need to continue to evolve."*

Evolving Toward Modularity

At the operational level, this evolution is being guided by a strategy of product and component modularity, by which multiple products are assembled from a core set of common components, complemented as needed with unique parts to ensure all the finer points of customer-requested functionality.

This approach is particularly vital for the efficient manufacture of trucks, and other industrial transportation systems. As variable and customizable as individual automobiles are today – dozens of color choices, a myriad of trim packages, and countless other available cosmetic and performance upgrades – there's a fairly stable "base" mechanical and electronic configuration beneath the surface of most makes and models.

For commercial trucks, however, customer- and application-specific configurations can go much deeper. Compared to cars, complexity is highly amplified, both within and across the Volvo Group's businesses. This naturally makes efficiencies not only more elusive, but simultaneously all the more critical to obtain and maximize.

CAST: An Organizational Framework for Modularity

Volvo's electric trucks are emblematic of this challenge. The design of the vehicle is extremely complex not only for the reasons already cited but driven also by multiple discrete but tightly integrated domains of science and engineering – mechanical and electronic components, of course, but also increasingly crucial software elements. This obviously creates an immense number of dependencies within each individual design. And, given the size of the Volvo portfolio and the growing needs of its customers, many products are in design concurrently.

Therefore, when driving to maximize modularity on an enterprise-wide basis, critical dependencies multiply: at the component level, at the system level, and then vertically. This dynamic applies even as the absolute number of parts, components, and products are being reduced.

To organize, govern, and manage this company-wide modularization initiative, Volvo has created its CAST system, for "Common Architecture and Shared Technologies." As Ms. Laks notes, *"This is really the foundation of how we think about this opportunity, and how we want to build our products…Our target is to create a platform where we have a modular system, with as many components as practical that we can share around the world, in many different products."*

Managing Complexity with PLM

Ms. Laks continued to describe how the powerful data management and collaboration capabilities of product lifecycle management (PLM) software are critical to managing the complexity of the global modularization initiative. After careful evaluation, Volvo selected PTC's Windchill as their PLM platform of record. *"We need really efficient PLM tools, to help us store the information, but also so that we can work together – across businesses, regions, and disciplines - the way we need to. The (PLM) collaboration tools, the visualization tools, and the simulation tools are all really important."*

With a robust and versatile PLM system in place, Volvo has deployed the CAST methodology with measurable positive results. This impact can be seen not only in the ongoing, effective management of an intrinsically complex environment, but in actually reducing the amount of complexity overall. *"We have seen that even as we have increased the number of products, we have reduced the number of parts by a lot,"* said Ms. Laks.

Striking the Right Balance: Common Components v. Unique Attributes

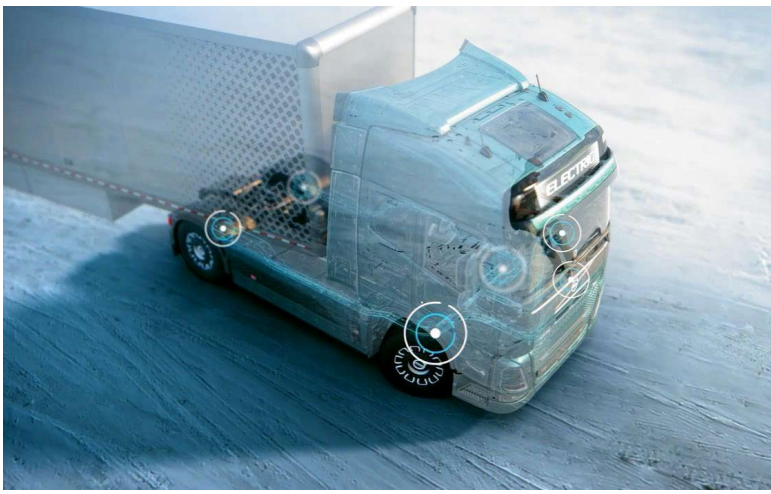
It is critical – but not always easy – to balance the modular opportunities within a given design against the need to protect unique features that may define a competitive advantage. If momentum swings too far in the direction of common parts or components, at the expense of unique product benefits, the eventual cost of that tradeoff may exceed its apparent initial benefits.

The Volvo Group has learned that striking this balance is not formulaic and must consider the market for each individual product – not just the aggregate portfolio. Their internal governance model for the modularization program includes a management team known as the CAST Committee. This body collaborates on all decisions regarding whether a given component should be modularized, as well as on branding questions related to the affected products.

Modular Design Yields Enterprise-wide Benefits

In a big organization, management of an enterprise-wide process change is bound to present challenges. Volvo has been successful in this case not only through careful planning and the introduction of powerful tools like Windchill, but with thorough communication explaining how much return the program will deliver the organization over time. Already, the process is yielding wins that resonate throughout the business, including:

- Expanded product offerings increase selection and choice



- Reduced overall part count saves engineering time and costs
- Fewer parts to hold in inventory improves service delivery times
- Significant quality improvements elevate the customer experience
- Consolidation of production facilities drive efficiencies in manufacturing
- Reduced material waste advances sustainability – even as costs are reduced
- Shorter design cycle-time leads to faster time to market

The Modular Future at Volvo

As for the future of modular design at Volvo, Ms. Laks emphasizes the foundational nature of this strategy. *"Looking forward, it's even more important that we leverage our common architecture and shared technologies as the foundation of the business. The complexity of this industry will only increase – and we can't predict exactly how that will unfold. But with the modular approach, we can quickly assess new technologies, combine them with existing products, and get new products to market fast."*

Today, many discrete manufacturers are working harder than ever to manage the demands of complexity, while simultaneously increasing efficiency. The Volvo Group's modular approach demonstrates how a visionary company, by enlisting and inspiring its people while deploying critical digital infrastructure like PLM, can overcome the headwinds of increased complexity to advance and consolidate its competitive advantage for the long term.

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