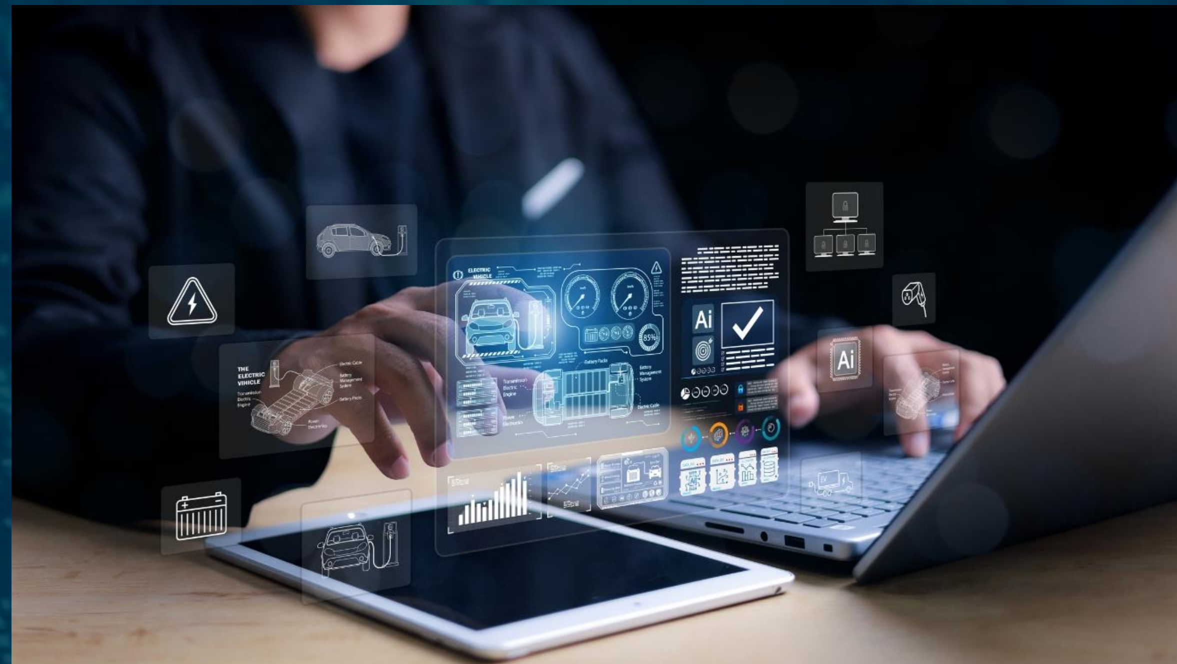
CIMdata




# Automating Engineering Intelligence: Accelerating Profitable Product Development

## Transforming PLM from a System of Record to a System of Action

Sponsored by aPriori

# Contents

# Takeaways

- **Accelerating product intelligence** enables profitable product development by providing cost, carbon, and manufacturability visibility during design. This allows early trade-off decisions and reduces downstream rework and margin erosion. Accelerating profitable product development requires making cost and manufacturability implications visible during design so speed and margin are achieved together. By embedding cost, carbon, and manufacturability insights directly within engineering workflows—enabled by platforms such as the aPriori Manufacturing Insights Platform—teams can evaluate trade-offs early, when changes can be made at low-cost and low-risk.

- **Automating cost and manufacturability analysis** enables organizations to scale evaluation across entire assemblies and BOMs instead of relying on manual, component-level analyses. This shifts engineering from time-consuming, reactive work following supplier feedback to proactive, enterprise-scale decision-making focused on the highest cost and complexity drivers. Automating Design for Manufacturing (DfM) and cost analysis enhances consistency, reduces reliance on tribal knowledge, and offers faster and higher ROI without requiring additional headcount.

- **Integrating cost and manufacturability insights** with PLM strengthens the digital thread by enabling more informed decisions across engineering, procurement, and manufacturing. While PLM manages product structures and data, it often lacks decision-ready insights during the product design process. Extending PLM with aPriori's Manufacturing Insights Platform transforms PLM into a system of action, enabling cross-functional alignment and improving the business value of PLM investments.

- **Establishing structured, design-based cost and manufacturability insights** provides a reliable foundation for scaling better engineering, sourcing, and manufacturing decisions across the enterprise. Insights derived directly from 3D CAD geometry and product definitions are more consistent and scalable than spreadsheet-based or experience-driven approaches. This structured, high-quality dataset  supports more accurate and predictable outcomes, improved sourcing strategies, and enables enterprise-wide DfM.  It also establishes the critical foundation required to scale AI-driven decision-making across the product lifecycle.

# The Challenge: Why Profitable Product Development is Increasingly Difficult

Manufacturers are facing increasing pressure on speed, cost, and product complexity across global markets. Competitive intensity continues to rise, while material costs and supply chain volatility create sustained margin compression. Organizations are expected to deliver more complex products faster, while simultaneously maintaining cost discipline and meeting profitability targets.

Supply chains have become more variable and regionally differentiated, introducing cost differences that directly impact sourcing and manufacturing decisions. These variations are difficult to evaluate during the design phase, limiting the ability of engineering teams to make informed trade-offs early in product development. As a result, sourcing and manufacturing implications are often not fully understood when key design decisions are made.

Engineering teams frequently lack visibility into cost and manufacturability during design. Decisions are made without a clear understanding of downstream production feasibility or cost impact, increasing risk and reducing confidence in early-stage design choices. This lack of insight creates a disconnect between design intent and production reality.

Feedback from procurement, suppliers, and manufacturing teams is often delayed. Organizations rely heavily on supplier quotes and manual inputs, which slows decision-making and introduces uncertainty into the development process. Engineering decisions are therefore made without timely or complete downstream manufacturing and procurement insight.

The consequences of this disconnect are significant. Late-stage changes drive costly rework, redesign, and program delays, while missed cost targets reduce margins and negatively impact overall product profitability. Engineering resources are consumed by repeated iteration cycles, limiting their ability to focus on innovation and higher-value activities.

# Why PLM Alone Does Not Enable Better Decisions

PLM systems play a critical role in managing product data, including CAD models, BOM structures, and product configurations. They provide strong capabilities in governance, traceability, and configuration control, forming the backbone of the digital thread and ensuring that product information is organized and controlled throughout the lifecycle.

However, while PLM systems effectively manage data, they do not provide the decision-ready intelligence required to guide engineering decisions during design. Cost visibility is limited during early design phases, and manufacturability or process feasibility insights are not embedded within engineering workflows. As a result, engineers lack the information needed to evaluate the production impact of design choices in real time.

PLM systems also do not evaluate production risks such as scrap, process complexity, or regional variability. These factors are critical to understanding how a product will be manufactured and at what cost, yet they are not inherently addressed within traditional PLM environments.

Because PLM focuses on data management rather than decision support, engineering teams must rely on spreadsheets, assumptions, and individual experience to make critical design decisions.

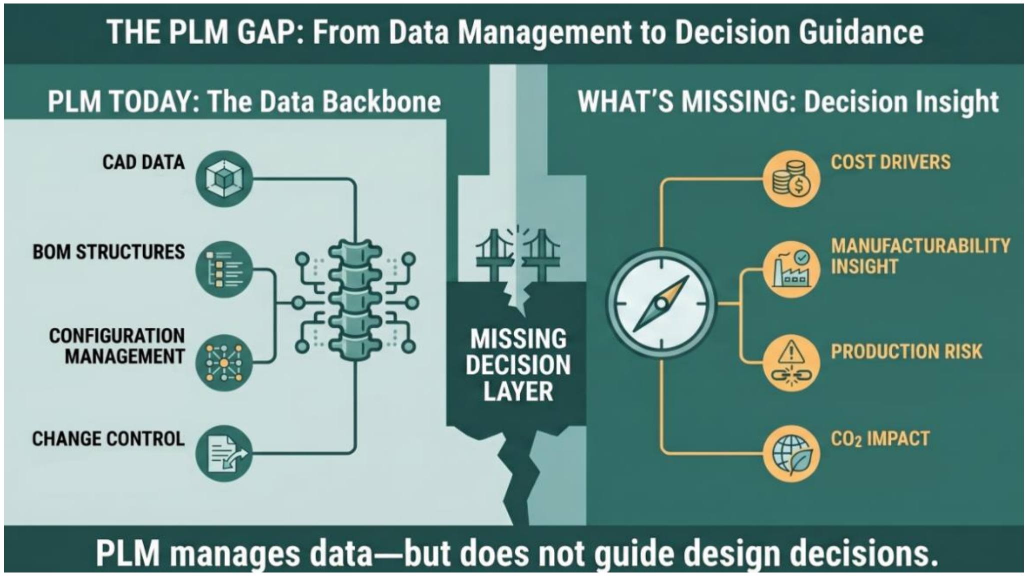



*Figure 1: The PLM Manages Data but Does not Provide Decision Support*

This creates a gap between the availability of product data and the ability to use that data to drive better outcomes.

The result is a digital thread that exists but lacks actionable intelligence. Without embedded insights, PLM remains a system of record rather than a system capable of enabling informed, real-time decision-making.

# Why Traditional DfM & Costing Fail & Do Not Scale

Traditional Design for Manufacturing (DfM) approaches depend heavily on expert knowledge and specialized roles, creating a reliance on a limited number of individuals to evaluate manufacturability and cost. This reliance introduces bottlenecks and results in inconsistent application across products, programs and teams, as different groups apply varying assumptions and levels of rigor.

Most traditional approaches rely on manual, part-level analysis. While this can provide insight at a component level, it does not scale across assemblies or full BOM structures, introducing delays that prevent timely design decisions. These analyses are typically performed using spreadsheet-driven processes that are disconnected from engineering environments and lack integration with CAD and PLM systems, preventing insights from being embedded directly into engineering workflows.

Because these approaches are not connected to product structures, they are not scalable across assemblies and BOMs, limiting enterprise-wide adoption. In addition, traditional DfM does not quantify the relationship between manufacturability and cost, leaving these insights siloed and preventing informed trade-offs between design decisions.

These methods are also not repeatable or consistent across teams and programs. Iteration loops with suppliers and manufacturing introduce delays, as feedback is often received late in the development process. Finally, reliance on historical cost knowledge limits the ability to challenge assumptions—especially when existing costs are already inaccurate—restricting opportunities to improve outcomes.

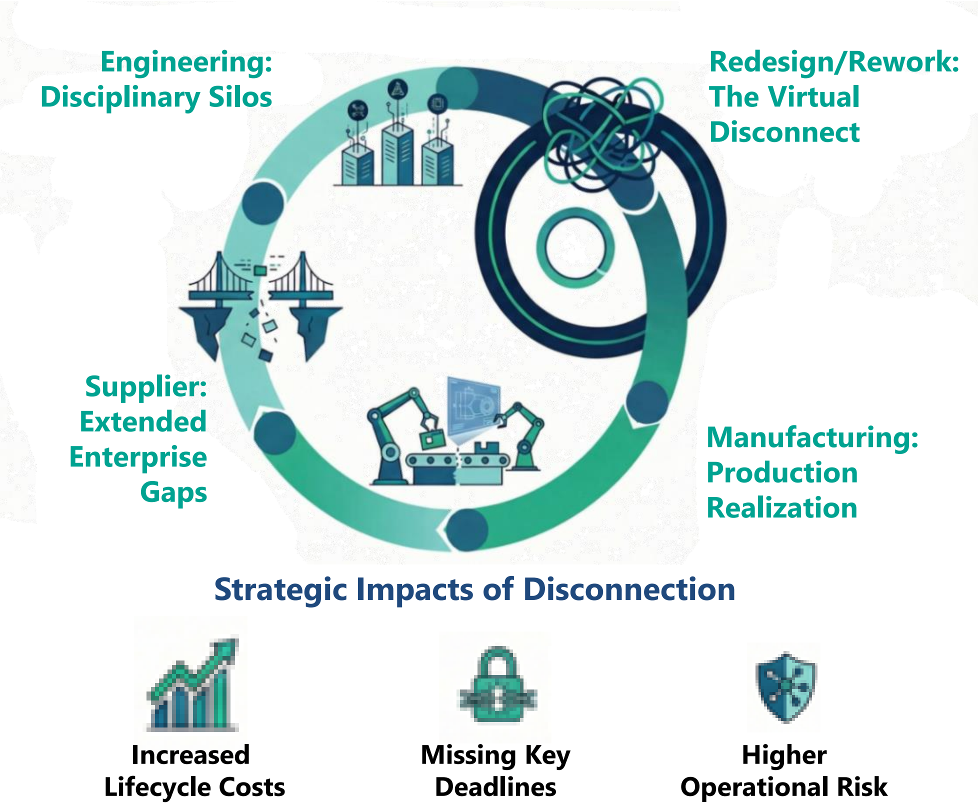



*Figure 2: Why Traditional DfM Fails*

# Automating Engineering Intelligence with aPriori (1/2)

The aPriori Manufacturing Insights Platform generates cost, manufacturability, and production insights directly from product design data. Leveraging CAD geometry, BOM structures, and production parameters, it creates a structured view tied to engineering definitions and automates analysis at scale across assemblies, reducing manual effort, and enabling more evaluations.

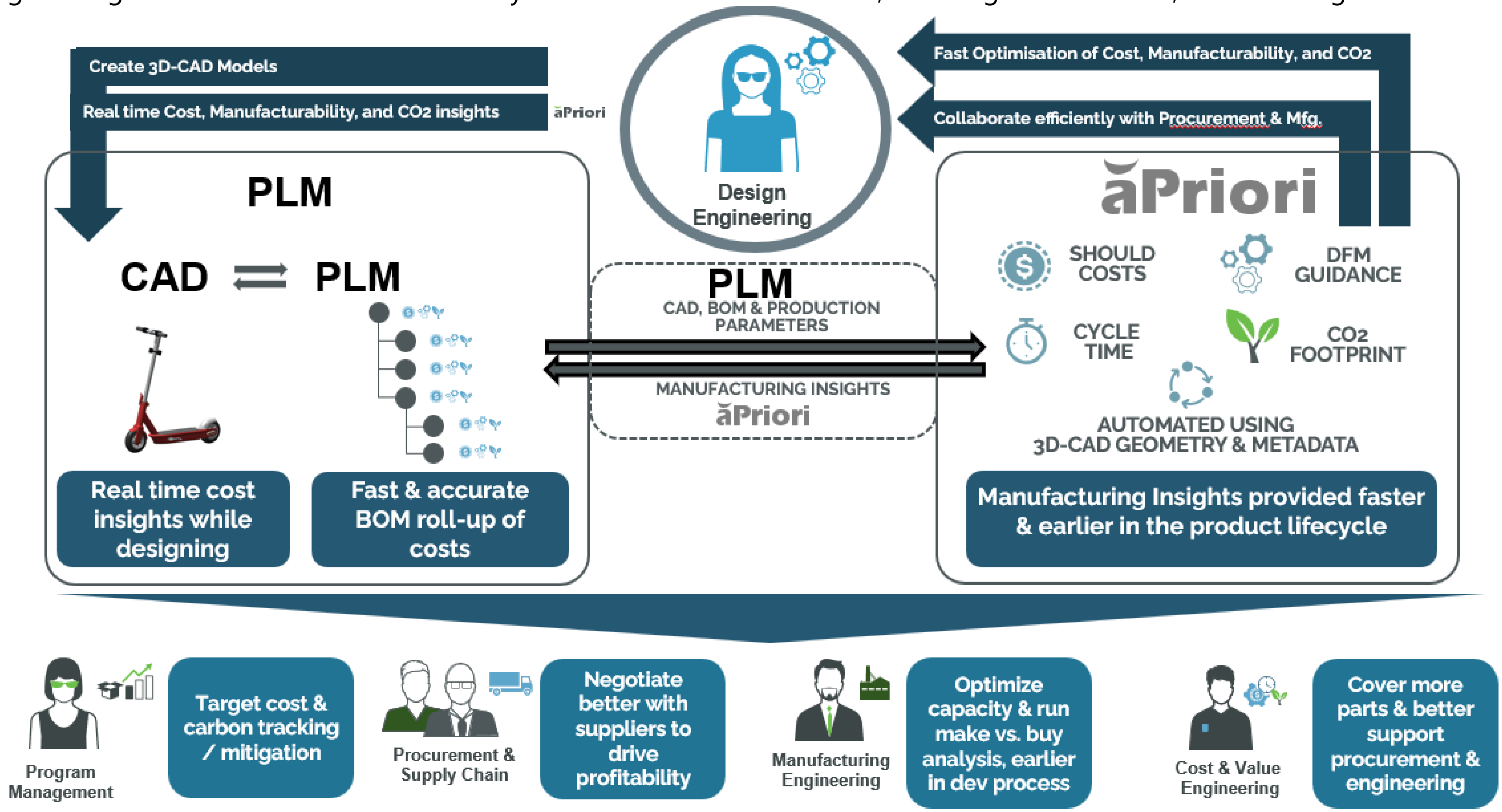



*Figure 3: How aPriori Works*
*(Courtesy of aPriori)*

# Automating Engineering Intelligence with aPriori (2/2)

Inputs to the platform include CAD models for geometry-driven analysis, BOM structures for assembly-level evaluation, and production assumptions such as manufacturing process, region, and production volume. These inputs enable aPriori to evaluate how products will be manufactured and what they will cost under different scenarios.

The platform produces detailed outputs, including cost breakdowns across material, labor, and overhead; manufacturability insights related to process feasibility and complexity; scrap and consumable impacts; regional cost variations across global supply bases; and $CO_2$ and sustainability metrics where required. These outputs provide a comprehensive understanding of production implications directly within the design process.

*Automation enables analysis across entire assemblies and BOMs, allowing organizations to move beyond manual, part-level evaluation. Thousands of components can be evaluated simultaneously, enabling identification of the highest cost and complexity drivers across a product. This scale allows organizations to focus engineering effort where it has the greatest impact.*

Engineering teams can continuously evaluate designs, immediately understanding how changes affect cost and manufacturability. This enables rapid iteration and more informed decision-making throughout the design process.
The platform provides a structured dataset that supports engineering decisions, procurement negotiations, and supplier selection strategies. Procurement teams can engage suppliers with data-driven cost targets rather than relying on reactive quoting cycles. This shifts organizations from reactive to proactive cost management.

By quantifying manufacturability trade-offs, aPriori supports DfM in a way that is consistent, repeatable, and scalable. Integration with PLM systems enriches product data with decision-ready attributes and creates a continuous feedback loop, ensuring that engineering decisions are consistently informed by production realities.

# Shift Left: Making Design Decisions Actionable (1/2)

Embedding product intelligence earlier in design compresses decision cycles from weeks to hours. Engineers evaluate manufacturing processes, material options, and regional sourcing scenarios in real time. Assembly-level analysis highlights the highest cost and complexity drivers across hundreds of components in a single pass. Faster iteration and earlier cross-functional alignment follow. Decisions are made faster and with confidence, reducing cycle time, and improving profitability.

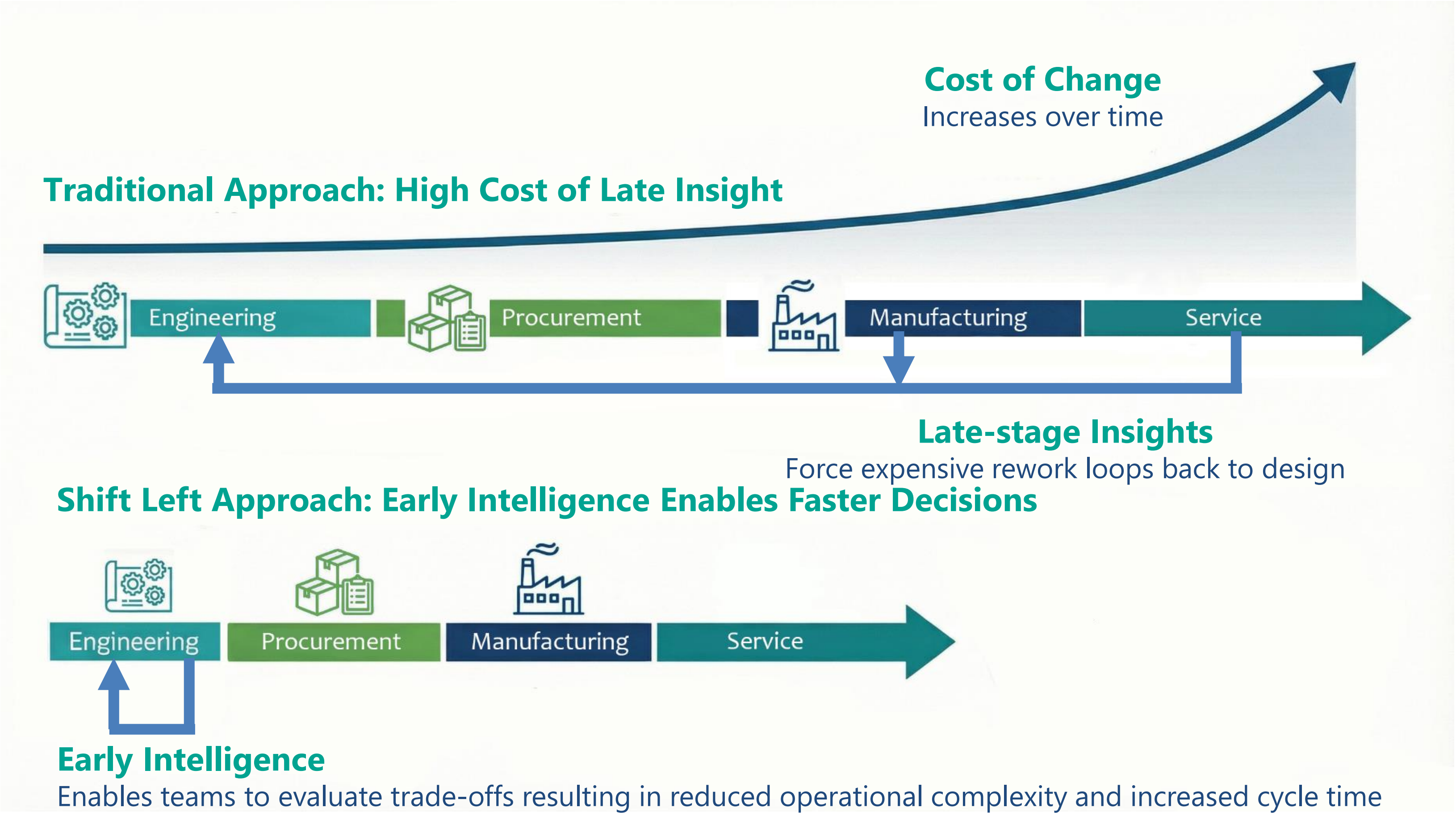



*Figure 4: Shift Product Intelligence Insight to Earlier in Product Development*

# Shift Left: Making Design Decisions Actionable (2/2)

Shifting product intelligence earlier during development enables engineering teams to evaluate cost, manufacturability, sourcing, and carbon implications before designs are released. This allows trade-offs to be made when changes are still low-cost, low-risk, and easier to implement.

With aPriori, engineers can assess design alternatives directly from CAD geometry, BOM structures, and production assumptions. This provides immediate visibility into how design decisions impact material selection, manufacturing processes, regional production strategies, scrap, cycle times, and sustainability metrics.

Importantly, this capability changes how decisions are made. Instead of relying on delayed supplier quotes, manual analysis, or downstream feedback, engineering teams can continuously evaluate designs in real time. This transforms decision-making from episodic and reactive to continuous and data-driven.

Shifting left also enables organizations to prioritize effort where it matters most. By analyzing entire assemblies and BOMs, teams can identify the highest cost and complexity drivers early, focusing engineering resources on the decisions that have the greatest impact on product profitability and performance.

This approach aligns engineering, procurement, and manufacturing around a shared, data-driven understanding of product outcomes. Procurement teams can engage suppliers with should-cost targets earlier, while manufacturing teams gain visibility into process feasibility before designs are finalized.

By making product intelligence actionable during design, organizations reduce late-stage rework, compress development cycles, and improve margin predictability. Equally important, this establishes a structured, high-quality data foundation that supports advanced analytics and future AI-driven decision-making.

# Transforming PLM Into a System of Action

PLM systems manage product data, structures, and configurations, providing the foundation for the digital thread. They ensure that product information is organized, controlled, and accessible across the lifecycle, supporting traceability and governance.

However, without embedded intelligence, PLM systems do not enable decision-making. They store and manage data but do not provide the insights required to guide engineering choices during design.

By integrating aPriori's Manufacturing Insights Platform, PLM is extended with decision-ready intelligence. This enables engineering teams to evaluate cost, manufacturability, and sourcing implications during design, rather than addressing these critically important issues after designs are completed.

This integration strengthens the digital thread by connecting product data with cost and production insights. It enables real-time visibility into the impact of design decisions, improving alignment across engineering, procurement, and manufacturing functions.

Organizations benefit from improved collaboration and more informed decision-making, as all stakeholders have access to consistent, data-driven insights. This reduces misalignment and ensures that design, sourcing, and manufacturing decisions are coordinated.

Extending PLM in this way maximizes the value of PLM investments by transforming it from a system of record into a system of action. This transformation is critical as organizations seek to leverage more complete product data and prepare for future AI-driven capabilities that depend on high-quality, structured information.

# Use Case: CNH Industrial

CNH Industrial develops large, complex product platforms that require scalable cost and manufacturability analysis across assemblies and configurations. Traditional approaches made it difficult to evaluate cost and manufacturability at scale, limiting the ability to apply Design-to-Cost principles consistently across product platforms.

By implementing automated analysis, CNH Industrial enabled cost and manufacturability insights to be generated across assemblies and configurations and integrated directly into engineering workflows. This allowed engineering teams to evaluate design decisions earlier in the process and apply consistent cost and manufacturability analysis across products.

The ability to scale these insights supported the expansion of Design-to-Cost practices across product platforms, improving early-stage decision-making and enabling more predictable cost outcomes. Engineering teams were able to identify cost drivers earlier and make more informed trade-offs during design.

As a result, CNH Industrial improved product profitability while reducing manual effort and reliance on expert-driven analysis. Evaluation cycles became faster and more consistent, enabling better alignment between engineering, procurement, and manufacturing.

> "Our farmers are under continuous pressure for their input costs, and one of those significant input costs is the price of our machines. So, our responsibility as partners with our farmers is to have cost-effective products that they can buy. And that's where aPriori comes in, helping make sure that the parts that we buy that go into our machines are being delivered efficiently, that they are designed efficiently right from the start, and that we can collaborate with our suppliers to get to the right cost levels and have a win-win with our suppliers."
>
> — John Haupt, VP Harvesting Product Platforms, CNH Industrial

# Use Case: Rivian—Additional Case Evidence

Rivian operates in a high-speed product development environment with aggressive cost and timing targets, requiring continuous decision support throughout the design process. Engineering teams must evaluate cost and manufacturability in real time to meet program objectives while maintaining product delivery performance.

By leveraging automated product intelligence, Rivian enabled continuous cost and manufacturability evaluation during design. This reduced reliance on delayed supplier feedback and minimized iteration loops, allowing engineering teams to make faster and more informed decisions.

The platform also enables sourcing comparisons across regions, allowing teams to evaluate manufacturing options in locations such as the United States, India, and China during the design phase. This capability supports more informed sourcing decisions and enables organizations to consider global supply options earlier in the process.

In addition, Rivian leverages detailed "should-cost" models to support data-driven supplier negotiations. These models provide consistent and structured cost insights that improve cost control and enable more effective engagement with suppliers.

The result is improved cost control, faster engineering decisions, and more efficient execution across programs. By reducing rework and enabling continuous evaluation, Rivian is able to achieve significant cost improvements while maintaining development speed.

"As communicated previously by Rivian, BOM cost for R2 is significantly lower than R1 platform. This was achieved by dedication of all teams at Rivian including Engineering, Operations, Cost Engineering, Finance, etc. One important aspect of this was Cost Engineering developing timely, consistent, and detailed should-cost data for data-driven negotiations with the suppliers. Without aPriori, it would be difficult to do so much work on time with consistent level of output."

— Rizwan Mohammed, Senior Manager, Cost Engineering

# Conclusion

Manufacturers seeking to improve product profitability must address the limitations of traditional approaches to cost, carbon, cycle time, and manufacturability. Increasing product complexity, supply chain variability, and competitive pressures require organizations to improve the speed, quality, and consistency of engineering decisions.

Embedding cost, carbon, cycle time, and manufacturability insights into the design process enables earlier and more informed trade-off decisions. This reduces downstream risk, minimizes rework, and improves the ability to meet cost, schedule, and performance targets.

Automating these capabilities allows organizations to scale cost and manufacturability analysis across products and programs without increasing engineering resources. This enables more consistent application of Design for Manufacturing principles and supports enterprise-wide adoption.

Extending PLM with aPriori's Manufacturing Insights Platform transforms PLM from a system of record into a system of action. By integrating decision-ready intelligence into the digital thread, organizations can improve alignment across engineering, procurement and manufacturing and drive more effective product development outcomes. This establishes a critical foundation for AI by generating the high-quality, contextual data required to enable meaningful and scalable AI initiatives.

CIMdata recommends that companies seeking to accelerate profitable product development, improve engineering productivity, and enhance decision quality evaluate aPriori's Manufacturing Insights Platform as part of their PLM and digital thread strategy.

## About aPriori

aPriori Technologies provides software solutions that help manufacturers accelerate product intelligence by delivering cost, manufacturability, and sustainability insights directly from product design data. Its Manufacturing Insights Platform leverages 3D CAD geometry, BOM structures, and production assumptions to generate actionable intelligence, enabling engineering teams to evaluate manufacturing processes, estimate product costs, and assess production feasibility during design, when changes are still low-cost and low-risk. By automating Design for Manufacturing (DfM) and cost analysis across parts, assemblies, and BOMs, aPriori reduces reliance on manual methods and supplier feedback cycles while improving consistency across engineering, procurement, and manufacturing. By integrating with PLM and other enterprise systems, aPriori extends the digital thread with decision-ready intelligence, transforming product data into action to improve product profitability, strengthen sourcing decisions, and accelerate development outcomes at enterprise scale.
To learn more, visit aPriori's website.

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