

# OPTIMIZE ENTERPRISE VALUE STREAMS FOR A LEAN STRATEGIC ADVANTAGE

Dassault Systèmes V6 PLM Solution for Lean Product Development in the Industrial Machinery Industry



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## Executive Summary

Industrial Equipment and Machinery manufacturers are responding to the challenges of an uncertain economy and global market pressures by implementing strategies to lower costs and increase productivity. One of the most popular of these strategies is “Lean” – a concept for recognizing and eliminating manufacturing waste.

At the core of Lean manufacturing is a focus on what the customer wants, identifying anything that doesn’t add value (waste) in providing a product or service, and then eliminating or minimizing that waste across the enterprise value streams. The work is challenging because value streams run across departments (from product design to after-sales support) and across companies (to suppliers and to customers).

Effective management of value streams requires a clear view of how each activity and process contributes value (or waste) to the end customer, and improves (or worsens) productivity for the company as a whole.

Because virtually everyone today practices Lean manufacturing techniques, its power as a competitive advantage is waning. However, the application of Lean principles to product development is overlooked, despite the availability of powerful Product Lifecycle Management (PLM) solutions that can eliminate redundancy, error, and other common forms of waste.

PLM can help Industrial Equipment companies “do Lean right” by providing clear visibility and tracking of collaborative business processes. 3D dashboards integrate, and present information from an array of sources (multiple design systems, multifunctional bills of materials, procurement, Enterprise Resource Planning (ERP), etc.).

The Dassault Systèmes V6 PLM solution addresses these challenges by capturing corporate knowledge and enabling business, engineering, and manufacturing functions to have visibility into each other’s decisions. These capabilities ensure, for example, that engineers know the relative costs of similar purchased parts as they make their design decisions, and that the product design includes any manufacturing constraints. Consistency and quality are by-products because the solution automatically applies corporate design standards and best practices.

Dassault Systèmes V6 PLM solution enables all three elements of Lean:

- Designing and developing products that meet or exceed customer needs
- Designing products that can be effectively and efficiently produced and serviced
- Designing products without excessive development cost

Industrial Equipment and Machinery manufacturers, such as L&T Infotech and Schuler Company, are achieving Lean product development benefits with V6 PLM from Dassault Systèmes. By eliminating routine work, streamlining processes, keeping far-flung teams in constant communication and collaboration, and dozens of other ways, V6 PLM helps manufacturers and their suppliers realize the dream of a product development process as Lean as possible.

# Lean Product Development

## *After 30 years of Lean manufacturing, it's time for Lean product development*

As markets have become increasingly global and competitive, Industrial Equipment and Machinery manufacturers have responded with strategies designed to lower costs and increase productivity.

For many years, one of the most popular cost-cutting initiatives has been "Lean," a concept that cuts costs and improves product quality by recognizing and eliminating waste (defined as anything that does not add value for the end customer). Lean is as simple as rearranging a manufacturing floor to minimizing the distance parts must travel or as sophisticated as building a culture in which every employee actively seeks to contribute to improving product quality.

Lean principles were born in manufacturing, and that is largely where they have remained. As a result, virtually everyone practices Lean manufacturing today, making it a prerequisite for remaining in business, but not a competitive advantage. The good news, however, is that areas outside manufacturing, such as product development and engineering, are prime candidates for the application of Lean principles. Benefits such as waste reduction, improved work-in-process and faster cycle times are all possible when manufacturers take the Lean fundamental principles and create a specific Lean product development methodology.

"Product development is a virtual wilderness when it comes to Lean," says David VanHorn, Director, Archstone Consulting, a leading consulting firm in the Industrial Equipment and Machinery industry. "Very few people have even attempted it because it's difficult to see how to translate the Lean principles developed in manufacturing to the field of product development. But it can be done, and the potential return is substantial."

In terms of product design, "Lean is all about designing and developing products that meet or exceed customer needs, that can be effectively and efficiently produced and serviced, and that do not involve excessive development investment," VanHorn says. "In manufacturing, Lean 'works on' physical product and information flow, while in product development Lean 'works on' engineering product and information flow – virtual products, if you will."

Lean can improve engineering efficiency and reduce product development cycle times, resulting in extra product development capacity that manufacturers didn't know they had available. While not an unknown concept, many manufacturers struggle to understand and integrate the full capability of Lean in the product development process. In order to implement Lean successfully, experts say it is essential to address the seven areas of waste in product development:

- **Overproducing.** This includes producing goods that the market doesn't want, loading a product up with unwanted features, over engineering (such as using a half-inch piece of metal where a quarter-inch piece will do the job), and suboptimal designs that generate excessive costs in manufacturing or purchasing.
- **Waiting.** Waiting includes time spent searching for information, waiting for someone to design or change something so you can take the next step, designing parts in sequence rather than concurrently, and designing tooling only after the part design is complete. The result is waste.
- **Conveyance.** Conveyance is related closely to waiting. Handoffs are a common form of conveyance that can slow the process due to delays on the part of either party in the handoff, lack of clear instructions, or lack of complete information. Releasing a design to manufacturing without clearly conveying the intent behind the design is an example of a conveyance likely to generate waste.

- **Inventory.** Inventory can take several different forms in a product development context and is difficult to spot because it is not easily seen. Inventory can refer to designs. For example, a company that cannot organize its existing designs for reuse is generating waste. The unused designs are waste, and the time spent redesigning parts that exist but cannot be found is waste.
- **Processing.** Processing refers to redundant, stop-and-go tasks, reinvention, and the lack of standardization. For example, if a design calls for 3,000 brackets that vary only by size, it is wasteful to design each bracket individually, rather than designing the bracket once and adapting it to the requirements of each occurrence. Such a process not only wastes design time, it also wastes manufacturing time.
- **Motion.** Motion involves activity undertaken specifically to compensate for broken communication processes, and includes lengthy searches for information, travel designed to overcome an information disconnect, redundant meetings, and redundant status reports.
- **Correction.** Correction is perhaps the single largest source of waste in product development. Change orders, unnecessary physical prototypes created to verify design integrity, program audits, and rework, are all examples of costly correction waste.



Most people understand these areas of waste in terms of manufacturing. But how do they relate to product development? These terms are not commonly associated with engineering, which adds to the difficulty many people have in applying Lean to product development. To simplify, Dassault Systèmes identifies waste in the following areas:

- Creating data
- Storing data
- Locating data
- Reusing data

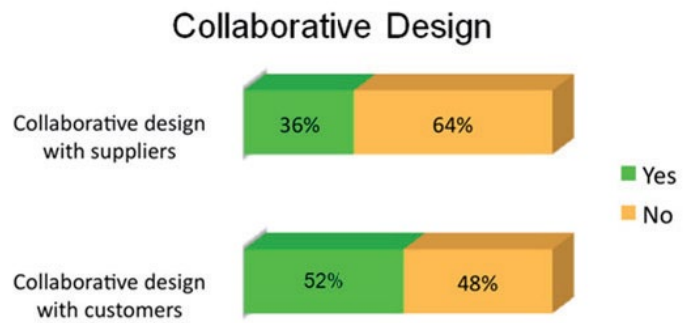
When these areas contain activities that do not add value for your customer, then they contain waste.

Communication and collaboration are among the biggest challenges to overcome when implementing Lean product development. These challenges are especially critical today, as companies (OEMs) outsource to strategic partners much of the design and manufacturing for parts or entire subsystems. This action spreads the risk of large projects across multiple companies, creating extended value streams. These partners, in turn, have joined the OEMs in sending business “offshore” to low cost suppliers in emerging markets — an effort to meet the severe price pressures that characterize the modern marketplace.

The necessity of Lean principles in product development becomes even more obvious when value streams of globally extended enterprises is distributed across functional areas (from product design to after-sales support) and across companies (to outsourced suppliers and on to customers). Effective management of value streams in an Industrial Equipment company requires a clear view of how each activity and process contributes value (or waste) to the end customer, and improves (or worsens) productivity for the company as a whole.

For example, according to a 2009 study by the Manufacturing Performance Institute, 83% of manufacturers participating in an Industrial Equipment and Machinery supply chain follow Lean manufacturing. Yet only 38% of these companies deploy Lean practices at an extended enterprise level, including suppliers and customers. This study (Figure 1) of U.S. manufacturers in industrial machinery supply chains shows that only half (52%) engage in collaborative design with customers, and far fewer extend that collaboration practice upstream to suppliers (36%).

The optimization of global value streams by applying Lean product development principles, enabling access to product or process data, and the customer review of new product designs can improve the collaboration dramatically —eliminating waste and reducing the risk of product failures.



Source: 2009 MPI Manufacturing Study, Manufacturing Performance Institute, 2009.

Figure 1.

# Business Possibilities with Product Lifecycle Management

## *The application of Lean to product development*

To effectively manage processes across a value stream and achieve Lean continuous improvement, executives, managers, and employees must have access to current, accurate, and well-organized information. When dealing with customers and suppliers, this nearly always includes data from a variety of information-management systems, ideally integrated into a single Product Lifecycle Management (PLM) platform to deliver three fundamentals of efficiency:

- **System Stability** – All participants need to access a single, consistent data source.
- **Process Standardization** – Definition and capture of standard reference processes is a must.
- **Correction and Improvement** – Problems and improvement opportunities should be identified, analyzed, and eliminated quickly.

To effectively manage entire value streams, a PLM system must also offer federated data management capabilities, allowing users throughout the organization – and not just engineering – to search, navigate, and collaborate on data from multiple native sources or systems (e.g., desktop tools, Computer-Aided-Design [CAD] systems, Enterprise Resource Planning [ERP] and procurement tools).

Then, too, an effective PLM process must accommodate a variety of engineering and manufacturing models, including engineer-to-order, build-to-stock, build-to-order, and assemble-to-order. In parallel, the PLM process must also enable greater agility in functions such as bidding, sourcing, procurement, and production. Other important and critical elements include:

- **Multi-discipline product and process engineering** – Enable engineers to collaborate on all manner of product data (from CAD and manufacturing information to complex mechatronics simulation data) – even if a specific engineer is not using the system that generated the data.
- **Project and program management** – Create a unified collaborative environment, enabling customers to manage an overall project or development program in context of product data, linking project tasks to deliverables, and visualizing design maturity in real time.
- **Portfolio management** – Allow product managers to track adherence to standards (e.g., quality, safety, regulatory) and product configurations.
- **Supply chain management** – Permit procurement departments to measure current supplier performance, review fill rates, deliverability, and other measures daily.
- **Requirements management** – Enable sales teams to capture the voice of the customer (i.e., what the customer truly values, what they need from a product) and work on real-time collaborative customer product development (turning the “voice” into new products).

# Dassault Systèmes V6 PLM for Industrial Machinery Industry

Industrial Equipment and Machinery companies can cut the time required to design routine parts by 25% when following Lean product development principles and implementing PLM using standardized product templates that eliminate routine engineering work. Companies can use that 'new-found time' to improve time to market or increase design quality. Manufacturers can cut the time required to adapt existing designs for innovative new models from 20 person-days to just one day.

Studies have documented cases in which applying Lean principles to product development have reduced:

- Product development cycle times by 60-70%
- Response time to Requests for Quote (RFQ) by 50%
- Design time by 25% when multiplied by 1000 parts
- Engineering change process cycle time by 20%
- Overall time to manufacture by 15%<sup>1</sup>

Dassault Systèmes customers have realized these savings through the application of Lean principles via V6 PLM Solutions.

Being on the leading edge of the Lean product development curve gives companies a tremendous competitive advantage in the Industrial Machinery market. Companies can cut costs or reinvest in product development —savings that some of their competitors have not yet learned to tap.

## *Lean product development and value stream management solution*

Dassault Systèmes offers a wide array of PLM solutions to address the waste in an Industrial Machinery manufacturer's product development processes. These PLM solutions have provided significant savings to our customers while addressing some of their more serious business issues.

- **Maximize design abilities** – Reduce design manpower requirements by 70, 80, and even 95 percent while ensuring that the design process takes full advantage of the designs, standards and corporate intellectual property (IP) that defines your company.
- **Protect and control IP** – Keep IP safe while optimizing the use of corporate knowledge, improving collaboration and reducing wasteful search time.
- **Reduce the risk of product failures** – Identify the best innovative options that meet and exceed customers' expectations and dramatically reduce the risk of product failures.
- **Ensure manufacturability of designs** – Define, monitor, and control the manufacturing process and expand Lean product development savings; improve product manufacturability and reduce the cost of prototypes.
- **Supplement design capacity to meet project needs** – Increase design and analysis capacity while protecting vital IP.



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Dassault Systèmes V6 industry solutions are based on industry expertise and a proven methodology for implementing Lean principles in product development (Figure 2).

The methodology begins with a Product Development Execution Classification Assessment. The assessment defines the product development execution model (value streams mapping, processes and mechanisms, specifications, interfaces and ROI estimate) for each product development discipline and business process.

The model also includes process improvements based on 3D collaborative technologies. Lifelike 3D collaboration and simulation technology and ready-to-use PLM business processes enable manufacturers to evaluate new ideas and concepts without associated physical costs.

Analyzing design alternatives early in the product development process improves a company’s ability to meet customers’ needs while reducing risks and shortens time to market. Dassault Systèmes PLM solutions help companies enhance their competitive positioning by:

- Driving user productivity
- Enabling engineering efficiency
- Reducing product development cycles
- Leveraging product, process and resource knowledge

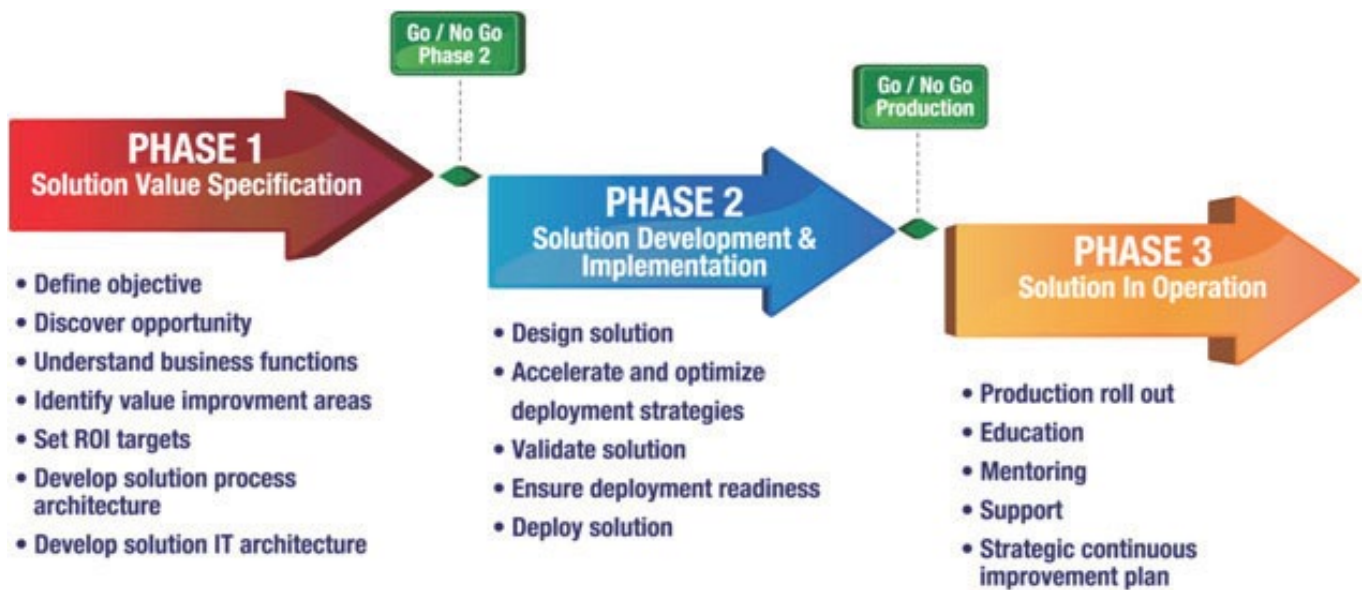


Figure 2.

## Conclusion

Companies who adopt Lean PLM will see extra product development capacity by doing more things right the first time. This extra capacity can be leveraged for incredible cost savings, applied to improve product quality or refocused on the key to increasing long-lasting competitive advantage – innovation.

Collaboration is required between engineering specialties like electrical, mechanical and software as well as between engineering and downstream stakeholders like manufacturing, sourcing and marketing. Innovative 3D lifelike experience enables teams to share new ideas and concepts without the cost of physical prototypes, across geographic and organizational boundaries. They will be better equipped to respond faster to the most advanced market trends.

We have seen how Lean PLM can help companies to leverage corporate knowledge and increase productivity, reducing design cycles by as much as 25% and reduce the overall time to get a new product into manufacturing by 15%. As impressive as these results are, they represent just the beginning of PLM's potential to eliminate waste, improve efficiency, and deliver better products faster and more cost effectively than ever before.

Dassault Systèmes' V6 PLM solutions help industrial equipment manufacturers to enable Lean Product Development and Value-stream Optimization, forward-thinking organizations that take advantage of this breakthrough will be well positioned for future growth.



## Delivering Best-in-Class Products



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