



TECHNOLOGY SPOTLIGHT

Powering the 4th Industrial Revolution: Innovation and the Need for Speed in Industrial Equipment

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Adapted from *IDC PlanScope: Building the Product Innovation Platform* by Jeffrey Hojlo, Kimberly Knickle, et al.,
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To manage a variety of new challenges and meet unique customer demand with quality products, manufacturers of industrial equipment must have a single source of information about products, people, processes, and production that is secure and easily accessible and that enables collaboration among all internal and external company stakeholders. Manufacturers need to extend product life-cycle management (PLM) across the enterprise and value chain in a product innovation platform to leverage the full power of this information — upstream to marketing, design, and engineering and downstream to supply chain, manufacturing, and service functions so there is collaboration among the team on the same information, resulting in faster time to market, smarter decisions, collaborative production, and high-quality products. This IDC Manufacturing Insights Technology Spotlight looks at these trends and the role that Dassault Systèmes' Single Source for Speed Industry Solution Experience plays in meeting the challenges described.

Introduction

Manufacturers of industrial equipment face multiple challenges that are changing the way they design, develop, produce, and service their products. Global competition, product complexity, compliance and sustainability issues, customer expectations for unique configurations, rapid time to market requirements, and the need for proactive, excellent service throughout the life of the machine are just a few of these challenges. Furthermore, from an end-user perspective, manufacturers, construction companies, miners, and agriculture producers expect their industrial equipment to address some of the world's toughest problems, including population growth, urban expansion, and food and energy demands. This in turn places pressure on manufacturers of industrial equipment to develop high-performing, reliable, quality products.

To manage these challenges and meet unique customer demand with quality products, manufacturers must have a single source of information about products, people, processes, and production that is secure and easily accessible (either on-premise or in the cloud) and that uses an innovation platform that enables collaboration among all internal and external company stakeholders across multiple sites.

There are also unique concerns for each segment of the industrial equipment market, whether manufacturing machines or equipment related to agriculture, construction, or mining. In the area of industrial manufacturing machinery, there are tens of thousands of companies globally, including very small companies that have low margins on their machines. Some niche companies that specialize in a particular industry or have strong market share in a particular country may have high margins but may not sell a large quantity of products annually. In both scenarios, the faster the machine is up and running at a customer site, the faster they get paid, and the higher the margins.

Industrial machinery manufacturers also need to be cognizant of the 4th Industrial Revolution, also known as Industry 4.0 or Smart Manufacturing. This new and highly software-intensive approach to manufacturing requires machines to communicate with one another and the goods they are producing to meet the highly dynamic demand that exists in today's market. This approach also drives the need for manufacturers to more closely connect manufacturing with the rest of the product life cycle — upstream to marketing, design, and engineering and downstream to service so there is collaboration among the team on the same information, resulting in faster time to market, smarter decisions, smarter production, and high-quality products.

To address these issues and concerns, some industrial machinery manufacturers are looking to simultaneously model product and manufacturing processes to ensure proper manufacturing and more rapid commissioning. If you can virtually commission a machine through a combination of a unified PLM system, CAE, and CAM to verify that it functions on the shop floor as designed, your time to customer will be dramatically reduced. Industrial machinery manufacturers also recognize the need and opportunity to service these machines across a long life cycle. Becoming a service provider is a way for them to increase revenue, maintain profitability, and become a partner to the manufacturers they sell to for the lifetime of these machines, which is 20–30 years at a minimum.

Heavy equipment companies are selling their earth-moving machines to businesses and municipalities to ultimately address the world's macroeconomic challenges of increased demand in the food supply, massive urbanization, and growing natural resources requirements. To be high performing and highly reliable, these machines need the latest technology.

Adding to the complexity required to meet these challenges beyond an enormous amount of software code are multiple customization and configuration requests from customers in different localities around the world. The same model tractor, for example, can be configured thousands of different ways. Designs need to be configurable, and communication needs to take place quickly among an extended, global product development value chain. In addition, manufacturing needs to be very flexible across multiple locations to meet the array of diverse, local requirements.

All of these considerations drive the need for a unified product innovation platform that extends to both manufacturing and service. It's just not possible to address all of these challenges without a technology platform in place that provides a unified, holistic view of product information and processes for design, development, engineering, modeling, manufacturing, and service.

Addressing the Simultaneous Demands of Complexity and Speed

A single source of data and processes needs to be in place for the team involved with new product development and introduction — a global team consisting of design, marketing, engineering, supply, manufacturing, and service elements. Increasingly, in fact, the extended team across many industries includes customers and partners for co-design and open innovation. This single source, or what IDC Manufacturing Insights refers to as the product innovation platform, is the speed enabler for manufacturers of complex products such as industrial manufacturing machinery or heavy equipment, enabling rapid design, development, manufacturing, and service.

Speed is a concern not just for manufacturers in fast-moving industries like consumer packaged goods and consumer electronics; increasingly, industrial equipment companies are also faced with the dual challenges of complexity and speed. Manufacturers of industrial manufacturing machinery and heavy equipment need to design, model, and engineer complex products across multiple internal sites and with external partners while meeting customer demand for highly configurable products rapidly and responsively.

Industrial manufacturing machinery provides the machines that make things we consume, while heavy equipment addresses the world's toughest problems; two very important industries that help move our society forward at a rapid pace. Makers of goods as diverse as cars, planes, computers, and pharmaceuticals face demands from customers for uniquely configured, rapidly produced, high-quality products, and so they expect their production lines, milling and cutting machines, and robotics to work in optimal fashion. Heavy equipment operators, whether they are construction workers, farmers, or miners, have cities to build, crops to harvest, and energy to produce.

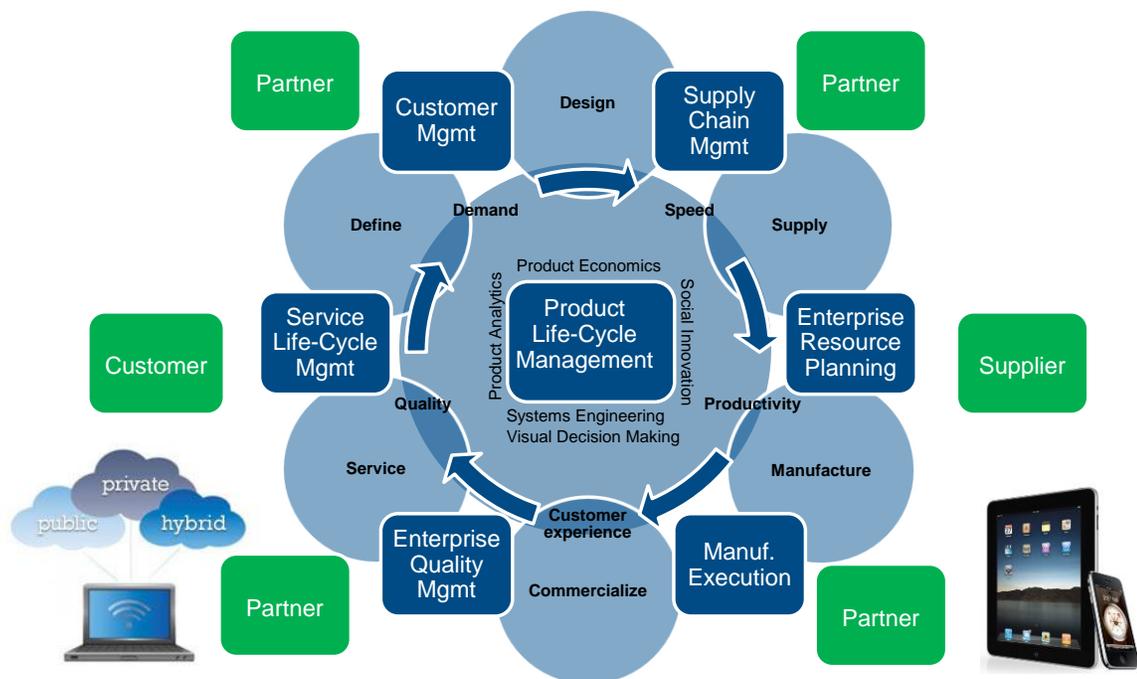
When one considers industrial equipment in light of the end consumer and making a better society, one realizes the importance of the quality and reliability of machines and hence the importance of a product innovation platform that unifies design, development, and production and the extended value chain. IDC Manufacturing Insights thinks this product innovation platform should include the following considerations:

- Visual decision making and open innovation is difficult if all parties involved in the product development process are not working in the same system.
- Systems engineering across multiple engineering and manufacturing domains needs to be unified.
- Product life-cycle economics includes business and cost rationalization of product decisions, and product development is tied to business strategy and goals.
- Collaboration needs to extend across the value chain, from engineering to production.

When all of these pieces are in place, flexible, social, and collaborative product design, development, and manufacturing are possible across the value chain (see Figure 1).

FIGURE 1

The Product Innovation Platform



Source: IDC Manufacturing Insights, 2015

As previously mentioned, one area often discussed in the industrial manufacturing machinery market is the 4th Industrial Revolution, also known as Industry 4.0 or Smart Manufacturing. The 1st Industrial Revolution was powered by water- and steam-driven machines, the 2nd Industrial Revolution was powered by electricity and mass production, and the 3rd Industrial Revolution was powered by manufacturing automation; the 4th Industrial Revolution will be powered by smart machines, designed with an increasingly large amount of software and a product innovation platform that extends from design to engineering to manufacturing to supply chain to services.

Having a solid foundation of product, process, demand, and supplier information accessible on-premise or in the cloud while developing products is critical to enable this 4th Industrial Revolution. Smart production machines that communicate with one another or products themselves sound like a good idea, but there must also be a connection to the product life cycle if new product designs are to be communicated quickly to manufacturing and process or product quality issues are to be communicated back to design and engineering. Critical to this advanced manufacturing approach are value-added services that ensure machine performance and the ability to track quality and service issues to respond to customers as quickly as possible. This information could be used to improve products or develop new products.

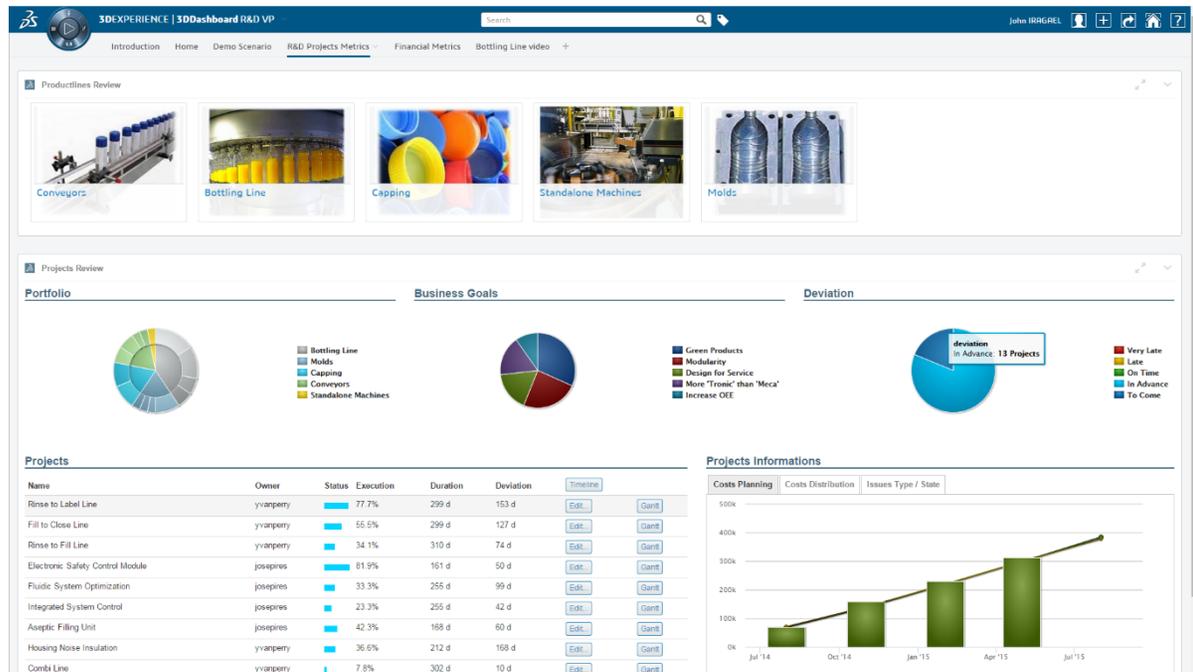
Considering Dassault Systèmes' Single Source for Speed

The Dassault Systèmes offering for the industrial equipment market, based on the company's **3DEXPERIENCE** Platform, is called Single Source for Speed. This platform enables industrial equipment companies to manage the product development process — from early-stage ideation, simulation, and design to production, servicing, and collaboration — across multiple, global locations, partners, and customers. The key, as Dassault Systèmes states, is that Single Source for Speed "provides a unified design experience to the many disciplines that contribute to the development of some of the world's most complex products." By leveraging multiple Dassault Systèmes offerings such as ENOVIA, CATIA, SIMULIA, DELMIA, and EXALEAD in Industry Solution Experience offerings, the company is striving to provide best-in-class business processes to address customer challenges, as well as provide a collaboration platform for all stakeholders that not only is visual, global, open, and cross-domain but also enables social and smart product development and production.

Although service life-cycle management (SLM), systems engineering, and virtual commissioning are different Industry Solution Experiences, Single Source for Speed is the PLM engine that enables each of these capabilities. It is also the innovation platform that can help manufacturing power the 4th Industrial Revolution, where flexible and collaborative product design, development, supply chain, production, and service functions now exist in concert. Increasingly, manufacturers are considering these kinds of product-centric platforms to enable this revolutionary approach (see Figure 2).

FIGURE 2

Dassault Systèmes' Single Source for Speed Industry Solution Experience



Source: Dassault Systèmes, 2015

IDC Manufacturing Insights thinks Dassault Systèmes' Single Source for Speed offering is appealing for a number of situations:

- It benefits machine builders and heavy equipment providers that need a unified platform on which to design, collaborate, reuse, and become service providers for the entire machine life cycle.
- It can be used by manufacturers of products across industry that use industrial machines and by construction workers, farmers, and miners who use heavy equipment and need to be highly productive, whether building, growing, mining, or manufacturing.
- Another key category is industrial equipment companies that want to extend collaboration from design and engineering to manufacturing to enable social, collaborative, and smart production.
- From a process standpoint, ensuring global collaboration and better-quality processes and products is a key area of focus for manufacturers. According to our research, 42% of respondents want to use a PLM system to enable better product quality.
- Connected products and the 4th Industrial Revolution drive the need for a unified set of data that can be acted upon by the value chain of employees and partners required to bring products to market and improve them. IDC Manufacturing Insights believes that by 2017, 70% of global manufacturers will offer connected products, driving the need for systems engineering and cross-enterprise product innovation platforms.

Challenges and Opportunities

There are other unified product data management/product life-cycle management offerings on the market that connect the global development team on-premise or on the cloud. However, sometimes the issue is less about technology and more about people understanding the benefits of collaborating with the global development team. PLM vendors recognize this issue and have built industry teams to support the transformation in which manufacturers need to engage. The challenge for PLM vendors will be to provide a team of employees and partners that enable systems integration and consulting support on an ongoing basis in this age of the Internet of Things, connected products, and the 4th Industrial Revolution.

From a technology standpoint, manufacturers in machinery will need to link their single platform of data with systems engineering, manufacturing, supply chain, and service functions. Single Source for Speed is the first step for a company to achieve this extended product innovation platform approach. Separate Industry Solution Experiences from Dassault Systèmes for SLM, configuration, production, and systems engineering can be integrated with Single Source for Speed to achieve a broader approach to PLM. As long as Dassault Systèmes can easily integrate these Industry Solution Experiences and connect them into a single user interface, manufacturers in industrial manufacturing machinery and heavy equipment should consider the Single Source for Speed Industrial Solution Experience to support their PLM process.

Connecting everything — including products, manufacturing, and people (suppliers, partners, and customers) — is and will be creating a lot of data that can be applied to improve service, product development processes, and even future products. The Single Source for Speed Industry Solution Experience could accelerate this evolution by including a control layer of analytics on top of the data and processes within the solution. IDC Manufacturing Insights expects that by 2017, 40% of global manufacturers will make analytics a top PLM investment, driven by product complexity, systems engineering, and multidisciplinary PLM.

Conclusion

Although industrial manufacturing machinery and heavy equipment manufacturers have unique challenges, there are some commonalities among these two broad segments:

- Value chain complexity requires a unified platform for collaboration, for internal and external constituents.
- Product complexity requires systems engineering with a model-based framework for mechanical, electrical, software, and manufacturing data, enabling closed loop performance validation.
- Regulatory compliance (e.g., eco-design for energy efficiency in industrial manufacturing machinery and tier 4 emissions in heavy equipment) requires a single source of data and reporting.
- High product quality is the top goal of all manufacturers, according to our research, thus the need for more collaborative, smarter product innovation.
- Both segments typically field multiple configuration requests from customers and simultaneously have the need to get products to market quickly.
- There is a need to service machines across a long life cycle to keep them up and running, sometimes in the harshest conditions.

How do you address complexity and speed simultaneously in the world of industrial equipment, whether industrial manufacturing machinery or heavy equipment? Through a unified, open product innovation platform that connects engineering with manufacturing, supply chain, and service functions. This system must have a unified set of information accessible by multiple roles in the company and the ability to integrate with other enterprise systems. It must also have the capability to track quality issues and service demands after development and commissioning of a machine.

Customers expect a high-performing machine, as well as responsive, effective service throughout the life cycle of that machine, whether it is on a manufacturing floor, at a construction site, or on a farm field. To meet these demands and ensure reliability and quality, manufacturers of these machines need a unified product innovation platform to enable rapid and collaborative design, simulation, engineering, manufacturing, and service. It is only in this way that manufacturers will reap the benefits of connected products, the extended supply chain, open innovation, and the 4th Industrial Revolution.

A B O U T T H I S P U B L I C A T I O N

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