

Practical Data Management – A Smart Alternative to Product Lifecycle Management

Innovation is a long-term strategy for competitive advantage in manufacturing. Companies such as those that make heavy equipment or industrial machinery introduce completely new products relatively infrequently, with good reason.

In the mining industry, for example, Joy Global Inc., a leading worldwide mining machinery and services company, finds much of the design data that goes into building complex machinery is used again in new equipment. Sonardyne International Limited makes and operates acoustic equipment for underwater navigation and other applications, and its customers tend to place a first order for standard products, then request new, derivative ones based on those initial designs.

In this respect, Joy and Sonardyne are no different than many other industrial and heavy equipment manufacturers. In fact, conversations with Autodesk customers in many manufacturing sectors suggest that anywhere from 60 to 90 percent of product designs are used again. When product designs *must* perform certain functions, improvements tend to be made incrementally – rather than through wholesale invention of new equipment.

Manufacturers therefore often look for incremental gains from process improvement. In order to understand success factors, uncover new opportunities, find ways to free resources for innovation, and even reduce costs, some of the world's largest manufacturers are using technology to understand and streamline the lifecycle of a product, from demand all the way through to production and retirement. However, these product lifecycle management (PLM) initiatives are not to be undertaken lightly: They can require extensive software customization, trigger enormous organizational change, and require months or years to complete.

This paper identifies the crucial aspects of the product lifecycle where streamlining processes can bring the greatest benefit, how data management affords a very attractive alternative to PLM, and how practical data management can drive innovation – without massive expenditure, a stroke of luck, or a thunderbolt of inspiration.

The Market Today

Large and small, manufacturers have several challenges in common:

- An increasing dependency on manufacturing partners around the world to service customers around the world;
- Mass customization – producing more to meet customers' demand for specific products at better prices; and
- Shrinking margins and growing global competition, which increase the pressure to cut costs while speeding time to market.

Business process automation may address these issues by reducing costs outside of production. It can help with mass customization and shrinking margins. It may even contribute to the bottom-line profitability of a particular product line. However, cost reduction through process automation is a business strategy that offers diminishing returns.

Here's why. Manufacturers first targeted their internal processes and systems to pare down time and resources used in production. This scrutiny gave rise to process improvements such as the kanban

system developed by Toyota – using cards to signal timing and quantity for a specific step in production, so that time and resources are not spent needlessly. Internal scrutiny also has improved enterprise resource planning (ERP) and supply chain processes, giving a boost to productivity, collaboration and efficiency. Not surprisingly, as business process automation has become more common, it has become a requisite rather than a strategy for competitive advantage.

Now, manufacturers who have made process-specific improvements are looking for new areas in which to further streamline activity and reduce waste – and achieve “Lean” manufacturing ideals.

The Next Phase: Streamlining Lifecycle Functions

While it lowers operating expense, Lean manufacturing does not directly increase top-line revenue. For that, manufacturers must innovate – whether by new product lines, or ways to generate incremental income from existing products, or ways to deliver better quality to customers. Because innovation requires resources be freed from other tasks, early adopters of Lean principles have moved on to explore how functions spanning multiple departments and stages of the product lifecycle might be made more efficient. These are the companies testing technology for PLM in areas such as custom order-taking and design specification.

PLM software ties together information – and business systems – from every phase of a product’s life to create a holistic view of the processes that bring it to market and culminate in its end of life. These stages include product definition, design, pilot, manufacture, support, retirement. AMR Research found PLM efforts range in focus, from core product design and engineering process, to activities that are more peripheral to production, such as accurate order-taking.ⁱ

A Solution for all Manufacturing Sectors?

Regardless of scope, these initiatives foster greater collaboration, which in turn creates potential for advanced practices such as replication of proven procedures, and a host of benefits, too, from greater productivity to quality improvements and faster time to market.

But the benefits of PLM initiatives are not necessarily easy to come by. PLM requires technology integration across multiple departments’ respective systems. And it requires employees’ willingness open up their work to multiple departments: PLM is intended to integrate functions that often are isolated or “siloes,” so that information can be shared among line-of-business managers, IT professionals, and design engineers. As a result, it’s time-intensive, potentially disruptive, and costly. With that level of investment, it’s no surprise that PLM initiatives require executive sponsorship. For many mainstream manufacturers, PLM solutions simply may not be a reasonable option.

Data Management: The Right Place to Focus

Product design affects every stage of the product’s lifecycle, from conceptualization all the way to performance and customer satisfaction, support, and retirement. AMR Research quantifies design’s impact as determining 75 percent of a product’s cost over its lifetime.ⁱⁱ And it’s estimated that more than 10 people use the data that each design generates. The purchasing department uses design data to negotiate raw materials’ purchases; sales may market products based on early designs; and production teams use design information to help schedule production workflow and timing.

The quality of design data impacts the quality of business decisions made later in a product’s lifecycle, from pre-sales to production – and the service and support required once the product is in the market.

The processes that are part of product design share in common the need to manage the design data – its accuracy, integrity, and accessibility. This may involve organizing and reusing information, making the design team’s work available to the rest of the manufacturing team, and doing so in ways that are secure, efficient, and cost-effective. In fact, a practical approach to data management offers mainstream manufacturers many of the benefits large companies seek with PLM.

Design Data Proliferates in the Organization

In most organizations, information related to or resulting from product design resides in multiple systems. These range from the technology the design department uses to create product concepts, to the ERP system used to manage production including raw materials and finished inventory, to order-taking applications and customer relationship management (CRM) systems that store information about demand. The number of major, separate systems that typically are employed to handle design-related business processes may be surprising.ⁱⁱⁱ

- High-tech manufacturers typically maintain five to eight systems per billion dollars revenue;
- Automotive manufacturers typically maintain 10 to 15 systems per billion dollars revenue; and
- Aerospace and defense companies maintain from 20 to 30 systems per billion dollars revenue.

A sensible approach to data management should afford access to and control of design data, and must incorporate important related information. Design data gets put into an ERP system to generate material requirements such as type, cost, and availability, or else it drives engineering change orders. Practically speaking, data management should provide manufacturers the ability to automate the processes required to share, communicate, and use this information among multiple departments.

A data management solution also can minimize the ever-present potential for human error, from inadvertently overwriting the current version of a design, or distributing the wrong revision so that incorrect data is perpetuated through co-workers' calculations and specifications for supplies and production time. Anecdotal evidence suggests production costs increase about ten-fold at every phase of the manufacturing process where errors are not corrected. In this example, losses in terms of capital costs and time to market could be compounded by the lost opportunity to take advantage of an existing, successful design – simply by using the wrong version.

Key Data Management Tasks to Automate

Three key aspects of the product lifecycle depend on design data accuracy. For these three processes, failure to convey up-to-date, accurate design information is potentially most damaging – and easily prevented.

- *Work in process (WIP) data management* helps ensure successful designs and components are used and reused to maximize productivity. Correct and most recent versions are used and a history is maintained. In addition, multiple designers and/or teams have the ability to work on a design simultaneously without risking inadvertent mistakes; and data is indexed in a fashion that makes searching straightforward.
- *Release management* helps ensure designs that are released for production are complete, accurate, and timely; time from concept to production is minimized; ERP systems reflect the correct revisions of designs and bill of materials; and suppliers have a clear understanding of what revision of parts or assemblies needs to be delivered.
- *Engineering change management* helps ensure that others who use a design – manufacturing, procurement, quality or supply management, for example – easily access designs and provide valuable feedback on cost, manufacturability, quality, and so forth, before critical design decisions have been locked down.

Already, there are tools that contribute indirectly to data management by helping companies produce and distribute accurate designs more quickly. For example, 3D design tools incorporate complex characteristics such as volume, thickness, and weight, and enable virtual performance tests that speed creation of a successful physical prototype, while minimizing expense due to trial and error.

These kinds of tools underscore design data's significance beyond the design department. As a foundation for better decision-making with regard to other aspects of product lifecycle, design data can be managed in a way that creates additional competitive advantage.

A Different Approach to Solving Manufacturers' Challenges

Most PLM solutions introduced to date have been designed for the needs of large enterprises such as automotive and aerospace manufacturers. These solutions so far have proven costly and complex to implement, and extremely broad in scope and scale, discouraging most mainstream manufacturers from giving the concept serious consideration.

A practical approach to data management can present an alternative to traditional PLM solutions, by providing a solution that:

- Is standards-based to enable fast and easy implementation
- Employs incremental deployment to resolve one business problem at a time, instead of requiring complex, simultaneous deployment that disrupts business operations
- Takes advantage of existing investments and processes
- Offer a measure of flexibility for customization
- Is accessible and useful to individuals throughout the manufacturing process, from designers and engineers, to production managers, sales and marketing staff, and purchasing agents.

This is Autodesk's vision for helping mainstream manufacturers achieve many of the quality and time-to-market advantages that manufacturing giants hope to gain through PLM. Autodesk is taking a practical approach to deliver data management solutions integrated with all design applications to allow manufacturers to create, manage, and share design data throughout the manufacturing process – and over the course of a product's lifecycle. Autodesk solutions are developed to address all aspects of the data management challenge, while allowing incremental deployment and at the pace appropriate to the organization.

Autodesk Data Management Solution

Autodesk's solution includes Autodesk® Vault, Autodesk® Productstream™, and Autodesk Streamline® software applications, and addresses the crucial aspects of product lifecycle management – work-in-process management, release management, engineering change-management, and collaboration – that demand seamless integration and absolute accuracy for the myriad of business decisions contingent on design.

- **Work-in-process:** Autodesk Vault helps CAD users manage fundamental work-in-process issues, such as the organization and protection of design data from inadvertent changes. Integrated into all of Autodesk's manufacturing design applications (Autodesk Inventor® Series, Autodesk Inventor Professional, AutoCAD® Mechanical, and AutoCAD Electrical), Autodesk Vault automatically captures all sophisticated attributes of a design— even elements of an assembly. This makes it easier to track and locate current versions of a design, and reuse final, proven designs that drive accurate decisions “downstream” and perpetuate product quality and performance.
- **Release management, engineering change management:** Users and managers involved in design review need to be able to comment on drawings without being fluent in CAD applications, and they need revision control to ensure they are working on the correct designs.
- **Autodesk Vault and Autodesk Productstream functionalities automate the release management process,** simplifying electronic review of files, and minimizing errors caused by manual transfer of data among team members, providing access to accurate bill-of-materials data early in the manufacturing planning cycle, and so that designs released to manufacturing are complete, accurate, and can be produced as planned. Forthcoming capabilities will further automate the engineering change-management process, notifying the extended manufacturing team of modifications and integrating updates to product features, materials, inventory, and so forth into all related design requirements.
- **Collaboration:** To facilitate collaboration among the engineering team and the extended manufacturing teams (manufacturing, purchasing, sales, etc.), Autodesk Productstream provides secure access, review, and markup of up-to-date designs to users, without putting data at risk of unintended change.

Autodesk Streamline extends project visibility outside the four walls of the enterprise, where manufacturing partners and customers can use Autodesk Design Web Format™ (DWF™) file format capabilities to view and respond to current versions of the designs online, for better understanding and communication.

Essential to this vision is the ability to introduce data management easily into the enterprise. This requires technical features such as tight integration with the Microsoft® Windows® platform, an open application programming interface and built-in connectors to ERP and MRP software such as Microsoft Business Solutions.

In addition, Autodesk's data management solution takes advantage of existing technology investments and allows manufacturers to introduce data management incrementally and at their own pace. Product design might begin with Autodesk Inventor Series 3D design tools. As the product model is refined, work-in-process data could be captured in Autodesk Vault. After design release, purchasing and manufacturing teams are notified of updates through Productstream, and changes automatically perpetuated throughout the product design for accurate supply requisition, updated sales collateral, and so forth.

A Step toward Revenue Growth, Competitive Advantage, and Innovation

Because Autodesk's data management solution can be deployed incrementally, it is a more practical solution for the mainstream manufacturer – and one that produces results. For example, WMH Tool Group, a leading manufacturer of power tools, reported an immediate productivity gain of 10 percent through use of Autodesk's design and data management capabilities to collaborate with off-shore suppliers and manufacturers. Once the solution is fully implemented, the company expects a permanent 20 percent boost in productivity.

Similarly, Lightolier, the largest subsidiary brand of global lighting manufacturer Genlyte Thomas, reported a productivity improvement of 35 percent in the first 10 months of using Autodesk software to create and share design information. In addition, the parent company expects to cut costs by 25 percent, reduce time to market by 70 percent, and maintain security for proprietary information through further implementations.

As a means to drive design reuse and optimize the product release cycle, data management solutions can help companies maximize the return on their investment in engineering. As an agent for effective collaboration with suppliers, partners, and customers, data management can bring about dramatic changes in the cost and speed with which products are brought to market, updated, altered or retired for maximum revenue generation and competitive advantage. Finally, a practical approach to data management frees resources from the design process, to be applied to innovation.



Autodesk, Inc.
111 McInnis Parkway
San Rafael, CA 94903
USA

Autodesk [and other products] are either registered trademarks or trademarks of Autodesk, Inc., in the USA and/or other countries. All other brand names, product names, or trademarks belong to their respective holders.

© 2004 Autodesk, Inc. All rights reserved.

ⁱ K. O'Marah, "For Engineering Businesses, Customer Relationship Management Is PLM," AMR Research (April 2003).

ⁱⁱ K. O'Marah, "PLM Is Poised for a Strong 2004 as Agile and Autodesk Show the Way," AMR Research (March 2004).

ⁱⁱⁱ K. O'Marah, "The Value of PLM and How to Get It," AMR Research (April 2003).

Autodesk, AutoCAD, Autodesk Inventor, Autodesk Streamline, Design Web Format, DWF, and Productstream are either registered trademarks or trademarks of Autodesk, Inc., in the USA and/or other countries. All other brand names, product names, or trademarks belong to their respective holders.

© 2004 Autodesk, Inc. All rights reserved.