

Autodesk Productstream Integration with ERP Systems

Introduction

As one of the world's leading design and content companies, Autodesk has helped improve productivity for more than six million design, building, and manufacturing professionals in 145 countries worldwide. This depth of experience has imparted many important lessons about customers' design processes and the importance of these processes in driving downstream business decisions. These processes inform and inspire Autodesk's effort to make available a cost-effective data management solution that facilitates the processes and communication crucial for successful product development.

This white paper summarizes the industry practices and technology issues that have long stood as hurdles to effective sharing of product design information among downstream users responsible for manufacturing, planning, and procurement. It introduces Autodesk's unique, practical approach to design data communication and explores a generic product development cycle using Autodesk data management technologies and services. Most important, it shows how Autodesk® Vault and Autodesk® Productstream™ software close the loop between engineering, manufacturing, and planning for today's progressive manufacturers.

Background

In the manufacturing sector, it has long been taken for granted that the product development process is inherently inefficient. One of the complicating factors is the number of individuals involved; estimates show that for every person who creates product design data, more than 10 people use that same data for downstream tasks. For instance, the purchasing department uses design data to negotiate the purchase of raw materials and solicit supplier bids; sales teams may market and sell products based on early designs; and manufacturing teams use design information to help determine manufacturing tooling and schedule production workflow and timing.

The need among various departments for access to design data doesn't fit a neat timetable. Yet from the engineering perspective—and according to industry practice—it is important that the product development cycle follow a standardized process, which includes the following basic steps:

1. Engineering iterates and completes a design.
2. The design is released to manufacturing and purchasing where it is accessed for manufacturability.

If questions arise among the production teams (purchasing and manufacturing) during step 2, they communicate proposed changes via engineering change orders (ECOs) to alert the engineers to specific problems. ECOs typically trigger a rigorous process that requires representation from both engineering and the manufacturing team. Procurement or manufacturing may not start until the ECO has been discussed, reviewed, and either implemented or rejected.

AUTODESK PRODUCTSTREAM INTEGRATION WITH ERP SYSTEMS

Traditionally, the release of a design from engineering means someone has to review paper-based drawings and populate downstream applications such as Enterprise Resource Planning (ERP) systems using paper copies of a parts list. This process entails the assignment of item numbers, descriptions, revision levels, quantities, and so forth. It is a manual and error-prone operation that is typically carried out by a configuration management specialist, the designers, or the manufacturing engineers themselves. In effect, the parts and assembly data created during the design process (usually in a CAD application) has to be re-created in the ERP/procurement system.

The inefficiencies in this development chain stem largely from the fact that the primary stakeholders—engineering, manufacturing, and planning—rely on disparate systems and applications. Product designers use CAD applications such as AutoCAD® Mechanical, AutoCAD® Electrical, and Autodesk Inventor® software to create product designs. Procurement planners use ERP systems to manage operations and spending. And manufacturing teams, sitting in the middle of the chain, often rely on improvised or customized systems—or, in many cases, binders or ledger books—to track parts and assembly drawings. In fact, the business reality for many manufacturers is that the lack of integration between stand-alone solutions necessitates manual data entry and handoffs between departments. Manual steps, reentry of data, and paper-based processes often introduce errors. Overall, the disconnected nature of the product design and manufacturing cycle slows time to market and prevents manufacturers from taking advantage of cost-saving opportunities.

Obviously, automating the design and manufacturing cycle would resolve many of these problems. More to the point, tight data integration and process automation would help to unlock the full value of a design's intellectual property. AMR Research quantifies the impact of a design as determining 75 percent of a product's cost over its lifetime.¹

The problem, however, has been that solutions promising to help manufacturers integrate design and ERP applications require end-to-end process reengineering. This prospect is complex, time-consuming, and daunting in a competitive manufacturing landscape where shrinking margins and growing global competition increase the pressure to cut costs while speeding time to market. Moreover, because these integrations require considerable customization and investment in infrastructure, it is costly and inevitably brings a certain period of business disruption.

What the industry has lacked is a modular, easily implemented data management solution that enables manufacturers to get the full value from their installed systems and realize the benefits of design/manufacturing/planning integration quickly and at a reasonable cost.

Why Integrate with ERP?

Traditionally, ERP systems are viewed as the owner of the item master where item information, such as part and assembly CAD data, as well as document and requirement specifications are entered, stored, and managed. However, part specifications and requirements actually originate in the engineering department, specifically in CAD or desktop authoring applications, and then are stored in a managed data vault. As such, it would make sense for parts, assembly, and design data originating in design applications to be pushed to an ERP system that it could instantly populate the item master once a design is complete. Sourcing, routing, and other operations could then be performed immediately. Of course, no manufacturer is starting from a clean slate, so practical integration between CAD and ERP applications must be flexible enough to handle existing ERP applications and data. Clearly, creating design data once and then using that data throughout the development process is the most logical path.

¹ K. O'Marah, "PLM Is Poised for a Strong 2004 as Agile and Autodesk Show the Way," AMR Research (March 2004).

How would such a process work using Autodesk Inventor, Autodesk Vault, Autodesk Productstream, and a standard ERP system? Consider the following example of a typical product development cycle using Autodesk data management technologies and an ERP solution.

Product Design

As designers use Autodesk Inventor software to create 3D parts and assemblies and 2D drawings, Autodesk Vault helps them manage fundamental work-in-progress issues such as the organization and protection of design data from inadvertent changes. Vault automatically captures all attributes of a design, from parts to the entire assembly. This capability makes it easier to track and locate current versions of a design and reuse final, proven designs that drive accurate decisions downstream. Increased accuracy perpetuates product quality and improves team performance everywhere in the development process.

Product Release

Tight integration between Autodesk Inventor and Autodesk Vault enables Autodesk Productstream to be aware of the parts, assemblies, drawings, and documents used to define a product and their association to existing items (from prior releases of the product). Because Autodesk Inventor and Vault track the structure of the parts in the assemblies, as well as other relevant information (called *metadata*) such as descriptions, material, and versions, Productstream can use this data and automate several important tasks:

1. Define items
2. Define bills of materials (BOMs)
3. Assign item numbers
4. Promote engineering items from “work in process” to “released,” signaling that the items are ready for manufacture and locking down all related files
5. Push information directly to the ERP system (Fig. 1), skipping the manual steps and eliminating errors

Autodesk Productstream can also be used to create an “engineering BOM” from the “design BOM” by adding any non-CAD items needed for manufacturing and procurement (packaging, material finishes, and subcontracted parts, for example).

Item number assignment by itself can consume a significant amount of time and effort. Automating this process adds significant value for engineering as well as planning, since revision history—including BOM structure and CAD data—are now all online and available for inspection.

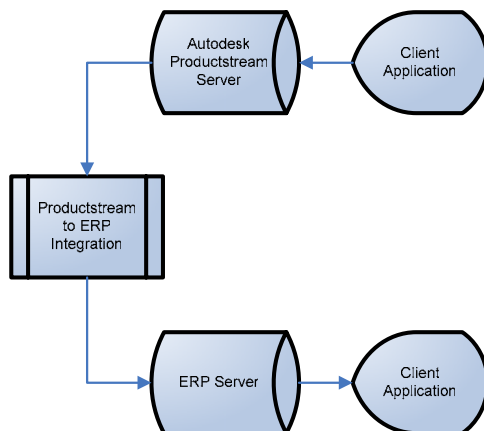


Figure 1: Design to manufacturing handoff.

AUTODESK PRODUCTSTREAM INTEGRATION WITH ERP SYSTEMS

At this point the BOM is ready for manufacture, so the engineer instigates the publication process. Doing so allows all items in the design, their attributes, the complete BOM, and any other supporting documentation to be sent to the ERP system in a single, rich-format file.

Once the file is published, the ERP system receives automatic notification of the availability of the file, which is downloaded, parsed, and consumed. Autodesk Productstream can also receive information back from the ERP system using standard formats.

Conclusion

For many years, only the largest manufacturers have had the resources to integrate manufacturing and ERP solutions. Because Autodesk's data management solution is modular and does not require process reengineering, it is a practical solution for the mainstream manufacturer—and one that produces results fast. For example, WMH Tool Group, a leading manufacturer of power tools, reported an immediate productivity gain of 10 percent through the use of Autodesk's design and data management capabilities to collaborate with offshore suppliers and manufacturers. Once the solution is fully implemented, the company expects a permanent 20 percent boost in productivity.

Autodesk has made powerful data integration affordable for manufacturers of all sizes. In fact, organizations currently using Autodesk design applications already have in place many of the components needed to create a seamless end-to-end solution. In short, the benefits of high-end PLM—out of reach for so many for so long—are now readily available and easily implemented.



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