

# What PLM Brings to the Small Engineering-Centric Enterprise



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Engineer-to-order businesses face a number of challenges, but unmanageable design and change processes don't need to be counted among them. Product Lifecycle Management (PLM) software can help small businesses proactively manage their mission-critical intellectual property and control their product definitions. Once custom-built for Fortune 500 manufacturers, PLM systems are now available in many sizes and flavors to meet a variety of needs.

## What is PLM?

PLM is a collection of applications for defining and managing any data associated with your products, from concept through retirement. Most commonly, PLM consists of an authoring tool (Computer Aided Design-CAD), some analysis/simulation tools (Finite Element Analysis-FEA and/or Computational Fluid Dynamics-CFD), and a management tool (Product Data Management-PDM). In its most basic sense, PLM can be a system for generating and managing drawings and other product documentation.

The backbone of any PLM system is the PDM management system, which has a lot in common with ERP systems. For instance, PDM manages a large number of records, typically using a relational database as the engine for search, retrieval, and linking of records to one another. PDM systems also frequently manage Bills of Material and other structured relationships, like ERP. But unlike ERP systems, PDM is purpose-built to manage documents and files, too. PDM systems are particularly adept

at understanding the complex file inter-relationships present in most CAD systems.

## What Problems Does PDM Solve?

PDM is meant to solve a number of business problems. Many of these stem from the challenges introduced by CAD systems and from the desire to automate long-standing manual processes related to document control. One of the primary problems that PDM systems fix is the web of files created by 3D associative CAD systems. These systems generate separate files for 3D (3-dimensional) parts, 3D assemblies, and 2D (2-dimensional) drawings, but the files are all interconnected (drawings need the parts, etc.). Most engineering users can manage this first level of complexity, but when selective pieces of a large design are revised (and the company needs to keep revision history), the file interrelationships become too much for a person to manage, and a computer system is needed. PDM provides a file vault to secure the files, a database to track all of the complex relationships and versions, and a software engine to take in and serve back groups of files in logical groupings. ("You want the 2D drawing? I'll give you the 3D part because you'll need that, too.")

File management (even complex file management) is only the tip of the iceberg of what PDM can do. Another common problem faced in small and large businesses alike is the intractable nature of paper change processes. Change control is challenging when done optimally, but can be a disaster when big drawing packets with multi-page ECO cover sheets sit on the desks of various members of the design team. PDM provides tools for creating electronic forms (your ECO cover sheet), and for automatically routing documents through e-mail-like tools. By managing change processes inside the PDM system, users have a central place to determine if a design is under change, and they avoid having multiple copies of large drawing attachments in their e-mail. Change data is searchable, organized, and available for later analysis to locate bottlenecks, to highlight problem areas, and to maintain an auditable product record/design basis, which is often

critical in regulated industries.

Certain flavors of PDM address another important business problem: maintaining Bills of Material (BOM). Experienced designers and engineers know that CAD can rarely be used to model/represent the full engineering BOM (EBOM); there are things like grease, paint, small hardware, and other things that just don't make sense to model. Similarly, manufacturing and operations people know that the EBOM is rarely equivalent to the manufacturing BOM (MBOM). MBOM are typically much flatter structures, or "kitted" to better serve the needs of users on the shop floor. But there is a lot of time wasted, and a lot of errors made, in translating from the CAD BOM to the EBOM to the MBOM. And changes in any one of those structures can take days or weeks to update in the other structures when automated tools are not available. Advanced PDM systems provide BOM management tools that allow item masters to be authored, and BOM to be managed in a way that relates back to the CAD design. And of course, these capabilities have to be integrated downstream with ERP to avoid that last level of duplicate data entry.

PDM systems can address other business challenges, too. For instance, some systems have the ability to expose/publish specific data out to suppliers/partners via portal interfaces. Through these tools, external resources can work with your live data, but in a protected and secure manner. Other PDM systems provide project management capabilities, tying assignments and timelines to product definition deliverables (i.e., the specification will be done by John by the end of next week, and then the conceptual model will be created by Sue after that, etc.). Some PDM systems allow users to perform Systems Engineering functions; capturing customer requirements, tying them to internal specifications, and then using those specifications to drive the engineering design in a very controlled way. Of course, each PDM system has its own specialty in the market, too. Some are specialists at MCAD (mechanical CAD), others are best at ECAD (electrical CAD), while still others provide excellent cross-functional tools for

full mechatronic (electrical, mechanical, and software machines) development.

### How Can I Ease Into PDM?

If PDM sounds like something you need, the next logical question as a growing business is, "How can I get into PDM without a million dollar investment?" That is the challenge facing the large PLM vendors today. Companies like Dassault, Siemens, Parametric Technology, and Autodesk have worked for years to perfect and extend their PLM capabilities for the largest manufacturers like Chrysler, Boeing, John Deere, and others. But small businesses need a limited subset of that "perfect world" functionality at first, and the ability to grow into other areas as the business develops and the need arises. Fortunately, PLM vendors have recognized this and most of them now offer pre-packaged versions of their PDM tools where industry best practices have been baked in and a number of configuration options have already been set. (The reason traditional PLM applications took millions of dollars to deploy was that they were essentially toolkits, which highly trained consultants used to create customer-specific applications.)

Beyond purchasing an "express" version of PDM, small companies can do other things

to ease into such a system. Specifically, these elements are helpful in keeping a PDM deployment manageable:

#### 1. Choose a partner with experience.

A lot of people still try to save money by self-implementing PDM, and they end up making the same mistakes that consultants made their first week on the job. Experienced consultants accelerate the learning curve and help avoid the pitfalls that are likely to appear. Further, you don't buy PDM just for the tools; you hope it improves your process. To get a new perspective on your process, consider getting help from people that work with business processes every day.

**2. Get your house in order.** If CAD files and data are spread across user machines and network drives, start to collect it and clean it. If no one is sure where the latest version of something is, run that to ground before you try to load your information into a system.

#### 3. Have a strategic vision for the system.

You should know what you want the system to do five years from now, even though you will only work on one area in the next six months. "Keeping the end in mind" (as Steven Covey, author of *The 7 Habits of Highly Effective People*, says) will allow you to control scope throughout the project.

If someone on the project team wants to add this or that, you can redirect them by reminding them that either A) we'll get to that in a later phase, or B) we need to focus and finish this phase to get to other parts of the project.

**4. Implement in phases and solve your largest problems first.** If getting control of CAD files is the biggest issue today, undertake a 3-6 month phase to solve that problem. Let workflow, BOM management, and supplier collaboration wait. By taking on a manageable objective, and succeeding at it quickly, you'll build momentum and user support that will be invaluable to later parts of the project.

PLM is a complex business system, at least as complex as product development and change management processes. Just because the software is complex and multi-faceted doesn't mean that its deployment has to be lengthy or its cost has to be outrageous. More and more small businesses are benefiting from the value of PLM by considering carefully which pieces of PLM to take, and by deploying the tools carefully.