

# SMALL ENGINEERING TEAMS, BIG PRODUCT COMPLEXITY



*Small engineering teams face the same product data complexity as larger organizations. Yet they don't have the resources required for a Configurable PDM system. A new wave of modern PDM systems is emerging that is right-sized for small engineering teams.*

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## Every engineering organization faces data complexity challenges.

There's no doubt, with hundreds or even thousands of users of CAD, design work in large engineering organizations must be carefully coordinated. The correct versions of a design must be used. Users must avoid overwriting other's work. Changes from supplier's designs that come in many CAD formats must be carefully tracked. If such CAD data complexity is not managed, it results in significant rework, change orders and delays.

It's not just the largest engineering organizations, however, that face these challenges. The exact same issues plague small engineering teams as well. The difference lies in how readily each can address them. Big engineering organizations, with needs to address larger challenges as well, turn to configurable Product Data Management (PDM) systems as a solution. Small design teams, unfortunately, lack the resources to plan, deploy, maintain and actually use such systems.

Recently, that story has begun to change. A new wave of modern PDM systems is emerging that is right-sized for small engineering teams, in terms of both deployment and usability.

In this eBook, you'll find details that put these issues and more into perspective. Specifically, it contains an overview of the needs of small engineering teams, the challenges they face, the traditional approaches to managing such data and the capabilities of modern right-sized PDM systems.



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## The Challenges of Managing CAD Complexity

So what exactly is so complex about managing CAD? There are longstanding issues that have been talked about for more than ten years. If you've worked with CAD in that timeframe, then you're surely familiar with them. We'll cover them here briefly:

- Accessing a Single Source of CAD Truth
- Sharing Common Parts across Design Projects
- Securely Sharing Design Intellectual Property

By all rights, each of these challenges is serious. However, they have been covered time and again and in great detail.. So instead of rehashing those issues, here we'll focus on more relevant and often overlooked issues for small engineering teams.

## Unlocking the Intelligence in CAD Data

Engineering data is unlike any other in the company. CAD files, in particular, are packed full of product information, including:

- A CAD part file contains the geometric shape of the component.
- A CAD part file can also contain Product Manufacturing Information (PMI), which can be used instead of drawings.
- The product structure in a CAD assembly file is the basis of the Bill of Material (BOM).
- Relationships can be built between CAD files so they react intelligently to change.

How does all this embedded intelligence translate into a challenge in managing CAD complexity? There are two main issues that arise.

- A large amount of the product information in CAD files, such as geometric shape, PMI and the product structure, can and should be used by the rest of the company. Because CAD files can only be opened by CAD and other specialized applications, engineering must find a way to publish this product information in formats that the rest of the company can use.
- Propagating change between CAD files is also critically important. A change to one CAD part can initiate a ripple of change across many others in the same assembly. Engineers must find a way to track and manage such change propagation scenarios. Otherwise, an out-of-date design could get downstream.





# SMALL ENGINEERING TEAMS, BIG PRODUCT COMPLEXITY

## **Avoiding the Overwrite: “He Who Saves Last Wins”**

Today’s products are often more than a single engineer can design alone. As a result, a product is frequently broken down into various design tasks and assigned to multiple engineers, who must work together to complete the design on schedule.

In CAD, this translates to each engineer taking ownership of specific parts, assemblies and drawings. Each CAD file, however, isn’t completely separable. Interdependencies are often created between them so they can react intelligently to change. Despite the advantages such practices provide, they can cause unintended changes as well. With no or minimal data management tools in place, one engineer can overwrite another engineer’s work.

## **Managing Today’s Multi-CAD Design Reality**

It is now fairly widely accepted that almost all engineering teams, everywhere, even small engineering teams, must deal with multi-CAD design data. While importing CAD files in a variety of formats may not be the problem it once was, the bigger issue lies in dealing with supplier change.

Early on in the design process, companies often need an early representation of designs from suppliers. As suppliers proceed through their design process, their designs will morph and change. As a result, companies will often get multiple versions of a design. The trick is tracking and managing which versions have been integrated into the assembly.



# SMALL ENGINEERING TEAMS, BIG PRODUCT COMPLEXITY

## Managing CAD Complexity with Traditional Approaches

The challenges related to CAD complexity discussed in this eBook so far are by no means new. In fact, most have been around for some time. As you'd expect, different organizations and teams have taken various approaches to managing their CAD data. Here, we'll discuss some of those approaches as well as any related issues.

### Desktop Management

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CAD files, like any other type of file, can be managed on desktop computers. However, a number of serious issues crop up when CAD files are managed in this manner, including:

- Engineers must manually publish geometry, PMI and BOMs to everyone else in the company. Any change translates into duplicating this effort.
- If multiple engineers are working on the same assembly on different desktops, then the risk of creating different versions of the same CAD files is quite high. Manually integrating such disparate change is extremely time consuming.
- Managing and tracking the integration of multi-CAD data from suppliers is a manual effort, often through spreadsheets. A large amount of time can be sunk into keeping track of such changes.

### Shared Drives Management

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An improvement upon desktop management of CAD files is the use of shared drives. With all of the CAD files sitting on a central file server, everyone on the team can

access a single source of truth in terms of the product design and share common parts across design projects. But unfortunately, there are still several serious issues with this approach.

- Engineers still must invest time in manual efforts to publish geometry, PMI and BOMs to the rest of the company. They must also manually manage and track the integration of supplier's multi-CAD.
- The risk of creating multiple versions of the same CAD files is eliminated. However, engineers working in the same assembly could leapfrog each other's versions as they save. Unless manually tracked, such saves could be lost in the shuffle, allowing errors to get downstream.
- The propagation of change across CAD files still must be done manually by opening them in the CAD application. Engineers do not receive notification of changes and must track them manually.



# SMALL ENGINEERING TEAMS, BIG PRODUCT COMPLEXITY

## Content Management Systems

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A different approach is to use a server-based software system to centrally manage CAD files. One type of system that manages a wide variety of files and information across a company is called a Content Management System (CMS). There are advantages to such a system, including eliminating the risk of overwriting other's work. Yet there are still detriments as well, including:

- A CMS does not understand the product information packed into CAD files, so engineers still have to manually publish it to the rest of the company.
- A CMS also does not understand the structured nature of product data. This includes how documents, CAD files and other descriptive documents connect to a Bill of Material structure.
- A CMS does not provide capabilities to visualize 3D models outside of the CAD application. This is critical to providing access to design data for the rest of the company.
- A CMS also does not understand CAD files in multi-CAD formats. Furthermore, a CMS does not understand the relationships between CAD files. As a result, engineers will need to manually track and integrate supplier's multi-CAD changes as well as propagate intelligent change across CAD files.
- A CMS is an enterprise system that often requires significant effort in terms of planning, installing and maintaining, requiring more resources from small engineering teams.

## Configurable PDM Systems

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In engineering organizations, the traditional approach to managing CAD files has been to use a different kind of server based software system: PDM. Like a CMS, a PDM system centrally manages CAD files. However, it has a significant advantage over a CMS in that it understands and can read the product information embedded with those CAD files as well as the complex relationships in a product structure. Furthermore, it provides embedded tools to visualize 3D design data. As a result, many of the issues around publishing product information to the rest of the company are addressed by providing access to the design data. The PDM system's ability to read CAD, understand product structures and view design data do the rest.

That's not to say, however, that configurable PDM systems are the best fit for every organization. There are some drawbacks for small teams, including:

- Configurable PDM systems offer a wide range of capabilities that satisfy the needs of larger engineering organizations.
- Configurable PDM systems require time to plan out the deployment, to re-engineering processes and even to customize the system to the company's preferences.

For smaller engineering teams, the additional deployment effort isn't worth the advanced capabilities that aren't required. A solution with fewer capabilities and a shorter path to value is desired.

# SMALL ENGINEERING TEAMS, BIG PRODUCT COMPLEXITY

## Managing CAD Complexity with Right-Sized PDM Systems

In recent years, a new wave of PDM systems has emerged that are right-sized for small engineering teams. They share some common traits that we'll talk about here.

### Just the Right Functionality

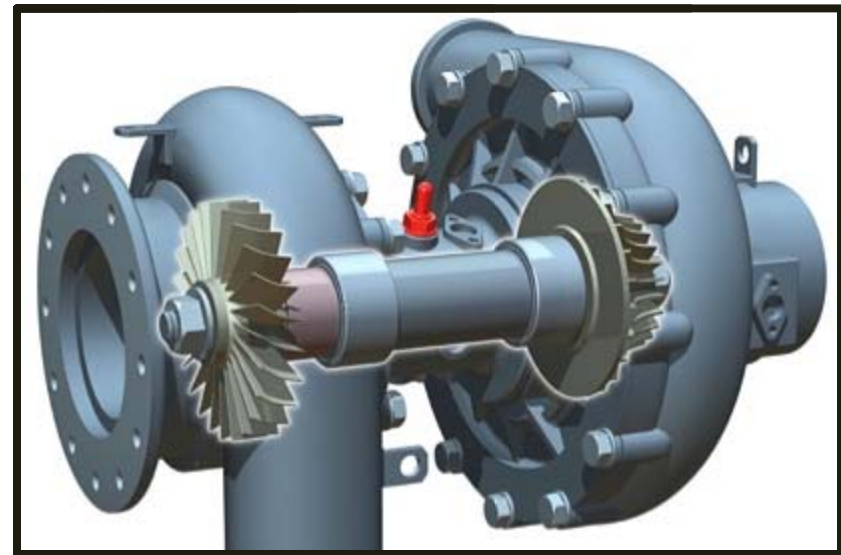
Small engineering teams often are not looking to re-engineer their product development process. They often don't need to integrate with a myriad of other enterprise systems either. These new, right-sized PDM systems focus on providing the set of functionality that small engineering teams need to design products, namely the capability to:

- Access to a single source of CAD truth
- Share common parts across design projects
- Securely share design intellectual property
- Manage product structures and Bills of Materials
- Read product information in CAD files so they can be shared with the rest of the company
- Visualize design data from CAD applications
- Manage team-based design and change amongst CAD assemblies
- Track, manage and integrate supplier based multi-CAD designs

## Deployment and Adoption Ready

As we've hinted at earlier, getting a PDM system right-sized for small engineering teams isn't just about what functionality is included in the system. It is also closely tied to how easily the PDM system can be deployed and maintained as well as how it is adopted by users. In this regard, these new right-sized PDM systems have certain deployment characteristics as well:

- Minimal planning before deployment. No upfront consulting or process re-engineering is required.
- Deployment is relatively hands-free. Installation of components required by the system is automated.
- The emphasis for training is on online on-demand resources, eliminating time away from the office.
- Usability has become a paramount focus, making it more intuitive for engineers to use.





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## Summary and Conclusion

Big engineering organizations aren't the only ones that face CAD complexity challenges. Small engineering teams often face the exact same issues. In recent years, A new wave of modern PDM systems is emerging that is right-sized for small engineering teams, both in terms of deployment and usability.

### Challenges of Managing CAD Complexity

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There are some longstanding CAD complexity issues like accessing a single source of truth, sharing common parts and securely sharing design that have been covered in great detail. But there are additional CAD complexity challenges that have been overlooked, including:

- Unlocking the Intelligence in CAD Data
- Avoiding the Overwrite: "He Who Saves Last Wins"
- Managing Today's Multi-CAD Reality

### Managing CAD Complexity with Traditional Approaches

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There is not one, but many traditional approaches to managing CAD complexity in small engineering teams:

- Desktop Management
- Shared Drives Management
- Content Management Systems
- Configurable Product Data Management Systems

Unfortunately, there are disadvantages for each, ranging from the need to manually publish product information to the right ratio of capabilities to deployment effort.

### Managing CAD Complexity with Right-Sized PDM Systems

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Fortunately, a new wave of right-sized PDM systems has emerged as a fifth alternative of managing CAD complexity. These systems share two common characteristics in that they:

- Offer Just the Right Functionality
- Are Deployment and Adoption Ready

### Final Thoughts

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For the longest time, small engineering teams really have not had a truly palatable solution to manage CAD complexity. It seems as if now, however, some solutions that are truly right-sized have arrived.

*For more information on managing CAD complexity in small engineering teams, please visit [PTC.com](http://PTC.com). Underwritten in part by PTC, all concepts and ideas developed independently, © 2012 LC-Insights LLC.*



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