

Best practices for designing in a multi-CAD environment

Abstract

Most manufacturers today are leveraging a variety of 3D CAD (computer-aided design) packages in their product development activities, whether they prefer to or not. Some companies have purposefully adopted different CAD tools to support different design processes, such as mechanical design versus electrical design, while others are forced to use multiple tools due to acquisitions or customer requirements.

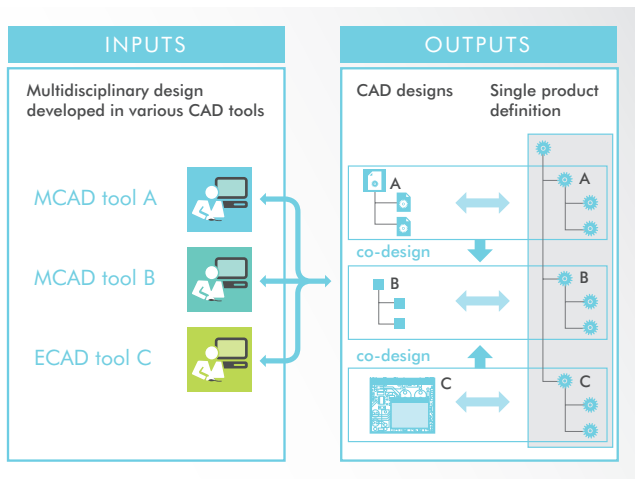
Despite using a variety of tools, today's global development teams must still design a product in an 'integral' way. That means engineers must be aware of all elements and components related to the design, so products can be designed holistically, which prevents rework from dealing with out-of-sync parts in the design. Given the complexity of today's products and supply chains, designers can't be expected to create an optimal product without the ability to design in the context of related parts and assemblies. And without visibility into the full product, even the best design efforts can result in poor-quality design and significant rework.

To be successful in today's fast-paced world of global product development, companies must be able to manage the complexities of today's design environment by supporting what's called multi-CAD product design—that is, the creation of a single product design using various CAD applications within an environment of enterprise-wide data management.

With multi-CAD product design, manufacturers now have the power to define a single product despite the complexity of a heterogeneous design environment. Read on and discover how today's most successful organizations are thriving in a multi-CAD product design environment.

Building winning products in a multi-CAD environment

Effective product development in a multi-CAD environment is critical to developing profitable products in today’s complex, global markets. Such an environment allows companies to achieve the access, speed, collaboration, insight, and visibility into the progress that’s required to keep designs in sync. In fact, Aberdeen Group reports that best-in-class companies—those that achieve the best on-time product launch, revenue growth, and reductions in labor costs—were 51% more likely than the industry average to support multi-CAD environments. (2009 Aberdeen Report: Design Anywhere)



Multi-CAD product design: create single product design using various CAD applications within enterprise data managed environment.

Trends affecting multi-CAD product design

A well-defined multi-CAD product design process helps manufacturers thrive in an environment where different engineers are working concurrently on different parts of a product.

Today’s manufacturers rely more heavily on effective multi-CAD management due to several trends in industry today:

Increased product complexity. Today’s products come in more varieties, incorporate greater levels of technology, and provide more functionality than ever before. This complexity requires the use of multiple authoring tools, potentially including mechanical, electrical and software design solutions so information has to be managed across disciplines and systems.

Globalization of product development. Manufacturers have globalized, spanning different time zones and requiring design data to be replicated at different sites. As a result, manufacturers need to accommodate supply chain partners, working with different CAD tools, to enable collaboration.

Industry consolidation. Mergers and acquisitions are much more common in today’s global marketplace. Integrating businesses requires effective assimilation of legacy CAD infrastructure to maintain data integrity.

These market trends are now driving the need for better processes to manage multi-CAD environments.

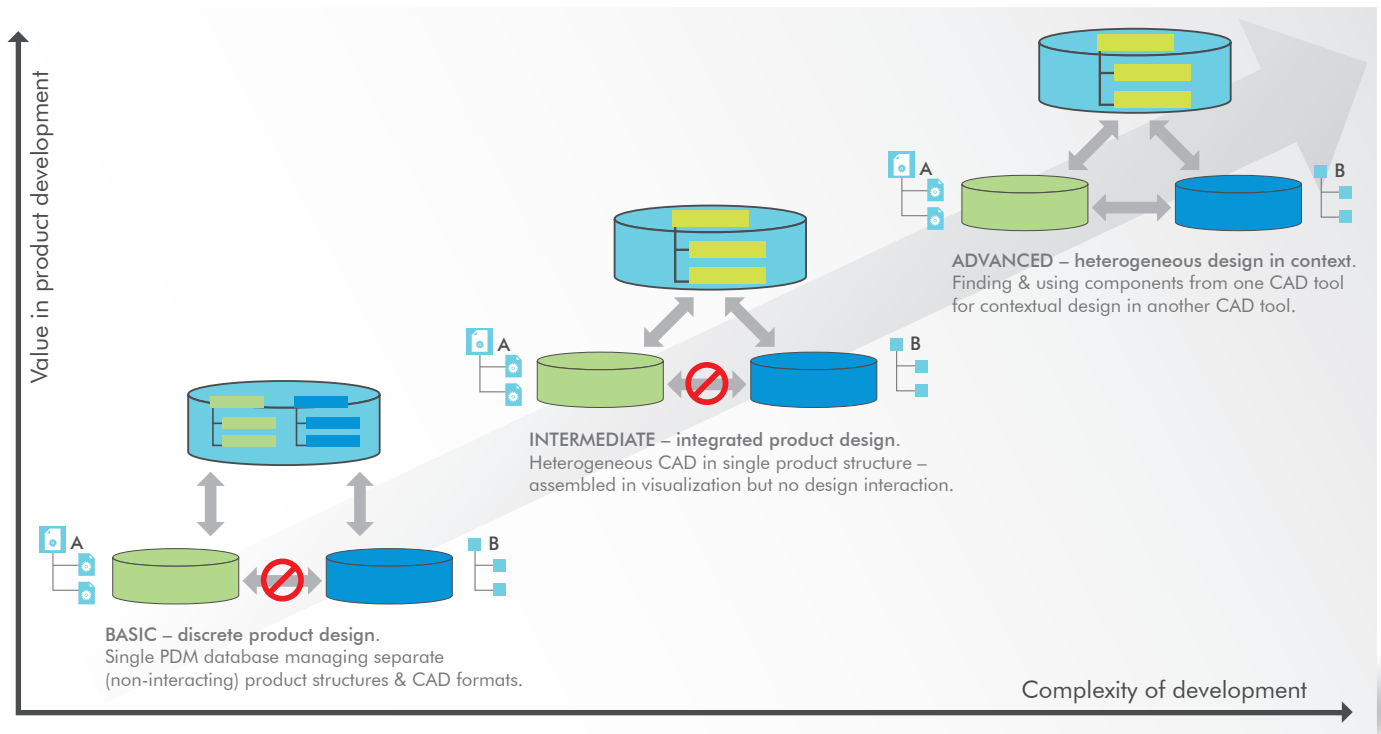
Trends	Impacts
Increase in product complexity (variety, technology, functionality)	Multiple authoring tools used, so information has to be managed across disciplines and systems
Growth in global design outsourcing	Need to accommodate supply chain partners with different CAD tools to enable collaboration
Mergers and acquisitions	Integration requires effective assimilation of legacy CAD infrastructure to maintain data integrity

PTC’s solution for multi-CAD product design

PTC’s answer to helping companies succeed in a multi-CAD environment is to apply a combination of structured product development processes enabled by robust PLM (Product Life-cycle Management) technology.

Whether multi-CAD is chosen for strategic purposes, or as a result of the trends identified above, or for a combination of the above factors, manufacturers must consider the following multi-CAD dynamics when making a PLM investment:

- Coping with differing levels of complexity in product development
- Synchronizing product development across multiple CAD tools and multiple disciplines
- Managing CAD across the enterprise and into the supply chain



Multi-CAD product design environments vary in complexity and sophistication.

PTC has identified three different levels of multi-CAD complexity and sophistication that companies are adopting. The sophistication of a company's multi-CAD processes is a direct correlation to the complexity of the manufacturer's products, supply chains, and development needs. These three levels of multi-CAD sophistication include:

- **Basic (discrete product design).** A single PDM (Product Data Management) database that manages separate (non-interacting) product structures and CAD formats. This approach involves using multiple CAD systems, with different databases for each CAD package in use.
- **Intermediate (integrated product design).** Heterogeneous CAD in a single product structure, assembled in visualization, but having no design interaction.
- **Advanced (heterogeneous design in context).** Finding and using components from one CAD tool for use in contextual design in another CAD tool.

The Advanced approach above provides much more value, but may not be required for organizations that build simpler products or operate in simpler design environments. On the other hand, this Advanced heterogeneous design-in-context approach becomes even more valuable in globally distributed and complex environments.

PTC's Windchill® PLM software platform helps manufacturers efficiently and effectively manage their multi-CAD needs across all levels of complexity and sophistication.

Effectively managing a multi-CAD environment requires consistent, efficient processes enabled by integrated, flexible software. PTC has developed best practices and software to help manufacturers develop world-class multi-CAD processes.

In this paper we will highlight the most efficient technology foundation and the exact capabilities companies will need in order to address today's significant multi-CAD challenges.

Overcoming the challenges of multi-CAD product design

Based on our experience of implementing thousands of customer engagements worldwide, PTC has identified four significant challenges to managing a multi-CAD design environment, as well as the best practices required to address these challenges. At stake is a company's ability to enhance productivity, lower overall cost, improve quality, and accelerate time-to-market.

These challenges are magnified when complex products are developed globally with a dispersed internal and external network of design partners, suppliers and manufacturers. Getting participants on the same page to advance the design and change process is the primary goal.

1 ACHIEVE A COMPLETE DIGITAL PRODUCT DEFINITION

THE CHALLENGE: How do I establish and maintain a single definition of the product when I am working with multiple CAD systems?

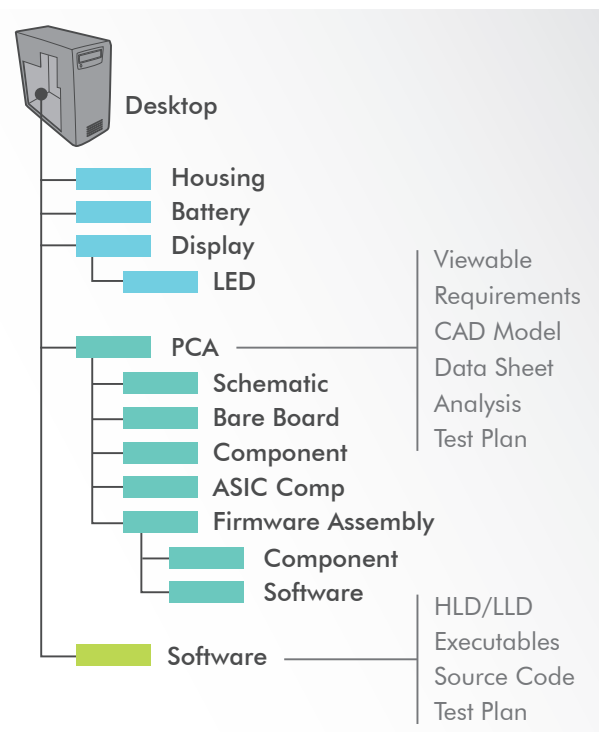
THE SOLUTION: Establish a single data repository, enabling a complete digital product definition to be developed using any number of CAD tools.

Integrating the product definition enhances product quality with a single, accurate, version-tracked record of a project. This approach allows engineers to efficiently design in one CAD tool while using heterogeneous data for contextual design from another tool.

This centralized approach also improves engineering productivity because all designers have real-time visibility into design status across CAD tools. In addition, the centralized approach helps manufacturers avoid the costs of switching between tools and retraining workers, by allowing designers to work with familiar tools. Also, this approach delivers a lower total cost of ownership because you're working from a single database, which means you won't absorb the onerous costs of maintaining many silos of information.

PTC excels at enabling design teams to create a single, complete, digital product definition, while also allowing seamless, scalable collaboration with familiar CAD tools, so all designers are using the right version of data.

The result: highly efficient design reviews and faster arrival at the optimal product definition.



Complete digital product definition in a single product structure.

Best practices:

Integrated, Cross-Discipline BOM. PTC enables engineers to collaborate seamlessly using familiar development tools, which means that everyone is using the right version of data to accelerate the overall product definition.

- Store all design information in context of a single product definition in Windchill PDMLink®
- Integrate concurrent data management within multi-vendor ECAD/MCAD/Software tools
- Connect design and PDM tools for a range of scenarios, including design-in-context, for faster, more controlled access to product information, so designs can be coordinated
- Enable best-in-class, automated content management
- Manage complex design relationships
- Propagate attributes
- Convert formats
- Accurately control versions

Efficient heterogeneous design review. Within a single system, PTC provides secure, scalable, collaborative visualization of multi-CAD product data for continuous feedback, to enable efficient design review preparation, execution and follow up.

- Integrate visualization of multi-CAD data in a single product structure
- Support multi-disciplinary 2D/3D visualization and digital mock up
- Exchange product information across domains for better product insight, early in design
- Provide pervasive visualization across the extended enterprise for design review, markups, clash detection, and what-if scenarios
- Standardize and streamline design review processes (in multi-CAD space)
- Track, capture and resolve stakeholder issues
- Improve supplier collaboration through secure, “lightweight” visualization for non-CAD users (i.e., shop floor, purchasing)

2 SUPPORTING CONCURRENT DESIGN

THE CHALLENGE: How can design teams find, reuse, and synchronize accurate data across CAD systems to advance the overall design?

THE SOLUTION: Enable dynamic access, reuse, and synchronization of cross-discipline design data across CAD tools to efficiently and accurately advance the overall design.

Manufacturers must capture and control multi-disciplinary, multi-CAD design information in a single system and efficiently synchronize complex designs and related changes across connected teams.

Ready access to integrated designs accelerates the creation of a single product structure that offers instant visibility into status across CAD tools. This approach allows manufacturers to improve product quality, while also reducing errors, rework and scrap, through accurate version control. It also helps to maximize engineering focus on quality, as opposed to data management.

PTC excels at supporting concurrent design by providing easy search, retrieval, assembly, synchronization and delivery of heterogeneous data to electrical and mechanical design teams throughout the lifecycle.

Best practices:

Integrating heterogeneous design environments.

- Provide search of, and access to, PLM-managed heterogeneous CAD data from any CAD environment
- Deliver accurate data, in the appropriate CAD format, to multiple design teams
- Manage evolution of relationships between product structure and related heterogeneous CAD design data

Automated synchronization across MCAD systems. PTC provides automated synchronization across MCAD systems, so source information contained in one CAD system can be easily reused in another.

- Propagate design modifications across systems, so change impact is identified and managed faster
- Provide accurate version control across MCAD systems
- Provide timely notification of design changes
- Enable the flexibility to incorporate the latest changes from other design teams

ECAD/MCAD collaboration. PTC provides automated communication of design changes via accurate version control across ECAD/MCAD systems.

- Minimize errors and enforce good design practices
- Provide secure visual collaboration, design comparison, identification of change, and markup
- Support in-context ability to update to latest incremental changes from other MCAD systems

3 ENABLING GLOBALLY DISTRIBUTED DESIGN

THE CHALLENGE: How do I manage design integration across globally dispersed teams that use multiple CAD systems?

THE SOLUTION: Deploy secure, collaborative design environments that allow for efficient, scalable exchange of multi-CAD design data globally.

Enabling a global environment for design collaboration ensures that accurate, up-to-date information flows smoothly in a single system. This approach results in less time spent working on redundant paths, and increased productivity, with less searching for information.

A global, collaborative design environment also allows manufacturers to reduce errors on new products, because stakeholders share early, frequent, cross-discipline communication. Companies also enjoy shorter review cycles due to increased quality of continuous feedback. By collaborating on the data globally, companies can preserve design-data integrity between systems and locations.

Best practices:

External partner collaboration. PTC provides multiple, flexible methods to efficiently share product data, integrate work, and capture multi-CAD visual data for design reuse.

- Share product data in secure, collaborative workspaces
- Define and share rich, traceable work packages
- Include internal and external stakeholders
- Flexibly control access to multi-CAD data
- Streamline design-change integration
- Support CAD-agnostic integration of the most competent suppliers to enhance collaboration

4 SCALABLE PERFORMANCE

THE CHALLENGE: How do I ensure fast, global access to the most current product data?

THE SOLUTION: Overcome network limitations by implementing scalable IT solutions to enable controlled access to rich multi-CAD product data, regardless of location.

A scalable solution allows manufacturers to set up secure, flexible, new-user sites, quickly and cost-effectively. This approach allows companies to synchronize content automatically between sites globally, which means that designers can quickly access and interact with product information using lightweight visualization for outsourced designs. It also ensures fast, local access to heavyweight content like CAD models.

Best practices:

Data replication & WAN acceleration. PTC WAN-acceleration partners provide not only validated solutions that make the most of your network resources, but also downloadable file servers that enable high-speed local access to content.

- Invite remote participants into integral, access-controlled contexts
- Enable download and installation of remote file servers at each collaboration site
- Apply smart replication rules that minimize network load and maximize availability of content to users
- Optimize performance of low-bandwidth, high-latency networks
- Use file servers, WAN accelerators, or a combination

Conclusion

Taking the next step toward successful multi-CAD data management

Multi-CAD product design is a focal point of competitive advantage in product development. It is one of the “must-haves” that affect business drivers such as quality, time-to-market, and product cost, which in turn fuel revenue, market share and profitability.

As products become more complex, and as product development becomes more distributed, managing and visualizing multi-CAD data in a single system, using robust PLM technology, is the optimal way to derive an integrated and accurate digital product definition.

With a single focus on product development, and with 25 years of experience serving the world’s most successful manufacturers, PTC excels at managing multi-CAD product design across disciplines, ensuring that the design process is always synchronized with product design data in a single, integral system. Add to this a powerful, automated workflow, and teams can collaborate more efficiently and securely “24/7,” supported by a robust technology infrastructure.

A single PLM system is required to effectively manage complex, multi-CAD environments. The system must be capable of integrating the BOM and visualization of multi-CAD data in a single product structure. Within the system, cross-discipline design processes and related content must be synchronized

to allow for secure collaboration inside and outside the enterprise. To provide the capabilities needed to extend multi-CAD product design across the enterprise, companies must have dynamic collaboration capabilities, with a robust, scalable and secure technology infrastructure.

PTC has the PLM track record to help you plan and execute the right strategy for multi-CAD environments.

Take a look at the PTC Value Roadmap as a first step toward evaluating your needs regarding multi-CAD design, and start developing a strategy to improve your Global Product Development operations within your business.

See the PTC Value Roadmap at
[PTC.com/solutions/value-roadmap](https://www.ptc.com/solutions/value-roadmap)

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