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Issue in Focus:

Enabling Product Lifecycle Management

The CIO's Guide to Supporting a PLM Initiative

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Introducing the Issue

Manufacturers today are adopting and expanding the use of Product Lifecycle Management (PLM) processes and software. Particularly valuable during difficult economic times, PLM offers a relatively unique opportunity to simultaneously increase top line revenue while controlling product development and product costs to improve margins. PLM accomplishes this by helping companies improve product innovation, product development, and engineering performance and drive higher levels of product profitability. Today's CIO needs to be prepared for some unique implementation and support challenges to ensure that the enterprise can fully capture the strategic benefits available from PLM.

> *CIOs must be prepared to address PLM infrastructure requirements on an enterprise scale as the applications shift from an assortment of engineering tools to an integrated suite of enterprise class systems*

While PLM originally started with Computer Aided Design (CAD) and other engineering tools, broader use quickly led to a need to manage an even larger volume of CAD files. Product Data Management (PDM) solutions were developed to meet this need, and then extended to address a broader array of product data and collaboration. Today, PLM use is maturing and broadening (see Figure 1) to the point that PLM has become a full-fledged component of the manufacturing enterprise IT systems ecosystem. Now, CIOs must be prepared to address PLM infrastructure requirements on an enterprise scale as the applications shift from an assortment of engineering tools to an integrated suite of enterprise class systems.

Figure 1: PLM Expansion and Evolution

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While some manufacturers may have relied on Engineering IT for the architecture and technical environment for engineering tools such as CAD or Computer Aided Engineering (CAE), CIOs are getting more involved due to enterprise-class support issues and integration of PLM with other enterprise-level systems such as ERP. CIO's organizations have experience implementing, supporting, tuning, and maintaining enterprise level systems. These lessons are critical to successful PLM implementations and the expansion of the manufacturing systems ecosystem. However, the nature of PLM brings other considerations into play that the CIO and their team must be aware of to ensure that the full value of PLM can be achieved. This paper is intended to share special considerations, practical experience, and best practices in supporting the PLM initiative.

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Sharing Highly Sensitive Data

One of the first considerations that CIOs must face is data protection. Managing and controlling product-related intellectual property (IP) is critical. CIOs are used to protecting confidential information such as financial data, human resources records, and costs. This data, however, is usually information that can be safely protected behind the company firewall. Managing PLM requires facing a contradiction. PLM data is concurrently highly confidential, and much more valuable when shared broadly. Today's product development and engineering environment frequently includes third party participants. Joint ventures, co-innovation, contract design, and outsourced manufacturing are all commonplace in manufacturers today, require ready access to information, and can contribute to security challenges.

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These complexities require PLM to adopt a very granular security model. Like other enterprise systems, security needs to be managed by process and organization. But product innovation and engineering typically require additional access rules by program, project, or even by specific subassemblies or parts. The security model needs to address who has access to what, and trace access to information for audit requirements. This is mandatory in some countries and industries, for example to support regulations such as International Traffic in Arms Regulations (ITAR). Other industries may also demand unique security features such as authenticated electronic signatures, for example 21 CFR Part 11 regulations from the Food and Drug Administration in the United States. Advanced users can leverage security models in leading PLM solutions, but the CIO may

also want to integrate corporate controls to standardize access and provide enterprise-level authorization and single sign-on capabilities.

Managing Large Data

Modern CAD files encompass a lot of information and can be extremely large. When you extend those files with additional data that can be associated with them, such as the analysis results from related CAE studies and other product data, database sizes can grow rapidly. Because innovation is an iterative process, you can further extend data volume by multiple design revisions. Most CIOs have significant experience in managing large databases given the expansion of ERP, other enterprise systems, document management systems, and data warehouses. PLM data, however, can offer some unique challenges.

> *Engineering and product development data is different*
> *than large volumes of transactional data*

Engineering and product development data is different than large volumes of transactional data. ERP, for example, is typically made up of large volumes of small records. PLM data frequently includes very large individual files for a single CAD model. In addition, global design strategies dictate that large files may need to be moved from one location to another. CAD files are frequently accessed simultaneously, and require a check-out/check-in approach to avoid duplicate updates. Centralizing access and control is ideal, but frequently will not work in large-scale, global deployments. Large file sizes and limited network bandwidth frequently demand a synchronization approach for adequate performance. However, synchronization must be timely so engineers can work in the context of other changes that are being made concurrently. Designers are frequently working on parts that can interfere with one another, and benefit from mockups of related designs to be as close to real time as possible.

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> *collaborating on large files in order to support PLM*

Network throughput and lag time might force different deployment options, depending on company goals, network capabilities, and the nature of the CAD files. CIOs should be aware of these different options, as well as alternate methods for sharing designs. For example, sharing a design does not always have to be based on the full CAD model, but might be able to leverage the ability to share designs at different levels of fidelity for different purposes. This approach can also play an important role in the prior challenge, protecting IP. CIOs and their organizations must be aware of the potential issues arising from collaborating on large files in order to support PLM.

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Broad Scale Adoption, Collaboration, and Integration

Another reason that CIO organizations are getting involved is the current expansion of the scope of PLM. As Figure 1 shows, PLM is expanding in the following dimensions:

- **People** – Product development and product innovation are expanding across the enterprise to more people inside and outside of the business.

- **Product** – A "product" consists of much more than R&D or engineering specifications, with a richer view including commercial considerations to address the "whole product." In addition, the technical view is growing, expanding in scope to include mechanics, electronics, and embedded software designs.

- **Lifecycle** – Product-related processes are being integrated across previously disparate functions, providing integrated access to Sourcing, Manufacturing, Service and other departments that previously did not have access to this kind of product data.

- **Process** – PLM processes are being expanded and integrated across all three of these directions, and it is this extension and integration of processes and information that really puts the value into PLM. Without process, the other three are not possible.

> *The lesson is not to scope for today's implementation, but develop*
> *an infrastructure that will handle the strategic end state*
> *which includes many new users throughout the extended enterprise*

While many companies start with a sub-segment of PLM, such as PDM, or started their implementation in only a specific division or product line, they are frequently adopting a "PLM Program" approach. This approach involves developing a long-term strategy for PLM, and then achieving it in a series of smaller, practical steps that move the business. It allows for a series of short projects with clear, attainable ROI that lead to a strategic PLM implementation that is greater than the sum of its parts. The implication for the CIO is that although companies may have started small, they should be ready to scale and usage will expand over time. The lesson is not to scope for today's implementation, but develop an infrastructure that will handle the strategic end state which includes many new users throughout the extended enterprise. Also, as more advanced CAD, CAE, and simulation processes are adopted, already large file sizes will likely increase dramatically.

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> *CIOs organizations should be ready to support frequent,*
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> *and the rest of the manufacturing systems ecosystem*

Another consequence of PLM expanding and becoming a larger part of the enterprise ecosystem is integration to and from other enterprise systems. As recent Tech-Clarity research "The Evolving Roles of ERP and PLM: Integrating the Roles of Integration and Execution" indicates, the integration of ERP and PLM systems is both expanding and maturing. Many companies are moving to real-time interaction to share PLM information downstream, but also to pull inventory, costs, and other data into the PLM environment. CIOs organizations should be ready to support frequent, bi-directional, real-time integration between PLM and the rest of the manufacturing systems ecosystem. Also, as discussed in Tech-Clarity research "Issue in Focus: Business Intelligence Extending PLM Value," the use of search and business intelligence (BI) will enable better business decision-making, but also broaden demand to access to PLM data both independently and in combination with data from other systems.

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Reducing Risk, Implementation Leadtimes, and Cost

The good news is that PLM solutions were designed and have evolved to support these special needs. The PLM industry has learned from large scale PLM deployments, and has developed technology and best practices to address these issues. Tiered architecture offers scalability and different implementation options. Enterprise-class architectures such as service oriented architectures (SOA) provide easier integration as well as better scalability. PLM is ready for its expanded role.

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At the same time, enterprise infrastructures have evolved in parallel to support more integrated, collaborative, real-time business environments. Today's CIO needs to understand both domains, as well as the intersection of the two. Armed with this knowledge, the CIO can be comfortable that they can support the enterprise system needs for product innovation, product development, and engineering today and as their company evolves through their PLM Program.

Conclusion

PLM has evolved to an enterprise-class system, and requires special consideration from the CIO. As PLM usage expands and matures, it brings new requirements with it. CIO's organizations need to understand the unique challenges of sensitive data, large file sizes, broad scale adoption, collaboration, and integration. As PLM becomes more strategic to profitability in today's manufacturing business, the CIO's organization needs to be ready to address these needs. Leveraging well architected PLM solutions and adopting PLM best practices can help CIOs help their business profit from PLM and support PLM implementations well into the future.

Recommendations

- Combine domain experience with enterprise software systems with experience and best practices with product innovation, product development, and engineering processes and PLM solutions
- Look for solutions built to scale, on architectures designed to support enterprise-level adoption
- Look for solution providers, including both software and services, that bring best practices, technologies, and the intersection of PLM and enterprise skills required to be successful in today's manufacturing systems ecosystem
- Be ready for integration, BI, search, collaboration, and other scalability requirements brought about by the expansion of PLM

About the Author

Jim Brown is the President and founder of Tech-Clarity, an independent research and consulting firm that specializes in exposing the true business value of software technology and services. Jim has over 20 years of experience in application software for the manufacturing industries, with a broad background including roles in industry, management consulting, the software industry and research spanning enterprise applications such as PLM, ERP, SCM and others.

Jim is an experienced researcher, author and public speaker and enjoys the opportunity to speak at conferences or anywhere that he can engage with people that are passionate about improving business performance through software technology.

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