

**Tech-Clarity**

*making the value of technology clear*

# Tech-Clarity Insight: Managing Engineering Data

*The Role of Product Data  
Management in Improving  
Engineering Efficiency*



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## Executive Overview

Research on today's manufacturing environment makes three things clear. The first is that manufacturers must innovate to capture their share of lower sales volumes. The second is that they must bring products to market faster to combat hungry, global competitors. The third is that manufacturers are running very lean due to price pressure from customers and the recent economic downturn. The combination of tough markets, reduced headcount, tight budgets, and aggressive new product development targets means that manufacturers need to be able to design and develop products extremely efficiently to get the most out of their engineering efforts.

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Leading manufacturers are leveraging engineering software to provide the product development efficiency they need to survive tough times. For many companies this starts with an investment in world class Computer Aided Design (CAD). These tools help engineers better communicate product designs with Manufacturing and other departments to improve product development cycles. But these tools also add complexity to managing files, making the use of shared folders and other informal data management processes ineffective.

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*Ken Lechner, Vice President of Engineering, AMETEK*

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In order to manage the complexity, manufacturers are turning to data management solutions to share product data across the business through a central repository. These systems go by many different names, including Product Data Management (PDM), Collaborative Product Data Management (CPDM), Product Lifecycle Management (PLM), Engineering Document (or Data) Management (EDM), and others. The core requirement of each of these systems is to get engineering data securely under control and make it easily accessible to those who need it. Product data management is the fundamental building block of any engineering software strategy and helps companies get the most out of their precious engineering resources. *"The key is product integrity,"* explains Ken Lechner, Vice President of Engineering for AMETEK Technical and Industrial Products. *"With PDM, we don't wonder what the right revision is and don't need to go to multiple places to find it. We know it is the latest revision and that it has gone through the approval process."*

PDM provides the foundation needed to improve product development and engineering performance. Once product data is under control, manufacturers can streamline and automate product-related processes such as transmittals and engineering change orders. It also enables information sharing with other parts of the business that play important roles in developing high quality, profitable products. In fact, as PDM gets established, other departments such as Manufacturing, Quality, Purchasing, Sales, and Marketing frequently recognize the value of extending PDM to manage their product-related information. These improvements rely on a foundation of accurate, current engineering data. The result is that PDM has become a mission critical initiative that enables faster, more effective product development by managing and sharing product data across departmental boundaries.

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## **PDM and the Business Strategy**

Manufacturers must focus engineering systems strategies on supporting their business strategy. Whether a company chooses to compete as an innovator, a fast-follower, a low-cost provider, or an alternative strategy, their engineering software must help them achieve that position. PDM is a critical element of any engineering strategy and can help companies realize their targeted market position.

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For example, one proven business strategy is to grow by acquisition. AMETEK, who manufactures rotary and linear motion control products and electronic instruments, has adopted this approach. “*Our objective is to grow by acquiring companies with complementary technologies,*” explains Ken Lechner, Vice President of Engineering for AMETEK. “*Our division has had five acquisitions over the last 12 years, and we now have nine engineering locations and nine manufacturing locations globally.*” Their PDM strategy, then, must support a distributed environment for both product design and production.

Another example is to compete on agility. This strategy typically includes reducing the time it takes to bring new products to market. Visa Lighting Corporation, a manufacturer of performance decorative lighting, differentiates against their competition in this way. “*We are very aggressive on new product development (NPD), it is the lifeblood of our organization,*” comments Mark Hastings, Engineering Manager at Visa Lighting.

*“We want to compress the time from product idea to hitting the marketplace as much as we can.”* In this case, PDM must support engineering efficiency.

Another business strategy companies adopt is a *design anywhere, build anywhere* philosophy. This approach allows them to share resources across different divisions and geographies in their business, allowing them to balance resources with demand and augment capacity from the outside as needed. SchuF-Fetterolf, an international industrial valve company specializing in the design and manufacture of process critical valves, describes their approach. *“Some sites might be busier than others, so sharing resources is important,”* describes Brian Walsh, IT Manager for SchuF. *“We wanted to share workload across design departments,”* he explains. *“We practice simultaneous engineering, leveraging all our sites; Germany, the US, Ireland, India, and Brasilia,”* adds SchuF’s Director of Sales, Christoph Kehrs. This strategy dictates that PDM software has to support project collaboration and allow engineers to share product information globally in a real-time environment.

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AMETEK has adopted a flexible model for their business in addition to competing on growth by acquisition. It was important, therefore, that their PDM system supported both needs *“We want to be able to smoothly move products from one location to another,”* explains AMETEK’s Lechner. *“Now, we don’t worry about engineering and manufacturing being in different locations because our system allows seamless and timely access globally.”*

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*Christoph Kehrs, Director of Sales, SchuF-Fetterolf*

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All of the companies above chose PDM as a critical element in achieving their business strategy. *“Without a PDM system, we would not be able to make the worldwide handoffs across all time zones,”* explains SchuF’s Kehrs. *“PDM was the natural choice to help us share resources globally,”* adds SchuF’s Walsh. Clearly, not all companies will adopt the same business strategy. Likewise, they will have different goals for engineering and product lifecycle automation. Each manufacturer needs to focus on the highest value for their company first and make sure they have room to grow as the business strategy evolves over time. Experience and research for this paper show that PDM is a strategic system that plays a fundamental role in helping manufacturers achieve their selected business strategy.

## Gaining Control of Product Data with PDM

How does PDM help the business of manufacturing? One of its key benefits is establishing control over product data. Controlling product data helps manufacturers improve efficiency and reduce mistakes. *“We had a manual, paper-based system for control of documents, resulting in all the typical problems,”* comments Ken Lechner of AMETEK. *“We had the wrong parts being made, produced out of revision parts, and had revisions not being distributed to the right location. We had all of the horror stories companies have with a manual system.”* SchuF shared similar issues. *“We had situations where we had two files and ordered castings from the old drawing and suffered the immediate cost associated,”* SchuF’s Walsh recalled. *“But with PDM, we are not seeing problems like that anymore.”*

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The problems resulting from poor control of engineering data get even more challenging with engineering tools such as 3D CAD, which generate a large number of inter-related files that must be managed. *“We really needed help when we moved to 3D CAD,”* SchuF’s Kehrs recalls. *“You need to have a good PDM system to keep a 3D system running properly.”* PDM helps keep complex file relationships intact as files are checked in, checked out, moved, copied, or renamed. For example, changes to one file often have ripple effects that impact related assemblies. *“It wouldn’t be feasible to work with 3D CAD across sites. It was possible with 2D, but when you have complicated assemblies with lots of parts you need a PDM system. No question about it,”* SchuF’s Brian Walsh concurs. PDM prevents mistakes made by wrong revisions or wrong files. *“Now we get the file we want at the click of a button and it is always the latest revision so we can continue our work,”* explains SchuF’s Kehrs. *“With PDM, you don’t worry about it, you always have the latest. The headache is gone.”*

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As companies get their data gets under control, they can leverage PDM to handle more complex engineering challenges. For example, PDM systems can manage and track multiple configurations of product assemblies and subassemblies. *“We are very configuration-heavy, one part file might represent six actual part numbers,”* explains Mark Hastings of Visa Lighting. *“Our subassemblies have different configurations and we have different layouts in main assemblies.”* These complex configurations are

managed by the PDM system in order to prevent mistakes. The PDM system must also manage, track, and control files from multiple CAD systems. “*Which CAD tools do we have?*” AMETEK’s Lechner laughs. “*One company we acquired had five or six; the total is now about eight.*” For this reason, PDM integration with multiple CAD applications is critical.

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***Getting control of engineering also makes it faster and easier to retrieve information when needed.***

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Getting control of engineering also makes it faster and easier to retrieve information when needed. “*We can’t afford for somebody in the US who is looking for a document in India to send an e-mail to request a drawing or BOM,*” cautions Christoph Kehrs of SchuF. “*We can’t afford days, it may be too late and our customer’s plant may be shut down. That’s not good customer service. Search is critical; the data has no value unless you can find it.*” Leading PDM systems offer multiple ways to retrieve information, including searching on the contents of documents or metadata extracted from CAD files. PDM replaces inefficient, manual approaches to managing and finding information, allowing global companies to get products to market faster and better serve their customers.

## **Collaborating with PDM**

In addition to managing the complexities of 3D CAD, complex configurations, and multiple CAD systems, PDM helps companies work across sites and share information more fluidly. Many companies leverage their centralized PDM repository to improve collaboration between local and global design teams. “*The document vaults are located where the individual design and manufacturing functions reside,*” says AMETEK’s Lechner, “*But the PDM database is centralized enabling everything to be accessible globally.*” World class PDM systems typically support a distributed model to support local design teams, but also provide secure access across the business.

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Centralizing access to product data allows engineers to collaborate with other departments as well as other locations. PDM also allows companies to leverage resources across multiple design and manufacturing teams, supporting the design anywhere – build anywhere strategy discussed earlier. “*We needed the ability for globally distributed engineering groups to collaborate on designs in order to meet our end goal of leveraging resources across locations. That’s the key,*” explains AMETEK’s Ken Lechner.

*“Now, anybody from any location can collaborate on any product. It is very advantageous that we can work together with PDM.”* SchuF has also seen the benefits of their global PDM implementation. *“We had no connection between design sites, resulting in problems with mailing and copying as well as version control problems,”* says Brian Walsh of SchuF. *“We changed from single location installations to a centralized one, and now everybody is working off of the same data.”*

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Sharing data not only helps with collaboration, it enables design reuse. *“Now we don’t reinvent the wheel,”* explains Visa Lighting’s Hastings. PDM provides the ability to copy designs while keeping all file relationships intact. By enabling better design re-use, PDM makes engineering more efficient and saves the company both time and money in new product development.

## **Automating Product-Related Processes**

As manufacturers use PDM to organize and manage their engineering data, it opens up opportunities to streamline product-related processes such as automated product approval. *“We set up workflows so that designers can design and checkers review and approve their work,”* explains SchuF’s Walsh. *“It gives us accountability because they realize their name is going on the review and it provides audit capabilities so we can trace exactly what has happened.”* Moving from paper processes to electronic workflows improves efficiency, provides better traceability, and improves time to market. *“Now our communications are more streamlined and we have fewer non-value added steps,”* states Mark Hastings of Visa Lighting, *“It is helping us save money and grow.”*

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PDM also helps automate engineering change control. Effective change management is critical to prevent errors and to confidently introduce product enhancements to manufacturing. PDM automates the process with workflows that include the right people in the process to ensure that everybody is looking at the most recent data. *“Now we have a streamlined change control process that is paperless and automatically routes files so we don’t have a huge paper trail travelling around the building anymore. We can find the change document and pull up all related drawings, images, and everything else we need in a couple of clicks. All the information is at our fingertips,”* Visa Lighting’s Hastings explains.

As data moves outside of engineering, PDM can help share CAD and other documents with non-engineering people by providing CAD and document viewing, redlining, and markup technologies. *“We can now route red-lined versions through the PDM system. It is a lighter weight way to manage the change request process,”* states Visa Lighting’s Hastings.

Automating product-related processes offers other benefits, including better quality assurance and compliance with industry standards. As AMETEK’s Ken Lechner explains, *“The electronic approvals process for changes provides an audit trail which is traceable and helps plants with ISO certification.”* PDM provides a valuable audit trail for product development and engineering. With PDM, it is easy to see when changes were made and by who, along with who approved them and when. It also tracks which designs and revisions have been shared with others. By automating and managing the creation, revision, and transmittal of data, companies can reduce errors and have a historical audit trail of all engineering activities throughout a product lifecycle.

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for product development and engineering.***

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## Leveraging PDM beyond Engineering Data

As most engineering software strategies expand, information about products expands accordingly. As manufacturers recognize the value that centralized engineering data can provide they frequently start using PDM to manage more of their engineering data, such as specifications, documentation, and quality information. For example, SchuF’s Kehrs explains that *“Even for a valve from 1950, we can get spares for it. We have complete drawings but we also have design calculations.”*

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Another common practice is to incorporate manufacturing data into PDM. *“We are adding manufacturing processes, routers, and process sheets to our system,”* explains AMETEK’s Lechner. PDM manages all of the engineering-related documents to make sure they are not lost and that the most current revision is available. It also keeps all product data in one place so it is easy to find and update related information as design changes occur. *“Our work instructions for assembly start as spreadsheets. We can add notes based on options, and then the software automatically converts them convert to PDF when it is signed into the library,”* describes Mark Hastings of Visa Lighting. *“That is a benefit on the shop floor, where they can search, find, and view things very quickly.”*

Associating project information with products also helps provide a much better picture of the new product development process. *“We identified documentation that was not easily accessible such as project schedules, engineering processes, and procedures, and pulled it all together so everybody has access to it,”* says Ken Lechner of AMETEK. *“It is much better than putting it on a shared network drive, it is just there so anybody given proper permission can search and get what they need.”*

Many companies also leverage PDM’s document and file management capabilities in non-engineering areas. For example, information like market studies or product requirements can be stored along with the product design. *“The initial spark came from design,”* recalls SchuF’s Christoph Kehrs. *“Now, different departments – even Accounting – are using PDM. It is not purely in design anymore. Commercial things like project calculations and quality documents like nonconformance reports are in there. We even store invoices and purchase orders to vendors.”* Because all of the information in PDM is searchable and accessible, people outside of engineering are able to access design and related information throughout the product lifecycle.

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Of course, product design only represents one aspect of engineering where manufacturers can use PDM. It can also be used to manage plant equipment and facilities layouts for operations and maintenance. The companies interviewed for this paper all indicated that they found additional uses for PDM beyond their initial needs and expectations, proving that PDM is a valuable and extensible foundation to an engineering software strategy.

## Conclusion

PDM helps companies gain control of product information, enhance collaboration, improve traceability, and drive efficiency in their product development processes. Perhaps more importantly, companies are taking advantage of PDM to achieve mission critical business strategies. *“Time to market is important to our business, even though we are running lean and mean,”* concludes Mark Hastings of Visa Lighting. *“It has worked out, our new product line for healthcare had a very tight cycle and PDM helped us hit the market in record time.”*

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SchuF's PDM solution has also helped them realize their business objectives, including reduced product development time. *"Engineering is our key competence. If you want good engineering, you need to give them all the tools they need. A normal valve company takes 6-12 months for a new product. We develop a completely new valve range in 6 weeks – PDM really makes us very fast."* explains SchuF's Christoph Kehrs. PDM has also allowed AMETEK to realize a global distributed environment. *"Now we can support our multiple locations with separate engineering and manufacturing. Some are twenty feet from each other, others are thousands of miles away and in different time zones – now it doesn't matter,"* states AMETEK's Ken Lechner.

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These companies realized significant business value from PDM, including increased efficiency, reduced cost, and improved quality. They started by controlling and sharing engineering data. Over time, they recognized that PDM could also help them streamline and integrate product-related processes, making design reviews, change management, and other processes more efficient. They have all since extended the value gained from their PDM infrastructure by capturing and collaborating on non-engineering data in addition to CAD files. *"I can't imagine we would be where we are without PDM. We have grown massively over the last 15 years while some competitors are really struggling. We wouldn't be in this position without PDM, we would have had to add three or four more people and still wouldn't be as effective as our system. We have the same number of people as when started with PDM but now have three times the output. It is worth every dollar we spent on PDM, we get good return on it,"* SchuF's Kehrs concludes.

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## Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Develop a PDM strategy that supports the business strategy, including both short-term and long-term goals.
- Leverage PDM to get the most out of precious engineering resources
- Use PDM to get engineering data under control, including management of revisions and configurations.
- Share product data to enable collaboration and make designs available for reuse.
- Extend product data with workflows to streamline and improve product-related processes such as engineering change management and design reviews.
- Look for opportunities to extend the PDM infrastructure outside of design engineering to incorporate and control additional data.

## About the Author

Jim Brown is the President of Tech-Clarity, an independent research and consulting firm that specializes in analyzing the true business value of software technology and services. Jim has over 20 years of experience in software for the manufacturing industries, with a broad background including roles in industry, management consulting, the software industry, and research. His experience spans enterprise applications including PDM, PLM, ERP, quality management, service, manufacturing, and others. Jim is passionate about improving product innovation, product development, and engineering performance through the use of software technology and social computing techniques.

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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