

Tech-Clarity

making the value of technology clear

Tech-Clarity Insight: Engineering Reference Information in a PLM Strategy

*Empowering Speed, Efficiency, and
Quality in Engineering*



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Executive Overview

Manufacturers today compete on speed and innovation to drive product profitability and profitable growth. These companies have recently given a lot of attention to business process improvement, organizational design, and enabling software technology to improve engineering productivity. Little executive attention has been placed, however, on the importance of providing efficient access to engineering reference information. Streamlined, electronic access to engineering information is another tool in the Product Lifecycle Management (PLM) toolkit that improves design efficiency so engineers can spend more time on innovation, create more new intellectual property, and accelerate time to market to capture market share and margin advantages. *“Engineering reference information is an enabler,”* says Spyro Kotsonis, EMS Global Mechanical Métier Manager at Schlumberger. *“Engineering is made easier, more streamlined, and efficient by using electronic engineering reference information.”*

Streamlined, electronic access to engineering information is another tool in the PLM toolkit that improves design efficiency so engineers can spend more time on innovation.

In essence, PLM focuses on improving product innovation, product development, and engineering performance. Reference information can play a significant role in these improvements. Too frequently, an engineer will have to pull away from their design work to look up a critical specification, formula, or other piece of information. To reduce the impact of this disruption and improve efficiency, the information they need should be:

- Readily available
- Easily retrieved from a myriad of available information
- Provided from trusted, validated, and current sources
- Provided in the context needed (units of measure, etc.)
- Integrated into the engineer’s daily workflow
- Easy to reference for added credibility and risk management

Engineering is made easier, more streamlined, and efficient by using electronic engineering reference information.
Spyro Kotsonis, EMS Global Mechanical Métier Manager, Schlumberger

Electronic engineering reference material helps individual engineers in their pursuit of making confident, informed decisions. Digital references also provide corporate benefits. Most notably, a survey by the American Society of Mechanical Engineers (ASME) indicates that having electronic reference materials can help improve engineering productivity by 20% or more¹. Perhaps the most tangible benefit, if not the most strategic,

is reducing the direct cost of traditional books and libraries. *“We had libraries all over the place that had to be staffed and maintained, yet I always felt as an engineer it was not up to date,”* said Colin Reid, VP Engineering for Refining at BP. *“We had to ‘make do’, I felt compromised.”*

Given the current financial climate, manufacturers can’t afford to waste any of the scarce engineering talent and capacity they have available to them. Companies need to have a trusted source of information that they can turn to for rapid access to high quality reference information so they can focus on creating innovation and value for the business.

Just the Answer I Need Please

Imagine if an engineer had access to a library of books that held all of the answers they needed, would they be happy? Or what if they had one really big book with all of the answers they needed, would that make them productive? No, what the engineer really wants is not all of the answers to all of the possible questions, but just the one they need at that given moment. What they need is better than a book can offer, and better than a library of books can offer. They need the right information so they can make the right decision quickly, accurately, and with confidence. Like many aspects of today’s life, engineers can suffer from information overload. Electronic information, if provided poorly, can make the problem worse. The answer is not providing *more* information, it is providing the *right* information quickly so the engineer can get what they need and keep focusing on designing products. As Mr. Kotsonis of Schlumberger puts it, *“Reference information must be readily available, or it will just not bring any value.”*

Fishing through mountains of information is inefficient at best, and at worst can lead to taking a shortcut to get *“an answer”* instead of the *“right answer.”* In order to allow engineers to focus on value-added design work instead of looking for information, intelligent search capabilities are critical. *“We learned the hard way that the capability of the search engine is very important when we decided to put our own standards on the system,”* explains Mr. Reid of BP. *“We just put paper documents on screen and it was hideous, there was no search, no connection, and it just wasn’t used. The electronic world didn’t work until we added search capabilities that made this medium usable in a meaningful way. The search is brilliant, it’s critical.”*

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Digital information is important, but electronic books are not enough. Companies can’t afford to have engineers waste time searching abstracts and fishing through books. *“We found a lot of good books, bibles,”* said Mr. Kotsonis of Schlumberger. *“Many engineers have them on the shelf, but they would rather Google because they feel it’s faster.”* But a

generic search engine over the vast amount of uncontrolled content on the Internet is an inconsistent and often insufficient solution. Google is not enough. Engineers need a tool that understands the context of engineering with its specialized terminology, units of measure, and contextual knowledge such as keyword mapping for columns that are frequently referred to differently in different references. And perhaps most importantly for the company, when the engineer finds information, they should be confident that the information is right. It should come from trusted, reliable, and validated sources because the stakes can be very large when engineers base their decisions on the data.

Engineers need a tool that understands the context of engineering with its specialized terminology, units of measure, and contextual knowledge.

Building Reference Information into the Engineering Workflow

Engineers need reference information to solve a wide variety of problems during the work day. According to data from a 2008 study of ASME¹ members, the most time consuming problems to research include:

Problem Being Solved	% of Respondents
Material Selection or Applicability	24%
Modeling and Simulation	15%
Product Design or Improvement	13%
Process Design or Improvement	8%

Table 1: Most Time Consuming Problems Requiring Reference
Source: ASME Study¹

Not only are these the most time consuming problems that engineers face, they are also the most frequent. The data indicates that the same four problems reported as the most *time consuming* were also the top four cited as the most *frequent* problem types that engineers turn to reference information to resolve. Each time an engineer needs this type of information, they have to set aside their design work – and their thought process – to gather the required reference. This disrupts the engineer’s workflow and degrades productivity.

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Bringing reference information to the desktop helps to minimize disruption and increase productivity. The value of digital information needs to go beyond accessing it from the desktop, to taking advantage of the fact that electronic information can be more easily integrated into the engineer's work. Books are static, while electronic information can be interrogated. More advanced reference tools can provide capabilities such as interpreting an equation or a graph to understand the underlying data. Instead of an engineer estimating or measuring the number on a curve, tools are available that can calculate the values and create a better reference. "*Our engineers find the graph tools very useful because of the accuracy instead of the age-old 'eyeballing' method,*" commented Mr. Kotsonis of Schlumberger.

Electronic information can be more easily integrated into the engineer's work.

Strategic Benefit: Efficiency

Of all of the benefits offered by a strong reference information component to a PLM strategy, engineering efficiency probably provides the most strategic value. As benchmarks on engineering strategy have shown, improving engineering efficiency is a means to achieving cost reduction, but also a path to compress product development lead times. The latter can be translated to faster time to market which drives increased market share, higher selling prices, and richer product margins. In short, a successful engineering reference information strategy can drive top-line as well as bottom-line benefits.

Given digital reference information's ability to drive improved profitability from a cost and revenue perspective, it is no surprise that it is receiving increased attention. In the current economy, engineering capacity will likely remain flat (at best). Given the unprecedented need for innovation and speed despite these conditions, engineering throughput is at a premium. Electronic engineering reference information can help optimize throughput to combat engineering skills shortages and limited budgets. But how much can companies expect to gain in efficiency and throughput?

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Data from the ASME study indicates engineering reference information (specifically the ASME eLibrary) improved the productivity of engineers in significant measures. Specifically:

- Over three quarters (79%) of the participants say electronic access to reference information *improved their efficiency by 10% or more.*
- A full one third (34%) of respondents indicate that electronic reference information *improved their productivity by 20% or more.*

Even a modest 5% gain in efficiency would likely provide a significant return on investment (ROI) for most engineering organizations. Interviews conducted for this report indicate that leading companies are recognizing these benefits. *“I can find something within 10 minutes from scratch, where before the best I could do was an hour. I think it is speeding me up a factor of 6-7 times to get a piece of information compared to a decent traditional library,” said Mr. Reid of BP, “and we were a well-resourced company compared to others. If you didn’t start with a decent library the improvement goes up and could be 20 to 30 times.”*

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Mitigating Corporate Risk

While efficiency is a compelling value, the role that trusted information plays in improving decision-making quality shouldn’t be ignored. Engineers need speed, but can’t afford to be reckless and make bad decisions. Engineers need validated resources to back up their decisions with a high degree of trust and confidence. *“We had a challenge in BP because of rapid growth leading to a lack of standardization,”* said Mr. Reid. *“We want to have the ‘BP way’ of doing things for cost and efficiency, but also to protect our reputation.”* Like other PLM enablers, common access to electronic reference data across the enterprise can help standardize engineering processes and promote reuse. *“By providing centralized information, we removed the engineer’s little black book where they gathered up information”* Mr. Reid of BP continued. *“From an engineering management perspective, we can now ensure that they use the latest thinking and be assured that it’s up to date. Now, with regulators and agencies, we can show rationale for what we are doing.”*

Ready access to the right information can also help improve the results of an engineer’s designs. *“When we need information, we need it now. Otherwise there is a lull, and someone will take a shortcut that is not necessarily validated,”* Mr. Kotsonis of Schlumberger cautioned, *“Material specs can be different in different sources, and it could lead to a product that might fail.”*

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Financial Justification: Cost

Not all of the benefits are as sensational as risk mitigation. Despite seeing the strategic value in efficiency and risk mitigation, some companies feel it is easier to develop a financial ROI model using cost. Given the 20% improvement in productivity reported by the ASME study, a compelling ROI can be developed based solely on labor costs. But many can justify the transition to digital engineering reference information based on direct cost savings alone. Buying individual books is expensive, and an inefficient use of resources. *“Engineers are constantly asking questions, referring to books they would have to buy and then only use 2-3 pages,”* said Mr. Kotsonis of Schlumberger. *“We want to point people to books without buying them and going through them only once.”* Besides being difficult to share, paper-based reference materials go out of date over time. *“We used to hold tech libraries locally, but have since replaced the librarian service at each site,”* said Mr. Reid of BP. *“Now, the information comes to individuals directly. They receive a wider range of materials than you could hold in a single plant library, and it’s up to date. With the paper approach, the investment to keep up to date would be much greater. Instead we have chosen to centralize supply and improve efficiency, leading to improved quality of the material while also cutting cost.”* Clearly most companies can’t afford to provide traditional paper reference materials from a pure cost perspective, particularly when coupled with time to market and throughput improvements that can help increase revenue at the same time.

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Putting Reference Information in Place

Providing reference information to engineers provides multiple advantages, including increased efficiency, lower risk, and reduced cost. Companies must decide between three primary information delivery options: traditional paper books, digital books, or an online reference tool. Digital, electronic books have advantages over paper. More advanced reference tools provide the content from these books with the advantages of tools such as graphing, parametric search, unit conversions, and filtering. In the final analysis, the content is what helps the engineer make the right decision, but the tools approach extends that advantage with significant efficiency gains that promote adoption and speed.

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Electronic information also provides other opportunities for efficiency. Information from electronic references tools can be retrieved and converted to a format that engineers can incorporate more readily into their work. For example, higher end reference tools can convert units of measure to the engineer's standards automatically, even in search criteria. These tools provide data in a format that allows easier creation of references, offering the ability to integrate information into the engineers' daily workflows and deliverables. *"Automatically converting mathematical references into a package like MathCad has a lot of value, because transcribing multiple pages has a lot of room for error,"* said Mr. Reid of BP, *"If it can be done quickly for you and validated, that adds a lot of value."*

Conclusion

In the final analysis, companies need to view electronic access to engineering reference information initiatives as an investment in engineering productivity. Companies can't afford to have their engineers search endlessly for information, and they can't afford to reinvent the wheel every time someone needs to find a new reference. But digital engineering reference information can also reduce direct cost and reduce risk for engineers, engineering management, and the corporation as a whole. Justification can be made on purchasing costs alone, although 20% productivity increase can also be developed into the ROI analysis.

Leading companies are complementing the advances they have made (or are making) in other aspects of their PLM program with digital reference information. In this way, they are getting the most from limited engineering resources and meeting aggressive engineering deadlines driven by time to market needs. *"Electronic access to engineering reference information enables faster and better product development, although credit won't be given where it is due,"* concludes Spyro Kotsonis of Schlumberger. *"Upper management probably doesn't care about reference information directly, however they want to make sure they are doing everything possible to enable and empower the engineering organization. They expect you to put what is required in place."* Colin Reid of BP sums up the magnitude of the productivity improvements achievable by saying *"It used to be a minimum of an hour and could be up to half a day to find the information we needed. Now it takes minutes, and we know are getting accurate information that we can be completely confident in."* In today's competitive global market and challenging economic climate, these tangible business benefits are highly compelling and worthy of inclusion in each company's PLM strategy.

Recommendations

- Standardize and rationalize engineering reference information
- Provide validated, trusted information online
- Look for providers with intuitive search capabilities, including parametric search capabilities focused on engineering specific attributes
- Support decision-making with electronic references to validated resources
- Cut the cost and inefficiency of paper books and traditional libraries
- Implement solutions that go beyond the capability of books by offering advanced tools which allow engineers to manipulate data and incorporate it into their workflows
- Enable engineers to focus on innovation and IP creation and get products to market faster by improving their productivity
- Include electronic access to engineering reference information as a strategic component of the corporate PLM strategy

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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References and Notes

¹ The American Society of Mechanical Engineers (ASME) study consisting of approximately 500 surveys completed by engineers, academics (students & professors), management, and consultants. The study investigated the use of engineering reference information, specifically the ASME eLibrary, to improve engineering productivity. The study was conducted in conjunction with Knovel Corporation, the supplier of the ASME eLibrary.