Collaboration Solutions for Engineers

Engineering Collaboration – Why a white paper in 2009

Information for this white paper was gathered from over 200 interviews with engineers, engineering managers, product designers, purchasing agents and project managers across the following industries in North America:
- Manufacturing
- Construction
- Automotive
- Medical devices
- Electronics
- General consumer goods
- Heavy equipment manufacturing

We asked many questions to understand the various collaboration needs of these engineering teams. The most common issues we found were:
- The need to manage manufacturing partners in low cost geographies such as China
- Challenges coordinating a distributed product design team with external consultants and suppliers
- Remote project management control for construction projects at remote locations
- Specification and model version control across a lengthy complex design process
- Process control and time to market conflicts
- Challenges coordinating a multidisciplinary team
- Finding alternative communications for face-to-face meetings due to the rising costs of travel.
- Quality processes and audits that demand too much documentation

Most if not all of these issues are associated with shrinking engineering budgets and lower price targets for products in the market. With the current recession being top of mind, the common threads we found were requirements to engineer for lower costs of tooling, labor, production and processes. However, all of these issues in themselves create more engineering work, although there are frequently fewer resources available to get that work done.

These issues led us to believe that North America is at a cross-roads in engineering. Engineers feel under attack, being continually asked to do more with less, while responding to fickle consumer tastes, shrinking budgets and environmental issues.

Why do engineers need to collaborate?
Working more economically means working with people outside the organization. As organizations downsize they outsource. Collaboration with external contractors or suppliers in low-cost geographies comes as a result of corporate strategy rather than as a goal in itself. However, many of the forward-looking companies are using extended team collaboration as a competitive advantage. They see value in bringing disparate perspectives to engineering problems to generate more creative solutions.

Some of the specific reasons that engineers provide for needing to collaborate include:
- Faster and better decision-making to reduce time-to-value.
- Saving money by controlled outsourcing of repetitive tasks
- Eliminating missed or repeated process steps to speed development cycles.
- Reducing errors in design, purchasing and manufacturing by maintaining a centralized document storage with version control
- Gaining visibility into design processes to increase customer confidence and management tracking
- Increasing accountability for tasks to improve on-time delivery across all programs
- Earlier and more effective collaboration between design and the supply chain to reduce and more accurately understand costs.
- Maintaining control over flexible processes to ensure that quality protocols are followed and documented

An overview of collaboration tools for engineers

Over the past several years the technology powering engineering collaboration has improved dramatically. Complex tools from the major software providers such as Autodesk, Siemens, PTC and Dassault have enhanced the work-flow and documentation of many large companies. However, successful implementation of these technologies requires a very large software and services budget. Accordingly, most smaller enterprises do not have these technologies, nor will they acquire them any time soon.

This white paper is intended to help engineers make some decisions about what sort of solutions will best fit their needs. We divide the engineering collaboration landscape into 4 quadrants:

What business applications support engineering collaboration?

We see four major categories of business applications in use in engineering departments across North America.

- Generic office tools like Excel and Webex
- Groupware tools such as Sharepoint, Lotus Notes and MS Outlook
- Targeted engineering solutions such as viewers, BOM tools and ECO tools
- PLM solutions that include CAD and PDM along with budgeting and portfolio management

Increasingly we are also seeing the emergence of some Web 2.0 tools, such as crowdsourcing, social networking and online collaboration tools. A recent search on LinkedIn and Facebook
revealed almost 3,000 groups associated with engineering. However, none of these tools are as yet customized in any way to engineering.

**What processes demand engineering collaboration?**

Engineering design projects encompass a broad array of tasks, processes and decisions that must be executed to achieve the budget and timeline. These business processes exist in many forms to support completely new projects, products, new revisions, as well as changes in location, logistics or scale of production. Examples of tasks and processes in engineering design include: design review, sourcing, design for manufacturing, structural analysis, BOM development, and many, many more.

We have found that there are very few truly unique projects or products. Whether engineers are building a new shopping mall or designing a new aircraft assembly, the processes they follow tend to be consistent from one project to the next. This is even more true of repetitive construction projects such as new store construction or extending a product line to accommodate additional features.

While a classical view holds that engineering design occurs in a very specific segment of the product or project lifecycle, market-dominating companies understand that the design process should extend throughout, improving the design process as well as capturing production and service experience to improve the next generation.

Companies have attempted to manage engineering design using existing solutions within the Product Lifecycle Management (PLM) and Building Information Management (BIM) space such as Project Management and Product Data Management (PDM). Unfortunately, these tools typically do not support the flexibility and velocity required for the design process. To be competitive, decisions and changes must occur in hours, not weeks. Companies often find that these tools hinder more than help, and revert to using spreadsheets and email as a result. A major new complication, the dramatic rise in multi-site engineering and supply-chain outsourcing, adds critical challenges to engineering design process execution — including more complex communication requirements, overcoming geographic barriers to teamwork, and delays due to people and information residing in different places.

Engineering teams are seeking to effectively orchestrate and track collaborative design processes across a multi-site team. Creation, visibility and tracking are required for documents and drawings, tasks, processes, issues and action items as well as visualization and interrogation of design information within structured or ad-hoc processes. Ideally, technology toolkits should integrate project, process, and product information to provide rapid access, context and understanding to all team members. Increasingly design teams are turning to Internet based tools to support the flexibility and velocity required for engineering design while enabling companies to reduce costs and time to value and improve quality.

**The elephant in the room – user adoption**

One of the biggest challenges that we see preventing effective collaboration is that not all members of the extended engineering design team have access to the same tools. Specifically, we have seen a distribution of collaboration tools that looks like the following chart.
Our research shows that engineering departments are typically the only users of sophisticated PLM tools. This is typically because these solutions are CAD-centric and require a deep understanding of the technical elements of the application. That requires extensive training, which limits the usefulness of the tools outside of the engineering departments. For this reason, large-scale PLM roll-outs have typically failed to deliver on the promise of including the marketing departments, supply chain and other users.

Moving down the curve we see viewers and other lightweight engineering specialty tools. These are typically used by people outside of the engineering departments to review project or product design and project timing.

The next group of solutions include email and groupware solutions. Email is still the most prevalent way to share documents. Groupware is the most common way to manage engineering changes and other repetitive engineering processes. These are most often combined with standard office tools such as Word and Excel to manage BOMs, specifications and other engineering processes. We also noted an increasing use of web conferencing, although most web conferencing tools lack the screen resolution to support CAD models.

Finally, we are seeing widespread and increasing adoption of Web 2.0 tools such as message boards, wikis, file sharing, and social media tools. Some of these tools include community elements such as idea exchanges and contract bidding features that allow product managers to post specifications for engineers and manufacturers to bid on.

We expect to see an increase in web-based engineering tools offered in both a subscription or advertising supported models. Companies like Autodesk with their Buzzsaw, Constructware and Green Building Studio products provide a good example of subscription-based Software as a Service (“SAAS”). Arena solutions online PLM suite and ENGINEERING.com’s Collaboration Suite are other good examples of SAAS engineering solutions.

As more solutions become available for “free”, such as Google’s Sketch-Up, we expect to see more advertising supported collaboration solutions arise to support engineers who have a need, but no budget for collaboration. And increasingly, these solutions will offer feature sets that rival the use of paid services. ENGINEERING.com intends to offer a range of solutions for engineers under this business model.
If you have any comments or questions on engineering collaboration, please contact the author as set out below:

John Hayes  
President  
ENGINEERING.com  
jhayes@engineering.com  
p. 905.273.9991 x280