Every engineering company collaborates with its customers, but some do it better than others. Done well, collaboration can turn a potential disaster into a competitive advantage.

Design engineering is an inherently collaborative undertaking. Design engineers frequently check each other’s work; they solicit their peers for advice on new methods and technologies; and most important, they keep their project managers, manufacturing engineers, and other product stakeholders informed and up-to-date on the status of their product development activities.

But traditional collaborative methods – face-to-face meetings, email, phone calls, ‘snail mail’ – can’t make up for the new realities of today’s distributed, global product development. As one engineer said recently, “Seven years ago I sent my design to a manufacturer that was twenty miles away, and we delivered products to customers that were in North America only. Today, the manufacturer is in China and our customers are all over the world.”

Not only has product development become fully globalized, but the pressures to deliver products on time and within budget have mounted. For a medium-size business, your customer – the OEM – will have high expectations not just for on-time delivery, but for consistency in everything from product quality to pricing to delivery schedules. To succeed in this environment, you’ll need to collaborate on an entirely new level.

A Common-Sense Approach to Collaboration

In an ideal world, engineering collaboration should feature three key ingredients: high-speed information transfer to keep collaborators current; high accuracy of the information being transferred; and 100% completeness of the information coverage.

The reason for high speed is obvious: if you’ve made a design change, you want to communicate it to everyone on the team – the manufacturer, the purchasing officer, and others – as soon as possible. As for accuracy, design engineering lives and dies by numbers: tolerances, weights, pressures, and so on. Information that is old or inaccurate may put the entire project at risk. Completeness of coverage means that the right person gets the right information at the right time.

If you need to get a design-change approval from a manufacturing test engineer that you’ve never met in person – perhaps working for a new supplier to your company, you’d better be certain that the signature you receive is from the correct person.

Speed, accuracy, and completeness: these metrics will help you get started in reviewing the state of your company’s collaborative framework, so you can establish a collaboration-building strategy that works for your organization.

Product Development Challenges for SMBs

Product development companies – both large and small – are facing multiple challenges in every area of the business: by the ever increasing complexities of products and product design; by the added time and effort of working with geographically distributed design and manufacturing partners; by the fragmentation of company IT systems, which can isolate product development from Purchasing, Finance, and other departments; and by the increasing need to include, in the product design, the regulatory and safety requirements of multiple regions and countries.
Yesterday’s Collaboration Methods Inadequate

Note the ways that engineering and related professionals collaborate today. Engineers and designers converse in person, or they connect using the phone, email, IM, and fax. They often use a Web-conferencing tool like Webex or Live Meeting, or they may use a CAD-conferencing tool to share images of CAD models via the Web.

Each of these methods can be effective, depending on the need at the time. But none satisfies the three required collaboration dimensions of speed, accuracy and completeness. Face-to-face meetings and phone calls are fast, but they don’t guarantee accuracy or completeness of information. Email and Web conferencing produce audit trails, thus they are potentially more accurate, but maintaining or assuring information accuracy when collaborating with email and Webex can slow a project to a crawl – just ask the litigation attorney spending weeks slogging through emails during the discovery phase of a corporate lawsuit.

And none of these methods ensures that the collaboration is complete, since anyone can forget to put a name on an email distribution list.

Widening the Collaboration Circle

As Aberdeen Group states in recent research reports, collaboration may be seen by some as a ‘silver’ bullet for speeding product development, but such thinking oversimplifies the challenges associated with forming a real-world collaboration strategy. Different companies need to excel at different types of collaboration, from small-project collaboration to collaboration that’s extended across the supplier-customer value chain. Below, we discuss the three main areas of collaboration: collaboration within a project workgroup; collaboration across a product development company; and collaboration that extends out to customers and the entire value chain.

Collaboration in a Project Workgroup

For a small engineering design shop, face-to-face, phone and email collaboration tools are fairly sufficient because these tools function mostly in-house and typically involve little or no reuse of product modeling data. In this environment, speed and completeness of coverage aren’t very difficult to achieve because project members know each other well and work in close proximity.

Yet even in this setting, the design team itself will evolve to include non-technical members from groups such as Marketing, Sales and Purchasing. What’s necessary in this scenario is a secure data vault: a product data management (PDM) repository that collects and stores all electronic data – CAD model data, product structures, and model-related documentation and annotations – and also maintains accurate version control, so all design team members are working with the most current information.

This PDM repository takes care of the accuracy criterion, and documents team members’ interactions. This solution, plus a simple workflow engine, helps project managers track progress of each phase of the project. Also, the PDM capability can manage change management processes, which also enables engineers and designers to reuse CAD designs in building-out families of related parts and products.
Collaboration Across In-house Product Development

Collaboration takes on new meaning, and scales up considerably, when taken in a company-wide context. Here, it’s important for team members to stay current, and the optimal way to achieve that goal is to install a ‘virtual sandbox’ in the form of visualization software.

Visualization software enables product designers, test engineers, and project managers to share a three-dimensional (3D) virtual prototype of the product. Using their laptops or desktop computers, they can rotate the 3D model design, animate it, step inside it to try out ergonomics, and take turns marking it up with changes and comments. The visualization software will update the model in real time, while ensuring that each team member has the most current copy. And, the software automatically documents all changes, so questions about design accuracy or design-team intent can be fully and quickly explored and resolved.

The speed and accuracy of a ‘virtual sandbox visualization function’ is vital in this scenario because these highly complex collaboration interactions can slow down collaborative decision-making. The visualization software should be accessible to all members of the growing design team, which often includes people unfamiliar with visualization software. For these people, it’s beneficial to make it as easy as possible to download the visualization client prior to a virtual design review—or for any other reason. And, it’s helpful if the visualization software employs a UI that makes it easy for non-CAD-literate users to manipulate, mark up, and annotate the 3D models.

Collaboration Across the Customer-Supplier Value Chain

Reaching out to collaborate with customers—in the case of a small or medium-size company such as a larger OEM—can be challenging because the OEM/customer will want assurance of the timely delivery of accurate CAD data, or of consistently high-quality components.

Here, it’s beneficial to assemble all the OEM’s suppliers, along with the OEM itself, for virtual design reviews via your visualization software. In this way, each supplier can see how its component fits within the OEM’s complete product. If you’re building a dashboard for a bus, for example, a virtual design review session can let you “walk” into the bus, so you can see how your dashboard looks in the context of the complete interior design.

In this scenario, for the component supplier, the major collaboration challenge becomes that of maintaining control of the collaboration workflow. Once the collaboration effort moves out to the value chain, the numbers and types of people who may join the customer-supplier design team can grow quickly. For the virtual design review, you might now include design engineers, manufacturing engineers, ergonomics experts, financial personnel, and Sales and Marketing people both from your company and from your co-supplier companies, as well as from the customer. Many of these people are located in different parts of the world, and at least some of them are people you’ve never met before.

Working with such a dispersed, somewhat unfamiliar group, you need to maintain control of your CAD and PDM data, and you need to make sure your information is getting to the right people, and that you’re getting correct and timely reviews and responses. What’s needed here is a more powerful, project-oriented workflow capability, one with high capacity and high tolerance for dealing with frequent change—in people, in assignments, in locations, and so on.
Mixing-in Documentation

Customer-supplier collaboration is fast becoming vital to any size company or industry type particularly in developing technical documentation that accompanies the final product. The value of documentation has historically been overlooked in all types of products, both for businesses and consumers, and by all types of engineering companies, from small to medium to large. As too many companies will attest, poor documentation can result in a host of issues, from missed time-to-market deadlines to excessive product returns to diminished customer loyalty.

Companies should also know that it's not necessary to produce documentation in a linear fashion, whereby the project manager waits until the CAD model is complete before bringing in the technical writers. Today, sophisticated publishing capabilities enable authors to produce annotated illustrations – derived directly from CAD models – in parallel with the design phase. With today’s powerful dynamic publishing tools, illustrations automatically update as new parts or changes are added to the model being designed.

These drawings can help manufacturing engineers set up their machinery and processes for the coming product. They can help customers determine the extent of an assembly they want in the component that will be delivered to them, and your customers might even use your documentation to collaborate with their customers – the end users – in advance of delivery.

And because these drawings can be rendered in the same fashion as product visualization software – with markups, annotations, and various manipulation techniques – they can play an important role in the larger collaborative strategy.

Vendor Perspective: PTC

When it comes to high-speed information transfer (the first requirement in customer-supplier collaboration), PTC’s ProductView™ visualization software is helping thousands of small and medium-size engineering companies to improve collaboration across the enterprise because it is easily and economically accessible to people both across the company and out to the value chain. ProductView features high-performance visualization capabilities and intelligent compression algorithms, so users can instantly see and manipulate representations of extremely large models. Thanks to its Microsoft®-licensed UI, ProductView can be operated by anyone familiar with PowerPoint®. And ProductView fits well into large multi-vendor value chains because it can recognize and work with more than 180 CAD file formats.

As far as achieving the other requirements of global collaboration (accuracy and completeness), PTC offers additional solutions, all fully integrated into a single, powerful, web-based architecture. PTC’s Windchill® software, which includes Windchill PDMLink® (data management) and Windchill ProjectLink® (project management), brings industrial-strength version-control and workflow capabilities to small and medium-size businesses without a heavy cost. Today, a small product development company can cost-justify Windchill with just three user licenses.

PTC’s Arbortext IsoDraw® publishing software automatically produces and updates documentation through associativity with PTC’s CAD software, Pro/ENGINEER®. PTC’s Arbortext IsoView® software lets design team members view documentation via Internet Explorer®. As well Arbortext IsoView can be customized and integrated with external applications, so an OEM can more easily use it in collaboration with the end user.
Achieving the New State of Supplier-Customer Collaboration:

Have A Plan

Putting together an engineering collaboration program incorporating customers and suppliers takes solid planning, but it shouldn’t be difficult if it’s conducted as part of an enterprise-wide plan, taking into account the needs of all product stakeholders. For a small and medium-size business, it’s important to know what’s possible, and what’s best for the type and style of the business. It’s also important to put the plan into action as soon as it’s complete, because customer expectations will be linked with, and influenced by, the advancing state of the collaborative process.