



## **Collaborative Design**

**July 2002**



Enterprise  
Solutions

**Solution Profile**

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## BUSINESS ENVIRONMENT

In today's business environment, the ability for people to work together in collaborative product design is a critical factor in time to market, cost, quality, and innovation. Rarely is design performed by individuals working in close proximity in isolation from others. More likely, efforts must be coordinated, ideas exchanged, and information shared between members of dispersed product development teams that often include people not only in design but marketing, purchasing, manufacturing, and other areas as well - in different locations down the hall, within an industrial complex of buildings, across the country, or around the world.

The increasing globalization of companies dramatically increases the distance between people as companies become more organizationally decentralized and geographically dispersed, increasing the need for departments and groups to function as virtual offices. Extended enterprises and virtual corporations also rely heavily on collaboration between strategic partners, consultants, subcontractors, OEMs, vendors, customers, and others. Supply chains especially are highly dependent on effective collaboration as OEMs delegate growing levels of design responsibility to subcontractors.

These trends toward increased globalization, decentralization, extended enterprises, and supply chains are driven by bottom-line business benefits of increased market share, greater profitability, and improved competitiveness. The initiatives are often hampered, however, by companies managing their important information in file cabinets, moving documents around via mail delivery, faxes, or email.

## OVERCOMING OBSTACLES

A new generation of web-based tools overcomes the obstacles of these outmoded methods. The Internet gives users easy access to a huge range of information previously unavailable or difficult to find, yet alone manage. Virtually instantaneous transfer of data is speeding up processes. In the world of manufacturing, this technology revolution is having far-reaching implications, and the impact is immediate.

By communicating at lightning speed with the click of a mouse, systems electronically link users to work together more effectively within the walls of a company, distributed facilities are able to coordinate their efforts, OEMs and subcontractors can share information across the supply chain, and companies can communicate efficiently with partners throughout the extended enterprise.

Traditionally, the huge amount of information associated with product design is stored and controlled with conventional product data management (PDM) systems, which are directed at managing documents, drawings, and other product design files primarily within engineering departments. These types of systems are used generally in archiving files, accessing data, and controlling revision levels as engineers proceed through the design cycle.

Recently, PDM has broadened to include the use of other technologies including web interfaces, portals, 3D visualization, and XML-based data exchange capabilities that facilitate tremendous levels of collaboration, both inside and outside of companies.

These collaborative tools provide an effective approach to defining and managing work processes, coordinating activities, and enabling greater communication between workers, groups, departments, and enterprises. Driven by advanced capabilities for web-based communications and workflow management, the tools move beyond limited use in the design department to an enterprise process technology that enables companies to obtain the far-reaching business gains. In this way, PDM becomes a collaboration platform in global manufacturing enterprises, allowing users in distributed locations to readily access and route critical product development information. In supply chains in particular, collaborative systems link OEMs, subcontractors, vendors, partners, and others that make up these virtual enterprises.

## TOOLS FOR COMPANIES OF ALL SIZES

Some companies have been slow to implement collaboration technology because the time, resources, and expertise required seem beyond their reach, especially small and medium-size companies with limited resources. Also a number of companies have found that many solutions lack true collaborative capabilities for complex product development.

Of course, these organizations nearly all use the Internet for e-mail between individuals and the web for researching information. But establishing a formalized, collaborative system for exchanging data, managing engineering changes, and coordinating information flow has often been beyond their means, since traditional PDM and related systems typically cost hundreds of thousands of dollars to purchase, may take months or even years to get up and running, and usually require extensive programming to configure for a company's processes and procedures. Many organizations thus were locked out of collaborative design because they lacked sufficient time and money to plow into expensive systems.

Newer web-centric collaborative design solutions such as SmarTeam change this direction by providing convenient and economical tools for rapidly implementing these approaches. One customer calls SMARTEAM a "digestible investment." Using simple web interfaces and running under Windows, the systems are not only affordable but also easy to install and use, with users becoming productive in a matter of hours or days rather than months.

Because the software can be implemented so quickly, companies can start with a few seats and then expand the number of systems incrementally across the enterprise. At each step of the way, new users become productive in a short time so that the company is spared the trauma and expense usually associated with trying to institute enterprise-wide PDM all at once, dragging out implementations for months or years before seeing any benefits.

## SOLUTIONS TO SUIT DIVERSE NEEDS

A SmarTeam collaborative design solution manages and enhances a wide array of business processes, typically returning a company's investment within months through collaborative business practices, streamlined engineering change or design approval processes, or the implementation of ISO, QSO or FDA standard compliance. A wide range of solutions are available to meet the unique needs of individual companies.

SMARTEAM provides core product knowledge management, improving the modeling and analysis phases by providing integrated access and exchange of data between disparate design teams. SMARTEAM Web Editor enables SMARTEAM functionality from any Internet browser. SMARTEAM Workflow helps to implement 'best practices' through flow processes running across the enterprise and supply chain. SMARTEAM Gateway provides robust EAI, for cross enterprise leveraging of product knowledge, and SMARTEAM Multi-site enables global companies to distribute SMARTEAM benefits across dispersed operations.

Furthermore, SmarTeam offers best-in-class solutions to facilitate real time collaboration - among product designers and engineers, or with customers working on the conceptual design and configuration of a new product. You can include the end-user or customer building configurations from options on a website, or involve suppliers in the supply chain, including web-based standard part catalogs.

SmarTeam collaboration solutions include SMARTEAM Community Workspace, a project-based collaboration portal, SMARTEAM BOM, which enables efficient eBOM collaboration SMARTEAM Web Conferencing, a simple web-conferencing tool.

With vertical integration and product knowledge collaboration within and between companies having become a competitive imperative, effectively managing and sharing product data through corporate 'best practices' is what SmarTeam solutions are all about.

## BENEFITS AND ROI

Elements of SmarTeam's collaborative design solution are currently deployed to expedite distributed engineering, to facilitate outsourced supply chains, as well as to support manufacturing across global networks. SmarTeam solutions are used at over 1,700 customer sites in discrete manufacturing automotive, aerospace, medical equipment, electrical and electronic, process industries and others.

The ability to store, access, and share product information across an enterprise, and bring both customers and supply-chain partners into the product lifecycle process, is at the heart of SmarTeam's collaborative design solution. Diverse and complex types of data are created at different stages of the product development and manufacturing processes, and are all made accessible in real-time. Outsourcing of designs and procurement of components from multiple sources are performed efficiently and accurately, speeding time-to-market and keeping production flowing.

SmarTeam's Collaborative Design solution manages product content and facilitates mission critical real-time business collaboration between OEMs, their product and service providers, and customers. In addition to speeding processes across the extended enterprise, SMARTEAM-enabled manufacturers improve their customer-responsiveness, increasing satisfaction and reducing costs significantly.

ABB Xiamen Switchgear, for example, is achieving impressive time savings and quality improvement by implementing collaborative product development processes based on SmarTeam technology. The company designs and assembles electrical switching equipment for medium-voltage power control and distribution applications.

As part of their continuous quality improvement program and Six Sigma program, ABB compared product development times and error rates for the year 2000 with those of 2001 when SMARTEAM and other technologies and process improvements were deployed. According to the company's metrics, overall product development time was reduced by one-third, from an average of 48 days to 35 days. BOM accuracy improved by 40%. In terms of defects per million opportunities (DPMO - a standard measure in Six Sigma programs), the mechanical design error rate dropped from 9,446 to 2,749, a more than 70% quality improvement. Because the electrical design system already had been implemented for two years, the quality improvement here was more modest, with the DPMO decreasing from 19,700 to 19,100. The increased efficiency of the system has enabled the operation to increase business volume approximately 30% since collaborative technology and process improvements were initiated.

In the past, products were developed with little direct exchange of information between separate and incompatible databases for mechanical design, electrical design, and manufacturing. Each group managed its own data on different systems, with people extracting what they needed by hand and manually entered the data required for their part of the project. For the most part, information was passed around in serial fashion on paper documents.

With SMARTEAM, both mechanical and electrical design files are managed on the same system in a single unified database while also serving as a seamless link to their ERP system. Electrical design, mechanical design, and manufacturing are all linked. Groups collaborate in a concurrent engineering approach. Change orders flow through the cycle much faster. Product development processes are more efficient. Quality is significantly improved because information is exchanged digitally instead of hand copied.



Plans are to expand the collaborative system to give selected suppliers and customers immediate access to relevant data. This will not only result in further time savings throughout the supply chain but will also demonstrate ABB's continued commitment to its close business partners.

## IMPLEMENTATION STRATEGIES

The manner in which collaborative design solutions are used in an enterprise depends on the goals of the company, organizational structure, work processes, and other factors unique to each company. Indeed, the beauty of collaborative design methodology is that the approach can be applied across so many different areas and disciplines. Companies gain the competitive edge by using the tools in eliminating bottlenecks and inefficiencies in their operations that otherwise would hold them back in growing their business, becoming more profitable, and in many cases surviving in highly competitive markets. The following represents a sampling of such ways in which collaborative design can be applied in an organization.

**Integrating Heterogeneous Applications.** Enterprise-wide solutions typically involve integration of heterogeneous applications – multiple CAD applications (CATIA, SolidWorks, AutoCAD, Solid Edge, etc.) as well as other non-CAD applications. SMARTEAM CAD Integrations offer excellent capabilities to file manage all CAD packages (including UNIX files) and other Windows applications, including electronic, AEC, etc. SMARTEAM is useful in such an environment because of tight links to mainstream CAD packages and the ability to manage and intermingle these integrations. This promotes the sharing of data between applications and reuse of designs, resulting in time and cost savings as well as quality improvement.

These integration capabilities are useful in linking software not designed to work together, even packages from the same CAD vendor.

**Optimization through Re-Use.** One of the world's largest machine integrators with superior capabilities in robots, vision, precision placement and assembly technology, has a large engineering department of 365 engineers divided into project teams of 10 – 12 people. Typically parts get re-designed many times, because an engineer either does not know that the design, or a similar design, exists, or believes it will be quicker and easier to start from scratch, rather than hunt for a drawing, with the potential of drawing a blank.

Upon seeing a search by part description turning up 10 potential parts and then clicking through the choices on the viewer, the vice president of engineering exclaimed "We can pack up now. I don't care what it costs! I want it!" He instantly recognized the ROI potential of those search features in his busy department saying that any saving he could make would have as much impact on his bottom-line as adding revenue.

SMARTEAM's "in-process" feature performs such searches extremely efficiently, since engineers can continue working in their familiar CAD package while the PDM functionality is taking place automatically in background mode.

**Linking CAD and ERP.** At many companies, information is not passed directly from engineering to manufacturing. Rather, manufacturing personnel must manually extract the data they need and enter it into ERP. This process is not only tedious and time-consuming but also error-prone. As a result, production operations often begin later than would otherwise occur and often are delayed further by engineers having to troubleshoot problems caused by incomplete or inaccurate interpretation of engineering data.

To overcome this problem, SMARTEAM maintains a tight integration with major ERP systems and synchronizes this link with a well-defined items tree for managing CAD data. Synchronization can take place either automatically, at pre-defined times, or on a manual basis, when an engineer knows for example that he or she has made an important engineering change which needs to be immediately communicated to the manufacturing and purchasing organizations.

The SMARTEAM open environment and use of standard XML technology enables fast and clean data transfer between the CAD and ERP formats, converting engineering data into ERP material numbers extracted automatically from the ERP package. This type of integration enables information to be transferred quickly and accurately between engineering and manufacturing to eliminate redundant efforts, speed workflow, improve communication throughout the organization, and reduce errors and delays in re-creating data.

**Standards Compliance.** Audit trails are post-event collaborative tasks that represent a key requirement in many industries where quality and safety standards are mandated. For example, an audit trail is an essential component of FDA standards, QSO standards, MIL standards, and laws on the national and local levels. Moreover, companies in a wide range of industries (automotive, construction, architecture, aerospace, etc.) have internal policies for tracking processes and procedures.

SMARTEAMs fundamental management of versions and links to all associated data make access to audit information fast and easy. The ability to make notes about what was changed and why, and explain why changes should be made, helps to provide important audit detail. SMARTEAM also enables companies to bring their supply chains into the overall process, since compliance with mandatory standards often requires that both companies and their suppliers open up their processes for audit.

**Supply Chain Collaboration.** While there has been tremendous focus on supply chain collaboration among major OEMs - automakers, aerospace, and even the huge computer companies – supply chain optimization issues are no less important for mid-sized manufacturers and Tier One and Tier Two Suppliers for example who have their own supply and delivery chains.

Typically these organizations have the added problem that available solutions have been unaffordable – in terms of the original cost of the software and required infrastructure, as well as the huge cost and time needed to implement the solution. For this reason, SMARTEAM was designed on standard Microsoft and Internet products, and with an open architecture for simple installation and rapid implementation.

These product optimization features apply as well to both suppliers and customers. Using simple, yet powerful SmarTeam tools and processes with supply and demand chain partners, manufacturers have the ability to “get it right the first time” is considerably enhanced, and both price and pace can be optimized (or better profit earned.)

**Procurement Processes.** Better control, synchronization and acceleration of the engineering change and purchasing processes enable suppliers to shorten the design-manufacture-delivery cycle, enabling inventory to be delivered “Just in Time” to the factory floor.

Some customers utilize product packaging technologies to ensure the right mix of products are delivered to the production line – for example the correct mix of yellow housing car mirrors, red housing, and white housing – to match the production plans. Each vehicle is produced in different quantities at a different rate based on configuration forecasting coming from the roll up of consumer demand. The process must be managed, in order to know how long each part variation order will last at the production line.

Streamlining and accelerating the purchasing process reduces the errors which result from having materials faxed, mailed, or sent by courier between the customer, manufacturer and suppliers. Serious errors can occur with such processes – the wrong version of a part drawing may be manufactured and delivered, creating costly and unnecessary scrap and rework.