SIEMENS | SARATECH

ELECTRONICS AND SEMICONDUCTOR

Teradyne

Engineering change-order cycle cut by 84 percent, $2 million saved yearly

Product

Teamcenter

Business challenges

Increase business productivity

Improve enterprise project management and collaboration

Eliminate lengthy, largely manual process for engineering change management

Cut manufacturing costs while increasing customer satisfaction

Keys to success

Implement a centralized, automated process for engineering change management and collaboration based on Siemens Digital Industries Software's Teamcenter and Microsoft Office SharePoint Server

Results

Faster access to more accurate data

Cycle times for engineering change orders reduced from 90 days to just 14 days, an extraordinary 84 percent reduction

Test equipment manufacturer employs Siemens Digital Industries Software and Microsoft technology to deliver a centralized, automated process for engineering change management and collaboration

Executive perspective

For Teradyne – the U.S.$1.2 billion a year maker of automatic test equipment – the recession posed the same challenge that many other manufacturers faced: cut costs while boosting customer service, the better to weather the bad times and position itself for growth during the inevitable recovery. The company's multipronged approach to the challenge included the adoption of new processes for managing the requirements of product development projects, collaboration on project team documents and change orders, implemented through Siemens Digital Industries Software's Teamcenter® software and Microsoft Office SharePoint Server.

Teradyne's thoughtful approach paid dividends. Today, personnel have faster and easier access to more accurate data, which has led to less manufacturing rework, lower scrap costs, faster change-order cycles, lower project scheduling slip rates, lower change-order processing costs and higher customer satisfaction.

When the recession hit, Teradyne hit back

Teradyne manufactures automatic test equipment for testing everything from semiconductor chips and cell phone components to automobiles and aerospace systems. When times took a turn for the worse, the company took action on a variety of fronts. It outsourced manufacturing. It implemented new supply-chain systems. It moved into new markets.

The company also looked inward to wring excess costs out of its engineering and manufacturing processes, especially its processes for engineering requirements management and change management. Those processes varied from business unit to business unit within the company,



Results (continued)

Cost of implementing change orders reduced by 60 percent

Project slip rates reduced from 7.5 percent to -4 percent

Significantly improved productivity results in $2 million annual savings

Cycle times for engineering change orders reduced from 90 days to just 14 days, an extraordinary 84 percent reduction.

consistent with the relative autonomy that the business units had traditionally enjoyed. The lack of standardization hadn't been an issue when Teradyne was organized as separate business units and when engineering and manufacturing staffs were located together and could rely on informal communication to collaborate and expedite engineering change orders.

But as Teradyne grew and consolidated several business units, as engineering staffs were increasingly dispersed, and as manufacturing was outsourced, the lack of formal, standardized processes became an ever larger problem. Engineering and manufacturing teams might maintain their data in spreadsheets and word processing documents stored in hard-to-find locations on file servers and the hard disks of their members' PCs. An Oracle® database used mostly by operations staff hosted bill of materials data, but didn't support engineering documentation needs.

If a project team had a member versed in website design, it might host its engineering requirements and change management documents on an intranet site. If it had a member versed in IBM Lotus Notes® software, it might host that content in a Notes® database with workflow. Other project teams stored their information on file servers. All of these systems and storage locations meant that engineering documentation and project information could be difficult to find, especially if members were working on several projects.

Additionally, version control was nonexistent and historical information might be unavailable to those who needed it, when they needed it. Because engineering change management processes weren't automated and were mostly paper based, a staff of 15 was required simply to manage the flow of documentation and the review and approval of changes for project teams.

"Inefficiencies were baked into our processes and system," sums up Bill Duggan, engineering manager, Teradyne.

Inefficiencies were exacting a toll on the company's performance

Engineering change orders could take more than 90 days to implement into manufacturing – four times the industry average. That length of time had practical consequences for the company's manufacturing benchmarks. Scrap and rework costs were high because parts might be ordered after engineers had changed the requirements for a project or were driven to make changes based on the supply chain, but before those changes could work their way to the bill of materials system on the factory floor.

Managing product requirements and changes was also very manual and ad hoc, like the engineering change process. When a requirements change wasn't implemented in a timely fashion, it could lead to the need to rework a manufacturing process. That could cause a project schedule to slip by a month or more.



Another big concern was whether the product met all requirements. A missed requirement could lead to delays and more engineering change requests to correct the product before it entered the volume manufacturing system. In fact, the slip rate in Teradyne's delivery schedules was about 10 percent. Project delays further increased costs and lowered customer satisfaction – the opposite of what Teradyne needed in order to weather the recession.

"We needed to write better requirements at the system and subsystem levels, trace derived requirements to test cases, and manage the requirements change process efficiently to ensure that products were built accurately and that project teams delivered on time," says Duggan. "That called for improved discipline in requirements management, standardized processes for engineering change management and greater collaboration among project teams. We had to look at every aspect of how we handled product lifecycle management."

Integrated solution directly addresses company's need for structured processes; features strong support teams

Teradyne looked for a technological solution to replace the largely manual and impromptu processes that were hindering engineering and manufacturing performance. To help ensure that it was identifying and meeting as many requirements for that solution as possible, the company assembled an evaluation team comprising both engineering and operations personnel, and with members from the company's two major design centers, in North Reading, Massachusetts, and Agoura Hills, California. The team considered a number of solutions, including Dassault Systèmes' MatrixOne software, Oracle's Agile software, Parametric Technology Corporation's Windchill® software and Siemens Digital Industries Software's Teamcenter.

One of the greatest concerns for Duggan and his colleagues was choosing a system with the most flexible, up-to-date technology and the closest alignment to the needs of high-tech industry. They also sought a platform approach to solving the process and application problems, rather than a best-of-breed approach.

The team scrutinized candidate systems for reliability and for built-in capabilities for requirements management, part, bill of materials management and engineering change management. In addition, the team looked for a solution backed by a company's professional services group that could optimize and install the solution for the Teradyne environment and that had a track record in working with large-scale, global customers.

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On the basis of those criteria, Teradyne chose the Teamcenter solution from Siemens Digital Industries Software, running on the Windows Server operating system with Microsoft Office SharePoint Server, Microsoft SQL Server data management software and Oracle. The integrated solution combines Teamcenter capabilities in end-to-end product lifecycle management with Office SharePoint Server capabilities in content management, collaboration and social networking.

"The Siemens and Microsoft solution directly addressed our need for structured processes for handling engineering requirements and change management, as well as our need to replace ad hoc collaboration in project teams with consistent, centralized, fully accessible collaboration tools and methods," says Duggan.

Implementation strategy builds grass-roots support

Rather than implement the full Teamcenter suite of product lifecycle management capabilities at once, Teradyne chose a phased-in deployment approach. The company's goal was to give the solution time to build grass-roots support from the functionally and geographically diverse personnel who would work with it, plus give the company time to fine-tune each aspect of deployment before moving to the next.

The company started by implementing the Teamcenter functions crucial to addressing its core concerns: requirements management, followed by management of the engineering documentation (schematics, drawings and specs) used to build the product (also called "vaulting"). Next came the automation and standardization of parts management, followed by an integrated process for engineering change and bills of materials management.

This replaced six East and West Coast design center applications and processes with one standard process and tool.

Teamcenter drove the process standardization of parts creation and management. Six part-revision schemas, including alphabetical, numeric and alphanumeric combinations, were simplified into one alphabetical schema. Some 300 part number prefixes were replaced by a simplified numbering system.

Several existing workflows for managing part models and commercial part specifications were also consolidated. Again, separate workflows and databases were consolidated into a single workflow and database that made part information consistent and easily accessible. All information on project requirements, parts, specifications, engineering changes, bills of materials and engineering

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documentation came to be centralized in and managed through Teamcenter, accessible to anyone in the company.

Teradyne then implemented Teamcenter community collaboration, with Office SharePoint Server workflow, content management and collaboration tools, to address the challenges of having a highly dispersed work force and diverse requirements for product development teams. Checking documents in and out of a central document repository for reviews and revisions replaced the flurry of email messages and variety of storage locations that formerly marked Teradyne processes.

Once all product and project information became centralized in Teamcenter and Office SharePoint Server, the integrated solution naturally became the logical location for collaboration on project teams. Soon, setting up team SharePoint sites for the Program Management Office (PMO) became a routine part of kicking off a project, and that collaboration was reinforced through the use of SharePoint Server features, including wikis and blogs. The engineering PMO was one of the early adopters. This group is responsible for managing product development teams throughout the world. The social networking tools were added to the product development process to promote better knowledge management.

Training kick starts user engagement

Consistent with its phased-in approach, Teradyne began by initiating team sites for personnel directly involved in implementing and using the new Teamcenter engineering change management process. To use the new change process, users went to the SharePoint site, took the training, reviewed the documentation and completed a survey to obtain a user ID.

Searching for program documents had not been easy in the past. Now each team's own method for searching was simplified into one set of folders in Teamcenter, to which each team continues to add content. Recently, pictures were added as a new content type. This helps with communication between East and West Coast design teams and in program reviews. The pictures also can be shared with customers to help them to see progress and to provide evidence of that progress. The manufacturing group also uses pictures to document the progression of a prototype build for later conversations on the build process.

Duggan anticipates that the collaboration tools will be extended over time to include support and marketing personnel, and even suppliers and others located outside of the company – all of whom can benefit from some degree of access to the same information that engineering and manufacturing personnel need every day.

"Before, if you wanted to find an engineering document, you needed to know where it was physically stored, in which system, on which file share and in which folder. Now, we're able to collect both the engineering information and the other unstructured data – which is usually tenfold larger in size – all in one place.

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Teradyne is seeing a variety of benefits from the move to the Teamcenter and Office SharePoint Server solution. Personnel now have faster and easier access to more accurate data, leading to less rework in the manufacturing process, less scrap, faster change-order cycles, lower schedule slip rates, lower costs for change orders and higher customer satisfaction.

Users get the data they need, when they need it

By adopting the Siemens and Microsoft solution, Teradyne has given its engineering and operational personnel faster and easier access to more accurate data. Redundant and potentially inconsistent data has been replaced by "a single version of the truth," which increases the accuracy and lowers the costs of processes and decisions based on that more accurate data. The result is an enhanced ability to search for, share and collaborate on information throughout the organization.

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Adds Duggan, "We were able to ensure that our teams are always working on a single document – the latest document, the right document – and are moving that document through our processes efficiently. When operations personnel need to access the current specifications for a project, they can be confident that the data they access is indeed current. When engineers make changes to a project design, they can be confident that their changes will be communicated to operations personnel in a timely fashion."

Teradyne uses the solution not only to give its personnel access to better data, but also to push data to them automatically, through software-based workflows. Personnel now commonly receive the information that they need when they need it, rather than having to take time to find and access information. Automated workflows also provide a faster, more accurate and lower-cost way to move information through the engineering change management process than the 15-person staff on which Teradyne formerly relied.

Teradyne also is able to use the information about the change management process that the solution produces to track and measure the efficiency of that process. The company has gained manufacturing statistics that it never had before and that it can use to further streamline and refine its engineering and manufacturing activities.

Change-order cycles cut by 84 percent

By automating formerly manual activities, streamlining the change management process and providing better access to more accurate information, the solution has helped Teradyne to cut the cycle times for engineering change orders from 90 days to just 14 days, an extraordinary reduction of 84 percent.

Engineering change orders aren't just implemented more quickly, they're also implemented more accurately. The rejection rate for such orders has declined from

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United States

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70 percent to 26 percent. Together, the greater speed and accuracy of the change-order process have reduced the costs of implementing change orders by 60 percent. The faster, more accurate and more cost-effective change-order process has had a positive effect on a variety of measurements that Teradyne tracks. It has contributed to reduced scrap and rework costs as well as to decreased project slip rates – that is, the ratio of promised project milestone dates to actual dates, including project completion. As a requirement for completion, each project must release its parts, bills of materials and documentation-through-engineering. Some projects have several hundred such artifacts. Having a faster, more accurate change control process is one contributor to reducing project slip rates from 7.5 percent to -4 percent.

"That's right," says Duggan. "Now, we actually have a negative project slip rate. We're not just meeting our promised delivery dates – we're beating them, thanks in part to an improved engineering change management process. That's one of our most important improvements, because it makes it possible for us to hit critical market windows for our products."

Productivity dramatically increased, saving $2 million annually

Another benefit of the new process at Teradyne for managing engineering changes is reduced costs. The company has already wrung $2 million in excess costs out of its change management processes through the greater productivity, automation and accuracy made possible by the Teamcenter and Office SharePoint Server solution. The savings makes it possible for Teradyne to support the same level of engineering and manufacturing activity with fewer change management personnel, so the company can redirect those personnel to more valuable functions.

Teradyne also expects to boost productivity further as it expands the functionality of the Siemens and Microsoft solution and rolls out the expanded solution more broadly. The result will be support for increased engineering and manufacturing activity without requiring similar increases in staff. Millions of dollars more might be saved as the new solution is adapted to processes throughout the company. For example, as Teradyne comes to rely less on its Oracle software, the cost of maintaining that software will likely decline by at least 40 percent, saving an estimated $500,000.

"Major increases in manufacturing efficiency and the corresponding reductions in cost are a win-win for us and for our customers," says Duggan. "Those changes are helping get us through the recession, and they set the stage for major growth as the economy rebounds.".

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>
> Bill Duggan
> Engineering Manager
> Teradyne

Siemens Digital Industries Software

Americas 1 800 498 5351
Europe 00 800 70002222
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