

Company Improves Flow in a Professional Office Setting

Re-examining a value stream pays off, even if the initial improvements were substantial. Such a reassessment in a professional office operation at Rockwell Collins resulted in a complete rethinking of value, opening the way to even bigger improvements.

The re-examination, which began when the first pilot project was barely underway, is completely changing the process for producing technical manuals. "We're transforming from a publishing business to an information management solutions provider," said Scott Watson, senior director of technical operations. "In the lean transformation process, we're moving from mass production to mass customization."

In the initial phase of the lean transformation, writers, editors, and illustrators at the company's Aviation Services unit in Cedar Rapids, Iowa, were co-located into "cells," which cut the average time to publish manuals from five months to five weeks. But the follow-up re-examination of the value stream is generating changes that will allow information to be rapidly developed into a variety of paper and electronic formats that can be made into customized products for customers.

"Lean will eliminate waste and reduce costs, and that's great," said Watson, "but we're using lean to create expanded products and services at lower costs by freeing up capacity."

What ultimately became the lean journey began almost two years ago when the senior management team "saw the need to provide greater value to our customers in our service environment," Watson recalled. Senior managers wanted the service business to shift from a product-centric to a customer- or solution-centric focus. "By doing that we could reinvent ourselves and take another leap in the market," he said.

Batching Books

The technical publications unit within Collins Aviation Services produces and updates operation guides, maintenance manuals, training courses, installation manuals, illustrated parts catalogs, service bulletins, and service information letters for the "black boxes" or avionics that the company makes. The content and format of the publications must meet Federal Aviation Administration (FAA) and Air Transport Association (ATA) specifications. Since products change throughout their lifecycles, so must the documents supporting them.

As a result, temporary changes are made to manuals "constantly," said Watson. The temporary changes must become regular parts of revised manuals within time periods set by industry regulations. The result was continual revisions to production cycles to accommodate the changes. The process could easily "mushroom into a huge cloud of costs

and wastes," said Watson. But the manuals are absolutely needed by aerospace customers trying to maintain and operate technical equipment at hundreds of locations worldwide. As the aerospace market consolidated, customers needed to update and manage their technical documentation faster and more efficiently.

The value stream serving these customers was segmented. Writers, illustrators, and editors worked in three buildings in separate functional departments, much like people and equipment in a plant set up for mass production would work in departments dedicated to welding, milling, or grinding. The result was poor communications and delays as work was handed off in batches from one process to the next, where it waited in queue.

"We looked at this and decided we had to streamline the flow," said Watson. The illustrators, editors, and writers were relocated into one building two years ago. "That was simply a reorganization decision," he recalled. "Now the real work began. Our challenge was to transform ourselves, and the perfect tool or as we like to call it, the change engine, was lean principles."

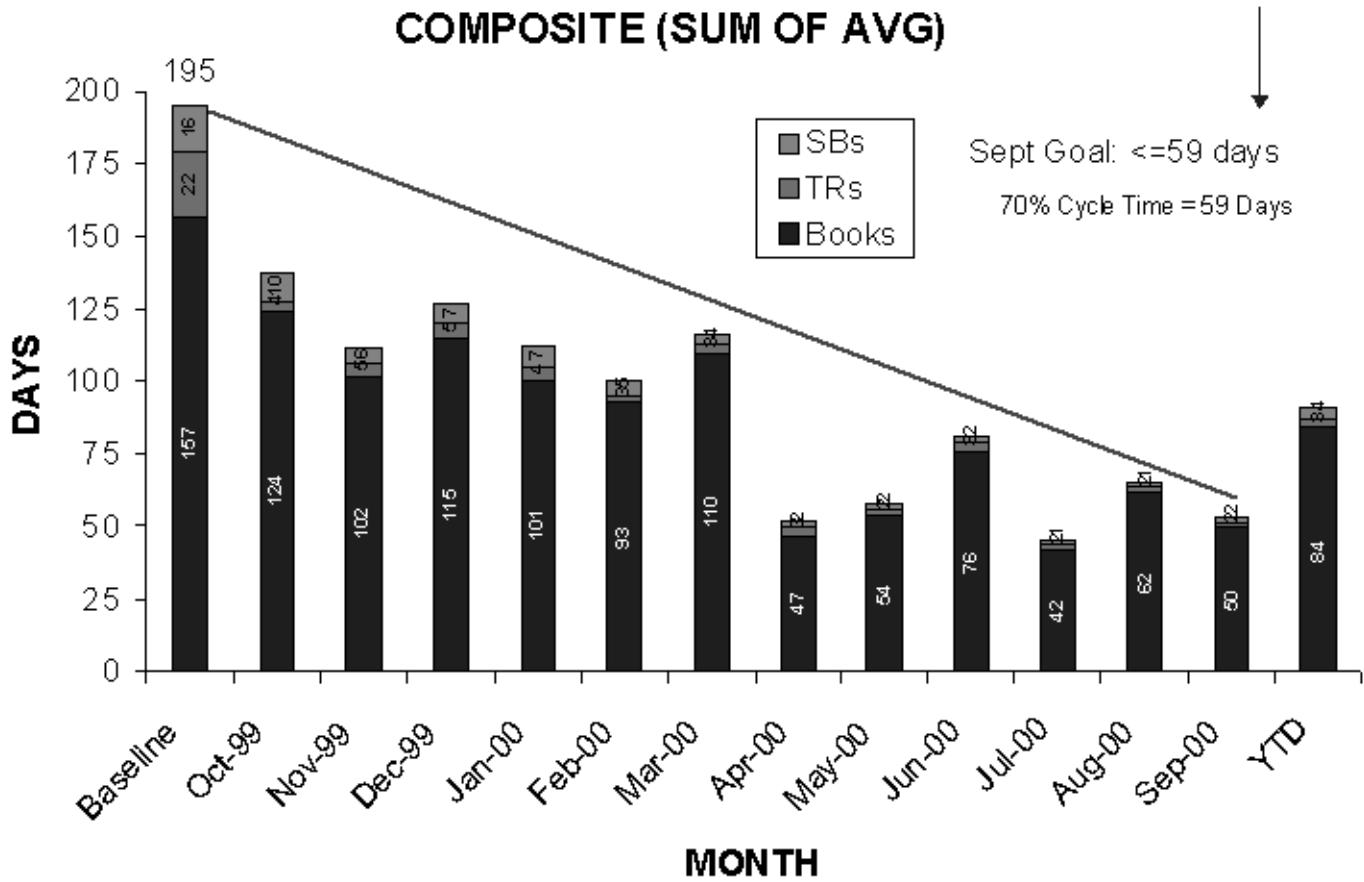
An ambitious goal of cutting publishing cycle times by 80 percent was added to the department's objectives and the review criteria for its 137 employees. A team of employees and supervisors, working with an outside consultant, mapped and analyzed the value stream and created a leaner one by configuring desks into a pilot cell staffed by a four-person team of illustrators, writers, and an editor.

Identifying Demand and Skills

Designing the cell or "bullpen" followed a process that will be familiar to anyone who has set up continuous flow cells on the shop floor, but with a few differences. One was that arranging workstations in processing sequence was not as critical as in a production cell. People sit along the inside perimeter of the cell's wall, close enough together to make communication easy. The wall is low to facilitate communication with others in the room. Another distinction is that "every job is a little bit different," said Gary Haberkorn, department director. "The products we put out are not really homogeneous." For instance, teams produce product updates as well as complete revisions. And formats differ from book to book. A different product means a different takt time. To deal with this, we simply took our products to the lowest common denominator: a page. We use a page to figure takt time instead of a book.

Still, creating the pilot cell was "not a whole lot different" than creating one on the shop floor, said Kevin Henning, a consultant with Simpler Consulting, Inc. The implementation team had to determine what customer demand was, list the work elements and skills needed to produce a product, and balance the work among the people in the cell. "The toughest thing was determining what customer demand was," said Henning. Because of a work backlog, the team had to make a judgment call on how much work was new work and how





The above chart and the chart on the facing page are used at the Collins Aviation Services unit of Rockwell Collins to track the individual cycle times for producing three types of publications and the composite cycle time for producing all three. The two charts track improvement over a 20-month period. On the original charts, the cycle times for each publication are color-coded, but appear here in different shades of gray on the bar for each month. Reproduction has made the numbers within the bands difficult to read. The time to produce service bulletins (SB) is represented by the dark band at the top of the bar and the band below represents temporary revisions. The bottom section, which is also the biggest band on the bar, represents books or technical manuals. Although titled a little differently, the charts track the same measure from last fiscal year to the current one. In January 2001, the average cycle time spiked up because a 12-day holiday shut down was counted in the measure. The reason for counting calendar days is that customers, which are the airlines, fly every day.

much of the backlog it wanted to complete each month. This was translated into how many pages had to be produced annually, then how many had to be produced each month. This was divided by the available time to get a takt time, which is the rate of customer demand.

Team members identified the major skills needed to produce manuals – editing, illustrating, and writing – and the work elements within each. Any steps that were wasteful were eliminated to avoid moving them into the cell. Based on their experiences, team members were able to estimate how much time was needed to do each work element. This information was used to create a rough bar chart, to determine how to staff the cell.

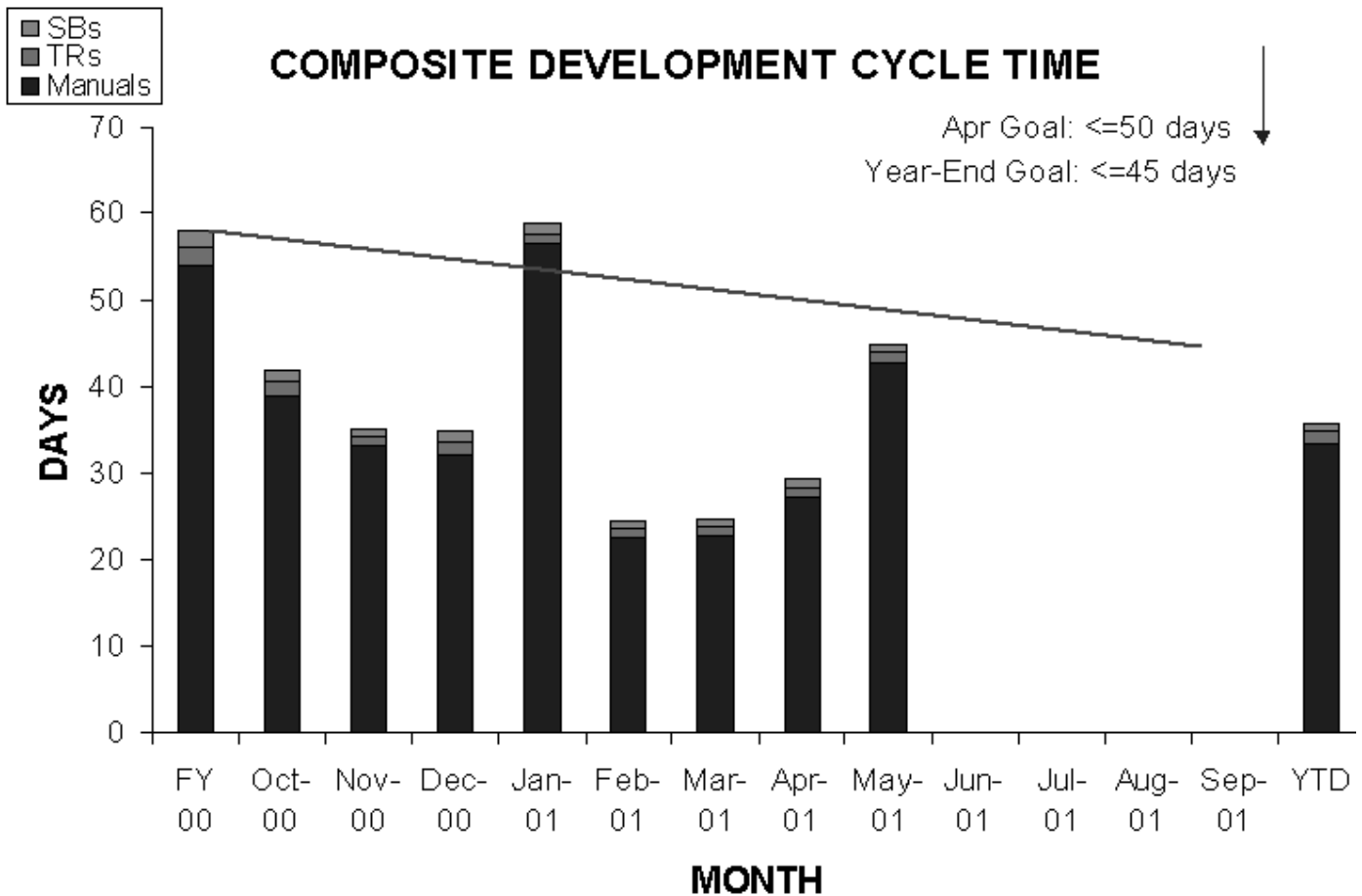
The bar chart was similar to, but not as accurate as the operator balance chart used to staff a lean production cell.

Still, it was a useful tool in the office environment. Each block within a vertical bar represented a work element and was proportional to the time needed to do the work. A horizontal line at the top of the chart indicated takt time -- how many books had to be produced in a week. The sum of the time of the work elements was divided by the takt time to determine how many people were needed in a cell. The total work elements for each person in the cell should approach but not exceed the takt time.

Visual Controls

Work begins on a manual when the team receives the product data and engineering drawings. It holds a "kickoff meeting" for "a day or so" to study the material and analyze the best way to do the job, explained Haberkorn. For example,





the team may decide that while a writer can work on some text, while the editor checks the rest for proper formatting, while the illustrator puts drawings in the right format and order. When a section is done, it goes to the editor for checking.

Ideally, only one job should be in a cell at any time. However, when someone is within a day or two of finishing work on a project, they can request work from the next project, explained Henning. Two is the maximum number of books that the cell can have at any time.

Visual controls alert management if there is a problem or potential problem. A post outside of the cell holds colored flags. Purple indicates a potential work stoppage. Green means there is plenty of work. Yellow means another job will be needed in less than five days. Red means there is less than a day's worth of work. "If there is a work stoppage, the manager gets involved right away," said Haberkorn. Another visual display shows how many of the tasks needed to finish a book are completed.

Computerized indicators show jobs that are due within the next week, work-in-process, cost performance, and schedule performance. Key performance metrics, reviewed weekly, gauge cycle time, productivity, and quality. "But what our customers told us first and foremost," said

Haberkorn, "is they care about on-time delivery." Customers also told them they had a different idea of what value was. Even as the initial improvements were being made to the pilot cell, the team looked at the value stream again, taking a deeper and broader perspective that included customers.

Re-defining Value

"What we thought was value was not of the greatest value to our customer," Watson recalled. "We thought our product, once the process was leaned out, was the value our customers were looking for. We found out that one product didn't satisfy the demand for value. One size didn't fit all."

The unit discovered that the distinct groups using the technical manuals, such as pilots, maintenance technicians and engineers, among others, really wanted publications customized to their distinct needs. Existing manuals contained information aimed at these groups, but it wasn't enough. Customers really wanted manuals and training materials customized for their jobs, and they wanted them in electronic as well as paper formats. The new challenge was to deliver greater value for customers by offering them customized manuals in the different formats, while reducing the time to create them and maintaining the Rockwell Collins' reputation for reliability, explained Watson.



A key to customization was moving the creation of manuals in Standard Generalized Markup Language (SGML) to the beginning of the publishing process. SGML is a text and document formatting language used for large databases and multi-media projects, particularly for ones with intensive cross-referencing and indexing. It makes documents and other files platform-independent and portable between applications. HyperText Markup Language (HTML) is an application of SGML that uses code as tags to tell web browsers how to display text and graphics.

In the old process, the SGML version of manuals had been created near the end of the publishing process, after the printed version. If it were moved to the front, a cell could develop a core product that was ready for customization. A core SGML document could be used to create paper or searchable electronic manuals for different computer platforms.

"The goal was to create information that could be developed or repurposed quicker than anybody in the industry," explained Watson. "When the core SGML product is revised all products are concurrently revised."

Moving SGML's place in the production flow required editors and writers to be cross-trained in its use. "We're not 100 percent there, but most of our cell teams are capable of writing in SGML," said Watson.

Change Management

Workplace changes such as learning new skills and new jobs required a substantial amount of change management. "Frankly there was resistance to all that change," Watson recalled. "We had expeditors; we had schedulers. Our goal was to eliminate those functions, not those people. But that was pretty hard for any employee who had been expediting and scheduling for 10 years to swallow."

Transforming any organization is a change management challenge, according to Watson. That doesn't mean people don't want to change or work hard. It means they want to understand the new environment, the new tools, the new process, and how they fit in. "Everything is out of their comfort zone; it's all new to them," said Haberkorn.

Management led the process of creating the pilot cell and then replicating it by setting the direction and "boundary conditions" within which employees worked together to create the new cells. People drew current and future state maps and served on the kaizen teams that implemented the future state maps.

The office kaizens, called radical process improvement, began with a "scan and plan" four to six weeks before the event to define the scope and goals, said Henning. The planning process could include meetings between teams, managers, and kaizen facilitators. A "magna carta" was drafted for the event, setting the team's responsibilities. For example, teams usually could spend between \$5,000 and \$10,000 before getting management approval. They could not fire people, but could move people and change their responsibilities. Haberkorn checked in daily with a kaizen team to see if additional support was needed. After four long days of work, a kaizen team reports to the management leadership team on what it had implemented.

Initially, kaizen teams examined the writing and illustrating processes to determine standard work, Haberkorn recalled. That set the stage for a kaizen team to create a

team of illustrator, writer, and editor around a product line for the pilot cell. The kaizen team analyzed the work, broke it down into its elements, balanced the work among cell team members, and established a lean work flow based on standard work. By the end of the kaizen, people had been re-

located to a cell. The first cell was operated and improved for six months before the practice of replicating it throughout the unit began.

At first, there was a "lot of disbelief" that lean tools such as takt time would work or were needed, since the company was successful, said Watson. But as people participated in the kaizen process, working with customers and talking to them, they realized they could improve existing products and create new ones. And they realized first-hand how they were adding value. The time needed to produce a manual dropped from nine months to one.

To help support the transition to the new lean system, the company made training videos that included testimonials from people who were enjoying the increased responsibility and empowerment of the cell team configuration. Selected people are recognized monthly by the company and fellow employees. Teams have daily meetings called "huddles," and get email broadcasts about what customer are saying – good and bad. If a team misses an objective, it performs a root cause analysis to fix the problem. For instance, teams report the number of pages completed each week. If it is below the goal, they do an analysis to understand why.

Improvements from Professional Office Cells at Rockwell Collins

Inventory	60% reduction
Floor space	53% reduction
Work in Process	55% reduction
Cycle time	74% reduction
On-time delivery	23% increase
Productivity	40% increase

Tips

That type of thoroughness plays a key role in the success of applying lean principles in a professional office environment, just as it does on the shop floor, Henning said. Other tips to adopt from the Rockwell Collins experience is to draw a current state map of the office value stream, then ask yourself what does your organization have to do to separate itself from the competition. "Have that goal in mind for your future state," he said.

The future state map helps you to see where to hold kaizen events so they improve an entire value stream, instead of isolated processes in it. "Lots of times people do kaizen just because someone said they should and not with a clear idea of how to measure improvement or what they expect to get out of it. So they do events that help a little bit here and there, but don't link together to produce a dramatic end result," Henning said. Finally, revisit the value stream multiple times to continue making improvements. That's one of the toughest things in any environment," said Henning. People do one kaizen and think, "Everything's fixed and now we'll stay like this forever."



How to Keep the Momentum Going

By Jim Spataro

After the lean transformation has tackled many of the initial big-ticket opportunities for improvement, how do you keep the momentum going?

Based on our experience at Invensys Energy Solutions/Building Systems in Loves Park, Ill., I'd recommend making a determined effort to open up training and problem-solving opportunities to all employees.

As companies go through the startup mode of adopting lean and six sigma practices, they hit the big ticket items up front. But imagine the returns in bottom line profit if we could continually hit the big-ticket items along with improving our everyday functions at all levels within the organization. In most cases, these types of improvements do not require significant investment in capital or massive amounts of time.

Another good reason to expand the conversion effort is attrition. Often, much of the early lean and six sigma training is spent on the managers and engineers attacking the problems offering big-returns. But these early veterans of the transformation then go to different jobs, promotions, or retirement. Many employees are willing to take their places.

For example, in our facility there is a printed circuit board manufacturing value center that had a recurring prob-

lem with programming a micro controller. A shop-floor repair technician volunteered for the Invensys lean/ six sigma training when it was offered. As her training project, she tackled the micro controller problem, implementing improvements that saved \$10,000 annually as validated by the finance department. If you get 50 of those, you've saved a chunk of change.

Building Involvement

But there are other rewards for the company. First, here is an employee coming forward to work the project herself, rather than just turning in a suggestion. The company gets a more valuable, and more motivated employee, which creates a better work place. At Invensys, employees who take the training put themselves in position for advancement or a monetary award through the company's lean enterprise award system. Overall, it's a win-win situation for all parties.

The lean/six sigma training is open to all 685 people at the Loves Park facility. Success has built interest in the training. People have seen improvements from lean and six sigma projects and have seen others receive promotions after becoming six sigma green belts or black belts. Green Belt training lasts two to three months with two full weeks of training and 25 percent of work time spent on project work. Black Belt training lasts four to six months with 4 full weeks of training in-between and the balance of time spent on project work.

It's really part of our culture change now. I'll walk through the factory, and someone will come up to me and say, 'Hey, I want to be part of this training. What do I need to do?'

Opening up the training in lean and six sigma techniques gives everyone the opportunity and the tools to contribute to the effort. The people doing the jobs every single day have a lot of improvement ideas. If you don't tap into that resource and make them feel part of the effort, you're going to short-change yourself.

Jim Spataro is a lean champion and master black belt at Invensys Energy Solutions / Building Systems in Loves Park, Ill., which makes heating and ventilation controls, building systems and energy metering devices.



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