



duplicating Success

Xerox reinvents itself

BY ELAINE SCHMIDT



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Quincy Allen and
Len Parker at
the Xerox facility in
Webster, New York.

THE COMPANY WHOSE VERY NAME DEFINED AN INDUSTRY ALMOST HALF A CENTURY AGO IS NOW USING LEAN SIX SIGMA (LSS) AND DESIGN FOR LEAN SIX SIGMA (DFLSS)

as a way to stay in the forefront of document technology, and provide better ways for customers to improve business results.

After a low period of declining market share and a devastating charge of accounting fraud, the Xerox Corporation recommitted itself to innovative solutions and services, and adopted the Lean and Six Sigma methodologies as part of its strategy “to rethink, redefine and reinvent itself.”

“The trick to being ahead of your competition is getting from an idea to building a product and satisfying customer needs and making money for the corporation, faster and faster,” said Quincy Allen, president of the Production Systems Group, one of Xerox’s key business units. To that end, Xerox is applying LSS and DFLSS to existing processes, to the design of new products and services, and even to products that are already in the hands of customers.

The idea that, “Lean Six Sigma is the way we work and Design for Lean Six Sigma is the way we win business,” is being incorporated throughout the company.

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Len Parker and Quincy Allen confer on DFLSS strategy.

Top-down Training

Xerox Lean Six Sigma was launched across the entire enterprise in 2003, led by CEO and Chairman of the Board Anne Mulcahy and her senior leadership team of about a dozen people, which included Allen. Under the theory that LSS must be pervasive throughout the company, they were the first people trained. All of them went through Green Belt training.

“It was a perspective of leading from the top and understanding what our employees were going to undertake,” Allen said. “You have a different perspective if you do it yourself.”

Vice President and Chief Engineer Len Parker, who also is Green Belt trained and in whose purview DFLSS falls, said, “This is not just a tool for the technical people in the trenches. Executives and managers have to be familiar with it and be trained in it too. The whole food chain needs to embrace LSS.”

The executive training ensured a common language. “Anne understood that there can be no language barrier from top to bottom in the corporation,” Allen said, explaining that this was essential in order for managers and executives to ask the right questions and give the right directions. More than 2,000 Xerox executives and managers have taken LSS and DFLSS leadership training.

‘Quality Improvement Army’

“For most of the months of 2004 we were in the initial stages of deployment,” Parker said. “Early in 2005 is when we really triggered a serious, concerted effort. We trained about 500 engineers and technical people during that year.” Using the analogy of a “quality improvement army advancing across the landscape,” Parker said that in 2006

Xerox is adding more and more lines of troops.

More than 600 Master Black Belts and Black Belts throughout the company are leading projects and coaching close to 3,500 Green Belts, a figure that is growing steadily. An increasing number of Xerox people are developing Xerox Lean Six Sigma awareness and skills. Some 30,000 have completed Yellow Belt training and many organizations have achieved 100 percent of their employees trained.

Parker described the specifics of the deployment plan by comparing it to a ladder, saying that the first rung entails getting individuals to produce results with LSS. The second rung is getting entire work groups producing results. The third rung is to get entire program teams, or product teams, producing results, and the fourth rung is where Lean Six Sigma permeates the entire enterprise.

He envisions the deployment as a three- to four-year process, saying, “We have a good, solid year under our belts.” Xerox is currently on the second rung of the ladder, he estimates. By the end of 2005, nearly 2,000 internal and customer-facing projects had made significant contributions to Xerox’s profitability.

Competitive Industry

The world in which Xerox does business is highly competitive and constantly changing. Meeting or beating the competition means that Xerox must continually develop machines that operate at an ever-faster rate of speed.

“The competition is not an easy question for us,” Allen said. “I can tell you who it is, but I can’t tell you what they are doing in their [design] programs. Therefore we are focused on what we have to do in our company and how that reflects on Xerox and the goals and objectives for Xerox.” He listed Hewlett-Packard, Canon and Ricoh among the company’s competitors.

Speed matters not only within the machines Xerox produces, but also in the time it takes to get a product from the idea stage to market. The company’s Lean Six Sigma focus includes eliminating waste, or non-value-added steps, from processes, and shortening process times without producing defects, or as Allen put it, “getting rid of things in our processes that customers are not willing to pay for.” LSS speeds up the overall production timeline.

Design for Lean Six Sigma

But Lean Six Sigma was only part of the equation. For a company built on innovation, Design for Lean Six Sigma was an obvious progression. Xerox launched DFLSS across the global product design and delivery community in spring 2005, approximately 18 months after the LSS deployment. Stated goals included: “faster time to market; lower total cost of ownership for customers; a consistently positive customer experience; and more opportunities for breakthrough, industry-leading offerings.”

Company Profile

Company: Xerox Corporation

Headquarters: Stamford, Connecticut, USA

Number of employees: 55,200

2005 revenues: \$15.7 billion

2005 net income: \$978 million

Offerings: Document technologies, products and services

Website: www.xerox.com

By the end of the year, close to 400 executives and senior leaders, including Mulcahy and her leadership team, had been trained in the basic DFLSS approach and concepts, and some 650 Xerox engineers and managers in the United States, Canada and Europe had been trained as DFLSS Black Belts and Green Belts.

The Production Systems Group (PSG) is in the forefront of Xerox's DFLSS initiative, and PSG engineers were among the first to implement DFLSS methods. The initial projects were in "the electro-mechanical world, with paper

development and toner formulation – as the second area of deployment. "We believe there is a rich opportunity to apply DFLSS principles here as well," he said.

The third area of application, which is just beginning, covers both the sophisticated software embedded in the machines and the application software that forms a bridge between users' computers and the actual machines. In order to understand the critical nature of that bridging software, it is important to note that the average teenager today has more computing power in their personal computer than NASA did when it sent men to the moon.

"In terms of leapfrogging the competition," Allen said, "once we have finely honed the DFLSS for software, that will put us ahead."

Elegance in Design

Allen noted that DFLSS, with its central idea of designing defect-free products based on understanding customer needs, is perfectly matched to Xerox's ongoing focus on doing things right the first time.

"We are shifting more of the development process to modeling and simulation based on DFLSS tools and capabilities," said Parker, who is in charge of the Xerox Engineering Center. (*See Computer Models in the Design Process*) "We continue to migrate toward an analytical model as opposed to totally relying on early prototypes, kicking tires and fixing problems, which is how our products were developed for decades."

"We are shifting more of the development process to modeling and simulation based on DFLSS tools and capabilities."

–Len Parker

and media handling," said Allen, whose engineering background and experience in sales and marketing gives him an appreciation for the business impact of DFLSS. "We started here because our products are challenging us more and more as we broaden the range of...paper we can handle, from heavier card stock to wider light media for bulk mailings, for instance."

Among the responsibilities of the Production Systems Group are Xerox's primary high-end product families – including the flagship iGen3 production presses, which combine the image quality of offset printing with the speed and technical capabilities of digital full-color printing. (*See All in the Family*)

"The breadth of substrates that our customers want to use in our machines is challenging, but the challenge compounds as we increase process speed and move things at higher rates," he continued. "So this was a great area in which to start our deployment."

Allen listed xerographics and electrographics – fusing

"We are trying to take the guesswork out of design," Allen said. "Guesswork has no place in engineering. We want design to be a science. DFLSS makes the design process more elegant."

As part of the design process, Xerox is also using DFLSS to develop technology and product platforms that share common parts and assemblies. This increases efficiency in parts inventory management and significantly reduces cost to the customer.

Elegance in the design process translates very quickly to the bottom line, enabling profits for the corporation at a faster rate. Although Allen was unwilling to go on the record with an ROI figure, he said, "I spend the same number of engineering dollars and get twice what I did before."

The DFLSS initiative at Xerox is too new to report on specific project results, but 1,500 DFLSS projects or studies were under way or completed as of mid-year 2006. Training goals over the next four years are to have 100 percent of the 4,500 engineers and product delivery pro-





All in the Family

The 1959 introduction of the Xerox 914, the first automatic office copier to use plain paper, was a milestone in document technology, dramatically changing the workplace. Twenty-four products grew from the 914. Xerox stopped production of it in 1976, and in 1985, one of the units became an artifact in the Smithsonian Institution, its place in history secured.

In 1990 Xerox launched the DocuTech Production Publisher, which helped create the print-on-demand industry and spawned a whole line of publishing systems. Today the leading family in Xerox digital printing is the iGen3. The company introduced the iGen3 Digital Production Press in 2002, and two succeeding models are based on the same successful platform. The family of high-speed digital color presses gives print professionals the capability of digitally producing offset-quality, revenue-generating applications.

The iGen3 90 debuted in April. So-named because it produces 90 color pages per minute, the newest member

of the iGen3 family offers the same application flexibility as the iGen3 110 (launched in 2005). "The new offering makes it easier for print providers who have lower print volumes to enter the high-end digital printing market with a lower capital investment," according to Quincy Allen, whose Xerox Production Systems Group developed and manufactures the iGen3 presses.

In concert with its digital printing systems, Xerox has used Lean Six Sigma to develop a new business tool – the digital readiness assessment. With this tool, Xerox consults with customers "to identify ways for them to take advantage of the opportunities that digital printing offers," Allen said.



iGen3 110 Digital Production Press

Computer Models in the Design Process

Design for Lean Six Sigma is allowing Xerox designers to use computer models of the complex, internal systems that run the products they are designing.

“That is the Lean part in engineering,” said Quincy Allen, who holds a degree in electrical engineering. “We model them using software, and test them without building generations of hardware. You can make changes with computer simulations far more easily than in hardware.”

One of the keys to making use of a virtual component in the design process, Allen said, is to understand the transfer functions for a given subsystem, thereby reducing the unknowns in the process. He explained transfer functions in simple terms, saying, “You have a black box, and you make some inputs to that black box. Based on the inputs, I know how the outputs will perform. That black box is a transfer function. The key is in knowing exactly how the system will perform.”

The more one knows about a transfer function, Allen said, the greater one’s chance of producing a defect-free product. “If we can make a computer model with better knowledge of transfer functions, it shortens the time of our development process and gives us a higher probability of building the product without defects,” he explained.

Allen illustrated his point with an example, saying that with the previous process, designing a new product could take up to 18 months. “Using the DFLSS approach we did it in five months,” Allen said. “The product worked exactly the way we thought it would work and at the level of defects we thought it would have.”

In addition to saving time, the use of computer models also saves a tremendous amount of money in the design stage of a product. The first savings occurs in avoiding the costs of not just one generation of test hardware, but possibly several.

“It also drives reuse,” said Chief Engineer Len Parker. “Once you’ve optimized a model, that model becomes something that the entire design community can use, not just the software team. That model is versatile enough to be used for another product team.

“What you leave for those coming behind you is very powerful. You leave that model for the next person who will take over your subsystem, and they can change it and model their transfer function,” he explained.

“We are just starting on this journey,” Parker said, “but this is the direction we are looking to have our program go in.”



professionals trained as Green Belts, with 25 percent being Black Belts. PSG alone will train 1,200 employees in DFLSS in the next four years.

DFLSS strategies and targets within each group in the product design and delivery community are consistent with how that group's business goals and targets are aligned with its role in the design and delivery process.

Listening to the Customer

At Xerox, design doesn't end when a product goes out the door. The company keeps a close eye on customers and the way they use their Xerox equipment.

"Our [LSS and DFLSS] certification process has an emphasis on the voice of the customer. This is a main part of our DFLSS," Parker said. Xerox employees continually ask, "Do I understand what the market segment needs of me as an engineer, or as a manufacturing person or salesperson?"

But the world of technology and the demands of business seem to change overnight. As a result, some of Xerox's customers find themselves using machinery for tasks not envisioned by the designers. A perfect example of this, Parker said, is the iGen3 Digital Production Press.

"This is a product that really stretched electronic printing to a new realm for the industry," he said. "Our customers are using it in ways that are beyond even what we intended – operating it outside the design boundaries – and finding it to do great things. But this is causing the

product to be pushed beyond the centerline of our design."

It's only by sending engineers out to the customers that the company can come to an understanding of how the machines are actually being used and what the customers really need, Parker explained. Taking DFLSS to the customer has allowed Xerox to respond to those unforeseen uses of the product.

"So we are working with the machines already out there in the customers' hands," he said. "We see what they are doing and we can offer modifications to those leading-edge customers. I would like to do even more of these things – hardening and optimizing what the customer has done with the product."

High Expectations

Both Parker and Allen are careful to point out that Xerox has not been on the DFLSS road long.

"We have high expectations for DFLSS," Parker said. "But we are cautious about creating the impression that you take one pill and things will be great in the morning. This has to be interwoven with development and delivery practices as well as our time to market. It's constantly evolving."

Part of that evolution is getting employee buy-in, or the process of making DFLSS a common language in the engineering and design communities.

He explained that DFLSS training in the first year was provided mostly to "the enthusiasts" – employees who volunteered. "They were the first to sign up for training," Parker said. "It was not necessarily a lot of people, but they were the ones who had the vision to know how it would help their jobs."

Word of mouth and job improvement were powerful motivators. As the numbers of volunteers began to mushroom, Xerox found its training program oversubscribed. "We are transitioning now, without discouraging the zealots, to a more program-centric approach to training," Parker said.

The effort now is to train people from multiple disciplines, all of whom are involved in a common program, so that they operate as a unit with a common language. This effort includes modifying training to optimize it for the different disciplines since software and hardware designers face different issues.

"This is not just a tool for the engineering community," Parker said. "DFLSS needs to be a component on the front side where we are getting requirements from customers, in the supply chain, in public relations and in marketing. It needs to be a value change in all areas." ♦

Xerox DFLSS Snapshot

Deployed: Spring 2004

DFLSS-trained population:

- 662 Green Belts (790 in progress)
- 27 Black Belts (58 in progress)
- 5 Master Black Belts

Currently in full-time roles: 5 Master Black Belts

Training goals: Over the next four years, train 100% of the 4,500 engineers and product delivery professionals as Green Belts, with 25% of the population being Black Belts

Number of projects: As of mid-year 2006, more than 1,500 DFLSS projects and studies were under way or completed

Financial benefit: Although no numbers are being made public, Xerox reports that it is already beginning to realize cost savings from its DFLSS deployment and anticipates even greater benefits in the years ahead

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