How Caterpillar Uses 6 SIGMA to Execute Strategy

By John Gillett, CPA; Ross Fink; and Nick Bevington

In 2001, Caterpillar launched its 6 Sigma program to drive change to achieve the company's long-term strategic goals (Caterpillar uses 6 Sigma to identify its Six Sigma initiatives). This 6 Sigma process was, and continues to be, extremely successful. Some of the results include first-year benefits that exceeded implementation cost and achievement of the revenue goal two years earlier than planned. We'll briefly discuss Six Sigma in general, describe Caterpillar, and show the entrenchment of 6 Sigma within the company's strategic planning process.

What Is Six Sigma?

Six Sigma is a total quality management (TQM) technique pioneered by and applied to Motorola processes in the 1980s by Bill Smith, a Motorola engineer who became known as "the father of Six Sigma." Since then, other companies, such as Bank of America, Honeywell International, Raytheon, and General Electric, have taken these learned processes and expanded them. Even though many people have reservations about the potential savings from Six Sigma, a story by Charles Waxer ("Six Sigma Costs and Savings: The financial benefits of implementing Six Sigma at your company can be Significant," www.isixsigma.com/index.php?option=com_k2&view=item&id=1228&ltemid=187) reports that GE saved more than $12 billion over five years, Honeywell saved $800 million, and Motorola saved $15 billion over 11 years. Each company takes the Six Sigma process and best practices and makes the technique its own.

The methodology, which was created in the 1920s, comes from mathematician Walter Shewhart's introduction of how processes could be corrected. It uses the Greek symbol "sigma" to represent a standard deviation away from the mean. The sixth sigma is a representation of six standard deviations away from the mean of the population. In the most common use of Six Sigma, the goal is to create only 3.4 defects per million parts manufactured. Contrary to the name of the process, 3.4 defective parts per million is only 4.5 standard deviations away from the mean.

To combat the defects referenced in the Six Sigma goal, companies have adopted methodologies to make a linear map of the process. Two common methodologies are DMAIC (Define, Measure, Analyze, Improve, Control) and DMEDI (Define, Measure, Explore, Develop, Implement). The website www.iSixSigma.com defines DMAIC as "a data-driven quality strategy for improving processes, and is an integral part of the company's 6 Sigma Quality Initiative." DMEDI is defined as "a creative approach to designing new robust processes, products and services." Thus the difference between DMAIC and DMEDI is that DMAIC examines processes already in place, and DMEDI helps put a new process in place.

A Six Sigma project is designed to improve a process. Each step of the process that needs improving is mapped to analyze where problems exist. The problems are analyzed with many different tools, such as Pareto diagrams, tree diagrams, root cause analysis, and process mapping. Then a Six Sigma team takes on the improvement project.

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Many companies have defined the mastery of Six Sigma with the terminology of the belt system of martial arts and use Green Belts, Black Belts, and Master Black Belts to undertake and lead projects. Black Belts generally drive and run projects with the help of Green Belts. Green Belts assist the Black Belts with projects but aren't working full-time on a project, whereas Black Belts are fully dedicated to process improvements and are responsible for leading the team of Green Belts in completing the projects. Master Black Belts are teachers of the process and lend a hand to Black Belts as coaches.

Caterpillar embraced this methodology in 2001 when then CEO Glen Barton challenged the company to change. To introduce his ideas, he had three karate Black Belts put on a dramatic show of power by breaking pieces of wood that represented quality, cutting costs, and a goal of attaining $30 billion in revenue. Barton realized that

he needed a tool that would allow the company to analyze where changes were needed, to help make the changes, and to help the company grow, so he chose 6 Sigma. Caterpillar had a long road in front of it, but the initial rollout of 6 Sigma used more than 300,000 hours of training in its first year. Dan Campion, Caterpillar Master Black Belt, points out that when Allied Signal sent its people through Black Belt training, the average number of years of company experience was five to seven. At Caterpillar, the average number of years of company experience was more than 20.

Who Is Caterpillar Today?

Caterpillar, or Cat, is the world's largest manufacturer of construction and mining equipment (most consumers would recognize the huge yellow equipment), diesel and natural gas engines, and industrial gas turbines. It also delivers many related services, including financial, logistics, and remanufacturing.

Caterpillar reaches every continent with its products and services and, as of 2008, employs approximately 113,000 people. Caterpillar typically doesn't sell to the end customer but uses a global dealer distribution network. As of 2008, 180 dealerships span North America, Europe, Africa, the Middle East, Asia, and Latin America. These dealerships, which have more than 131,000 employees, act as the contact from the end customers to Cat.

The company has had great financial success as well. In 2006, Caterpillar recognized $41.5 billion in total sales and revenues, easily exceeding its 2001 goal, and this led to $3.5 billion in profit from a highly capital-driven industry. The company spent $1.6 billion in plant, property, and equipment as capital expenditures in 2006. Cat has an aggressive growth strategy that requires high levels of funding. For example, Caterpillar spent $1.4 billion in research and development in 2006. Caterpillar is also on the list of *Fortune* 100 companies. According to the 2009 *Fortune* 100 list, Caterpillar is first in its class, is No. 44 overall, has $51.3 billion in revenue, and has almost $3.6 billion in profit.

6 Sigma at Caterpillar

Caterpillar CEO Glen Barton started the 6 Sigma culture change in 2001 when he challenged every officer for his or her personal commitment to the program. And he got it. But many in the company became worried when Barton announced his retirement in 2004 and that the helm would be passed on to Jim Owens. In Owens's first speech, however, it became obvious that he believed in the program that Barton had started. His speech was short, but his commitment was apparent. The Black Belts, Master Black Belts, and anyone else associated with 6 Sigma projects were relieved as they realized that the methodology and their roles in the company would continue.

Many individuals throughout Caterpillar participate in 6 Sigma projects each year, from the factory workers to the group presidents who support the strategies. According to the company, there are approximately 2,000 active Black Belts at Cat. Each employee knows and understands that major initiatives and changes will take place using the 6 Sigma strategy. If a problem exists, 6 Sigma is the tool that will help solve it. On a side note, employees even take the lessons they learn from work to other organizations in which they volunteer their time.

The 6 Sigma culture has permeated Caterpillar in all aspects of the business. Craig Brabec, the current Global Finance and Strategic Support 6 Sigma Division Champion, came from a consulting business that helped companies go through change. He noticed something different about 6 Sigma at Cat: 6 Sigma didn't exist only in the manufacturing or the engineering side of the business—it also entered the financial world and the human resources side. When the company faced the challenge of the general population of its workforce retiring, it turned to 6 Sigma, using a 6 Sigma team to identify whether its benefits package was competitive with ones at other top companies. For example, Cat matches up to 6% of an employ-

ee's base salary in a 401(k) program from the day the employee begins, and its compensation plan is rated in the top 10% of plans in the S&P 500. Caterpillar recognized that its greatest asset was its people and that it would have to competitively replace the knowledge base that was going to be leaving the company.

In 1990, Caterpillar reorganized to a business unit structure, which sometimes makes the transfer of knowledge between business units more difficult. But 6 Sigma provided an effective change mechanism and a means of integrating the knowledge learned through 6 Sigma projects across the various business units.

In addition to its own use of 6 Sigma, the company has taught its suppliers and dealers about the benefits of using the technique to refine the entire sales model. Caterpillar has introduced 850 suppliers worldwide to 6 Sigma, which has created more than 1,000 supplier Black Belts to help run the projects. One supplier that said it was interested in the Caterpillar 6 Sigma methodology allowed Cat to consult and transform the business. When implementing 6 Sigma, Caterpillar used facts and data to show the results the supplier could expect, so it didn't take long for the supplier to totally buy in to the methodology.

Dealers have also taken on the 6 Sigma commitment. More than 165 dealerships have produced more than 1,000 Black Belts to help with projects. Dealers find it amazing that they can share their projects with one another on a Caterpillar website that depicts best practices among the dealers. Even though each dealership is run as a separate business, 6 Sigma has helped give all of them a common feel across the world. Not only are dealerships learning about projects that need to be done in their business, but they're following the steps of the process and learning which projects to do first. Just as Caterpillar embraced the methodology, dealers have also accepted the idea of making 6 Sigma a top-down methodology that pushes the training and concept down to the workers at the lowest level.

Attaining Strategic Goals

When Glen Barton introduced 6 Sigma to Caterpillar, he envisioned using it to help the company achieve the $30 billion mark in revenue by 2006. Instead, it achieved this goal in 2004—two years ahead of plan. Current Chairman and CEO Jim Owens continues to execute strategy using the 6 Sigma methodology. New strategic goals include People; Performance Product & Process; and Profitable Growth. Metrics have been developed for each of the strategic goals for the years 2010, 2015, and 2020. For simplicity, the following metrics will be used in Caterpillar's 2010 strategic goals: People's metrics include a highly engaged workforce and achieving world-class safety. Performance Product & Process's metrics include being No. 1 in quality, market leadership, and market-leading availability. Finally, Profitable Growth's metrics include $50 billion in revenue and earnings per share growth in the top half of the S&P 500 companies.

Over the last eight years, Caterpillar has demonstrated the usefulness of 6 Sigma in achieving its strategic goals. This was accomplished by fully integrating the methodology and its principles into all aspects of the business, including suppliers and dealers. It also allowed the integration of knowledge from Black Belt projects across business units. Further, Caterpillar believes that, by using 6 Sigma to drive change, its new goals are obtainable.

One example that exemplifies Caterpillar's continuing integration of 6 Sigma into all aspects of the business is a project that will improve threaded joint design in the assembly process. This project focuses on continuous improvement in Caterpillar's quality culture and provides an opportunity to leverage best practices and replicate solutions across the enterprise.

The company is also working on a 6 Sigma project that focuses on ergonomic improvement. This project is helping Caterpillar put processes in place that allow a proactive and, ultimately, preventive approach to ergonomic injuries—providing a better work environment for employees.

As you can see, Caterpillar is continuing to embrace the 6 Sigma methodology, not only in manufacturing and engineering, but across the organization. This way of working and thinking continues to be successful in driving the company's strategy for change. **SF**

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