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The Use of Lean Six Sigma in Major Corporate Transformational Efforts

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The transformation effort in this case study is evolving end-to-end supply chains across multiple businesses to excellence using Lean and Six Sigma methodologies. Energizing and integrating the Six Sigma community is the vehicle to accomplish a transformation versus allowing a major effort to sprout on its own parallel improvement processes. Chris Koelsch discussed why the use of Lean Six Sigma as the “tool set” for major effort is a critical “X” for long-term sustainability of leveraged improvement methods.

It is DuPont’s vision “to be the world’s most dynamic science company, creating sustainable solutions essential to a better, safer, healthier life for people everywhere”. Its core foundational beliefs are safety and health, environmental stewardship, high ethical behavior, and respect for people. DuPont began production in 1802 with gunpowder manufactured at its mill along the Brandywine River in Wilmington, Delaware, and spent its first hundred years as an explosives manufacturer. Its second hundred years was spent as a chemistry and energy company. It is now transforming itself into a science company with the purchase of \$60 billion in companies and three growth strategies – “Put Science to Work”, “Go Where the Growth Is”, and “The Power of One DuPont” – all on a platform of Lean Six Sigma (LSS). It has five growth platforms: Safety & Protection products like Nomex and Kevlar, Electronic & Communication Technologies, Performance Materials, Agriculture & Nutrition, and Coatings & Color Technologies.

DuPont is a very large and diverse company with steady sales growth. DuPont sales were \$27.4 billion in 2006, \$29.4 billion in 2007, and \$32 billion in 2008 – and DuPont manufactures ninety percent of what it sells. DuPont is currently the largest producer of titanium dioxide – a white pigment used in products such as paints, plastics, papers, inks, lotions, foods, medicines, and toothpaste. It is the largest farmer in the U.S., mostly in the hybrid soybean and corn business, with agriculture/food making up 28% of its business. Motor vehicles are 26% of DuPont sales, with an average of fifteen pounds of DuPont materials on every vehicle manufactured

worldwide. Construction materials (14%), Plastics and Chemicals (14%), Electronics (9%), Other (8%), and Textiles/Home Furnishing (1%) make up the remaining sales by market.

DuPont top management drives its Six Sigma growth methodology. Its former CEO, Chad Holliday, says, “There is one way to execute growth strategies (do things the right way)... Six Sigma”, and Don Linsenmann, Vice President of Six Sigma, co-authored *The Six Sigma Fieldbook*. DuPont utilizes six pillars for successful Six Sigma deployment: full-time on improvement, Six Sigma assignment for future leaders, financial validations, a common framework, robust project tracking tools, and the ability to be dynamic. In 1999, DuPont put a champion in each of its 40 strategic business units to begin its Six Sigma journey. By the end of 2000, it had trained approximately 1,200 Six Sigma black belts and master black belts. These black belts had a tremendous training task initially and trained a total of 415 master black belts, 2,760 black belts, and 22,172 green belts (1/3 of all employees) in Six Sigma by 2006. Black belts, master black belts, and champions are full-time jobs and make up 2-3% of operations at any plant. These positions work on improvement full-time, without the day-to-day operations responsibilities that can derail improvement initiatives, and are in the position for a minimum of two years.

All exempt employees are green belts to become a better sponsor and a better leader, and complete four weeks of training and at least three projects with at least \$350,000 in benefits. Savings are validated by a third-party financial analyst who is trained to do project validations and can verify that the project savings are apparent in the bottom line. The widespread Six Sigma training creates a common growth language and framework corporate-wide, with a single Six Sigma process that prevents “tool wars” between divisions. All projects are entered and tracked in a single database, which is searchable by employees, and this enables employees to find similar projects to see what they can leverage for their own project(s).

Chris Koelsch says that “profit and earnings objectives are not a plan – they are an aspiration”. “Figuring out your continuous improvement projects for the year and calculating what these plans are actually going to deliver versus the headwinds for the year, such as material costs, are a plan... If I have more headwinds, I need more black belts and I can deliver you more money.” Generally, a DuPont black belt will average three projects per year totaling a little over \$1 million per black belt in benefit. Additionally, said Chris Koelsch, “At some point in time you think ‘when are you going to run out of projects?’ ...The truth is you don’t run out of projects. We’ve been at it nine years and we haven’t run out of projects.” In 2002, DuPont concentrated on “Design for Six Sigma” with more than 1,400 projects and \$2.2 billion in revenue in top line growth projects. “Process Excellence” was introduced in 2003, which identified corporate core processes. In 2004, Lean was introduced into the operations supply chain. In 2005, it was end-to-end process management, which included finance and human resources, and focused on defining the process, the process owner, and value streaming processes to make improvements. By the end of 2006, DuPont had achieved *over \$1 billion in final validated benefits*.

So, how do you do a “mega-project” that encompasses 90 supply chains in 300 plants? Approximately 4-5 years ago, DuPont benchmarked its end-to-end supply chains. It used the Supply Chain Council (SCOR) database assessing Level One performance of the DuPont supply chain versus industry peers, and found that its supply chain was in need of improvement. SCOR

has a supply chain model of “plan, source, make, deliver, and return” based on best practices from around the world, which allowed DuPont to use standard industry metrics and definitions across the company and across supply chains. The DuPont team analyzed publicly reported data, learned the supply chain practices of industry supply chain leaders through industry councils, consultant studies and the SCOR body of knowledge. The team visited a diverse group of companies that are excellent in end-to-end supply chain, including Toyota, Wal-Mart, ALCOA, John Deere, Caterpillar, and Dell. Dell in particular has figured out the cost of complexity. The customer can configure a Dell system based on current manufacturing capabilities, and the system first comes together on the customer’s doorstep through a partnership with FedEx. The hard drive may have come from Texas, the monitor from another location, the cables from yet another location. The complexity is as late in the supply chain as possible. This system allows Dell to own just four days of inventory, solves the cash flow problem and the cost of obsolescence. This is just one example of what you can learn from different industries.

The DuPont team committed to delivering \$600 million in supply chain cost savings and \$1 billion in inventory savings (16.6%) over the next 3-4 years. The keys to getting corporate senior leadership buy-in are to get results right away and have a good measurement system that can show results at least quarterly. Even the best projects will lose funding if you cannot show results within a year, as there is intense pressure for immediate results in publicly held companies. It is important to balance the short-term results that will keep your projects funded with the long-term systemic improvements that will benefit the entire company for many years. Businesses can fail when they take risks to maximize quarterly earnings and then fall short on cash. Earnings are great, but cash is king in the long run – businesses need to make sure they have the cash to sustain the business through good times and bad. Supply chain has a huge role in working capital and working capital is a huge piece of a company’s cash.

Through the benchmarking process, DuPont found gaps around metrics, system tools (IT), and skills in its end-to-end supply chains. DuPont invested approximately \$1 billion in SAP software to address system tool needs, but this alone did not solve the problem. So, DuPont assembled a team to talk to other companies and work on “SAP Value Capture”. The team quickly realized they had the wrong headline – they were focusing on how to get value out of a tool, without focusing on people and process. The team also went back to the business management to assure that they were focused on what is most important: where management wanted to be at parity, advantaged and superior to the competition in specific customer reliability, responsiveness, shareholder costs and asset management metrics. The team then developed a transformation map focused on five areas – customers/markets, processes, systems, metrics, and people – with goals in each year and in each area that lead to the ultimate 3-4 year goal in each area.

DuPont management had to make sure that it developed the competencies and processes, especially the Sales & Operations Planning processes (i.e., DuPont Integrated Business Management or DIBM, based on the Oliver Wight system) to transform its supply chain. DIBM consists of five steps: 1. Product Review – what is the management and product line strategy? 2. Demand Review – what is the forecast accuracy and what is the bias? 3. Integrate the resulting plans with the financials of the corporation so it is not just a discussion about volume. 4. Complete a management business review. 5. Document (i.e. current position, key assumptions, etc.). The master black belt(s) will then disseminate the DIBM process outcomes into well-

defined projects and assign them to black belts and lean practitioners to execute. This is the linkage from business management to the shop floor and around the measurement system. DuPont also included an end-to-end supply chain director on the business team, instead of a manufacturing person, in order to transfer business directives to the supply chain's make, engineer, and capital strategies.

People, process, and tools make business excellence when all is working together and create choke spots in your process improvement when it is not. DuPont had to ensure it was developing people to do the jobs needed and trained more than 500 employees in Certified Production and Inventory Management (CPIM) by the Association for Operations Management (APICS). DuPont created a "How To" supply chain activities guide for its supply chains and used its IT systems to lock in improvements and make the improvements part of the control plan to yield sustainable improvement. However, there was still a problem: The team was trying to work out end-to-end process flow – meeting the customer's expectations faster and better than anyone else – using Six Sigma methodologies, when flow is best addressed by Lean methodologies. This was a tool the DuPont team did not possess, so in keeping with being dynamic, they added Lean to the Six Sigma toolset and created a playbook so all lean practitioners use the tools, such as Kaizen events and standard work, in a similar way. In the end, they had to make sure that it had the Lean Six Sigma (LSS) tools – especially value stream maps and Kaizen events, in addition to business insight, SAP Advanced Planner and Optimizer (SAP/APO) utilization, product lifecycle management (PLM), APICS/CPIM, asset effectiveness, and all the things you do to improve capability and decrease the amount of resources that you are spending per unit of sales. As Lean engages the workforce much better than Six Sigma, DuPont can see 10% efficiency out of the 25,000 people who are wage payroll in operations and move mountains versus using the 600-700 black belts alone who are working on the big projects. Utilizing Lean gives its efforts a huge amount of additional energy versus utilizing Six Sigma alone.

DuPont completed value stream maps on process flow of money, material and information in the supply chain. How quickly is the money flowing through the process from DuPont's customers to DuPont's suppliers (is it a positive cash flow)? How far upstream can it get customer product usage information so the product can be manufactured as close as possible to when the product is needed? Is information/product getting to where and when it is needed? DuPont looked at current process value stream maps to understand the baseline, completed Kaizen events to get the current containment, and then looked at the fundamental disciplines versus the best in class. Changes must start with the customer experience and assure that efforts are linked with customers and markets. However, before making changes, it is *critical* to have a robust measurement system in place – especially at the customer interface so the business knows immediately if its service level is falling when attempting to make improvements. DuPont uses a Supply Chain Scorecard that measures customer experience in delivery and quality, end to end supply chain cost, and work capital management.

For DuPont, the supply chain transformation elements were putting the supply chain leader on the business team, using common methodologies, standard measurements and standard integrated processes, having a transformation map, and working all the elements at the same time. This is good supply chain science and it works for any end to end supply chain. End to end process is the key to success in supply chain.