

# Getting Lean and Mean at

# CATERPILLAR

with **ABM**

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**R**emember the recession of 2008-2009? To those who live their financial lives from quarter to quarter, it might seem like a distant memory. Don't tell that to the folks at Caterpillar Inc., though.

To remain viable through even the worst phases of an economic cycle, companies big and small need to focus on eliminating waste from all aspects of their business operations. Caterpillar has known this for years, especially when it comes to its manufacturing operations. Nevertheless, the company realized that streamlining its business-support processes in the office is just as important as what happens on the factory floor for delivering profits.

By utilizing activity-based management (ABM), Caterpillar's Marketing & Product Support Division (MPSD), as it was called at that time, streamlined its support processes, reduced its costs, and prepared itself for the volatile economic times that began in late 2008 and spanned into 2009. The concept of ABM at Caterpillar includes activity-based costing (ABC), 6 Sigma, and active modeling of potential improvements to current business processes. The combination of these methodologies in ABM was heightened by MPSD's global reach.

## What Does Caterpillar Do?

With approximately 125,000 employees in the United States and abroad, Caterpillar is the world's largest manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines, and diesel-electric locomotives. The company is also a leading services provider through Caterpillar Financial Services Corporation, Caterpillar Remanufacturing Services, and Progress Rail Services. In partnership with its worldwide dealer network and through direct sales of certain products, Caterpillar delivers goods, services, and technologies in two main categories of business: (1) Machinery and Power Systems and (2) Financial Products. Headquartered in Peoria, Ill., Caterpillar operates in more than 500 locations, including manufacturing facilities, parts distribution warehouses, and marketing locations, many of which are outside the U.S. Caterpillar has more than 60 product groups with roughly 400 models, which it distributes through 191 dealers worldwide.

Caterpillar's financial success has placed it at No. 46 on the list of *Fortune* 500 companies. In 2011, sales and revenues totaled \$60.1 billion, of which \$21.7 billion (36%) was in North America; \$15 billion (25%) was in the Asia-Pacific region; \$14.7 billion (25%) was in Europe, Africa,

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and the Middle East; and \$8.7 billion (14%) was in Latin and South America. Assets totaled more than \$81 billion, and profit after tax was \$4.9 billion (\$7.40 profit per share).

## How the Company Has Succeeded

Despite being the market leader for the past 85 years, Caterpillar wasn't immune to the economic and competitive pressures of the 1980s and early 1990s. Although it failed to turn a profit for five years between 1980 and 1992, Caterpillar emerged from those challenging times stronger than ever, while many of its competitors went bankrupt. Since that time, the company has experienced nearly two decades of success on the back of a four-step formula:

1. Reorganizing in the early 1990s into product-focused business units with full transparency to their bottom lines;
2. Introducing 6 Sigma in 2001;
3. Adopting a strategy with clear accountabilities and metrics focused on delivering superior results, developing the best team of people, and becoming a global leader in every market in which the company does business; and
4. Embracing a strong set of values and a worldwide code of conduct.

The values include INTEGRITY, EXCELLENCE, TEAMWORK, and COMMITMENT. Published in 1974, the code of conduct defines what Caterpillar believes, and it guides employees in making everyday decisions as they conduct business.

This foundation for success allowed Caterpillar to deliver record sales and profits from 2003 to 2008, with the company more than doubling in sales over that time. Yet, despite its success, Caterpillar wasn't insulated from the economic turmoil that plagued the world in 2009, as evidenced in Figures 1 and 2.

A key ingredient to success has been Caterpillar's steadfast commitment to the integrity of its financial reporting. This, coupled with its superior business analysis capabilities and ABC methodology, served Caterpillar well during the 2003-2008 period of growth and during the rebound that occurred after 2009. It was during the downturn, however, where these capabilities were most instrumental in helping the company implement its cost reduction plans, called trough plans, as the world entered a severe recession in late 2008.

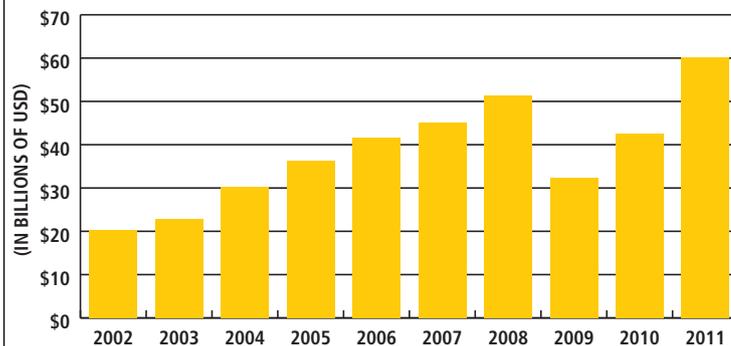
For one business unit at Caterpillar, the MPSD, preparations for the 2009 trough began by exploring what could be done to reduce its core cost structure ahead of time. MPSD began its work in 2006 by exploring how it could leverage one of Caterpillar's strengths: its ABC methodology. Traditionally, the company had applied ABC in the factory in support of manufacturing its products. But in 2006, MPSD decided to apply ABC to the processes it used in the office to support the manufacture and aftermarket servicing of its products.

## The Role of ABC at Caterpillar

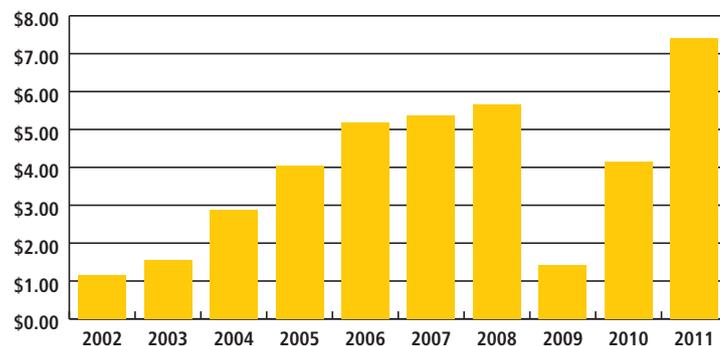
Caterpillar has been using ABC in its factories for more than 50 years. What makes ABC effective for Caterpillar is the common methodology that allows the company to compare the costs of manufacturing a part or product at several of its facilities around the world.

The ABC methodology mirrors the activities in the manufacturing process by allowing each activity to be costed using normalized cost rates. The cost for each part number within a bill of material is then rolled up to the product level. The methodology calls for each stage in the manufacturing process to be documented through work orders. A work order lists the assets a part will pass through during its manufacture (welding robot, machining complex, and so on) and the amount of time, in hours, that the part will require in its journey through each asset. Cost rates for each asset used in the production process are developed, then multiplied by the manufacturing and asset setup time, which results in a calculated cost for each stage in the manufacturing process. These rates consider the acquisition cost of the asset, square footage cost for the space the asset occupies, energy to run the asset, perishable and durable tooling used by the asset, the cost of labor to run the asset, and

**Figure 1: Consolidated Sales and Revenues**



**Figure 2: Profit Per Share**

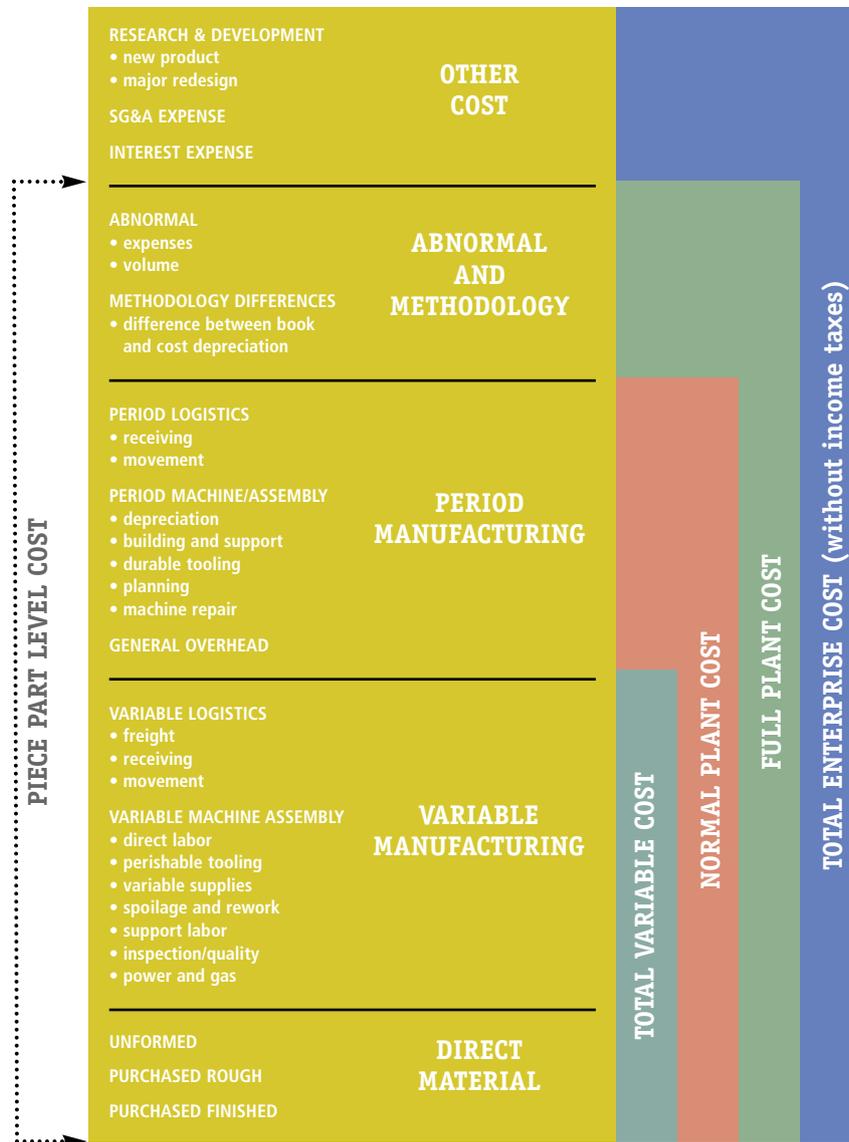


costs to maintain and support the asset, such as the programming cost, supervision for the labor, and so on. Ultimately, all costs associated with the asset are absorbed into the cost rates. Figure 3 provides more detail.

## Developing MPSD's Approach to Costing

MPSD specialized in creating, maintaining, and administering processes related to Caterpillar's product support or aftermarket activities. These functions included parts book development, language translations of parts books and product service literature for Caterpillar dealers, Dealer Service Technician training and training material development, warranty administration, brand management processes, and parts marketing activities.

The demand for MPSD's services was based heavily on company sales, which fluctuate with economic conditions. To maintain the affordability to dealers and other business units within Caterpillar, MPSD's trough plans required a flexible cost structure that could be increased or decreased as demand for the division's services changed. As these plans were developed, management

**Figure 3: Cost Structure of Caterpillar Inc.**

realized that MPSD's base cost structure was inefficient and could be improved. Thus, MPSD needed a way to streamline these processes to remove the waste while times were good. This would help maximize profits during times of growth and minimize the pain and difficulty of shedding costs during an economic downturn. To remove the waste, MPSD applied ABC and 6 Sigma to its largest office processes.

Caterpillar implemented 6 Sigma in 2001, which established a common structure and discipline for the major decisions being made every day. By introducing a recipe that included DMAIC methodology—the process of Define, Measure, Analyze, Improve, and Control that drives 6 Sigma—and supporting tools, Caterpillar was

able to embed this concept into every employee's thinking so that it has become the way Caterpillar operates. For MPSD, 6 Sigma presented a structured approach for tackling the needed cost improvements, and ABC applied to office processes provided the cost information and measurement data necessary to know progress was being made.

Unfortunately, something was still missing. Before applying ABC to office processes, MPSD needed a way to understand how changes made to its current processes would impact the cost of each step. It was easy to document how processes worked and to cost them with ABC, but understanding the critical path and bottlenecks within each process was a challenge. An even bigger challenge

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was to understand how the critical path shifted as processes were changed and where the new bottlenecks would arise. For help with sorting this out, MPSD turned to an external consultant.

The external consultant brought a capability to the table that allowed active modeling and simulation of option-based scenarios. It was the missing link that MPSD needed to apply ABC to its office processes in such a way as to understand the savings implications of making changes before it invested the time and effort to actually make the changes. The practice of 6 Sigma provided the disciplined, structured approach to reviewing each of MPSD's processes; the consultant's model allowed for an effective way to simulate different solutions identified through 6 Sigma; and ABC allowed the costing of the option-based scenarios that were proposed as new and improved processes. MPSD labeled this combined approach of ABC, 6 Sigma, and active modeling and simulation of option-based scenarios as "activity-based management," or ABM.

### ABM: A Five-step Process

The ABM process starts by searching for low- and no-value activities within each office process to eliminate or significantly reduce the cost of these activities. It ends by identifying the supply source for each office process. For MPSD, this meant examining the core competencies of its global operations, deciding what to keep doing internally and what to source from outside vendors. Ultimately, the goal was to perform the work where MPSD could best balance cost optimization and the value of the service to their customer. MPSD's goal was to continually enhance global competitiveness by exploiting opportunities in global supply. Because Caterpillar has locations around

the world, MPSD was able to address the services it provided to both internal (other Caterpillar divisions) and external (dealers and customers) organizations to leverage the global footprint by taking ABM-optimized processes and sourcing them where it made the most sense to provide each service. The five-step ABM formula used to optimize and decide the source for each process is shown in Figure 4.

ABM helps a growing business by identifying people who can be redeployed from handling existing processes to meet the needs of new and expanding business opportunities. Doing this work while a company is enjoying good economic times and strong growth helps ensure the organization is as lean as possible for whenever the next economic downturn occurs. Eliminating waste in good times limits the amount of pain during a downturn by minimizing layoffs and other undesirable or high-cost ways to shed employees quickly. For those businesses already in recession and needing to downsize staff, ABM identifies opportunities to free up resources and reduce costs without giving up value-added services. This is what MPSD did as it freed up resources by using ABM and kept employees engaged in the process to look for, and eliminate, further waste.

The five steps of ABM align well with 6 Sigma's

**Figure 4: ABM Five-step Formula for Sourcing**

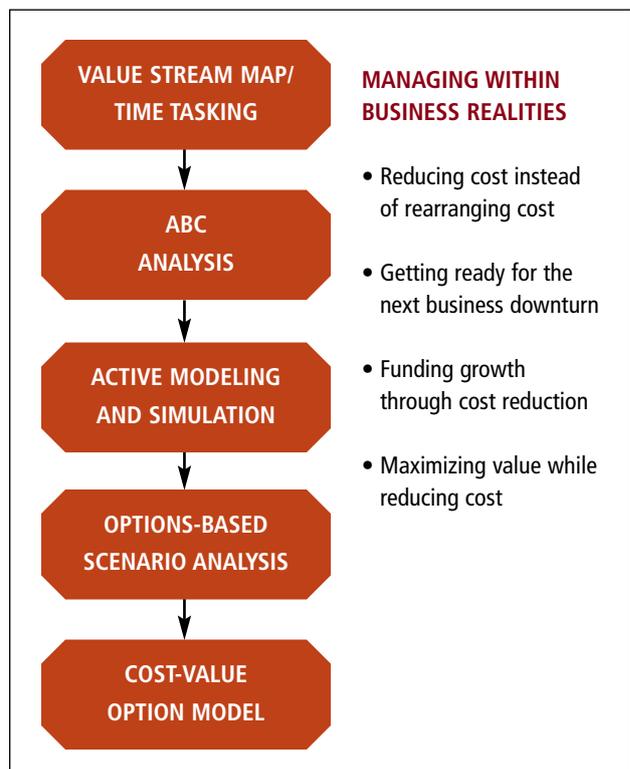
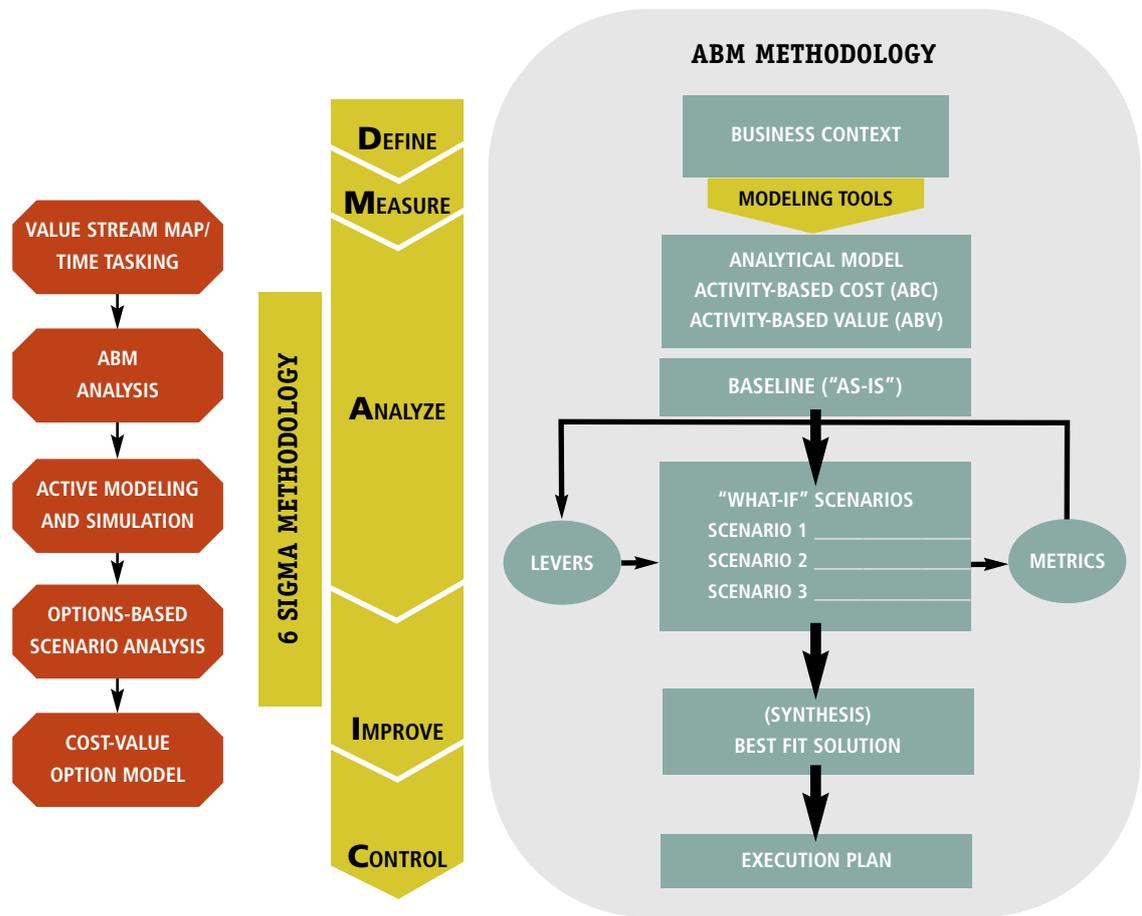


Figure 5: ABM DMAIC Methodology Chart



DMAIC methodology. Value stream mapping aligns with “Define;” process costing of the current process aligns with “Measure;” active modeling and simulation aligns with “Analyze” because this step develops a working model of the current process; options-based scenario analysis aligns with “Improve” since it evaluates options for improvement by defining a new or updated process; and cost-value option modeling aligns with the “Control” phase as it relates to implementing the chosen process improvements (see Figure 5).

### Step 1: Value Stream Mapping and Time Tasking

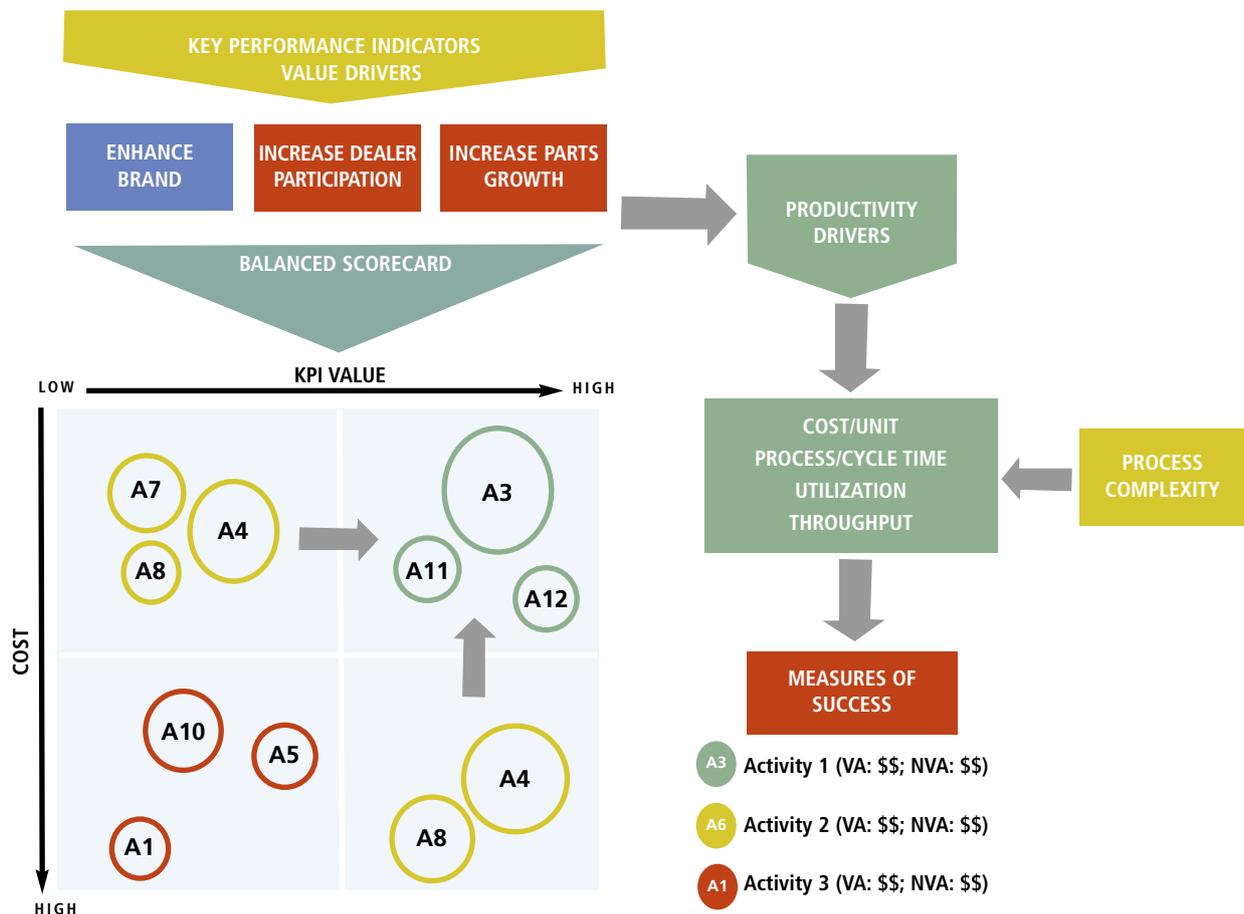
A key to success is knowing how processes work today. Many companies and their managers think they know every activity performed within their office processes. In many instances, they don’t. Instead, the managers and key personnel only know how the overall process is supposed to work. With the complexity of today’s processes in large corporations and the amount of staff and supervisory turnover, it isn’t uncommon for no one to know

how the process is *actually* working. Put simply, value stream mapping requires taking the time to document the work activities that are occurring in the process *as it exists today*—not how the process is supposed to work, but how it’s *actually* being performed. The discovery process begins at this point. MPSD conducted a value stream mapping of its processes, capturing the number of people working on each major activity and the amount of time involved in each step during a series of independent interviews with employees. Each person’s work stream was then combined into one overall process document known as a value stream map.

### Step 2: ABM Analysis—Process Costing

Once you have a fully documented value stream map of each process, the next step is to cost each activity within the process. To do this, you must ensure that your budget and actual expenses are aligned with the work being done within the process being studied. For MPSD, this involved aligning the way expenses are matched to the people

**Figure 6: ABM—Active Modeling and Simulation**



doing the work. That way, only the expenses associated with the work completed in a specific area, by a specific process, are recorded in that departmental expense. The labor, benefits, and indirect expenses—consulting, travel, employee relocation, and any shared services provided by the corporation centrally that support this area—are used to calculate a rate per work unit performed. In most cases, and for MPSD, it was an hourly rate applied against the number of hours associated with each activity as captured in the value stream map. The extended cost of each activity was added to arrive at a total cost for the process. Just as with ABC in the factory, ABM developed a cost rate for each activity to manufacture the support service done in the office.

**Step 3: Active Modeling and Simulation**

This is the most important step in the process. Because the activities in many processes are so interconnected, eliminating some can cause other obstacles to arise that significantly lessen the savings MPSD would’ve seen if it

had started blindly changing things. With the work done in steps 1 and 2, MPSD had successfully applied ABC to its office processes, but then it needed to use the information to cut its costs.

The external consultant brought a modeling tool to Caterpillar that built the value stream map and the costed processes into a model with the activities linked together. Identifying the key performance indicators (KPIs) for each process studied was the starting point. The KPIs are the main reasons why the process is performed. One of the MPSD processes studied was the creation of parts books and product service literature. The KPIs, or key objectives, for this process are to protect and enhance Caterpillar’s brand and increase Dealer Service Technician efficiency, which will lead to increased parts sales. Working with MPSD employees, the external consultant helped Caterpillar develop the simulation model and confirmed the accuracy of its interdependencies. This involved identifying what drives productivity in the process (see Figure 6).

Figure 7: MPSD's Chart for KPIs

ACTIVITY GROUP	ACTIVITY NAME	KPI 1 (50%)	KPI 2 (30%)	KPI 3 (20%)	AVERAGE KPI VALUE PER ACTIVITY	AVERAGE KPI VALUE PER GROUP
Activity Group 1	Activity 1	9	3	1	5.6	5.2
	Activity 2	3	3	1	2.6	
	Activity 3	9	9	1	7.4	
	Activity 4	3	3	0	2.4	
	Activity 5	9	9	3	7.8	

Drivers include:

- ◆ The quality of the input received to create the parts books and product service literature (How much rework is required when the input is received? How much missing information needs to be gathered?);
- ◆ The quality of the finished product, which is the output of the process;
- ◆ The complexity involved in creating the output of the process;
- ◆ The variability of demand for the process output (Are there large swings in demand because of market-related factors, or is demand fairly consistent over time?);
- ◆ What is the level of turnover in process personnel?

Once this information was known, MPSD personnel used a 6 Sigma weighting methodology (0, 1, 3, 9) to rate the importance of each activity across the KPIs. Then MPSD knew the value and cost of each activity and was ready to begin improving them (see Figure 7).

#### Step 4: Options-based Scenario Analysis

With the time, cost, importance rating, and relative value of each activity within each of its major processes identified, MPSD was able to discuss ways to remove obstacles related to improving high-cost activities. The entire work group (the whole “assembly line” of workers in each office process) was brought together in a brainstorming setting to find solutions to what drives time and cost within the highest-weighted activities. The approach they used to evaluate potential improvements to each activity within MPSD's processes is shown in Figure 8. Each activity was evaluated to see if the following could be done:

**Explore.** Focus improvement efforts on high-cost, high-value activities;

**Exploit.** Look to optimize low-cost, high-value activities;

**Extract.** Resource low-cost, low-value activities; and  
**Extrude.** Eliminate high-cost, low-value activities.

Using the collective knowledge of all staff and managers, MPSD was able to evaluate manual processes from the past five to 10 years that could now be mechanically processed because of gains in technology. They identified duplicate steps and data entry keystrokes. They also found ways to reduce or eliminate the poor-quality inputs they were receiving from supplying business units. One method was to reward the units that were able to improve input quality. By using the finely tuned model of their current process in step three, MPSD was able to foresee the savings that would result from changing various activities. The group brainstormed and simulated several scenarios before making the final decision to implement.

#### Step 5: Cost-value Optimization Model

After completing the simulations, MPSD made final recommendations for each process studied. With the aid of 6 Sigma, it identified the activities that were necessary to make the process changes, assigned resources to implement the changes, and tracked the associated savings to be sure the expected improvements really occurred. As mentioned earlier, by making these process improvements during good economic times, freed-up employees and other resources were redeployed throughout Caterpillar. For just the top few processes within MPSD, millions of dollars were saved even before the economic downturn. As conditions deteriorated in 2009, MPSD was able to flex its office cost structure further to deliver

acceptable returns more quickly and with less pain to full-time employees than would've been possible without ABM.

After optimizing its systems, MPSD evaluated where the work should be done within each newly streamlined process. This wasn't about a U.S. company looking to outsource or offshore. Instead, it was about considering what the work was, where the customer was, what their needs were, and the cost of production in order to allocate the process correctly. For MPSD, many of its processes were performed for the world in Peoria. Even after ABM, much of the work remained where it was. By looking at the processes from end to end, however, MPSD was able to move some functions to shared-service locations already established elsewhere in the world that were closer to the customer or to the sources of labor that could do the work best. For example, if parts books and product service literature needed to be translated into Chinese, it makes the most sense to do that work in China.

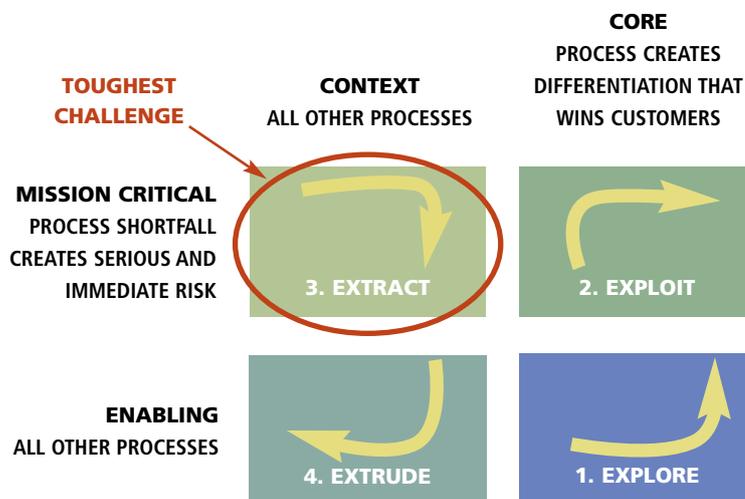
## How You Can Apply ABM

The five-step ABM process allowed MPSD to methodically identify and capitalize on its opportunities, specifically:

1. Document how processes are working today—*not* how management *thinks* they're working.
2. Identify nonvalue-added and duplicate work in their processes and eliminate it.
3. Identify employees who could be freed up from current processes and moved to high-value-added work.
4. Analyze where the streamlined processes should be performed to provide the best value for customers.
5. Allow MPSD to keep pace with ever-improving competition while aligning its processes and activities with today's business environment.

To do the same, you should streamline and optimize your processes by first using ABM. Even if you believe your processes are robust, continue to review them periodically—technology improves, and new opportunities for process improvement and cost reduction may develop over the years. After you've optimized your processes, ask yourself some questions: Are you performing tasks and activities that are done in one place because that's where they've always been done? Is it because your company used to be primarily a North American com-

**Figure 8: Four Approaches for Evaluating Activities**



pany that has now expanded globally, but you never reevaluated where the business support processes should be done? If you were to start your business from scratch tomorrow, would you source each work function from the location you have it in today?

After identifying the opportunities for improvement in your processes through ABM and answering our questions, all you have left to do is act, especially if you want to see the process improvements and cost savings that MPSD realized. Caterpillar succeeded after many years of trial and error, spotting what wasn't working and acting swiftly to correct it. Using what you've learned in this article as a guide, you and your organization can improve your systems, too. **SF**

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