CITGO Petroleum Meeting the Challenge with ABM

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Activity-based management (ABM) has helped process and energy industries cut costs and improve efficiencies, because it provides the baseline data needed for performance measurement, outsourcing, product costing, and capacity analysis. However, implementations of ABM have to be tailored to meet the unique challenges posed by Shared Services functions and operational units. This article outlines CITGO's implementation techniques for ABM and describes the company's results for its Shared Services and operations business units.

Activity-based management (ABM) techniques have proven invaluable in helping cut costs and improve efficiencies in process and energy industries. However, implementation techniques must be tailored to meet the unique challenges posed by Shared Services functions and operations units. Typical analyses and results differ significantly depending on the type of function or operation studied. Fortunately ABM provides the baseline data necessary to answer numerous management questions, ranging from performance measurement and outsourcing feasibility to product costing and capacity analysis. CITGO's experience with ABM dictated using the full scope of ABM-related analyses, with many lessons learned in the process. The following article outlines CITGO's implementation techniques and keys to success, and describes specific types of results developed for both Shared Services and Operations business units.

INTRODUCTION

In the drive to improve efficiencies, CITGO Petroleum Corporation implemented Shared Services several years ago to provide common support functions to all operating business units (e.g., crude supply, refineries, pipelines and transportation, lubricants manufacturing, asphalt production, and marketing and supply for light oils). Unfortunately, numerous challenges arose when full costs of the support functions were visible. Individual business units began questioning the size of their charge-backs and how they could reduce their allocations. As a result, the Shared Service organization saw the need to implement a standardized and repeatable approach for allocating costs so that business units would understand what they were being provided and thus reduce the amount of time spent in numerous budgeting and charge-back discussions. Service level agreements (SLAs) were identified as one method to help standardize this approach. In addition, senior management also wanted to see how costs could be reduced or whether certain functions should be outsourced to provide better value to the business units.

In researching approaches to help solve these various issues, CITGO determined that a single technique, activity-based management (ABM), provided the full range of required cost and management data necessary for supporting both Shared Service and business unit concerns. By analyzing activities and costs, ABM could provide service and product costing for charge-back

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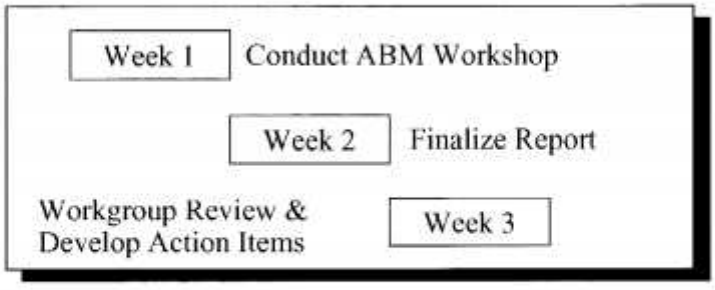
allocations, process-improvement/cost-reduction opportunities, service level agreements, and outsourcing feasibility data. CITGO then selected an internal team to lead the process, along with a consulting organization, MEVATEC Corporation, to provide ABM and domain expertise. Following initial training in ABM techniques and software, the team first conducted a pilot program on the Purchasing process. From the lessons learned in this pilot, the CITGO/MEVATEC consulting team developed an approach that would best fit the CITGO environment. Although most of the outcomes of the pilot study fulfilled defined goals, several lessons drove essential design changes and were incorporated into subsequent studies. The key points of the final approach included:

- *Voluntary approach.* Departmental ABM studies would be voluntary so that managers would not be forced to participate in a program they did not value. Although it had its limitations and occasional frustrations, voluntary participation assured cooperation and enthusiasm from the departmental groups and their managers. It was also key in building support from senior managers who were impressed that the process seemed to sell itself. Although participation was voluntary, approximately 75 percent of the Shared Services departments eventually elected to participate once they understood the benefits and payoffs of ABM.
- *Departments and not intracompany processes would be evaluated.* This allowed a manageable, consistent, and traceable set of costs to be used and provided a single point-of-contact for implementing changes (i.e., the general manager or representative VP). Processes would be linked afterwards as common cost drivers and activities were identified. The department-focused studies forced participants to determine *their* responsibilities in improving a process, as well as identifying and defining matters that required cooperation with other areas. In this way, "snake trails" led to other departments that became partners in process improvement. This objective and accurate assessment of role responsibilities and the establishment of a partnership approach for improvements allowed management to work intracompany issues with less controversy.
- *Workshop structure.* A workshop approach would be used with employee participation to promote departmental buy-in and enthusiasm. MEVATEC's FastTrack ABM™ technique and software was selected partly because it could generate results within 1–3 weeks. A typical schedule is shown in Exhibit 1. To gain the maximum benefit from ABM, it is important to get the truest picture of what is actually occurring in a group of activities. Therefore the workshop groups included employees who actually perform the activities, rather than supervisors who are often several steps removed. This allowed the team to clarify issues and problems and determine corrective actions that do not undermine other process aspects, which increased employee confidence in the ABM method and subsequent process changes. When workers were directly involved in the process of meaningful change, employee enthusiasm and cooperation were heightened considerably. The better the cooperation, the better the product. Rapid results also have a positive impact. Workers who have suffered through multiple studies and implementations may be overtaxed and less than enthusiastic about participating in another project. When

Exhibit 1

Typical Schedule



they realized that ABM results began to manifest within the first 3–4 days and process improvements were developed and implemented in the immediate short term, their enthusiasm was quickly ignited.

- *Action items and knowledge shared via intranet.* Process-improvement action items and the full reports for each department would be posted on an internal knowledge management system that alerted concerned parties to upcoming due dates. This would also allow knowledge sharing for other departmental areas and executives.
- *Key CITGO team members led the program.* Their knowledge of the organization, business, goals, philosophy, and processes, plus knowledge about how to get things done, brought credibility to process improvement. This is often lacking when change is driven down through management via consultants—often devoid of input from the people directly affected by the changes. Empowering employees to improve their own processes and seeing their managers and team members striving to implement the changes builds trust and true teamwork.
- *Consulting team partnership.* CITGO personnel trained and worked in tandem with the consultants. The consultants maintained the discipline of the ABM process, as well as contributing their experience and expertise. Strong factors in the acceptance of ABM by CITGO management and employees were the knowledge and expertise gained by permanent CITGO personnel and MEVATEC's willingness to work in partnership with them.
- *Process improvement is a primary goal.* It is quite possible to determine how much an activity process costs without making any improvements. However, in a competitive environment, efforts must be made to determine how to do things faster, better, and cheaper to fully use the results of activity analysis. ABM focuses on cost management and improvement techniques and illuminates those opportunities.

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- *ABM methods are superior to traditional methods for Shared Service allocations.* Measurements alone do not capture knowledge about processes, problematic customers, or transactions that take a disproportionate amount of time and effort. For example, Shared Services units traditionally charge based on headcount or volume, such as the number of invoices processed for a business unit. In a diversified refining company, there are thousands of transactions that vary widely in the degree of handling and follow-up required. ABM allows one to accurately identify appropriate chargebacks and develop realistic service level agreements. Also, by identifying and implementing potential improvements, Shared Services can demonstrate to the business units a continuing commitment to lowering costs.
- *Rolling implementation approach.* To ensure ABM results would be used to improve processes, and considering the large number of studies being conducted, it was essential to "roll out" changes as studies were completed rather than waiting until all studies were finished. This ensured that the data was current and allowed managers to take advantage of the momentum for change developed during the ABM workshop process. Department managers had the responsibility to begin implementing changes, usually within 30 days from study completion. The ABM team was called in as necessary to help support change management issues or clarify specific issues and best practices. To add additional incentive the department managers or their designated VPs were scheduled to brief CITGO's senior management team approximately 5–6 months after the ABM study to show progress and savings resulting from their initiatives.

The remainder of this article addresses specific applications of ABM such as product costing and process-improvement initiatives within representative Shared Service departments and operational units. The goal is to provide insights and initial road maps for implementing successful ABM initiatives.

THE ABM PROCESS AND CITGO'S IMPLEMENTATION APPROACH

ABM can best be illustrated by a review of the model shown in Exhibit 2. This model, known as "The CAM-I ABM Cross," was developed by the Consortium for Advanced Manufacturing-International (CAM-I) to assist managers in developing more accurate product costing than current financial accounting methodologies could deliver and to quantify methods of achieving tangible process improvements. ABM techniques are widely applicable, ranging from production and maintenance environments to information technology and service units. By generating realistic costs of processes, products, and improvement initiatives, ABM provides managers with the data needed to make informed business decisions.

The ABM model begins with resources—the cost elements allowing work to occur (i.e., salaries and benefits, office space, travel, computer expenses, etc.). Each resource, or percentage of resource, is then traced to an activity (i.e., the work performed) based on how the activity uses that resource. For most groups, 10–15 unique activities are usually sufficient. Of course, many tasks may be involved in each activity, but a successful ABM application should focus at the activity level to avoid unnecessary complexity.

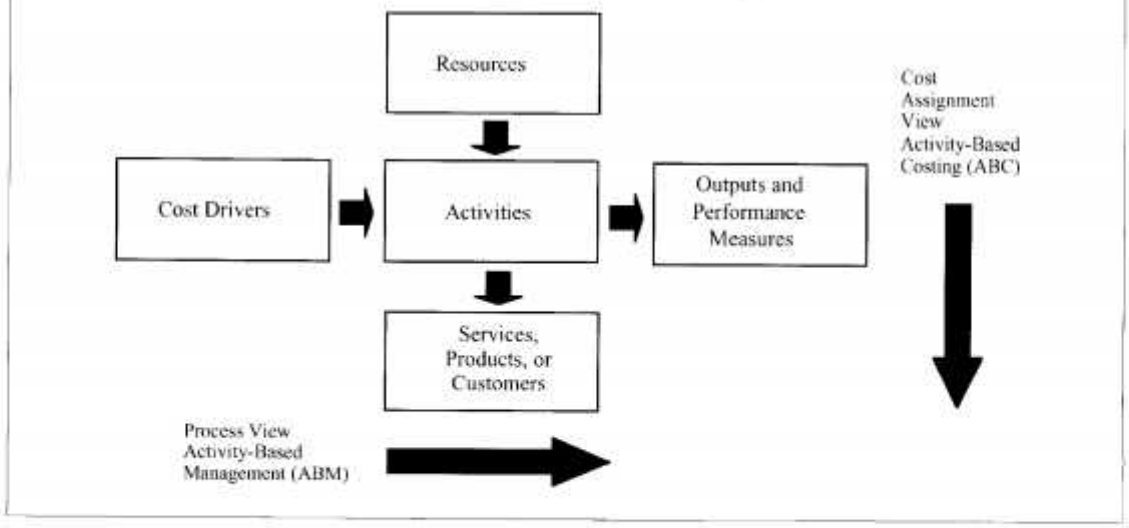
The most effective workgroup structure includes 5–10 employees (depending on department size and organization) who actually perform the work, along with ABM team leaders. Supervisors and managers play an important role, but typically do not have the hands-on knowledge required to identify required activities and cost drivers. Subsequent to the pilot study, each analysis team included a consultant and 1–2 CITGO facilitators.

Once the activity is costed, it is then traced to products, services, or customers, depending on the nature of the department's work and the information the manager wishes to analyze. This vertical axis is referred to as the cost view or activity-based costing (ABC) of ABM. ABC is sufficient if the goal of the analysis is to provide accurate activity, product, or service costing (i.e., costs of delivering barrels), customer/contract profitability analysis, and so forth, based on current processes and deliverables.

However, when the goal includes improved cost performance or process improvement (as is usually the case), then the horizontal axis, or process view, must be included. In the process view, each activity is analyzed to identify and quantify cost drivers—the root causes that require an activity or task be performed.

Exhibit 2

The CAM-I Cross of Activity-Based Management



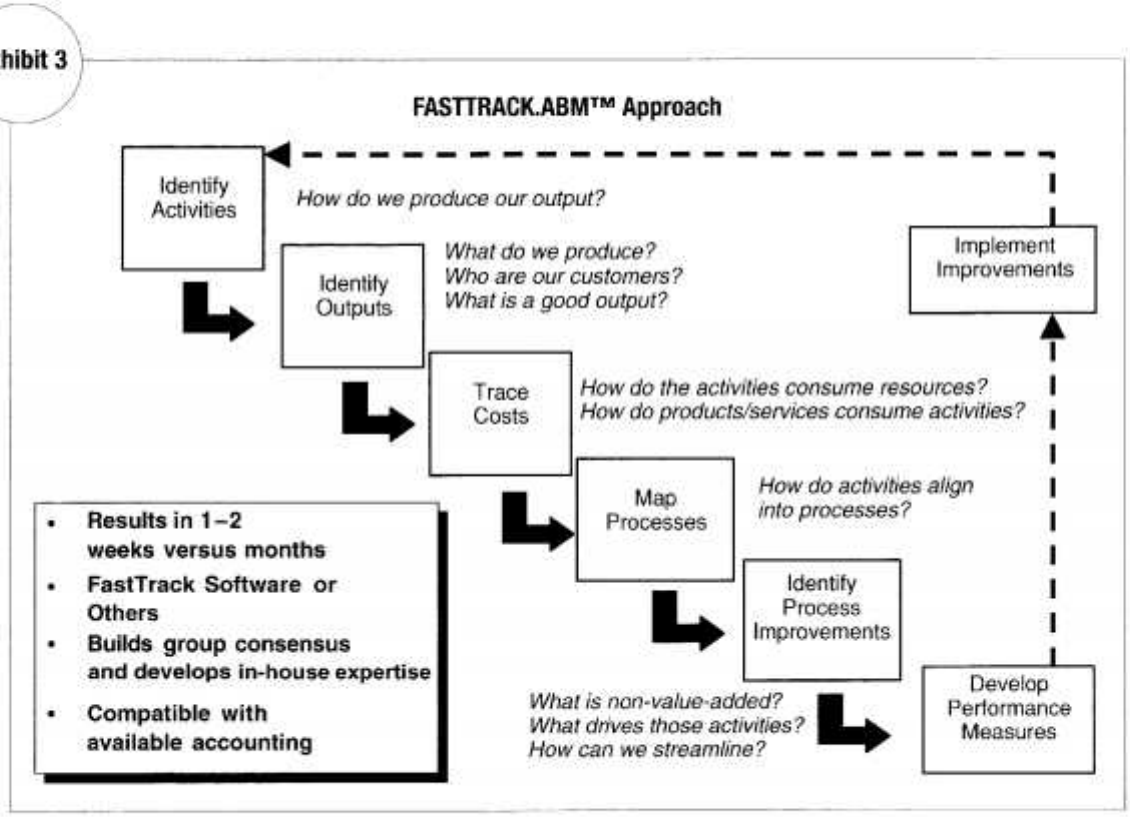
This analysis is performed through standard investigation techniques: the "why tree," affinity diagrams, flow-charting, and so forth. Once cost drivers are quantified, determinations can be made on the value of that particular activity and task. To promote process improvement, one must understand cost drivers in order to effectively change work processes and dedicate more resources to value-added work while eliminating resources assigned to non-value-added activity (NVA).

Each activity also includes an output and accompanying performance measures. These outputs and performance measures can often provide a valuable indicator of success in eliminating NVA and can link to balanced scorecard implementations. Exhibit 3 illustrates the process flow of the FASTTRACK.ABM™ approach used in the ABM implementations.

DRIVING COMPETITIVE ADVANTAGE IN SHARED SERVICES

CITGO's ultimate goal includes lowering the cost of doing business while maximizing shareholder value without sacrificing customer service. In the quest to establish competitive advantage, Shared Services groups provided challenges due to the extreme diversity in business functions and requirements. CITGO's ABM study of Shared Services encompassed areas such as accounting, corporate budgeting and planning/economics, information technology, tax, administrative services, customer service, order management, and pricing departments—areas typically viewed as overhead expenses absorbed through daily operations. However, Shared Services provides important support functions for customers both within and outside the organization. Operations managers want to know how Shared Services departments' fees are determined and the value received for these charges. Similarly, Shared Services managers need to know how their budget resources are spent in providing a service, and for which business units. By conducting an ABM study to learn where and how the

Exhibit 3



resource dollars are being spent, a Shared Services manager has definitive information available to develop accurate manpower/budget requirements and process-improvement initiatives and/or detailed service level agreements. ABM information is also valuable in determining appropriate price structures and accurate profitability margins and in demonstrating if return-on-investment decisions are meeting the goals of the corporation. (All dollar amounts and numbers used (other than percentages) in this article are fictitious and are presented for demonstration purposes only. Percentages shown reflect actual findings and outcomes.)

The First Step—A Pilot Project in Purchasing

The pilot project was the first step in ABM implementation. The six-week pilot focused on company-wide purchasing and procurement processes and was conducted at two refineries and at corporate headquarters. Specific targeted outputs for this pilot included

- Activity-based costing/activity-based management analysis
- Identification of key process links across departments and organizations
- Identification of non-value-added savings opportunities within each process
- Development of a process-improvement plan with desired timeframe and objectives
- Development of service level agreements and charge-backs for desired levels of performance

Exhibit 4 illustrates top-level findings of the activity analysis for the purchasing pilot, including the percentage of resources spent on each major activity. Total costs to the company of the purchasing process were 64 percent higher than the combined budgets of purchasing and warehouse departments alone. This indicates the significant amounts of time spent by accounts payable, maintenance and engineering, and other support personnel in working purchasing-related issues. It also indicates the need to understand all costs incurred for a specific business process, although it was determined through this analysis that it was more controllable to limit the process study to one department at a time rather than across departments.

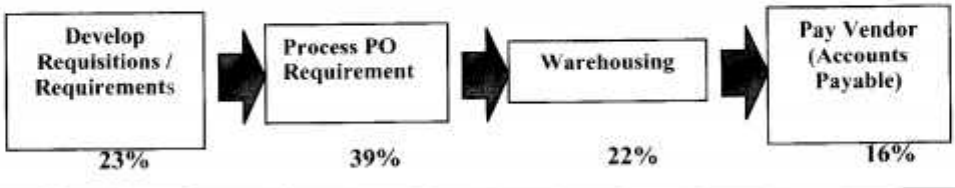
Six activities—Create Requests, Establish/Maintain Contracts, *Maintain Inventory, *Process Purchase Orders, *Receive Goods and Services, and *Resolve Problems—accounted for most of the identified costs of purchasing. Four of these activities (*) contained significant NVA—approximately 60–70 percent of the total cost of performing the activity.

Findings indicated that the total cost to procure a material or service using the company's recently installed ERP (enterprise resource planning) software was about two to three times the industry average. Obviously, this was not the anticipated outcome for the new automated ERP system. Fortunately, the company's Procurement Card purchases and non-ERP purchases cost to the company per purchase was a number consistent with industry standards. It was clear there were issues associated with the ERP system, as well as other related problems. Improvement opportunities for Purchasing were eventually categorized into five major areas:

- Improve Warehouse management/operations, including inventory reductions
- Standardize ERP and other purchasing processes for all business units
- Reduce the number of vendors from the existing list of over 40,000
- Revamp and simplify the Goods and Services Receipt process

Exhibit 4

Findings of Activity Analysis for Purchasing Pilot



- Identify and implement necessary fixes to a variety of ERP system problems

Though each category required some long-range, extensive improvements, each also included "quick fix" improvements—those that do not require significant investment, are under immediate managerial control, and could be implemented in the near term. If these fixes were implemented, the company could expect a minimum of 36 percent savings of their current purchasing process costs. Even if only half of these improvement opportunities were captured, the company would realize a *single year* return on investment of 22 times the cost of the ABM study.

Developing Service Level Agreements and Charge-backs

Four basic targets evolved for the Shared Services studies: (1) improve the processes, (2) reduce costs to business units, (3) determine if/where outsourcing could be beneficial, and (4) provide acceptable, understandable detail for SLAs and charge-backs. A significant amount of NVA activity was identified in both Shared Service areas and in the business units, providing excellent opportunities for improvement, savings, and cost reduction across departmental lines. In this manner, business units could lower their Shared Services allocations by improving their internal processes and eliminating NVA. Therefore, a business unit is "rewarded" for reducing work for other areas.

CITGO had experienced difficulty with business units not understanding their Shared Services allocations and charges, so the goal of developing clear and understandable SLAs was very important. SLAs should contain, at a minimum, the following: (1) activities/products provided to the business unit and how often they are performed, (2) sufficient cost and quantity detail to justify allocations, and (3) the process and cost improvement initiatives to be undertaken by both parties. The level of detail, charge-backs, and performance levels were expected to evolve over time. CITGO was able to develop the following "best practices" for implementing SLAs:

- Develop agreed-upon methodology between Shared Services and the Business Units regarding rules, processes, review times/updates, charge-backs, etc.
- Secure top-level support to force cooperation and action
- Use quantifiable and supportable data
- Identify accountability measures
- Empower personnel to make changes
- Utilize the SLA and supporting details to plan capacity and growth needs and for budgets

Exhibit 5 illustrates the structure of an SLA developed for Purchasing.

PROCESS IMPROVEMENT AND UNIT COSTS

As studies proceeded and issues were identified, study findings sometimes led to other departments or business units that were causing NVA. These "snake trails" often illuminated

Exhibit 5

Purchasing Allocation to Refinery "A"

Activity & Description	Output Measurement	Quantity	Unit Cost	Activity Cost
Purchase Material/Services	# of POs or line items	xx	xx	xx
Resolve Issues and Problems	# of problem calls	xx	xx	xx
Maintain Vendor Database	# of vendors	xx	xx	xx
Perform Special Projects	# of projects	xx	xx	xx
Obtain Bids	# of bids	xx	xx	xx
Manage Suppliers	# of suppliers	xx	xx	xx
Process Change Orders	# of changes	xx	xx	xx
Vendor Evaluation/Certification	# of vendors evaluated	xx	xx	xx

Total Costs Incurred by Refinery A = $XXXXX

critical linkage breakdowns, which affected multiple departments. Exhibit 6 illustrates how input problems in two areas, Pricing and Customer Service Master Data, drove costs for numerous accounting groups, approximately 40 percent of the total NVA. The processing problems linked to these two departments eventually led to targeted SAP retraining and system enhancements, which resolved much of the associated NVA.

Other benefits to using ABM techniques were identified. One benefit is the discovery that commonly accepted "cost-reduction solutions" sometimes camouflage undesirable and unforeseen outcomes. For example, hiring temporary contractors in lieu of permanent employees is a common "cost management" practice in many companies. The generally accepted premise is that hiring contractors who do not require company overhead expenses are more economical than full-time employees (FTEs). CITGO's Financial Services group, in particular, had embraced this concept. Following a major downsizing, one accounting area had consistently used contractors to fill vacant, existing positions totaling 35 percent of the staff workforce. This had been a primary method of "cost containment" for over three years.

During the department's ABM study, facilitators developed data that illuminated the following problems with the contractor-versus-FTE approach:

- High turnover and frequent, lengthy training processes are standard problems when relying on temporary contractors. Contractors knew their jobs were unlikely to lead to permanent positions and so would leave to take full-time jobs with other companies.
- The average length of stay for contract employees was four months. Employees with four to five months of experience performed at about 50 percent productivity. This is a typical learning curve, but as soon as a contractor can perform above this level, he/she is likely to move on, creating an endless cycle of new temporary hires and more required training time.
- Training new contractors pulled experienced employees away from their primary job responsibilities, creating additional loss of productivity and driving up costs. FTEs were constantly in a training mode due to the number of contractors and high turnover rate.
- It was determined that two full-time employees could replace the productivity of five contract employees at a much lower cost. The study results ultimately led to a lifting of the "hiring freeze" in accounting, which had been in place for over three years. To date, additional FTEs have been added and the use of temporary contractors in this department is limited to short-term/seasonal requirements. Significant cost savings and, perhaps more important, increased stability improved staff

Exhibit 6

NVA Processing Issues—Pricing & Customer Service

Departmental Area Affected	Resource $	Total NVA %	Total NVA $	Customer Service NVA %	Customer Service NVA $	Comm Pricing Dept. NVA %	Comm. Pricing NVA $
Revenue Accounting	X	47%	X	18%	X	28%	X
Terminal Accounting	X	57%	X	50%	X	20%	X
Exchange Accounting	X	43%	X	20%	X	0%	X
Bulk Accounting	X	46%	X	10%	X	10%	X
Aviation Accounting	X	60%	X	40%	X	50%	X
Refinery Accounting	X	35%	X	10%	X	20%	X
Asphalt Accounting	X	35%	X	25%	X	20%	X
Industrial Products Accounting	X	45%	X	15%	X	20%	X
Tax Dept.	X	16%	X	11%	X	0%	X
Marketing Credit	X	0%	X	0%	X	75%	X

morale, and a more productive, knowledgeable work group was the positive result.

Feasibility of Outsourcing

Outsourcing has been another popular "cost-reduction solution" for many companies. Several CITGO managers were anxious to see how much they could save by using outsourcing alternatives. The ABM methodology allowed managers to identify the true cost/benefit of outsourcing alternatives to ensure an "apples-to-apples" comparison of in-house services and activities. One such study was conducted in CITGO's Creative Services group.

The manager of the department was concerned about reducing costs in the overall budget. A number of creative projects were already being routed to outside vendor services, resulting in a low utilization rate for CITGO personnel and equipment. The manager wanted to explore the potential for outsourcing all creative services, with the expectation of lower costs of providing brochures, pamphlets, radio ads and other marketing materials to CITGO business units, as well as reducing department overhead.

ABM findings revealed the significant dollars being spent on creative projects by a wide variety of CITGO departments. Both within, and outside of, Creative Services, there was also an overall lack of knowledge about fee structures of outside vendors. Price and services lists were developed and benchmarked against typical outside agency rates, similar to the example in Exhibit 7, to determine how Creative Services measured up to the competition.

Study conclusions indicated that Creative Services provided an extremely responsive, cost-effective, and high-quality solution for most desired marketing and promotional materials. Outsourcing generally would not lower costs; thus, CITGO Creative Services provided a high level of value to the company. Creative Services began a plan to increase utilization by educating business units about services they provide and demonstrating the quality of the final product and the associated cost savings. To effectively function as a business within a business, they began competing for the client's business—similar to outside vendors—including

- proactively marketing their services to internal customers using brochures, an intranet Web page, and other tools, and emphasizing value-added components;
- staying attuned to and following up on customers' needs;
- benchmarking against charges for outside services to contain costs;
- participating in groups, competitions, and so forth to maintain and increase awareness of cutting-edge technical advancements and industry trends; and
- actively managing their costs to offer a cost/benefit advantage for using the in-house service.

Exhibit 7

Creative Services Rates versus Outside Vendor Agencies' Rates

Product	*Description*	*Revisions*	*Comments*	*In-House Cost*	*Typical Agency Rate*
Web-Page Design	**Single Web page including links.**	**One page (not entire site). Price includes up to 3 revisions.**	**This rate reflects the design of a single page including its links to other pages that are preexisting.**	**$ XX– $ XX**	**$ XX– $ XX**
			Multiply this rate by the number of pages needed for a new Web site.		
Web-Site Design	**Entire Web site including links.**	**Price includes up to 3 revisions.**	**Web-site design rates are largely dependent upon the size and complexity of the site.**	**$ XX– $ XX**	**$ XX– $ XX**
			Additional revisions will increase cost, as will site maintenance.		

In addition, Creative Services began offering a valuable new service to internal customers: serving as a managerial clearinghouse for projects, which means evaluating and identifying reliable vendors, developing bid specifications, and soliciting and reviewing bids. This allowed them to not only demonstrate expertise not usually available in the customer departments, but it also allowed them an opportunity to see what projects are being requested. If they can provide the service in-house, they also submit a bid. This created greater awareness of the services, expertise, and potential savings they could provide. The utilization rate in Creative Services is now 95 percent, compared to the 53 percent rate identified in their initial study.

In another outsourcing example, Human Resources wanted to investigate outsourcing options for Payroll, Benefits, and HR Service Center functions. The end result was that outsourcing at the expected service level was not less expensive and would require more unforeseen internal oversight. Once again, the cultural mythology of an accepted "cost-cutting method" did not measure up against costs and services provided in-house, once the optimization potential of the existing resource was better understood, implemented, and benchmarked item-for-item and service-for-service against popular alternatives.

PROCESS IMPROVEMENT, PRODUCT COSTING, AND CAPACITY ANALYSIS IN OPERATIONS

As ABM process improvements began filtering throughout the Shared Services organization, several operations units began requesting similar analysis. These business units included refineries, pipelines, marine transportation, and lubricants manufacturing. In particular, the business units wanted an objective look at their processes and costs and ways to improve their internal operations. Some had a good understanding of problems or specific issues, but often did not know how best to address improvements or to quantify the extent of the problem. In other cases, the business units wanted to use the technique for an overall evaluation or to get workers more involved in the processes and help improve communications and overall operation within the business unit.

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Three essential types of analyses were performed in operations units: (1) process improvement, (2) product costing, and (3) capacity analysis. Each of these analyses was developed using essentially the same ABC/ABM technique to generate the results. Although many different analyses were performed for each group, individual examples will be used to demonstrate the types of results achieved and lessons learned.

Process Improvement in a Refinery

It became obvious early in the process that implementing ABM at refineries required an ability to adapt to the operating environment and requirements. ABM efforts could not adversely affect the 24-hour, seven-days-a-week operation of the facility or the myriad health, safety, and environmental regulations. In addition, diverse sets of employees and contractors — ranging from contract maintenance personnel working in the field to high-tech control system employees and IT personnel, both local and from company headquarters—were present throughout the facility and needed to be included. Finally, but not least important, union requirements had to be considered before developing an implementation schedule and beginning work.

The workforce and processes were separated into three major elements: Operators, Maintenance, and Support/All Other. Each of these was considered a separate group during the evaluation process because of the uniqueness of their workloads and daily requirements. We did not address project and operations engineering except where their activities crossed routine operations and maintenance activities. However, it was clear to us that a similar ABM approach would also be effective in improving efficiency in project management and other engineering work activities.

Operators typically work 24/7 shifts and monitor and control the entire facility. Their processes and activities range from monitoring the system to performing preventive/predictive maintenance. Scheduling time with operators and identifying improvements had to account for both shift schedules and any requirements for man-in-the-loop control.

Maintenance personnel were typically on a single-shift sched-

ule. Their daily workload (when not involved in refinery turnarounds) ranged between reactive and preventive/predictive activities. Their efforts were usually scheduled through a work order (WO) system process. Contractors and the warehouse played vital roles with maintenance workers in helping to keep the equipment running.

The Support/All Other category included staff and office support personnel necessary for the refinery to function, ranging from management and human resources to purchasing, administrative, and IT functions. These employees were usually nonunion and worked directly with the Shared Services operations at headquarters. Therefore, many of their activities and processes were evaluated with techniques similar to those discussed previously in the Shared Services section.

At one of the refineries the maintenance group was evaluated with ABM techniques to help identify efficiencies in the maintenance processes and improve communications with both operations and management. One of the processes immediately identified for improvement was a recently implemented WO process in the ERP system. This WO process touched most elements of the workforce and often caused conflict. Operators would usually write the initial WO in varying degrees of completeness. Management would review, update, or correct the data and schedule the work. Maintenance would then do the work, often without using the data on the WO. Operators and management then performed final sign-off when the work was satisfactorily completed. Although the process appears relatively simple, there were actually over 50 separate steps in the process, multiple levels of sign-off, and little communication between the groups—even though all were trained and had access to the ERP WO system.

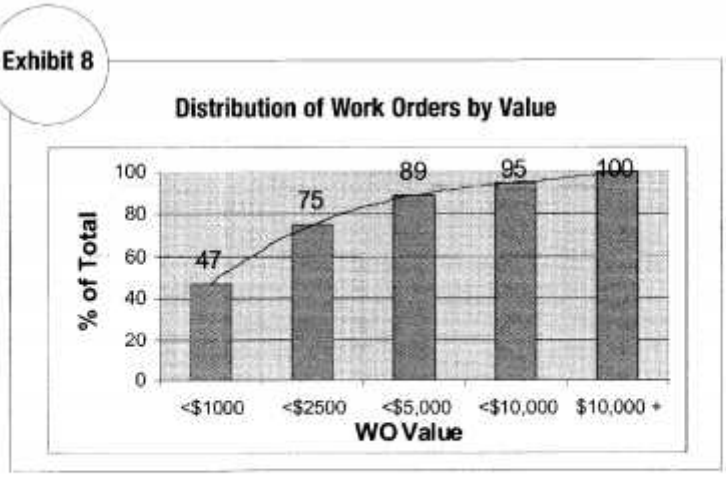
ABM identified that this process was costing significantly more than anticipated per WO in labor to implement the full writing, sign-off, and evaluation of each WO. This cost did not include the cost of completing the specific WO. Rather than spending time in the refinery repairing equipment, a large number of maintenance personnel were spending time inputting data and completing forms.

Balanced against this process was the cost of completing the actual WO itself. As shown in Exhibit 8, almost 50 percent of the WOs cost less than $1,000 to perform the required work, and a significant percentage of these were less than $500. Therefore, low-dollar WOs were actually costing the refinery much more in administrative and process costs and lost productive time than the WO itself (e.g., a WO estimated to cost $500 would actually cost the refinery almost twice that amount when the WO processing "fee" was included, as in Exhibit 8).

Based on this information, the refinery began developing two process-improvement initiatives. One involved the streamlining of the WO process, including reducing the number of signatures required for low-cost WOs, along with additional system training for maintenance personnel. The second involved reducing the number of low-cost WOs initiated through the system process. This latter effort included automating some of the low-cost WOs for predictive and preventive maintenance. Thus, WOs would be generated in the system without the need for manual input and supervisory sign-offs. In addition, other low-cost WOs were eliminated for activities that did not require tracking of data and costs, since the data would never be used in decision making.

Numerous other efforts and processes have been evaluated at refineries using ABM methods, including predictive and preventive maintenance programs, operators, warehouses, purchasing, administrative support, dock and other marine operations for crude oil supply, IT functions,

Exhibit 8



capacity analysis, and product costing.

Product Costing in Pipeline Operations

Implementing ABM in operational units usually requires a heavier focus on asset utilization than personnel-related processes and activities. Often the nonpersonnel costs, such as energy, materials, depreciation, chemicals, fees, and taxes, are much higher than personnel costs.

Unfortunately, reliable accounting records for many of these costs are often sparse, outdated (i.e., depreciation schedules), or not delineated sufficiently, making it difficult to trace to specific equipment, locations, or work processes. Therefore, engineering assumptions and estimates are often required. In addition, traditional accounting systems and their cost-center allocations may distort the true product and process costs. Resources are often attached to cost centers for better simplified management and budget control, instead of reflecting where the work is actually performed. As a result, product cost data residing in global accounting systems (e.g., SAP at CITGO) may not accurately reflect true product costs and may therefore lead to suboptimum business and pricing decisions.

The workforce and processes within a pipeline were separated into the same three elements as in a refinery: Operators, Maintenance, and Support/All Other. Some of the operators worked directly for the pipeline, while others worked in a centralized/consolidated control center. The control-center functions and personnel were analyzed in a separate ABM study to help identify additional process-improvement opportunities and to include all costs of operating the pipeline.

The initial Pipeline ABM study concentrated on product costing—determining the full and variable costs associated with delivering barrel volumes of product to numerous terminals along the pipeline. This initial costing analysis served as a baseline for comparison to previous product costs in the standard accounting system and for process-improvement discussions with the operators and maintenance staff. These discussions helped finalize ABC costs and quantified the specific pipeline segments and stations that were driving controllable costs higher, thus providing management a unique view which they had previously been unable to quantify.

ABC product-costing results also factored in tariff charges and were used to show the relative profitability of delivering product to various locations. Such data could then be used for future marketing and pricing analysis and other operating decisions. The chart (Exhibit 9) shows an example for a product pipeline along with a comparison of data available from the current accounting system.

Although product costing in the current accounting system reflected that all delivery points were profitable, some management and operations personnel inherently felt otherwise. By exposing some of the unprofitable segments, potential improvement opportunities such

Exhibit 9

Sample Product Costing—ABC versus Typical Accounting Costs

Pipeline Section	ABC Total Cost ¢/BBL	Accounting System Total Cost ¢/BBL	Tariff ¢/BBL	Profit ¢/BBL - ABC	Profit ¢/BBL - Acctg.	ABC - Variable Cost	Current System Variable Cost
A to B	3.90	4.10	10.4	6.50	6.30	0.0123	0.0396
B to C	8.01	5.80	10.4	2.39	4.60	0.0297	0.0411
B to D	17.00	10.30	13.5	-3.50	3.20	0.0412	0.0422
A to E	4.54	6.20	10.4	5.86	4.20	0.0198	0.0478
E to F	9.56	8.50	12.3	2.74	3.80	0.0355	0.0566
F to G	12.51	12.10	14.8	2.29	2.70	0.0399	0.0594
G to H	17.53	21.30	28.2	10.67	6.90	0.0436	0.0655
H to I	35.34	25.90	29.7	-5.64	3.80	0.0735	0.0721

All numbers used in Exhibit 9 are fictitious and for demonstration purposes only.

as proposed tariff changes, additional barrel throughput (if not capacity constrained), and the addition of automation could be considered and quantified for return-on-investment decisions. Although incremental costing is often used for business cases, true costs, both incremental and fixed, and projected returns must be understood to make well-informed business decisions.

The ABC product cost data was also used to help determine the costs associated with excess capacity—since variable costs in a pipeline are low compared with the fixed investment. Exhibit 10 shows an example of margin gains resulting from running at higher capacities, thus providing quantitative data for operational plans development, expanded marketing and pricing decisions, and/or the addition of drag-reducing agents (DRA).

The ABM Pipeline studies provided more accurate product costs and an improved understanding of the maintenance and operations activities on specific pipeline segments and stations. This allowed both improved marketing/pricing decisions and process-improvement implementations at the various pipeline offices. Lessons learned from this study included the following:

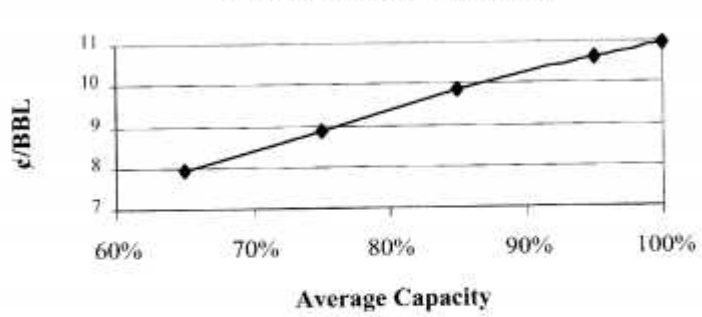
- A large percentage of costs (usually 65–70 percent) are beyond the control of the Pipeline operations group (e.g., depreciation, taxes and fees, etc.). Therefore, any savings or improvement programs should be based on the controllable budget and not total budget.
- Nonpersonnel resources, such as depreciation, can be traced either on actuals or estimated value per mile, or a combination of both.
- Correction factors based on engineering estimates must be used for segments with multiple or parallel lines.
- A concept was developed to trace specific resources based on barrel-miles (i.e., the number of barrels pumped over a certain distance) that appeared to be more accurate than using estimates of actual usage of some resources such as electricity.
- Process improvements and cost savings must include safety and environmental considerations.

Product Costing in a Lubricants Manufacturing Plant

Lubricants manufacturing plants are designed to blend and package a wide range of grease and oil fluid products. The complexity involved with producing large numbers of individual products (e.g., potentially thousands of SKUs (stock keeping units)) often tends to obscure the true costs and capacity of the plant. Thus, both headquarters personnel and plant management were concerned about a number of issues: What are the true costs of intermediate and finished products produced at the plant? Where should capital resources be applied to improve processes and maximize the return on investment? What is the true capacity and availability of the various production lines for increasing the slate of manufactured products?

An initial ABM analysis was performed in the warehouse and distribution areas. This lubes pilot demonstrated how certain customer types were driving up costs, often by an order of mag-

Exhibit 10



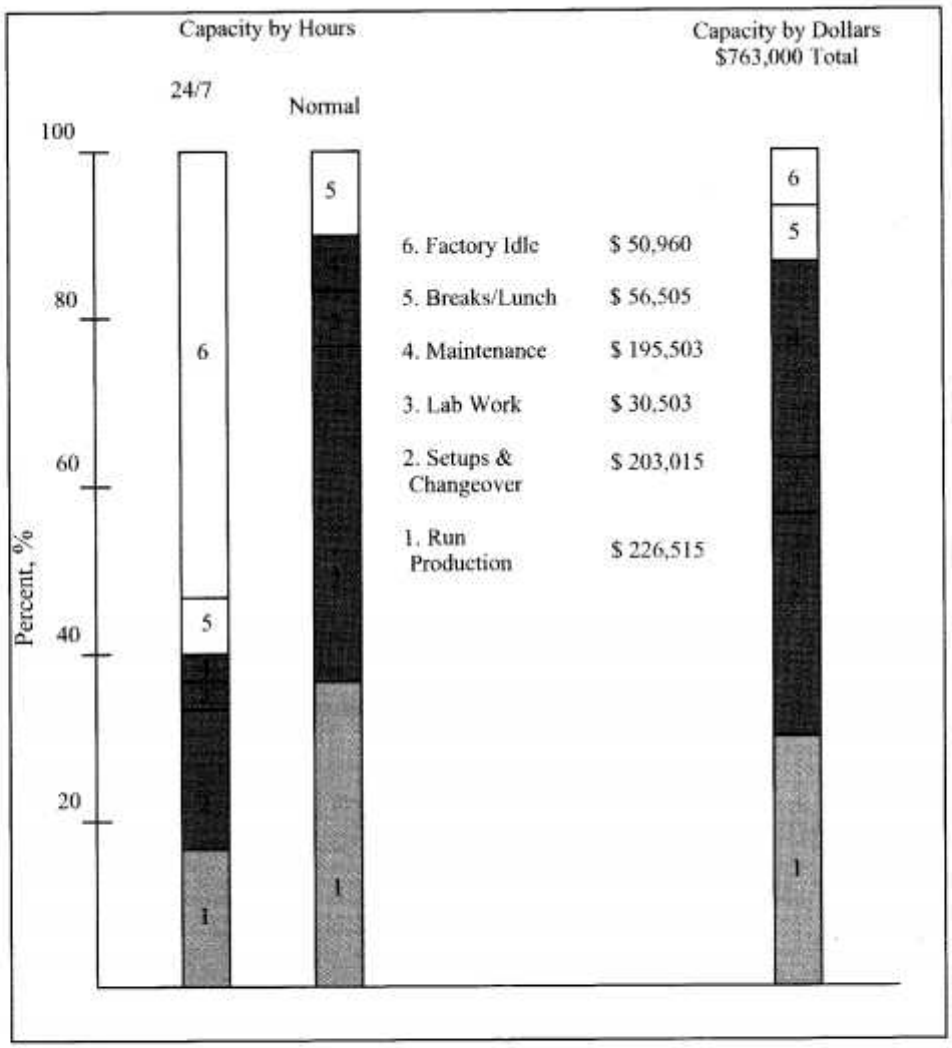
Cost numbers used in Exhibit 10 are fictitious and for demonstration purposes only.

nitude versus other customer types. The pilot results, which laid the groundwork for a plant-wide ABC product-costing study, provided quantitative data showing how some attempts to increase volume throughout the plant can actually decrease profitability. Such results were counterintuitive in the petroleum industry, where increased volume is typically associated with higher profitability. However, this is not necessarily the case with lubricants manufacturing.

One of the initiatives of the plant-wide ABC study was quantifying the capacity in the production lines using the CAM-I Capacity Model. This model works within the ABM framework to provide a view of how specific machinery or processes are being used. The model provides a unique view of capacity by identifying the costs and time required for processes in a format

Exhibit 11

Capacity Chart for Oil Packaging Production Line



All numbers used in Exhibit 11 are fictitious and used for demonstration purposes only.

useful to production and process management. The increased insight into how shift hours and resources are being employed allows improved decision making for balancing production, identifying available capacity, quantifying process upgrades, making capital investment decisions, and improving overall operations.

The CAM-I capacity model uses ABM techniques to identify true production run time, nonproductive time that interrupts production runs (e.g., changeovers, maintenance, waiting on lab results, waiting on products, etc.), and idle time (e.g., factory idle, waiting for orders, etc.). Production/plant managers are typically responsible for eliminating or reducing nonproductive time, while marketing and senior management personnel are responsible for filling idle time with new orders or initiatives. By quantifying both hours and dollars for each of these areas, management can evaluate their true working capacity as well as clarify the payoffs of new initiatives, capital investments, or business increases.

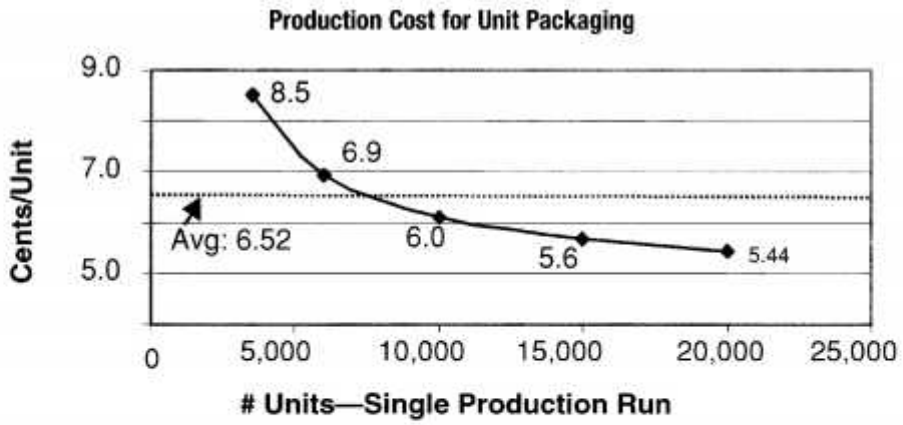
Exhibit 11 is an example of a capacity chart for an oil packaging production line. The capacity was analyzed both in terms of hours and dollars. The actual run-time of the production line (#1) was less than 20 percent of the total available capacity based on the standard 24/7 measure. When recalculated based on their typical operating hours, two shifts running five days per week, the actual run time is a little less than 40 percent. In terms of costs, only 30 percent of the total costs of the production line were associated with packaging runtime. Nonproductive time (e.g., #2, #3, and #4) or idle time (#5 and #6) consumed the remainder of the cost for the packaging line

In a single chart, management could begin to see their actual run capacity and could determine ways of increasing their capacity (i.e., eliminating the nonproductive time). In addition, decisions regarding quantitative return-on-investment trade-offs became much simpler. In this case, new capital equipment that could significantly reduce setup time and costs would pay for itself quickly, particularly since it would also reduce required maintenance.

A number of analyses were run showing the potential payoff for various capacity increases or process-improvement initiatives for the production line. Exhibit 12 shows packaging costs for a single production line run. Exhibit 13 shows the cost-per-unit reduction percentage possible with either process improvement alone, or with both production increases and process improvement.

Through ABM and capacity analysis, management was not only able to determine the utilization of their equipment and processes, but also the bottom-line impact of process improvement on product costs. Thus, with this single technique, production and marketing managers could begin identifying cost drivers to reduce production costs, improve their product marketing and sourcing decisions, optimize shifts, prioritize improvement programs and capital spending,

Exhibit 12



All costs shown in Exhibit 12 are for demonstration purposes only.

Exhibit 13

Cost-per-Unit Reduction Percentage

Same Production Total Process Improvement Only	17% Decrease in Total Cost	17% Decrease in Unit Cost
33% Production Increase	Same Total Cost	25% Decrease in Unit Cost
Yearly Production	Total Cost	Avg. Cost per Unit

and evaluate the effects of new business initiatives.

SUMMARY

Having implemented ABM in many diverse Shared Service departments and operational business units, a number of conclusions were reached:

- ABM is an excellent "one-stop shop" for implementing a variety of performance improvement goals and other management initiatives. These include everything from service level agreements and product costing through outsourcing feasibility studies and process improvement. ABM excels because it quantifies activity and process costs, root causes, and return-on-investment options. Going through the ABM process exposes strengths and weaknesses that may otherwise go undetected. Understanding and improving activities is at the heart of most management improvement initiatives.
- A voluntary approach to implementation can be extremely effective. Managers who request a study are characteristically motivated to make use of the results. They can expect that even a conservative recovery of only 25–35 percent of identified NVA dollars can capture a ten-to-one return on the cost of conducting an ABM study. It should be noted, however, that a voluntary approach in the absence of "top-down" directives may yield sporadic and inconsistent results depending on the individual manager. Therefore, accountability must be incorporated in the change management process.
- Approaching ABM by departments, rather than total process, can be key to developing process improvement since most organizations and cost centers are organized by departments. This empowers department managers to make internal changes versus forcing coordination across multiple departments and "silos," which can stall or defeat some improvement initiatives. Other steps must follow that address optimization of company-wide processes.
- The ABM-by-department approach will expose "snake trails"—areas where the root causes of NVA work reside in another department. These snake trails form a target of opportunity for greater savings. Process-wide efforts are needed across multiple departments to capture additional cost savings and ensure that individual process improvements of departments are not suboptimized. This requires developing process owners to defeat the silo effect. Fortunately, objective ABM study results can be a less threatening tool to use when working across departments. The association of resource dollars related to a problematic process is supported by real data; therefore, it casts light upon opportunities for improvement, rather than assessing "blame" for faulty performance.
- ABM should be implemented with substantial participation by department employees and others involved in the actual work processes. Workshop approaches facilitate employee buy-in and improve chances for successfully implementing change recommendations.

- With the trend toward integrated financial management software solutions such as SAP, organizations are now seeing more product and unit cost data. This data may be suspect in terms of accurately representing true product costs. In some cases product costing is based upon financial-accounting–based "cost-center distributions," which may not accurately reflect production cost linkages (correct allocations to reflect manufacturing or processing costs).
- Most organizations have been through numerous downsizing and reengineering exercises. ABM, by providing a new view of the organization, may uncover "slow, fat rabbits"—those areas and activities that are relatively easy to eliminate. However, in most cases the work of process improvement resembles the "death by one thousand cuts"—multiple NVA improvement opportunities exposed in many diverse activities. When examining numerous departments, these small opportunities can add up quickly to the six and seven figure range.
- Sustainable ABM efforts are built one group and one success at a time. Let the word spread of this "common sense approach" to performance improvement. Success breeds success because managers begin to see ABM as a reliable and realistic method to improve performance.

THE NEXT STEP: STRATEGIC PROCESS OPTIMIZATION

CITGO's initial ABM project design, while effective, has recognizable limitations. The critical decision, as noted earlier, to approach each study on a voluntary departmental basis versus a process approach does little to make process linkage breakdowns across departments easier to resolve without a follow-up effort. Although CITGO's initial ABC/M approach allows optimization of an individual group's performance, the organization-wide solution may remain suboptimized due to the lack of understanding, priority, or interest of a linked group. Of course, it is recognized that even limited improvements are still better than no improvements. A pilot to address the broader optimization needs of the company is currently underway at CITGO. This approach is referred to as Strategic Process Optimization (SPO). An outline of the process is shown in Exhibit 14.

Exhibit 15 illustrates a comparison of basic ABM

Exhibit 14

Work Flow Plan for Strategic Process Optimization

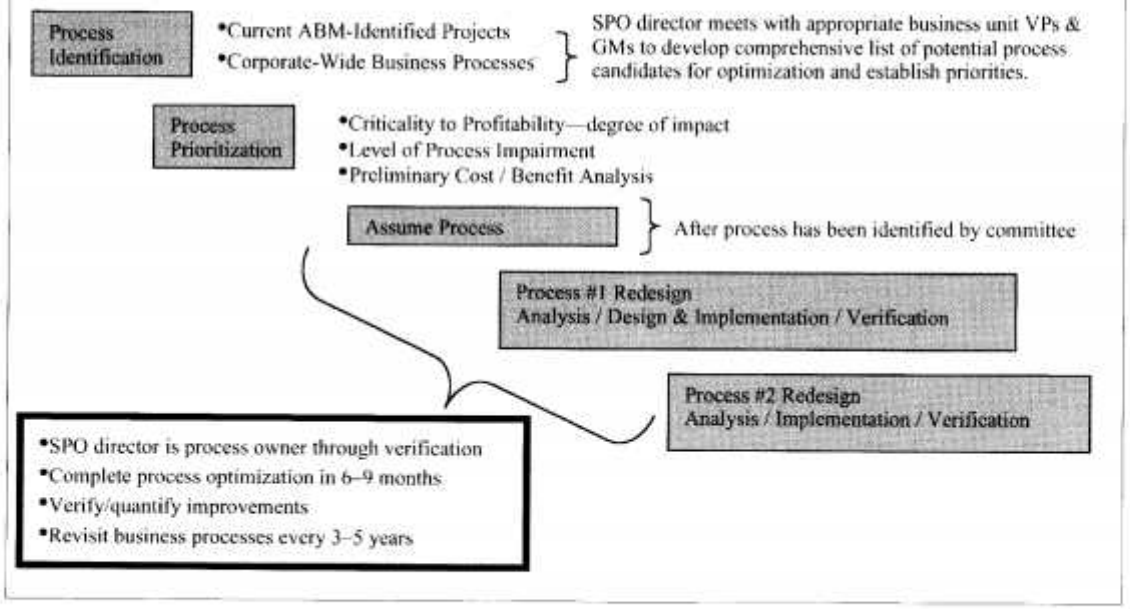


Exhibit 15

Comparison of Basic ABM versus SPO

	ABM	SPO
Time Frame	3 Weeks	6–9 Months
Analysis	Department-Based	Multi-Department Process-Based
Team Size	1–2	3–5
Implementation Success	<50% with Volunteer Approach	>90% with Dedicated Team
Process Improvement	Department Solutions Optimized Total Process Suboptimized	Total Process Optimized
Special Projects	Limited Duration Tactical	Ongoing Management Continuous Improvement Strategic Planning

versus SPO. The key differences address the time required to address the challenges of cross-functional process optimization (i.e., organizational priorities, resource constraints, and systematic implementation of an optimized business solution across an organization).

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