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**USING ACTIVITY-BASED COSTING TO IMPROVE
PERFORMANCE: A CASE STUDY REPORT**

by

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Abstract

The ongoing Department of Defense (DOD) downsizing and reorganization programs have had a significant impact on defense capabilities and resources. Declining defense resources, in particular, are providing significant incentives to improve the management of all costs in the DOD. To improve cost management, the DOD has identified activity-based costing (ABC) and activity-based management (ABM) for defense-wide implementation. ABC is a methodology that measures the cost and performance of activities, resources, and cost objects such as products and services to provide more accurate cost information for managerial decision making. Activity-based management (ABM) complements ABC by using it in the analyses of processes to identify inefficiencies and non-value added activities for process improvement.

Although various public and private organizations have implemented ABC, little is known about how military organizations have used ABC information. The purpose of this research is to examine and analyze the experiences of three military organizations to gain insights into how they use ABC information to improve performance. Although the ABC models provided some insights into possible areas for improvement, the results show little evidence that the organizations consistently used the models and acted on the ABC information to improve performance. The failure stems largely from a lack of preparation necessary to effectively use the models to initiate performance improvements. The study offers several recommendations to improve ABC acceptance and use by military organizations.

Part 1

Introduction

The ongoing Department of Defense (DOD) downsizing and reorganization programs have had a significant impact on defense capability. Since 1990, these programs have reduced total DOD manpower by over one million personnel and total obligation authority by over \$100 billion (in constant fiscal year 2000 dollars).¹ These declining defense resources are providing significant incentives to improve the management of all costs in the DOD. As a result, the DOD has identified Activity-Based Costing and Management for defense-wide implementation to improve cost management.²

Activity-based Costing (ABC) is a methodology that produces a bill of activities for cost objects such as individual products, services, or customers by measuring the cost and performance of activities and resources. It provides more accurate cost information than traditional cost accounting systems by recognizing the causal relationships among resources, activities, and cost objects. Activity-Based Management (ABM) complements ABC by using it in the analyses of processes to identify inefficiencies and non-value added activities, and thus allowing one to discern opportunities for cost reduction or profit enhancement. It deals with effectively managing activities to yield continuous improvement by answering “why” and “how well” activities are adding value to products and services. The goals of ABM are to improve the value received by customers and to improve performance.

The DOD guidance highlights the need to pursue ABC on a department-wide basis, and directs all military departments and defense agencies to develop individual implementation plans. Moreover, it stresses the necessity to aggressively implement ABC at military maintenance depots and everywhere else it could be expected to provide improved cost management. Although various public and private organizations have implemented ABC, little is known about how military organizations have used ABC information.

The purpose of this research is to examine and analyze the experiences of three military organizations participating in an ABC project to gain insights into how they use ABC information to improve processes and performance. I used a qualitative case study research design to determine the extent to which military organizations use ABC information to make improved management decisions. The scope of the study includes both the model developer and user perspectives. Although qualitative case study research is useful for an in-depth analysis to understand processes or situations in context, the narrow focus on a few units of analysis limits the generalizability of the results.

The remainder of this document is organized into four chapters. The next chapter reviews the literature of ABC and ABM and presents the major reasons why organizations use the techniques. Chapter three presents the qualitative case study design and data collection methodology. Chapter four discusses the research findings. The final chapter presents several conclusions and provides recommendations for future research.

Notes

¹ Department of Defense, *National Defense Budget Estimates for FY 2000* (Washington, D.C.: Office of the Under Secretary of Defense (Comptroller), March 1999).

² J. S. Gansler, Undersecretary of Defense - Acquisition and Technology, Department of Defense, memorandum to Secretaries of Military Departments, Chairman of the Joint Chiefs of Staff, Undersecretaries of Defense, Director - Defense Research and Engineering, Assistant

Notes

Secretaries of Defense, Director - Operational Test and Evaluation, Directors - Defense Agencies, subject: Defense-wide Implementation of ABM, 9 July 1999.

Part 2

A Review of the Literature

Activity-based costing shows - or at least attempts to show - the impact of changes in the costs and yields of every activity on the results of the whole.

— Peter F. Drucker

This chapter begins with a discussion of ABC that describes the cost assignment and process views of ABC. The following section presents ABM and discusses how organizations use it in conjunction with ABC. The final section examines the major reasons why organizations use ABC and ABM.

Activity-Based Costing

ABC is a methodology that measures the cost and performance of activities, resources, and cost objects to provide more accurate cost information for managerial decision making.¹ ABC is not an accounting exercise, but rather a methodology that produces a bill of activities that describes the cost buildup for individual products, services, or customers.² By recognizing the causal relationships among resources, activities, and cost objects such as products or customers, ABC allows one to identify inefficient or unnecessary activities and opportunities for cost reduction or profit enhancement.

As shown in Figure 1, there are two views of ABC: a cost assignment view and a process view.³ The cost assignment view assigns costs to the significant activities of an organization.

Activities are then assigned to a cost object that uses the activities such as a product or customer. The process view provides operational intelligence about the processes of an organization. A process is a series of activities that are linked together to achieve an objective. The process view provides information about cost drivers and performance measures for each activity or series of activities in a process.

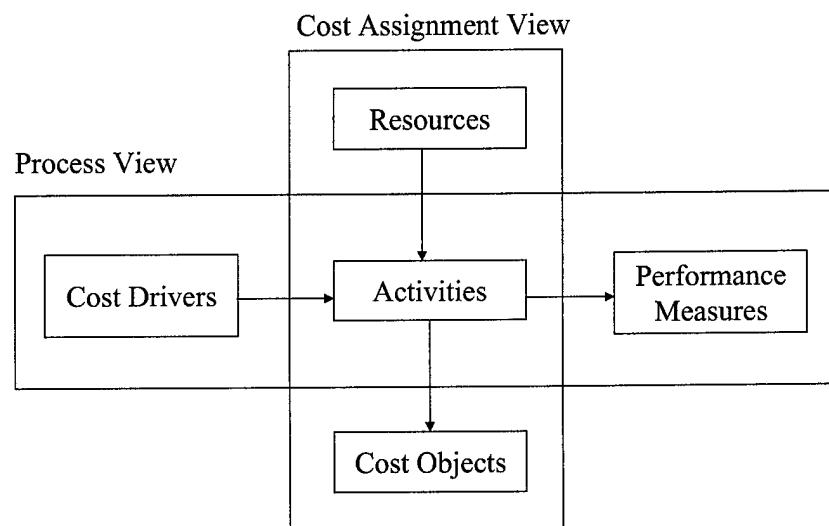


Figure 1. The ABC Model (Turney 1991: 81)

The cost assignment view is comprised of three building blocks: resources, activities, and cost objects (Figure 1). Resources are economic elements that are the sources of cost. In a logistics operation, resources can include direct labor, direct material, and indirect costs (e.g., overhead and management salaries). Activities are the processes or procedures that produce work. Logistics activities, for example, can include transportation, distribution, warehousing, order processing, and customer service. Since activities use resources, they are connected to activities via resource drivers that approximate the use of resources by activities (e.g., square

footage, percent of effort, etc.). Each resource that is traced to an activity becomes a cost element in an activity cost pool that measures the total cost associated with an activity. This provides a better understanding of why resources are used. The information provided can help identify which activities consume the most resources and where cost reduction opportunities may exist.

The next step after assigning resources to activities is to trace the activities to cost objects. A cost object is typically a product, product line, or customer, so it is the reason why work is performed. Activity drivers measure the use of activities by the cost object, thus linking activities to cost objects. The total cost of the cost object is the sum of all the activity costs used by the cost object. This process provides economic information to help in analyzing decisions such as pricing, product mix, sourcing, product design, and improvement efforts.

As shown in Figure 1, three main building blocks comprise the process view: cost drivers, activities, and performance. Cost drivers determine why and how much work is required to perform an activity or a chain of activities. A customer order, for example, initiates the order processing chain of activities -- the "why". The size of the customer order determines how much work is required -- the "effort". Cost drivers include both internal factors related to a specific activity and factors related to prior activities. Each activity in a series is a customer of a prior activity. Activities work together in an internal customer chain to provide value to the external customer.

Cost drivers are important because they reveal opportunities for improvement. A defect part received from a supplier, for example, will require correction activity to correct the problem, thereby expending more effort and resources. A quality certification program could help reduce a supplier's defect rate and thus reduce total costs of both the buyer and supplier.

Performance measures identify how well an activity is performed. Typical performance measures include activity efficiency, time required to complete an activity, and quality of work. Generally, the longer it takes to perform an activity, the greater the resources used and overall costs. Likewise, poor quality usually results in the use of more resources (e.g., scrap and rework in manufacturing organizations) and higher overall costs. The objective is to use this information to help improve performance and increase the value of products and services.

Activity-Based Management

Gaining more accurate cost information through ABC is only half the battle.⁴ The key is to use the information to make improvements. ABM complements ABC by using ABC information in the analyses of processes to identify inefficiencies and non-value added activities. It deals with effectively managing activities to yield continuous improvement by answering “why” and “how well” activities are adding value to products and services.⁵

The goals of ABM are to improve the value received by customers and to improve profits by providing this value.⁶ Turney recommends a three-step approach. First, analyze processes to identify nonvalue added or nonessential activities for possible elimination. This step entails comparing activities to best practices to determine the scope of improvement and examining the links between activities in a process to minimize time and duplication. The second step involves identifying and eliminating cost drivers that create waste through nonessential or inefficient activities. Finally, measure activity performance that contributes to the organization’s mission and success. These steps help guide strategic decisions and determine overall effectiveness. ABM can identify how to reduce cost by employing techniques such as decreasing time and effort, eliminating unnecessary activities, selecting low cost activities, sharing activities, and redeploying unused resources.

For many reasons, organizations sometimes fail to use the information provided by their ABC models. A study by Cooper et al. examined eight diverse companies and found that most of them had not acted on the ABC information.⁷ The authors suggest that these delays stem partly from inadequate preparation to make changes. ABC information, by itself, does not produce change. The key is to translate the information into action. This requires a conscious process of organizational change and implementation. The authors found that the most successful ABC projects have sponsors or project managers who are authorized to make changes.

Reasons to Use ABC and ABM

Given that organizations typically make few decisions without analyzing costs in some way, accurate cost information is vital to the success of most organizations.⁸ The types of products that are sold, where they are sold, and how they are designed and manufactured are typical decisions that require the analysis of costs. By using incorrect cost information, however, organizations can make wrong decisions and hinder performance and competitiveness. Unfortunately, traditional cost systems that apportion overhead costs of indirect activities based on direct costs such as material and labor can yield incorrect information.⁹ The main problem is that traditional cost systems allocate overhead costs of indirect activities based on convention, rather than on how costs are actually generated.¹⁰ Consequently, the costs of products and services do not represent the demands made by each product or service on the organization's resources.

When overhead costs of indirect activities were a small percentage of the total direct costs, traditional cost systems were adequate.¹¹ Today, however, these traditional cost systems are not in step with the internal and external business environment. For instance, the trend toward automation and the displacement of the direct labor force by "knowledge" workers decreases the

proportion of direct labor costs, thereby increasing the overhead costs of indirect activities. For some organizations, overhead is the major source of costs. Under such conditions, traditional cost systems that apportion overhead costs of indirect activities based on a decreasing proportion of direct labor costs can distort cost information.

The fundamental problem is that traditional cost systems assign costs directly to the products or services, so there is no information about the activities. Costs are usually compartmentalized into departments even though many processes and activities overlap across departments. Excessive output, functional myopia, and misdirected effort are some of the problems partly attributable to traditional cost systems. Consequently, traditional cost systems can actually hide problems and fail to identify improvement opportunities.

In contrast, ABC provides more accurate cost information by assigning costs to the activities that generate the costs, and then assigning the costs from the activities to the products or services. Unlike traditional cost systems, ABC assumes that activities cause cost, not products or services (i.e., products and services merely create demand for activities). By knowing what activities cost, organizations can identify activities that have the greatest potential for cost reduction. This more accurate cost information allows organizations to make improvements such as eliminating waste from overhead activities that are inefficient or nonessential.

Although beneficial to many organizations, ABC often takes more time to implement than expected and may actually fail in some cases. Krumwiede (1998) found that ABC implementations can be difficult and may take several years before some organizations can reach the usage stage.¹² Landry, Wood, and Lindquist (1997) identified many factors that can cause some implementations to fail such as too many cost drivers, lack of follow-through, too much emphasis on consensus, and improper administration.¹³ Finally, Palmer and Vied (1998) found

that some organizations encounter difficulties integrating ABC with reporting and performance measurement systems.¹⁴

Notes

¹ B. B. Turney, "What an ABC Model Looks Like," *Journal of Cost Management* 5, no. 4 (Winter 1992): 54.

² Robert S. Kaplan, "In Defense of Activity-Based Cost Management," *Management Accounting* 74, no. 5 (November 1992): 58.

³ Peter B. B. Turney, *Common Cents: The ABC Performance Breakthrough* (Hillsboro: Cost Technology, 1991), 20.

⁴ Peter B. B. Turney, "Activity-Based Management: ABM Puts ABC Information to Work," *Management Accounting* (January 1992): 20.

⁵ Ted R. Compton, "Using Activity-Based Costing in Your Organization - Part 1," *Journal of Systems Management* 45, no. 3 (March 1994): 33.

⁶ Peter B. B. Turney, "Activity-Based Management: ABM Puts ABC Information to Work," 20-21.

⁷ Robin Cooper et al., "From ABC to ABM: Does Activity-Based Management Automatically Follow From an Activity-Based Costing Project," *Management Accounting* 74, no. 5 (November 1992): 57.

⁸ Peter F. Drucker, "The Information Executives Really Need," *Harvard Business Review* 73, no. 1 (January-February 1995): 54.

⁹ Lisa M. Ellram, "Activity-Based Costing and Total Cost of Ownership: A Critical Linkage," *Journal of Cost Management* 8, issue 4, (Winter 1995): 22.

¹⁰ Ted R. Compton, 32.

¹¹ Peter B. B. Turney, *Common Cents: The ABC Performance Breakthrough*, 20.

¹² Kip R. Krumwiede, "ABC, Why It's Tried and How It Succeeds," *Management Accounting* (April 1998): 32.

¹³ Steven P. Landry, Larry M. Wood, and Tim M. Lindquist, "Can ABC Bring Mixed Results?," *Management Accounting* (March 1997): 29-30.

¹⁴ Richard J. Palmer and Michael Vied, "Could ABC Threaten the Survival of Your Company?," *Management Accounting* (November 1998): 33.

Part 3

Methodology

This two-part chapter provides a discussion of the methodology used in this research. It begins by describing the advantages, limitations, and sampling selection of the qualitative case study design. The second part describes the data collection methodology.

Qualitative Case Study Design

I used a qualitative case study design to determine how three military organizations used ABC information to improve processes and performance. Qualitative case study research is defined as an “intensive, holistic description and analysis of a single entity, phenomenon, or social unit.”¹ It is useful for an in-depth analysis of problems to understand processes or situations in context.² Compared to survey research, case study research seeks holistic description and explanation by examining a small number of units over a large number of variables and conditions.³ Because it is intensive, it provides insights into the variables, processes, and interactions that merit further attention. The inductive and descriptive aspects of case studies make them the ideal choice for insight, discovery, and interpretation rather than hypothesis testing.⁴ Case study results, however, can lead to the development of abstractions, concepts, hypotheses, and theories for future research.

Despite its advantages, case study research does have several limitations. Foremost, the narrow focus on one or a few units of analysis does not allow generalizations to the population

from which the units came⁵. Generalizability refers to the ability to extend the results of a study to other persons or situations.⁶ Many qualitative researchers reject the concept of generalization.⁷ As noted earlier, one selects a case study approach to gain an in-depth understanding of processes or situations in context, not because one wants to know what is generally true of a population.⁸ Before generalizing case study results to a population, one must accomplish follow-on research utilizing valid sampling techniques to test specific hypotheses derived from the results of the initial case study. A second limitation is that case study research is vulnerable to subjective biases since the researcher is the primary instrument for data collection and analysis. A researcher's subjective interpretation determines the inclusion, importance, contextual placement, and completeness of the data.

In qualitative research, sampling is usually purposeful rather than random.⁹ Since one uses purposeful sampling to select information-rich cases for in-depth study, I used it to select the organizations under study. The criterion was simply that the organizations had used their ABC models. Many of the ABC projects in the DOD are still in the early stages of development. For instance, the Air Force Materiel Command (AFMC) currently has thirteen projects in various stages of development that address a wide range of organizational functions such as video teleconferencing, legal services, civil engineering, aircraft maintenance, and base communications.¹⁰ I selected one ABC project at a military installation in which organizations had implemented and used ABC models. The project entailed developing ABC models for 29 organizations, but only five organizations had received models to date. Of the five organizations, two had not used their models, thus leaving three organizations for analysis.

Data Collection

Unlike other forms of research, case study research does not rely on any particular data collection method. One can employ any or all methods to gather data, although certain methods such as interviews are more popular.¹¹ I used the general interview guide approach to collect the data. This approach entails having an outline of topics to be discussed during the interview, but the order of topics is not set and the interviewer does not formulate the questions beforehand.¹² The outline is a guide to ensure that the researcher covers all the topics for each participant (Appendix). Questions are generated spontaneously, but are within the specific topics. The main disadvantage of this approach is that it is not as free flowing as the informal conversational interview, thus limiting the scope of topics covered compared to that of the informal conversational interview.

Since qualitative investigation is vulnerable to subjective interpretation, the triangulation of multiple sources of information is a method one can use to attain valid and reliable information.¹³ Triangulation of data sources refers to validating information from one source by comparing it to information gathered from another source. To evaluate data validity and reliability, I compared information collected from the model developers and users and various reports produced by the ABC models. Despite providing different perspectives, the model developers and users generally expressed similar views about how organizations used ABC information.

The main topic investigated in this research focused on how organizations use ABC information to improve performance. After reviewing the literature, I selected three main topic areas to cover during the interviews: activity and process analysis, product and customer analysis, and performance measures/cost driver analysis. The activity and process analysis involves allocating resources such as salaries, supplies, facilities, and overhead costs from

functional categories and departments to show how they relate to activities and processes. Typically, the analysis reveals for the first time the cost of activities. Organizations can use the information to help make decisions about activities such as outsourcing, elimination, or efficiency improvement.

The product and customer analysis involves allocating process-based costs to specific products, customers, services, or other cost objects. The analysis produces a bill of activity costs that should enable managers to see the costs of activities for each cost object. It can show which products or services are the most or least costly as well as those that are at or near the same cost. Typically, the analysis shows how low volume and/or complex products or services are more expensive to produce. The information can help managers make improvement changes in product or service scheduling, design, and mix. In addition, managers can use the information to take action to rationalize products, services, or customers to reduce complexity and reduce costs.

The final area covers both performance measures and cost driver analysis. Performance measures identify how well work is performed. Typical performance measures include activity efficiency, time required to complete an activity, and quality of work. Cost driver analysis entails identifying and measuring cost drivers that determine why work is performed.

Notes

¹ Sharan B. Merriam, *Case Study Research in Education* (San Francisco: Jossey-Bass Publishers, 1988), 16.

² Ronald C. Martella, Ronald Nelson, and Nancy E. Marchand-Martella, *Research Methods: Learning to Become a Critical Research Consumer* (Boston: Allyn and Bacon, 1999), 282.

³ Stephen Isaac and William B. Michael, *Handbook in Research and Evaluation* (San Diego: EdITS Publishers, 1981), 48.

⁴ Merriam, 10.

⁵ Isaac and Michael, 48.

⁶ Martella, Nelson, and Marchand-Martella, 272.

⁷ Martella, Nelson, and Marchand-Martella, 272.

⁸ Merriam, 173.

⁹ Martella, Nelson, and Marchand-Martella, 272.

Notes

¹⁰ "Current ABC Efforts Within AFMC," n.p.; on-line, Internet, 18 November 1999, available from <http://www.afmc-mil.wpafb.af.mil/organizations/HQ-AFMC/XP/XPM/xpms/abc/studies.html>.

¹¹ Merriam, 10.

¹² Martella, Nelson, and Marchand-Martella, 289.

¹³ Martella, Nelson, and Marchand-Martella, 266.

Part 4

Results and Discussion

This chapter presents and discusses the research findings. It begins by describing the model development approach and the three organizations analyzed in this research. The next section discusses the results of the activity and process analysis, product and customer analysis, and performance measures and cost driver analysis. The final section is a general discussion of the findings.

Model Development

After initially using ABC contractors in a limited role, the project sponsors created an in-house ABC team, hereafter referred to as the model developers, to develop ABC models for 29 organizations of a military installation. The developers began building models in the fall of 1998 and delivered their first model in November 1998. As of December 1999, the developers had built 5 models and planned to build 24 additional models. To complete all the models as quickly as possible, the developers used first quarter, fiscal year 1999 data as a baseline for all the models. Although the data were relatively outdated, it allowed the developers to focus strictly on developing new models since the tasks involved in updating and maintaining the models would have diverted their efforts. Once the developers completed all the models, they planned to then focus their efforts on updating and maintaining them.

The development team consisted of a project leader and four other full-time team members. The project leader and three other team members had aircraft maintenance backgrounds in various fields such as avionics and hydraulics. The remaining team member was an information technology specialist. Although the team was effective, the project leader expressed the need for more information technology team members as well as financial management representation. Manpower costs were approximately \$500,000. The project expended an additional \$16,500 for Business Process Re-engineering (BPR) training (approximately \$3,300 per team member).

The developers used OROS, a PC-based ABC system developed by ABC Technologies, Inc. The system cost approximately \$12,000 in addition to a yearly maintenance and update fee of about \$7,500. The developers manually entered resource, resource driver, activity, activity driver, and cost driver data collected from existing databases, interviews, and questionnaires. They designed the models to operate concurrently with existing financial and budgeting systems, so the models were not meant to replace these systems.

Of the five organizations that had received ABC models, two had not used their models, thus leaving three organizations for analysis. The mission of each organization is briefly discussed in the following sections.

Organization A

Organization A operates three major ground test facilities. One provides harsh climatic environments for full scale aircraft up to and including cargo and transport aircraft. A second facility simulates electromagnetic environments to test the integration of weapons with aircraft. A third facility simulates weapon system guidance systems in a virtual environment to allow the division to “fly” the weapons in a virtual environment. Finally, the organization operates a significant measurement capability including both airborne and ground-based infrared and

millimeter wave measurement systems to characterize targets and capture signatures for target recognition and tracking algorithms.

Organization B

Organization B manages and accomplishes test and evaluation for weapon systems with emphasis on air armament, weapon avionics interface, and smart munitions. The organization plans, programs, conducts, analyzes, and reports on tests of smart weapon systems, air-to-air missiles, launchers, weapons avionics system integration, navigation systems, and guided weapons. Other test systems include countermeasures, reconnaissance, surveillance, and target acquisition systems that are used to engage and defeat ground mobile vehicles and fixed facility targets. The organization supports model and simulation development and validation by conducting tests and analyses in areas of seeker/sensor performance, multispectral signatures, target detection in background clutter, warhead lethality, target vulnerability, ballistics, live fire, battle damage assessment, terminal effects, lethality, warhead characterization, fuses, guns, ammunition, and effectiveness analysis.

Organization C

Organization C provides aircraft, engine, conventional munitions maintenance, modification manufacturing, and equipment calibration to support air armament testing missions. The organization accomplishes on-equipment maintenance of aircraft systems including conventional avionics, fuel, aircraft and structural repair, and egress. In addition, the organization accomplishes off-equipment maintenance of aircraft systems including electro-environmental, avionics, propulsion, accessories, and associated equipment. Further, the organization provides maintenance production of aerospace ground equipment, aircraft maintenance modifications,

fabrication, munitions maintenance, and armament systems maintenance. Finally, the organization provides equipment calibration support for 420 regional customers.

Activity and Process Analysis

The activity and process analysis involves allocating resource costs from functional categories and departments to show how they relate to activities and processes. Typically, the analysis reveals for the first time the cost of activities. By analyzing activities and processes, organizations can identify nonvalue added or nonessential activities for possible elimination, compare activities to “best practices” to determine the scope of improvement, and examine the links between activities in a process to minimize time and duplication. Organizations often use the information gained from activity and process analysis to help make outsourcing, elimination, or efficiency improvement decisions.

In all cases, the process of allocating resource costs to activities revealed for the first time the cost of activities. The extent to which some activities consumed resources surprised most of the organizations. Level of effort was the most widely used resource driver; in other words, each organization allocated labor resources to activities based on the level or percentage of effort. Organizations A and B focused solely on labor resources and level of effort resource drivers since there were no other resources such as facility or overhead costs to allocate.

Using resource drivers, each organization allocated resources to a wide range of activities. Organization C, for example, divided activities into three broad categories: mission, indirect, and overhead. Mission activities included activities performed for a customer that made the customer successful. Indirect activities such as training and attending hospital appointments were actions performed that did not directly make a customer successful. Finally, overhead activities included support and command agency activities. In addition, the models typically

consisted of a large number of activities. For instance, the model used by organization A consisted of approximately 40 activities.

Both the model developers and users understood the necessity to analyze activities that consumed more resources than what were anticipated. The organizations were responsible for the analysis since the model developers did not have the knowledge or background to determine whether or not particular activities were consuming inordinate amounts of resources. Although all three organizations successfully allocated resource costs to activities, only one analyzed the information to help improve the efficiency of its activities.

Organization A found that reading email messages consumed relatively large amounts of labor compared to other activities. By investigating the relationships among the activity, cost drivers, and resources, the organization found that double-forwarding and distribution list redundancy contributed to an excessive amount of time spent reading email messages. To reduce the cost of this activity, management initiated actions to reduce email traffic such as eliminating or culling distribution lists and restraining the practice of double-forwarding.

In addition to reading email messages, general administrative work such as accomplishing activity reports and time cards consumed relatively large amounts of labor resources as well. The organization identified opportunities for efficiency improvements in general administrative tasks, although it represented only a small amount of the total effort (approximately three to four percent). Presently, the organization had not yet taken any actions to improve the efficiency of this process.

Product and Customer Analysis

The process of allocating activity-based costs to specific products, customers, services, or other cost objects produces a bill of activity costs that enable managers to see the costs of

activities for each cost object. Organizations typically find that low volume and/or complex products or services are more expensive to produce. The information can help managers make improvement changes and take action to rationalize products, services, or customers to reduce complexity and reduce costs.

In all cases, the analyses revealed the cost of each cost object. The organizations used various types of cost objects. Organization C, for instance, used products and services as costs objects that included products such as aircraft, engines, and serviceable parts as well as services such as munitions support, aircrew support, equipment calibration, and aerospace ground equipment support.

Overall, the analyses did show that some products and services were expensive to produce, but the information did not drive any improvement changes or cost savings. For example, organization B worked on unique test programs that used varying levels of activities. Approximately 70 percent of the time, the organization performed tasks to plan new munitions test programs, whereas the remainder of the time involved repetitive administrative tasks. Because each program was different, it was difficult to determine where changes could be made to initiate improvements. A particular program could require more time in attending meetings due to the complexity of the planning process, thus the level of resources expended in attending meetings may be higher compared to that of less complex programs. The fact that a particular program consumed more resources did not necessarily indicate a problem or an opportunity for cost saving. Although the organization could measure costs and identify how resources were used, they could not judge where to make improvements or cost savings at the cost object level. Consequently, the organization focused more intently on identifying improvements in the

relationships among cost drivers, activities, and resources rather than how cost objects used activities.

In a similar situation, organization C found that some aircraft and aircraft engines were expensive to maintain, but the organization could not use the information to rationalize products or services. For instance, the ABC model showed that the A-10 aircraft was three times more costly to maintain than the F-16 aircraft. Since the A-10 has a unique role in supporting the flying mission, the organization could not eliminate the A-10 or substitute the F-16 in its place to reduce costs. Similarly, the model revealed that the F-15 was more expensive per aircraft to maintain than the F-16, but the organization could not unilaterally eliminate the F-15 for the same reason.

For some cost objects, the model validated anticipated cost differences. Organization C anticipated that Pratt and Whitney F-16 engines were more costly to maintain than similar General Electric F-16 engines because Pratt and Whitney allows the organization to repair its engines. The ABC model showed that General Electric engines were cheaper to maintain since the model allocated only the cost of shipping and handling activities necessary to transport the engines to a General Electric authorized repair facility. Maintenance funds for General Electric engine repair came from a different funding source, thus the ABC model could not account for them. In comparison, the model allocated the resource-intensive maintenance activities to the Pratt and Whitney engines, so they appeared to be more expensive to maintain. Again, despite showing cost differences, the organization could not use the ABC information to make changes. The organization did not have the authority to replace all Pratt and Whitney engines with less maintenance expensive General Electric engines.

Performance Measures and Cost Driver Analysis

Performance measures identify how well work is performed, whereas cost driver analysis entails identifying and measuring cost drivers that determine why work is performed. The analysis reveals cost drivers that create waste through nonessential or inefficient activities. By measuring activity performance, an organization can identify how well activities contribute to the organization's mission and success. These analyses help guide strategic decisions and determine overall effectiveness.

Of the three organizations, only organization B used a performance measure, albeit an informal one, to ascertain ineffective activities. In the example noted earlier of the excessive amount of effort devoted to reading redundant email messages and accomplishing administrative tasks, the organization had an informal awareness of the appropriate consumption of resources by activities. Consequently, the organization could identify activities that consumed excessive resources. Furthermore, the organization analyzed cost drivers to determine the cause of the excessive resource consumption. No other organization conducted a cost driver analysis or identified activity performance measures.

Discussion

The results show little evidence that the organizations consistently used the models and acted on the ABC information to improve performance. The organizations, including the two organizations that declined to use the models, were skeptical of basing management decisions on ABC information for several reasons. First, the biggest problem reported by all the model users was the lack of updated cost data. As noted earlier, the project called for developing 29 models as quickly as possible, so the developers based all the models on first quarter, fiscal year 1999 cost data to reduce the time it would take to deliver models. Since most of the organizations

could access timely financial information through existing financial systems, they were reluctant to use ABC models based on relatively outdated cost data. Although most of the organizations understood and appreciated that ABC models provided new process improvement insights that existing financial systems could not reveal, the idea of basing management decisions on outdated cost data was totally unacceptable.

Organization A reported that it tracked monthly cost data, so it did not see the utility of using an outdated ABC model, despite the fact that the model revealed opportunities for improvement. Consequently, the organization used the model only once in the spring of 1999. Similarly, the two organizations that declined to use their models cited the lack of updated cost information as the main reason for not using them. The developers will ultimately resolve this problem once they deliver the remaining models and begin updating the cost databases.

The lack of updated cost information generated interest in the possibility of interfacing existing financial systems and ABC models. Although ABC is not an accounting system, most of the organizations believed that some method of automatic cost data updating from existing financial databases is necessary to improve model use and acceptance. Organizations A and B expressed the desire to link their ABC models to the Job Order Cost Accounting System (JOCAS). Since JOCAS tracks timely financial data by jobs or programs, it could provide updated cost data directly to the ABC models. Although the feasibility of using JOCAS in conjunction with ABC requires additional research, the organizations believed that such a system could possibly improve model acceptance and use.

A second factor that created skepticism was the limited user involvement during the model development phase. The project's top-down approach primarily used the organizations as resources of information, so the organizations played a minor role in that they participated in the

data collection process by answering questionnaires and interview questions. Despite the limited role played by the organizations, the developers still faced the challenge of overcoming the problem of getting organizations to commit their time to the project. Further compounding the skepticism was the lack of follow-up. With so many models to build, the developers spent most of their time building new models, so they had little time to actively follow-up with the organizations.

Finally, data accuracy was another problem that created skepticism among the model users. When answering the questionnaires and interview questions, the organizations had to recall from past experiences the activities they performed as well as the level of effort expended in each activity. Therefore, data accuracy depended on the ability of the participants to accurately recall the information. Given the lack of repetitiveness in performing tasks for programs, organizations A and B were skeptical of whether or not participants could accurately recall the information. Furthermore, since each program was unique, the organizations questioned whether the activities and levels of effort recalled from programs accomplished in the past were good representations of present activities and levels of effort. Given the lack of resources to conduct direct activity observations, the developers attempted to address these concerns by asking participants to report average times spent performing activities. This would give the organizations a reasonably accurate snapshot in time. The developers and users could review and update the models monthly, quarterly, or semi-annually to maintain model accuracy as needed. Despite the assurances, the organizations remained somewhat skeptical.

Part 5

Conclusion

The purpose of this research was to determine how military organizations use ABC information to improve performance. The study examined and analyzed the experiences of three military organizations that had implemented and used ABC models. Although the ABC models provided some insights into possible areas for improvement, the results show little evidence that the organizations consistently used the models and acted on the ABC information to improve performance. The failure stems largely from a lack of preparation necessary to effectively use the models to initiate performance improvements. Based on the results, a few conclusions and recommendations may be made.

First, ABC is still relatively new to the DOD, although the private sector has used it for over a decade. Just as other programs such as Total Quality Management (TQM) required time and resources to become inculcated in practice, the same may hold true for ABC. Other research indicates that ABC often takes more time to implement than expected and may actually fail in some cases (see Krumwiede 1998 and Landry, Wood, and Lindquist 1997). It is not uncommon for some organizations to take several years to reach the usage stage, so it may be too early to judge the extent to which military organizations use ABC information to improve performance.

Second, the degree of information technology integration determines the extent of effort required to ensure model accuracy, thereby affecting model acceptance and use. Given that ABC

models are not static, model accuracy depends heavily on updated resource, activity, cost object, and cost driver data. Models based on outdated cost data are unacceptable to most organizations since accurate cost data are usually necessary for effective decision making. The stand-alone PC-based systems used by the organizations examined in this research require some manual follow-on maintenance to ensure model accuracy. The effort required to maintain separate systems, however, may eventually disenchant some users. Integrating ABC, ABM, and financial and budgeting systems is one possible automated solution that could ensure data accuracy and increase organizational acceptance and use, although it will require financial management involvement. While such a solution shows commitment to using ABC and ABM, it may require a replacement of existing financial and budgeting systems.

Third, the model building approach greatly impacts the success of an ABC project. The model building approach should not only consider the available resources, but also a user's willingness to change, level of continuous improvement training, skepticism of new initiatives, and organizational complexity. In some cases, for instance, it may be beneficial to begin with a small pilot project to demonstrate the utility of ABC. The interest generated from the project may encourage and educate other organizations to use ABC to improve their processes. In other situations, an entrepreneurial approach may help reduce skepticism by empowering organizations to make change. The implementation team should include actual users who can provide valuable inputs to the model design. Given a willingness to change, organizations empowered to act upon the information to make process improvements and innovations will most likely achieve greater success.

The foremost limitation of this research is the narrow focus on three organizations as units of analysis. Consequently, this does not allow generalizations to the population from which the

units came. Future research can address this problem by utilizing valid sampling techniques to test specific hypotheses derived from the results of this study. A follow-on cross-sectional survey of DOD organizations could examine the costs and benefits of using ABC to improve performance. In addition, other studies could examine the relationships among model building approaches, organizational characteristics, and overall ABC model success. Finally, another study worth considering is the tradeoff relationship between cost cutting and the military mission. In the private sector, firms usually have the option to rationalize costly products or services to improve performance. In contrast, military organizations seldom, if ever, have this option. Despite finding some expensive cost objects, the organizations examined in this research could not rationalize the most costly products or services without seriously degrading their mission support capability.

Appendix

Interview Outline

1. Activity and Process Analysis. Allocating resources (costs/expenses of salaries, supplies, facilities, overhead, etc.) from functional categories and departments to show how they relate to activities and processes.
 - a. Success of identifying cost of activities.
 - b. Expected use of the information (e.g., outsourcing, eliminate activities, improve activity efficiency).
 - c. Types of resource drivers selected by the organization (e.g., square footage, percentage of effort, specific measurement of use of supplies, etc.).
2. Product and Customer Analysis. Mapping the original expenses from activities to individual products, customers, or other cost objects (allocate process-based costs to specific products or services delivered to a customer).
 - a. Expense of low volume and/or complex products or services (i.e., expense of low volume and/or complex products or services compared to the expense of other products or services).
 - b. Distribution of customers, products, or services (i.e., are some highly costly, most at or near the same cost, and a few less costly?).

- c. Bill of activity costs (i.e., a manager's ability to see the costs of functions for individual products and services).
 - d. Changes taken or expected changes based on the bill of activity cost information.
 - e. Actions taken by the organization to reduce cost and complexity by rationalizing products, customers, or services.
 - f. Types of activity drivers selected by the organization.
3. Cost Driver Analysis. Identifying and measuring cost drivers.
- a. Types of cost drivers selected by the organization.
 - b. Effectiveness of the cost drivers to determine why work is performed.
 - c. Cost drivers that create waste through nonessential or inefficient activities.
4. Performance Measures. Performance measures identify how well an activity is performed.
- a. Types of performance measures selected by the organization (e.g., activity efficiency, time required completing activities, or quality of work).
 - b. Effectiveness of the performance measures to identify how well activities contribute to the organization's mission and success.

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