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# Supply Chain Cost Control Using Activity-Based Management

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Sameer Kumar  
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# Supply Chain Cost Control Using Activity-Based Management

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# Supply Chain Cost Control Using Activity-Based Management

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# Dedication

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To our families and friends



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# Preface

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Outsourcing has become a predominant practice, and the cost of procured components now makes up the majority of the cost in manufactured products. The literature provides a method for supply-chain cost evaluation called *total cost of ownership* and suggests the use of activity-based costing to quantify it. Activity-based management can be used to manage activity-based costs. This book discusses the competitive advantage that cost analysis and management can bring to the companies within a supply chain. It addresses a number of strategies for evaluating the total cost inherent in a customer-supplier relationship and proposes a model, using total cost of ownership (TCO), activity-based costing (ABC), and activity-based management (ABM) for analyzing and controlling supply-chain costs. It uses industry survey data to examine whether these techniques are being used in real life, which factors affect their usage in the supply chain, and whether they are producing results. Descriptive and statistical analyses of the data are used to validate these observations, and a versatile game theory matrix is combined with the survey results to suggest cost reduction strategies in competitive environments and predict the outcomes of these strategies. The results show the importance of partnerships in applying activity-based management principles to suppliers and the positive results that use of activity-based management can have on elements of the total cost of ownership.

## Key Features

The book suggests the application of activity-based management methods to manage product and service costs at suppliers and subsuppliers levels



and studies whether these methods are being used in industry in producing meaningful results.

The key selling points of this book that will distinguish it from others on the topic include:

- It extends the total cost of ownership concept into the supply chain.
- It studies actual effect of activity-based management concepts on supplier related costs and overall competitiveness.
- It studies actual effect that supplier partnerships have on applying activity-based management principles to supplier-related costs.
- It examines how interaction with competitive players in the marketplace will affect adoption of cost evaluation and management methods based on total cost of ownership and total life cycle cost. Game theory can provide us with a tool to examine these interactions.
- It examines whether offshoring knowledge work increases shareholder value.
- It evaluates differences in elemental task learning curves in a production line.
- It presents major trends in supply chain innovations.

## **Contribution of the Book**

Having an accurate assessment of the costs of doing business is a key to staying in business. Seems pretty fundamental, but when a supplier in a supply chain is working to create, design, and produce a piece of an automobile or something some other firm will assemble and market, understanding the real costs is often a moving target.

Keeping an accurate picture of these costs becomes even more important as the members of supply chains become dependent on each other and the industry they supply. This dependency actually has a cost associated with it — a cost that is just beginning to be acknowledged. This cost assessment beyond just purchasing and inventory costs is referred to as a total cost of ownership.

Understanding the concept of total cost of ownership in a supply chain escapes traditional cost accounting practices because traditional cost accounting simply assigns costs to products and service lines. Activity-based management is the only system that allows a manager to correctly assess the costs involved in a tightly knit supply chain and enables managers to understand not only the total cost of ownership, but how these costs can and should be allocated in a supply chain for a member of the supply chain to remain competitive and profitable.

## Organization of the Book

This book covers the subject of supply-chain cost control through activity-based management by addressing various related topics in the following chapters:

**Chapter 1** Activity-Based Management and Total Cost of Ownership — An Overview

This chapter sets the stage for the research reported in this book. The relationship between activity-based management and total cost of ownership is also introduced. Some of the key factors with influence on total cost of ownership in a supply chain that are described include outsourcing, learning curves and supply chain costs analysis and control.

**Chapter 2** Major Trends in Supply-Chain Innovations  
This chapter exposes readers to significant trends taking place in innovative supply-chain initiatives for a better appreciation of supply-chain costs. It reviews the concept of the acceleration principle and its effects on the manufacturing environment and also presents how various supply-chain structures are forming across various industries.

**Chapter 3** Elemental Task Learning Curve in a Production Line  
This chapter presents an overview of learning curve with a focus on elemental task learning curves in a production line. It helps in improved product and process understanding when profits will occur based on plant size and cumulative output.

**Chapter 4** Offshoring Knowledge Work to Increase Shareholder Value  
This chapter seeks to report how offshoring knowledge work has become an important aspect of the American economy and the challenges companies should consider before making the conversion. It is observed that the benefits of utilizing low-cost labor in other countries not only result in direct savings, but indirect savings as well. These indirect savings are realized by reinvesting in more value-added activities across the organization. Through a case study, it is shown how one company that has announced it has offshored its work has relatively better year-to-year performance than the other using the DuPont financial analysis model.

**Chapter 5** Integrated Total Cost of Ownership and Activity-Based Management Process Model

This chapter addresses a number of strategies for evaluating the total cost inherent in a customer-supplier relationship and proposes a model, using total cost of ownership (TCO), activity-based costing (ABC), and activity-based management (ABM) for analyzing and controlling supply chain costs, which can be integrated into a balanced scorecard (BSC) management system. A hypothetical model, which is the basis of the TCO process model, is also proposed. Eleven hypotheses are evaluated and validated as part of this study.

### **Chapter 6** Methodology for Analysis

In this chapter the survey construct is described in detail. This includes the attributes of subjects surveyed, survey instrument design, sample size, profile of the survey participants' organizations, and the organization of the survey. Survey results were tallied at the macro level.

### **Chapter 7** Analysis and Findings

This chapter presents an analysis of the hypothetical model using descriptive and statistical analyses of data gathered from a detailed survey of companies in various industries. The results obtained from the analysis are summarized. This is followed by a game theory analysis of the same data to determine dominant TCO evaluation and management strategies.

### **Chapter 8** Conclusion and Recommendations

Finally, significant results realized from the research study show the importance of partnerships in applying activity-based management principles to suppliers and the positive results that use of this approach can have on the total cost of ownership in a supply chain. Limitations of this analytical work are outlined and a number of recommendations for future possibilities to further investigate this topic are described.

## **References**

The book provides a comprehensive list of up-to-date references on this topic to enable readers to study various subtopics more in depth.

## **Appendix**

The survey instrument used and the data collected from participants in various industries are also included.

## **Acknowledgments**

The authors would like to thank all those who helped us in bringing out this book for publication. First and foremost we have greatly benefited from the wealth of a vast array of published material on the subjects of supply-chain cost, activity-based management, offshoring, learning curves, total cost of ownership, and supply-chain management.

We would like to thank the reviewers of the manuscript of the book. The contents of this book have benefited immensely from their valued insights, comments, and suggestions.

The authors are especially grateful to the participants of industry surveys whose valued contributions facilitated enhanced understanding of the focus of this book. Their efforts in providing quality responses to questions were significant in validating research postulates. This book is largely based on information derived from the analysis of survey data. Names of participants are not listed here due to confidentiality of surveys conducted. Both authors are indebted to their families, parents, and friends for their support.

Finally, we wish to thank our editor, Raymond O'Connell, and the entire production team at the Taylor & Francis Auerbach group for their assistance and guidance in successful completion of this book.



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## *Chapter 1*

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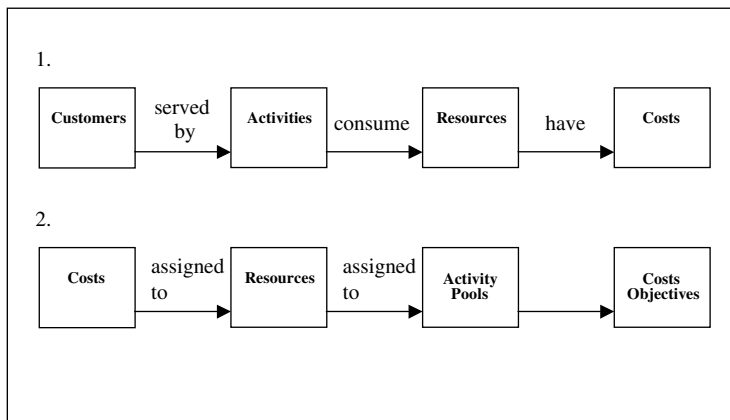
# **Activity-Based Management and Total Cost of Ownership — An Overview**

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### **Introduction**

This book explains the competitive advantage that cost analysis and management can bring to the companies within a supply chain. It addresses a number of strategies for evaluating the total cost inherent in a customer–supplier relationship and proposes a model, using total cost of ownership (TCO), activity-based costing (ABC), and activity-based management (ABM) for analyzing and controlling supply-chain costs that can be integrated into a balanced scorecard (BSC) management system. Industry survey data is examined using descriptive and statistical analyses to determine whether these techniques are being used in real life, which factors affect their usage in the supply chain, and whether they are producing results.

Whereas most businesses and enterprises conduct some form of budgeting and trend analysis to plan and forecast, many tools and techniques have evolved over the years to measure performance, control costs, and improve service. Some of these management tools include ABC, ABM,




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**Figure 1.1** Activity-based costing model.

benchmarking, process improvement, process reengineering, Total Quality Management (TQM), balanced scorecard, and Six Sigma.

*Activity-based costing* (ABC) is a procedure that measures the cost of objects, such as products, services, and customers. ABC first assigns resource costs to the activities performed by the organization, and activity costs are then assigned to the products, customers, and services that benefit from or create the demand for the activities (Kidwell et al., 2002). Morse et al. (2003, pp. 184–185) summarize the concepts underlying ABC (see Figure 1.1):

1. Activities performed to fill customer needs consume resources that cost money.
2. The cost of resources consumed by activities should be assigned to cost objectives on the basis of the units of activity consumed by the cost objective. A *cost objective* is typically a product or service provided to the customer.

ABC is a relatively new approach to cost assignment. However, because of its ability to provide more detailed and relevant analysis of costs for internal decision making, it is gaining recognition as being superior to cost assignment systems traditionally used for financial reporting. On the other hand, each ABC system needs to be designed to fit the needs and circumstances of a particular organization, which make the implementation of ABC systems expensive and time consuming. As a result, some companies decide to only develop ABC data for processes that management deems critical for success (Morse et al., 2003, p. 191).

ABC data enables managers to engage in ABM. ABM consists of performing activities more efficiently, eliminating activities that do not add value for customers, improving delivery of services, and developing better relationships with customers and suppliers. The goal of ABM is to satisfy customer needs while making fewer demands on organizational resources (Kidwell et al., 2002). ABM focuses managerial attention on what is most important among activities performed to create value for customers. One way to do this is to classify each activity as value-added or non-value-added. Management can evaluate and either streamline, reduce, or eliminate non-value-added activities to save time and money. Once this is done, it can then address the more difficult task of reducing cost for value-added activities (Morse et al., 2003, pp. 193–194). Again, ABM is a major undertaking, and, in spite of its benefits, adoption remains low because of the time and resources involved in successful implementation (Gourdie, 2001).

*Benchmarking* is the process of studying and comparing how other organizations perform similar activities and processes. The other organizations are generally selected because of their excellent performance of the benchmarked process (Kidwell et al., 2002). It encompasses both measurements and practices into a systematic and disciplined approach that stresses emulating (or “creatively swiping”) and implementing best practices (Kolarik, 2002). When executed well, benchmarking reveals gaps between the performance of the benchmarker and that of the benchmarked “best practices” leader, and often suggests what needs to be done to close these gaps (Stauffer, 2003). One of the biggest mistakes made when beginning a benchmarking endeavor is looking only at companies within the same industry or benchmarking the competition. But what if the competition is worse than one’s own company? Instead, the benchmarking team should evaluate a company that is well known for being a good model of successful business practices and processes. Another mistake companies make is measuring what is easy rather than what is needed (Stauffer, 2003; Forst, 2003). But this can fail to provide actionable information, something that is sufficiently detailed for a unit manager to make changes that improve performance. Instead, a company should examine the factors that are most important to a customer, and then identify companies that excel in each factor.

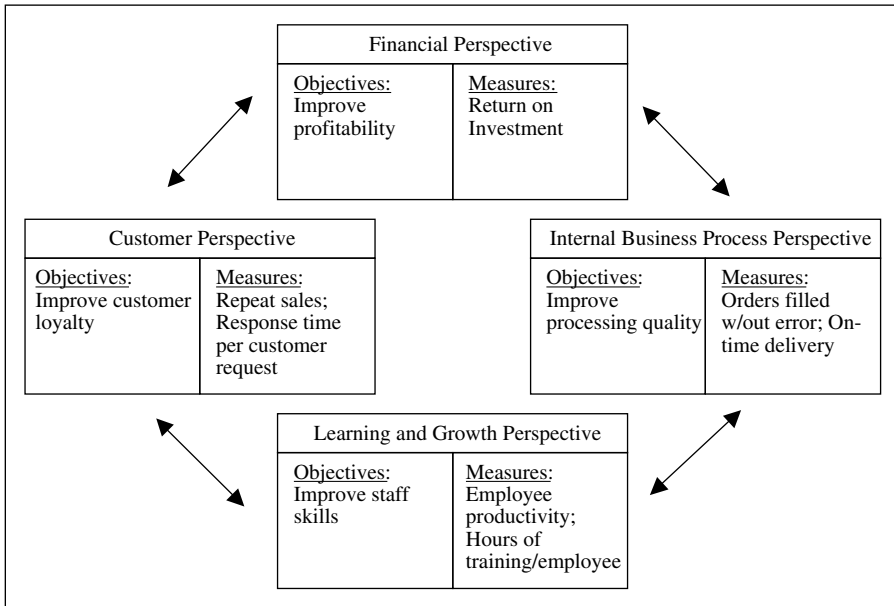
With process improvement, or continuous improvement, an organization’s employees constantly evaluate products, services, and processes, seeking ways to do better. Some companies have the goal of drastically reducing costs or radically improving quality or service. In such cases, it may be necessary to reinvent or reengineer a process instead of simply improving it (Morse et al., 2003). *Process reengineering* is a technique that has been described as “the fundamental rethinking and radical redesign

of business processes to achieve rapid and dramatic improvements in critical contemporary measures of performance, such as cost, quality, service, and speed” (Hammer and Champy, 1993). Based primarily on the works of Thomas Davenport, J.E. Short, and Michael Hammer, reengineering creates new processes to displace the old ones (Selladurai, 2002). Reengineering was embraced in the 1990s with its promises, but then disappeared around 1997 when, in spite of how good it sounded, it was too vague and technologically challenging for users to apply successfully (Clermont, 2001). Today, it has reappeared under different names owing to the ease of accessing information via the Internet, as well as the new generation of powerful, flexible software packages that enable companies to integrate systems and extract real-time information.

TQM, based on the ideas of Edward Deming, Joseph Juran, and Philip Crosby, aims to improve the processes within an organization by emphasizing continuous quality improvement through focus on implementing incremental change with minimal variation to existing processes (Selladurai, 2002). It is a management-led, organization-wide commitment to quality, as defined by both internal and external customers. It requires the development of a clear vision of what the organization does, what its values and goals are, and how it is going to achieve them. TQM focuses on understanding customers and their needs, as well as the needs of employees, while focusing on processes (Kidwell et al., 2002). It also proclaims the values of teamwork and employee participation, the use of reasoning-based statistical analysis of factual data, and the training of employees and managers across the organization. Although TQM has its share of critics, many others have expressed strong and continued support of the management technique (Selladurai, 2002).

A *balanced scorecard*, established by Robert Kaplan and David Norton in the early 1990s, is a set of measures that give top managers a fast but comprehensive view of the business. It complements traditional financial measures with other nonfinancial, operational measures. Based on a firm’s overall strategy, the scorecard typically contains a diverse set of 16 to 28 measures, commonly organized into four categories (see Figure 1.2): customer satisfaction, internal processes, and the organization’s learning and growth activities — operational measurements that are the drivers of future financial performance (Kaplan and Norton, 2005; Gumbus, 2005; Kidwell et al., 2002; Salterio and Webb, 2003; Jensen and Sage, 2000).

Four processes are involved in managing a balanced scorecard, and they follow the “plan, do, check, and act” sequence of Shewart and Deming in an iterative manner: business planning, feedback and learning, clarifying and translating the vision, and communicating and linking (Jensen and Sage, 2000). The balanced scorecard can help management form a link between long-term strategic objectives and short-term actions



**Figure 1.2 Categories of a balanced scorecard.**

(Kidwell et al., 2002). Proponents of the scorecard claim that it clarifies and translates the firm's vision and strategies, communicates and links strategic objectives and measures, enhances strategic feedback and learning in the firm, and helps plan, set targets, and align initiatives. The success of planning, target-setting, and aligning performance measures to strategic initiatives often depends on whether the managerial performance evaluation system directs managers' attention to those areas. They found that if the manager's compensation was tied to the results of the scorecard, the likelihood of the success of the objectives being met was increased.

*Six Sigma* is a business improvement approach that seeks to find and eliminate causes of mistakes or defects in business processes by focusing on outputs that are of critical importance to customers. As a result, process performance is enhanced, customer satisfaction is improved, and the bottom line is impacted through savings and increased revenue (Bisgaard et al., 2002). It is a strategic approach that works across all processes, products, and industries. Six Sigma is also a measure of process performance. The ability to produce products and services with only 3.4 defects per million would yield a Six Sigma process that is considered to be world-class performance for many processes (Knowles et al., 2005; Meyer, 2005; Folan and Browne, 2005).

Some believe these management tools and techniques are helpful in meeting the challenges of increased accountability, whereas others dismiss them as merely a fad (Kidwell et al., 2002, pp. 63–66). Many of the performance tools, including benchmarking, continuous improvement, reengineering, TQM, and Six Sigma, are variations of emulating how others do business. However, with most initiatives implemented by companies eager to outshine and outperform the competition, the emphasis is placed on instilling a new work culture within an existing one, without the benefit of a theoretical foundation to justify, tailor, and guide this superposition. Kolarik (2002) believes this may be the reason for the relatively low success rates associated with these well-intended efforts.

Recently, the term *outsourcing* has taken on a distinct and politically charged definition: the exportation of labor, both manufacturing and technical services, to overseas locations such as China and India where labor costs are lower than in the United States. This is just the latest permutation, however, on a process that has been ongoing for several decades. In this larger context, outsourcing means taking activities that exist within the company or firm and transferring them to a supplier company or agency outside of the original company. For example, a manufacturing operation that was once vertically integrated into the company's operations could be contracted out to another manufacturing company that specializes in that type of manufacturing activity. Even the supplier management activity itself can become a target of outsourcing (Maltz and Ellram, 1999).

Companies outsource for numerous reasons. The outsourced supplier specializes in the activity and can conduct it much more efficiently than the purchasing company. This sometimes means that the purchasing company can gain access to supplier-owned technology that it might not otherwise have (Tully, 1994; Ehie, 2001; Angeloni, 2002). Eliminating the activity in the original company frees up fixed resources such as labor and overhead (Ehie, 2001; Angeloni, 2002). It provides the flexibility to switch product offerings on a relatively short-term basis through workforce balancing and accelerated product development (Tully, 1994; Ehie, 2001). Costs can be reduced by taking advantage of the contracted manufacturer's economy of scale (Ehie, 2001).

Whereas many companies once had monolithic vertical supply structures (own facilities that produced parts and subassemblies), most now focus on their core business, often just developing and marketing their end product. Parts and subassemblies are manufactured, and often designed, by suppliers and vendors. Some do not even view themselves as manufacturers anymore but as service providers, providing a linkage between end consumers and the manufacturer. This is particularly true in the electronics and automotive industries, in which the modularity of the

products allows for easy outsourcing of manufacturing (Tully, 1994), though recent downturns in the electronics market are pushing contract manufacturers to diversify into other industries (Serant, 2002).

This has led to the development of *supply chains*, interconnected and highly dependent networks of companies that take products and services from concepts and raw materials all the way to the end customer. These organizations really came to prominence in the 1980s, as companies sought to enhance competitiveness by containing costs, enhancing product value, compressing the time to market, creating channel efficiency, and becoming more responsive to customers (Cavinato, 1991). As the outsourcing trend continues, companies will not merely compete against each other, entire supply chains will. The new strategy of supply chains will use a new set of principles: the only entity that puts money into the supply chain is the end customer, and the only viable solutions ensure that every element of the supply-chain profits. Therefore, supply-chain management is about economic value and total content; price is not the only issue anymore (Handfield, 2002, Johnston, 2004).

To stay competitive, the companies that sit within these supply chains will need to understand and influence the costs within their supply chains. Marien and Keebler (2002) have suggested that there are six stages of cost focus in a company's supply chain.

- Stage 1: Functional cost minimization — functional areas look to reduce their individual costs, often with cost penalties elsewhere in the system.
- Stage 2: Lowest delivered cost — company looks to minimize costs on acquired and delivered goods and services, often by looking at trade-offs in purchasing, transportation, and asset management.
- Stage 3: TCO — company begins to examine inventory and asset carrying costs.
- Stage 4: Enterprise value-add costs of sales — company begins to look at the costs beyond the mere costs of material ownership, e.g., sales and marketing, engineering, technical support, IT, etc.
- Stage 5: Interenterprise value-add cost with immediately adjacent trading partners — examines trade-offs and best working relationships with the immediate customer and supplier in the supply chain.
- Stage 6: Lowest end-user-delivered supply-chain cost — examines trade-offs and services between all members of the supply chain with focus on the ultimate end user.

The supply-chain cost perspective is migrating toward a total view of the system both upstream and downstream, beyond just purchasing and inventory costs (Handfield, 2002).



In this environment, purchasing takes on a critical role. In most supply-chain situations, procurement organizations become the manager of the wide and varied relationships with vendors, channeling communications from customer to vendor and leveraging buying power to the company's advantage (Cavinato, 1991). They manage increasing amounts of the company's overall expenses. Cavinato (1992) estimated that the cost of procurement specification and acquisition is 55 to 60 percent of the total cost in manufacturing firms. Carr and Ittner (1992) estimate that purchase materials, components, and subassemblies represent over 70 percent of manufacturing expense; Ellram (1995) placed it at 63.5 percent of total cost in manufacturing firms and 25 percent in nonmanufacturers. More recently, Handfield (2002) puts the cost of managing the supply chain at 56 percent of revenue in average manufacturing companies, increasing as one looks at more high-technology industries. Also, each dollar cut from the cost of purchasing generates the same bottom-line effect as increasing sales by \$17 (Handfield, 2002). In a competitive worldwide market with thinning margins, purchasing finds itself under pressure to reduce procurement costs.

## References

- Angeloni, J. (2002), Contract manufacturing and outsourcing can yield lower overhead and increase yields, *Military and Aerospace Electronics*, August 2002, p. 30.
- Bisgaard, S., Hoerl, R., and Snee, R. (2002), Improving business processes with Six Sigma quality, *ASQ's Annual Quality Congress Proceedings*, 701–704.
- Carr, L.P. and Ittner, C.D. (1992), Measuring the cost of ownership, *Cost Management*, Fall, 42–51.
- Cavinato, J.L. (1992), A total cost/value model for supply chain competitiveness, *Journal of Business Logistics*, 13(2), 285–301.
- Cavinato, J.L. (1991), Identifying interfirm total cost advantages for supply chain competitiveness, *Journal of Purchasing and Materials Management*, 27(4), 10–15.
- Clermont, P. (2001), Reengineering revisited: death and reincarnation, *Information Strategy: The Executive's Journal*, 17(4), 6–9.
- Ehie, I.C. (2001), Determinants of success in manufacturing outsourcing decisions: a survey study, *Production and Inventory Management Journal*, Fall, 31–39.
- Ellram, L.M. (1995), Activity-based costing and total cost of ownership: a critical link, *Journal of Cost Management*, 8(4), 22–30.
- Folan, P. and Browne, J. (2005), Development of an extended enterprise performance measurement system, *Production Planning and Control*, 16(6), 531–544.
- Forst, L. (July 2003), Benchmarking success hinges on internal data, *Industrial Management*, 20–23.