ACTIVITY-BASED COSTING APPLICATIONS WITHIN LOGISTICS
AND THEIR EFFECTS ON LOGISTICS DECISION MAKING

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the
Graduate School of The Ohio State University

By

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ABSTRACT

Logistics is recognized as a significant factor in firms' overall levels of customer service and competitive positions in the marketplace. To improve the effectiveness and efficiency of the logistics operations within an individual firm and within a supply chain, logistics managers require accurate and timely information on logistics activities and costs, including how best to allocate these costs among customers, products, services, suppliers, and other important cost objects. Traditional management accounting techniques often provide information that is of limited use to logistics managers. Activity-Based Costing (ABC) provides a different approach to management accounting, giving managers both more accurate cost information and fresh insight into the activities consuming organizational resources.

This research studied the experiences of eleven organizations in applying ABC techniques within their logistics operations. Specifically, the objectives of this study were to discover motivations for ABC use within logistics, to discover characteristics of ABC systems used in logistics, to explore capabilities and deficiencies of ABC systems used in logistics, and to discover the impact of ABC use within logistics in terms of logistics decision making and attitudes of logistics practitioners. A case study
methodology was followed using structured interviews of selected personnel within each organization and performing content analysis on the resulting, transcribed data.

The study found that the primary motivation of firms in implementing ABC within logistics was to gain a better understanding of their product and/or service costs due to difficulty in costing their logistics operations. The complexity of firms' ABC models was generally found to be unrelated to a number of other factors, including the degree of price sensitivity in the marketplace and the number of different decisions supported by the ABC system. Most models were limited in scope, all models fully allocated costs to the cost objects of interest, and none of the models incorporated capacity measures. Despite the fact that most firms reported that their ABC systems were providing improved information for decision making and were worth the investment, firms were divided on whether the ABC data had resulted in improvements to their competitive positions in their respective markets.
Dedicated to my wife, Deanie,

and my children, Catherine and Stephanie
I wish to thank the many individuals from the eleven organizations that participated in this research project. They dedicated many hours from already busy schedules to answering a substantial number of questions, and I am truly grateful for their willingness to participate.

I thank Dr. Bernard J. LaLonde for his valuable assistance and guidance in the early, proposal stage of this project.

I also wish to thank the members of my committee. Dr. Terrance Pohlen’s assistance in introducing me to Activity-Based Costing, as well as his persistent guidance and encouragement, were invaluable and much appreciated. I also appreciate Dr. William Bentz’s expert advice and support on such short notice.

In particular, I shall be forever indebted to my advisor, Dr. Martha Cooper, for her incredible patience, persistence, guidance, and encouragement. Without her support, this research most certainly would not have been completed.

Finally, I wish to express my gratitude and love to my wife and children for their patience, understanding, support, and love during a most difficult and challenging time in my life.
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CHAPTER 1

INTRODUCTION

Background

Firms are facing an increasingly competitive, changing, and fast-paced world. Intense global competition, Advanced Manufacturing Technologies (AMTs), Just-In-Time (JIT) strategies, various quality initiatives, rapid advances in telecommunications and computing capability, and other factors interact to create a complex and dynamic business environment. Consumers are demanding increasing quality and value; competing on product alone or price alone is no longer good enough [23]. To compete, firms often have been frustrated at trying to simultaneously improve quality, gain market share, expand flexibility, and lower costs.

In recent years, logistics has been recognized as a potential source of significant savings, differentiation, competitive advantage, and customer service. For example, in 1962, Peter Drucker called distribution “one of the most sadly neglected, most promising areas of American business” [70:103], an area extending beyond the four walls of the individual enterprise, contributing to the overall cost structure of a product, vital to firms’ competitive positions, and ripe for disciplined management to yield competitive advantages [70:265-266, 270]. In particular, Drucker pointed out:
Almost 50 cents of each dollar the American consumer spends for goods goes for activities that occur after the goods are made…. Yet the costs of these distributive activities are rarely known and almost never shown. They disappear in general catchalls: ‘allocations,’ ‘indirect labor,’ ‘administrative expense’ or ‘burden.’ [70:103, 266]

Drucker defined “distribution” in terms limited to processes occurring after the final goods are created—a downstream activity to manufacturing [70:103]. Today, logistics is understood to encompass much more than simply the physical distribution of finished goods. The Council of Logistics Management defines logistics as that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements [64] [50].

This definition goes well beyond downstream distribution of completed products to encompass the procurement, flow, handling, and storage along the entire value chain, from raw materials to in-process inventories to final products delivered to end users or customers. In addition, information management and customer satisfaction are recognized as key aspects of logistics. Customer service is now recognized as a key means of competitive differentiation, and logistics is increasingly seen as an important driver in customer service [83:88] [118:111-148] [116].

Logistics issues are increasingly becoming key components of business strategy and can “spell the difference between success and failure in business” [94:85]. Fuller et al. expand Drucker’s concerns about distribution to logistics by stating that the aspect of business operations “…most in need of discovery these days is logistics” [83:87], as “…logistics problems seldom make it past the triage screen” [83:87]. They consider
logistics to be at least central to product strategy and “the driver of service
differentiation” [83:88], and at most the main driver of business strategy to achieve cost
savings, increased customer satisfaction, and increased flexibility [83:87-88]. They point
out that with advances in manufacturing flexibility and quality, along with greater
efficiencies forced out of upstream suppliers, logistics stands out as a remaining frontier
for differentiation and value creation [83:89]:

Indeed, whether they know it or not, senior managers of every
retail store and diversified manufacturing company compete in
businesses that are distinguished by their logistics, in effect,
‘logistically distinct businesses,’ organized, or potentially
organized, around the delivery characteristics of logistics
pipelines: the channels of transport, warehousing, handling, and
control through which manufactured goods flow [83:87].

Logistics is intimately intertwined with other elements of competitive strategy,
and therefore should be actively managed and leveraged to maximum benefit. Failure to
integrate logistical considerations into business plans can result in unexpected or
detrimental results to otherwise carefully crafted plans:

The choice of an overall competitive focus—product innovation,
for example, or superior customer service or cost leadership—
sets logistical requirements that, if not explicitly considered in
designing the system’s trade-offs, can do much to undercut the
prior choice of competitive focus. There is, then, much to be
 gained from successfully applying leverage through logistics—
and much to be lost from applying that leverage incorrectly
[154:120].

Indeed, just as Drucker pointed out that firms must consider factors outside their own
four walls as important to their overall competitive position [70], logistics partnerships or
alliances in which firms work with other firms in the value chain to increase the
efficiency and effectiveness of the entire supply chain are now considered important strategies to improve competitiveness and enhance customer service and value [32] [74]. Yet despite this increased understanding of the importance of logistics to the long-term viability of the firm, many logistics managers say they do not adequately understand their costs and/or they do not have adequate cost data for decision making [15] [148].

Activity Based Costing (ABC) is a cost accounting methodology that can provide firms with better insight into their key activities, the reasons the activities are performed, and the amount of resources used in performing the activities. The increased understanding of how activities consume resources can provide greater insight and visibility into how indirect or overhead costs are actually incurred. ABC systems can also provide large amounts of non-financial information concerning a firm’s operations that may be useful for process analysis and improvement [161] [139].

As important as cost reductions may be, there are also pitfalls in neglecting important, potential logistical competitive advantages by fixating on short-term cost reduction only [154:121]:

Far too often, managers think an effective logistics system can provide benefits only through cost cutting. For companies following a strategy of innovation, however, other factors are often more important than straight cost reductions [154:121].

The literature suggests that the use of ABC will continue to increase in the near future. Interest in ABC among logistics managers is apparently increasing, and ABC seems particularly useful in understanding and managing costs, cost drivers, processes, and the supply chain [148].
Increasing competitive pressures in the global marketplace require firms to continually focus on improving the efficiency and effectiveness of their internal processes. Firms must also monitor their processes and make decisions about which products and services to provide, which markets and market segments to serve, and which customers within those markets to serve. These decisions are not static; rather, they must be frequently revisited in light of market trends and profitability to ensure the long-term viability of the enterprise. However, focusing only on the effectiveness and efficiency of the individual firm is no longer considered adequate to ensure long-term viability and competitiveness. Increasingly, firms are understanding the necessity of forming and managing relationships in the supply chain which seek to optimize the efficiency and effectiveness of the entire supply chain in satisfying the ultimate needs of the customer [166] [50] [120]. The literature suggests ABC can be a useful tool in these areas.

Problem Statement

While the literature documents an increased interest in ABC, along with many success stories, the extent and effect of ABC use in firms remains unclear. Research projects to date seem to disagree in certain areas. For example, Cooper et al. report (in a 1992 study) that “few success stories of bottom-line improvement have surfaced” [49]. Later, two surveys conducted by the Cost Management Group (CMG) of the Institute of Management Accountants (IMA) indicate an increased use of ABC between 1993 and 1996, along with an increasing tendency to replace traditional costs systems with ABC systems [1] [6]. However, a Chartered Institute of Management Accountants study of the
Times 1000 in 1994 “turned up a mere 50 companies using ABC for any purpose...; double that number confessed they had not thought about the subject” [4].

In particular, despite increasing interest in ABC among logistics managers and ABC’s applicability for improving logistics cost information and efficiencies, ABC use within the logistics function is seemingly still quite low. Few studies have attempted to discover overall trends of ABC use in logistics [148] [140] [14] [43] [81].

In addition, little is known about the long-term use of ABC data in management decision making (Activity-Based Management). Firms that have implemented ABC are apparently slow in integrating ABC information into their management information systems and/or decision support systems [48]; most of the firms studied by Cooper et al. had not progressed to significant action based on the ABC data available [48:307]. These results were similar to Pohlen, who found that most of the firms he studied only used ABC as a diagnostic tool rather than as part of their day-to-day management information [148]. Most studies of ABC use within firms concentrate on immediate, short-term results, rather than addressing longer-term use of ABC data. For example, all of the firms Pohlen studied were implementing or had just implemented ABC, with the oldest ABC implementation being two years [148:221-223].

**Research Objectives**

The overall objective of this research was to study the nature, extent, and impact of ABC use in logistics. Specifically, this research studied why firms implement ABC in logistics, how firms implement ABC systems, what types of decisions are supported by
the ABC system, and the perceived impact or efficacy of the ABC information. In particular, this study investigated the longer-term effects of ABC use in the logistics operations of firms by including firms in the research sample that have implemented ABC within their logistics functions at least two years prior to this study.

The research objectives of this study covered four major areas: why is ABC used within logistics, how is ABC implemented in logistics, what capabilities do ABC systems have within logistics, and what is the impact of such systems? Specifically, the objectives of this study were as follows:

1. Discover motivations for ABC use within logistics.
2. Discover characteristics of ABC systems used in logistics.
3. Explore capabilities and deficiencies of ABC systems used in logistics.
4. Discover the impact of ABC use within logistics in terms of logistics decision making and attitudes of logistics practitioners.

Research Scope

This research focused on the use of ABC systems within the logistics operations of firms. While the literature clearly indicates that ABC may have applications in most if not all operations of organizations, this study focused only on the logistics operations of private- and public-sector organizations.

Even though the literature suggests that ABC use is becoming more common among firms and interest of logistics executives in ABC is apparently increasing; most existing research on ABC centers on manufacturing applications, and ABC use within
logistics may still be relatively rare [43]. Therefore, one of the goals of this research was to investigate in-depth the experience of firms that have implemented ABC in their logistics functions and that have used an ABC cost system in this capacity for at least two years. The in-depth, exploratory, and descriptive nature of the research objectives required a research design emphasizing depth of study and analysis rather than a broad focus on a few, well-established variables across a larger sample of firms. Accordingly, this study used in-depth case studies of a limited number of firms.

Given the goal of studying the longer-term effects of ABC use in logistics by studying firms that have implemented ABC at least two years prior to this research, the firms that participated in Pohlen’s research in 1993 were contacted to solicit their participation. Additional firms with longer-term experience in ABC were sought based on the literature, previous participants in the ABC track of the Council of Logistics Management annual conference, and/or recommendations from experts (academics, consultants, and practitioners).

**Research Questions and Guiding Hypotheses**

The four objectives of this research were accomplished through the study and evaluation of five guiding hypotheses and three research questions. Key phrases within each guiding hypothesis or research question were identified and broken down into more specific, investigative questions. Finally, the investigative questions were broken down into measurement questions and incorporated into an interview protocol to guide the
researcher in interviewing study participants. Data collected from the measurement questions were then analyzed to answer the investigative questions, and ultimately, to answer the research questions and evaluate the guiding hypotheses.

The guiding hypotheses of the research are presented in Table 1, while the research questions are listed in Table 2. The detailed investigative questions and measurement questions that flow from these guiding hypotheses and research questions are discussed in detail in Chapter 3.

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<td>Greater complexity in ABC system design will be associated with greater price sensitivity.</td>
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<td>Greater complexity in ABC system design will be associated with the use of ABC as part of the day-to-day, management information system.</td>
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<td>Guiding Hypothesis Four:</td>
<td>Greater complexity in ABC system design will be associated with larger numbers of different decisions that the ABC data supports.</td>
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<td>Guiding Hypothesis Five:</td>
<td>Greater complexity in ABC system design will be associated with more favorable attitudes of logistics practitioners toward the usefulness and impact of ABC.</td>
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<td>What decisions or decision-making areas are supported by ABC data? What decisions or decision-making areas does ABC fail to adequately support?</td>
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<td>Research Question Three:</td>
<td>What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?</td>
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Table 2: Research Questions

**Research Methodology**

The research followed a qualitative, case study methodology to investigate the use of ABC within logistics. An interview protocol was used to facilitate data collection and analysis. A purposive sample of eleven firms was studied using a combination of face-to-face and telephone interviews.

Firms with logistics functions were selected, and in-depth, personal interviews of key individuals in each firm familiar with the management accounting system used within logistics and/or logistics decisions were performed. The interview protocol was forwarded to the individuals prior to the interviews, allowing them time to reflect on the questions and assemble any helpful source data or documentation. The interview protocol guided the interviews, but the methodology retained flexibility to pursue promising, unanticipated lines of inquiry during the actual interviews.
The interview protocol was pre-tested through reviews by faculty and industry representatives. These reviews evaluated the instrument for content validity, question clarity, question relevance to the research topic and objectives, completeness (i.e. was there relevant information to the research topic and objectives the survey failed to address?), and willingness of industry executives to provide the requested information.

In addition to the interviews, documentation was provided by some organizations to clarify or explain their organization, their markets, or details of their ABC model or implementation.

The specific firms that participated in the research were selected from Pohlen’s research [148], participants in the ABC track of the Council of Logistics Management’s annual conference, the literature review, and recommendations of knowledgeable people in the field. The criteria for selection are outlined in Chapter 3.

The vice-president of logistics or similar, high-level executive of each potential participant firm was contacted via telephone. The initial, brief contact introduced the research project and offered to provide a cover letter (signed by the researcher and the research advisor on Ohio State letterhead stationery), a one-page research summary that more fully outlined the scope and purpose of the research project, and a copy of the interview protocol. A follow-on telephone contact was then made after the potential participant had time to receive and review the package. Respondents agreeing to participate were asked to recommend the appropriate, knowledgeable individuals in the firm to participate and best able to address the interview protocol questions.

Most interviews were recorded on audio tape (with the interviewee’s permission)
and supplemented by the researcher’s notes and any supplementary, relevant materials provided by participating firms. The audio tapes and researcher’s notes were then transcribed and loaded into a textual database for analysis. The data was analyzed using content analysis and systematic coding of the transcriptions and supplementary materials.

Responses to the interviews, along with other source data collected, were used to develop a summary of ABC systems used in logistics within the participating firms, the capabilities of these systems, their usefulness in logistics decision making, and the attitudes of logistics practitioners toward ABC and its usefulness for logistics management. The analysis and findings from the data were summarized and presented as part of the research results and conclusions.

**Research Limitations and Assumptions**

Several limitations and assumptions should be carefully considered in order to interpret the results of this research properly. These limitations and assumptions are discussed below.

First, the research was primarily exploratory and descriptive, and limited to a purposive sample of eleven firms. Since the research was limited to a small sample of organizations, one must exercise great caution in any attempt to generalize the findings of this study to all firms with logistics functions.

Second, while some of the tests of the propositions may lead one to infer a causal relationship, one cannot empirically prove such a relationship [78:70-71]. As Blalock explains:
One *thinks* in terms of theoretical language that contains notions such as causes, forces, systems, and properties. But one's tests are made in terms of covariations, operations, and pointer readings [26:5].

Emory continues:

To meet the ideal standard of causation would require that one factor always causes another, and that no other factor has the same causal effect. When one realizes that even the physicist in the laboratory cannot achieve such control, it is apparent that we will not achieve it in a business setting [78:71].

Therefore, while one may be able to reasonably infer a causal relationship from the data, one must exercise great care when doing so.

Third, there are many factors that may affect the design of an ABC system and the manner in which the data the system generates is used by decision makers. This study focused particularly on the complexity of the ABC system and the availability and usefulness of the output data of the accounting system for decision makers.

Fourth, no deliberate attempt was made to select firms from a wide variety of industries. Due to the relatively small numbers of firms using ABC in logistics and the exploratory and descriptive nature of the research objectives, most firms with a logistics function using an ABC system were acceptable. Care was taken, however, to limit the participation to include a number of firms that have been using ABC within logistics for at least two years. One of the goals of this research was to investigate the longer-term experience of logistics managers with ABC data, exploring original expectations and motivations for implementing ABC and how these expectations may have been tempered or modified over time. The expectations, experiences, and ways in which ABC data is used in decision making may be quite different in such firms compared to firms in earlier
stages of ABC system development. Therefore, care must be taken in generalizing any results to a larger population of firms.

Fifth, the survey data was subject to the knowledge and biases of the survey respondents. Ultimately, the survey records the opinions of the respondents, not necessarily absolute facts. Of course, some questions seek honest opinions rather than objective facts. For questions requesting objective data, the pre-testing of the interview protocol instrument, along with the research summary package and telephone contact with the respondents prior to conducting the interviews, should have helped mitigate problems related to insufficient respondent knowledge or misunderstood questions.

**Research Contributions**

This research provided at least three overall contributions to the body of knowledge concerning current logistics cost system capabilities and ABC implementation and use within firms and their logistics functions. These contributions are described below.

First, the research provided a means of characterizing and describing activity-based logistics cost system capabilities (in terms of abilities to accurately trace costs to particular cost drivers and cost objects and abilities to provide useful data for increasingly complex areas of logistics decision making). This provides a useful benchmark of current practice within logistics which firms can then use to determine how their activity-based logistics cost systems compare with other firms.
Second, the research investigated the longer-term experiences of firms that have implemented ABC in logistics. This approach discovered potential patterns, benefits, and pitfalls of ABC use over the long term within logistics.

Third, the research attempted to quantify and/or describe the breadth and extent of the use of management accounting data in logistics decision making. ABC data in management decision making (Activity-Based Management, or ABM) was investigated by listing the various ways the literature suggests ABC data can be used within a firm and then asking respondents to identify the extent and usefulness of ABC data in each of these areas.

**Research Organization**

This document has five chapters. This chapter provides an overview of the research area, including the need for this research, its scope, its limitations and assumptions, and its potential contributions. The specific objectives of this research project were stated, along with the research questions and propositions supporting the research objectives.

Chapter Two presents a review of the relevant literature.

Chapter Three provides a detailed description of the research design and methodology to be followed in the conduct of the research. This description includes an in-depth discussion of the guiding hypotheses, research questions, investigative questions, and measurement questions, definitions of all research variables, design of the interview protocol, and the relationship between individual interview protocol questions
and the investigative questions, research questions, guiding hypotheses, and research objectives. In addition, the actual conduct of the interviews is described.

The analysis of the research data to answer research questions and to test the guiding hypotheses is presented in Chapter Four, along with other findings not specifically related to the guiding hypotheses or research questions.

Finally, Chapter Five summarizes the research effort and its conclusions, discusses the research’s implications, and provides suggestions for future research.
CHAPTER 2

LITERATURE REVIEW

Introduction

This chapter provides the conceptual framework for this research by reviewing the Activity-Based Costing literature. To establish the foundation for this study, the review is organized as follows. First, the nature of today's competitive environment is discussed by providing a brief review of the major areas of change: the consumer marketplace; globalization; channel structures, relationships, and supply chain management; advanced manufacturing technologies (AMTs); and other technologies. Second, the importance of logistics in today's competitive environment is discussed. Third, cost accounting and its purposes are discussed. Fourth, cost accounting practices are reviewed, and the inadequacies of traditional cost accounting data for decision making are presented. Fifth, Activity-Based Costing (ABC) is defined and compared with traditional cost accounting practices. Sixth, the design and implementation of ABC systems is discussed, including how firms determine whether an ABC system would be appropriate for them. Finally, the ways firms use ABC data is presented, with emphasis on using ABC data to improve
business processes and management decision-making (ABM) and the applicability of ABC/ABM to the management of logistics.

**The Competitive Environment**

Today’s firms are facing an increasingly challenging and competitive marketplace. Rapid and dramatic technological changes; particularly in information systems, communications systems, and manufacturing processes; have significantly changed firms’ operations, processes, organization, and relationships. Product development times and life cycles are significantly shorter, and the falling prices of computing power have made computing technology more widespread and made it possible for firms to collect much larger amounts of operational data [161:24]. In addition, changes in consumers and the global economy have also altered the competitive environment in which firms must compete. Some of these changes are listed below.

**Consumer Marketplace**

The last fifteen to twenty years has seen dramatic changes in the U.S. marketplace. Consumers have become more knowledgeable about products, more demanding about quality and price, and less brand-loyal. In addition, consumers are insisting on increasing levels of customer service, particularly in the areas of convenience and flexibility. Consumers have become much less tolerant of things or businesses that they perceive waste their time, perhaps due in large part to faster-paced lifestyles and increases in the number of two-income families. The rise in drive-through services, expanded business hours, and other changes provide evidence of the increasing demands
of consumers to purchase the products and services they desire quickly at times most convenient to them. These competitive pressures felt by firms dealing directly with consumers influence business practices and relationships of firms throughout the supply chain [65:13-14]. As Coyle et al. state [65:14]:

This changing consumer market has significant implications for logistics and supply chains. The logistics supply chain has to serve the businesses that operate in this environment. In fact, the demands of the consumer have become the same as those of the supply chain—reduced order cycle times and more convenient and more flexible delivery.... Suffice it to say that the need for a supply chain focus in logistics has been exacerbated by the demands placed upon those businesses that interface directly with consumers.

Globalization

More and more markets are opening to firms from around the world; firms no longer compete solely against local, regional, or domestic firms, but rather against companies from around the globe. Innovative business practices now have global effects. In addition, regional trading blocs (e.g. Pacific Rim, European Common Market, North America) affect the competitive landscape for many markets. Companies seeking to improve their efficiency, effectiveness, and competitive position pursue business relationships and new markets on a global scale [65:14-15]. This includes purchasing raw materials and other production inputs from foreign sources; selective entry into international markets, often aided by intermediaries; and "multifaceted international manufacturing and marketing strategies encompassing international production sites, multistaging inventory, and counter-trading product sales" [65:15]. The increase in international competition has resulted in increased length and complexity of supply
chains [65:15], as well as the added complexity of building and maintaining relationships with culturally diverse, international firms.

**Channel Structures, Relationships, and Supply Chain Management**

The marketplace has seen the growth of larger retailers and "category-killer" stores (e.g. Office Depot) and a corresponding shift in channel power from manufacturers to such retailers. Retailers like Wal-Mart, Toys-R-Us, and McDonalds have high expectations of the companies that supply them, and they use their leverage to be proactive and request specialized services from their suppliers [65:14-15]. These retailers are often price leaders and/or offer larger selections of products than their competitors, and "efficient logistics is often the key ingredient in [their] success" [65:15]. Along with these dynamic changes in power and relationships in supply chains, firms are increasingly concerned with managing the logistics effectiveness and efficiency of supply chains, elements of which may extend beyond the borders of any one firm. Supply chain management implies coordination across multiple levels of suppliers, manufacturers, and customers. Better cost data consistently collected across the supply chain can improve overall performance [50][120] [118].

**Advanced Manufacturing Technologies**

Advanced Manufacturing Technologies (AMTs) have become prevalent in industry [68:50]. Their capabilities have led to changes in business processes and competitive competencies. Dilts and Grabski classify AMTs into four types (see Table 3 on page 23): design, planning and control, execution, and overarching. Design AMTs
include Computer-Aided Design (CAD), Computer-Aided Engineering (CAE),
Computer-Aided Process Planning (CAPP), and Design for Manufacturability and
Assembly [68:51]. CAD and CAE allow for rapid, computerized design, evaluation, and
testing, significantly shortening the time from concept and initial design to final design.
More advanced systems have the capability to design manufacturing processes and/or to
verify that a given design can be manufactured effectively and efficiently. In addition,
these systems can provide detailed, step-by-step plans for manufacturing [68:50].

Planning and control AMT's include Material Requirements Planning (MRP),
Manufacturing Resource Planning (MRP II), Statistical Process Control (SPC), and
constraint management. MRP helps explode actual or expected customer orders into their
component parts for inventory control and planning of purchasing, manufacturing, and
distribution activities [68:50-51] [118:472-473]. MRP II updates and expands on MRP
“to include financial, marketing, and logistics elements” [118:474]. Constraint
management helps control the manufacturing process by identifying, managing, and
eliminating bottlenecks in the production flow [68:51]. SPC is the use of control charts
to measure and help control and reduce process variation [162:113-115].

Execution AMTs, concerned with the actual conversion of raw materials into
finished products, include numerical control, robotics, Automated Guided Vehicles
(AGVs), Flexible Manufacturing Systems (FMS), and Automated Storage and Retrieval
Systems (ASRS) [68:51]. Numerically controlled (NC) machines receive digital
instructions and are programmed via computers, often with a magazine of various cutting
tools and the ability to setup and move the work piece to produce a finished product that
formerly required a series of machines and setups to produce. NC machines were originally designed for small-volume, high-variety production, although typical usage does not strictly follow this formula [152:109-110]. AGVs are computer-controlled vehicles that connect receiving, storage, manufacturing, and shipping by carrying material from one place to another [65:299]. An FMS is

a manufacturing process designed so that the production line may be rebalanced often, rapidly matching output to changes in demand. [It] involves mixed-model scheduling and multiskilled operators..., standardization of equipment for quick changeover times..., design of the production line to allow workers to do more than one job..., [and] design to cut down on transportation time between lines [152:96].

Schonberger and Knod point out that the ideas behind FMSs include unleashing brainpower and flexibility of people by eliminating traditional functional specialty boundaries, using flexibility to improve processes, increasing timeliness of responses to changes in customer requirements, and providing low-cost and low-tech ways to improve processes [152:97].

Finally, overarching AMTs are global in scope, in that they have an overall organizational or supply chain perspective. In fact, “the overarching techniques are so all-encompassing that they commonly are thought of as ‘philosophies’ rather than procedures” [68:51].
<table>
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<th><strong>Design</strong></th>
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<td>Computer-Aided Design (CAD)</td>
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<td>Computer-Aided Process Planning (CAPP)</td>
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<td>Design for Manufacturability and Assembly</td>
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<th><strong>Planning and Control</strong></th>
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<td>Material Requirements Planning (MRP)</td>
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<td>Manufacturing Resources Planning (MRP II)</td>
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<td>Statistical Process Control (SPC)</td>
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<td>Constraint Management</td>
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<th><strong>Execution</strong></th>
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<td>Numerical Control (NC, CNC, DNC)</td>
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<td>Robotics</td>
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<td>Automated Guided Vehicles (AGVs)</td>
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<td>Flexible Manufacturing System (FMS)</td>
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<td>Automated Storage &amp; Retrieval System (ASRS)</td>
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<th><strong>Overarching</strong></th>
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<td>Total Quality Control (TQC)</td>
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<td>Just-In-Time (JIT)</td>
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<td>Focused Factory</td>
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<tr>
<td>Computer-Integrated Manufacturing (CIM)</td>
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Table 3: AMT Technologies [68:51]

**Other Technology**

In addition to the AMTs discussed above, the marketplace has seen advances in the power and speed of computer technology (e.g. desktop personal computers) and communication technology. Computer hardware and software have become much more affordable and user-friendly, leading to a growth in the availability of larger, more complex databases; expert systems; simulations of business processes; inventory control
systems; network design methodologies; and other capabilities. Technologies such as point of sale (POS) systems, Electronic Data Interchange (EDI), bar coding, and satellite communications allow real-time transmission of data, pin-point location of shipments, and tracking of inventories and customer orders with greater speed and accuracy, allowing improvements in planning and customer service [65:16-17].

**Competitive Importance of Logistics**

According to Robert Delaney, Senior Vice President with Cass Information Systems, the cost of business logistics systems within the United States increased to $862 billion, 10.7% of the nominal Gross Domestic Product, in 1997. Delaney states that the increasing trend is disturbing in that increases in total logistics costs reflect $40 billion in lost productivity since 1993 [91] [159]. Therefore, increasing the efficiency and effectiveness of logistics will continue to be a key concern for individual firms and for the nation. In addition, “logistics costs can be a significant portion of a typical firm’s sales dollar” [118:24].

As stated earlier in Chapter One, the Council of Logistics Management defines logistics as

> that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from the point of origin to the point of consumption in order to meet customers' requirements [64] [50].

Therefore, logistics involves a variety of activities, including customer service, order processing, inventory control, demand forecasting, transportation, warehousing and
storage, material handling, procurement, parts and service support, packaging, and returned goods handling [118:12-13].

Customer service is perhaps the most important logistics activity, in that it “acts as the binding and unifying force for all of the logistics management activities” [118:13]. Logistics performance is important to the overall goals of a firm and to the satisfaction of customer expectations [104].

**Cost Accounting**

Horngren, et. al. describe five broad purposes for accounting systems. These purposes are listed in Table 4. Purpose 5 is satisfied via financial accounting, with methods largely dictated by regulations and statutes and which must follow generally accepted accounting principles. Management accounting is not constrained to these accounting principles, and it “measures and reports financial information as well as other types of information that assist managers in fulfilling the goals of the organization” [100:2]. Therefore, management accounting focuses on purposes 1-4. “Cost accounting measures and reports financial and other information related to the organization’s acquisition or consumption of resources [thereby providing] information for both management accounting and financial accounting” [100:2].

A firm must choose accounting systems that adequately address these purposes at a reasonable or justifiable cost, determined by comparing the degree to which these accounting systems help the organization achieve its goals with the cost of the systems.
Firms select accounting systems with benefits that outweigh the costs of the accounting systems [61] [100:6].

<table>
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<tr>
<th>Purpose</th>
<th>Description</th>
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<tr>
<td>Purpose 1</td>
<td>Formulating overall strategies and long-range plans.</td>
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<tr>
<td>Purpose 2</td>
<td>Resource allocation decisions such as product and customer emphasis and pricing.</td>
</tr>
<tr>
<td>Purpose 3</td>
<td>Cost planning and cost control of operations and activities.</td>
</tr>
<tr>
<td>Purpose 4</td>
<td>Performance measurement and evaluation of people.</td>
</tr>
<tr>
<td>Purpose 5</td>
<td>Meeting external regulatory and legal reporting requirements.</td>
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Table 4: Purposes of Accounting Systems [100:2]

**Traditional Management Accounting**

**Introduction**

Today’s management accounting information, driven by the procedures and cycle of the organization’s financial reporting system, is too late, too aggregated, and too distorted to be relevant for managers’ planning and control decisions [106:1].

With this straightforward indictment of today’s typical management accounting information, Johnson and Kaplan began their seminal work documenting the many inadequacies of traditional management accounting systems. Many concur with their thesis. For example, May asserts:
It is time for management accountants to accept the criticisms of the past. Accounting systems designed by accountants for accountants have contributed to two decades of stagnant productivity and shrinking economic opportunities. In the top down control cycle attention has been focused, not on fulfilling customer expectations but on achieving accounting-based targets by manipulating processes [130].

O’Guin asserts that “American manufacturing is in crisis ... [b]ecause American executives have been forced to manage their ... companies with misleading and distorted information for the past quarter century” [139:1].

In short, while traditional management accounting systems may be adequate for top-level summarization and reporting of costs, primarily for external purposes [21] [34] [111], they are often inadequate in today’s business environment. According to Johnson and Kaplan:

Corporate management accounting systems are inadequate for today’s environment. In this time of rapid technological change, global and domestic competition, and enormously expanding information processing capabilities, management accounting systems are not providing useful, timely information for the process control, product costing, and performance evaluation activities of managers [106:xii].

Many believe the root cause of the inadequacy of traditional cost systems is their primary reliance on direct labor as the basis for costing products and services and distributing overhead [139:2]. The rise of automation and AMTs have resulted in lower and lower direct labor costs, while material and indirect costs have risen substantially.
Activity-Based Costing

Definitions

Turney defines Activity-Based Costing (ABC) as

[a] method of measuring the cost and performance of activities and cost objects. Assigns cost to activities based on their use of resources, and assigns cost to cost objects based on their use of activities. ABC recognizes the causal relationship of cost drivers to activities [161:315].

O’Guin defines ABC as a cost management system which (1) provides management with more accurate cost information by assigning costs to products or customers based on the resources (or activities) required to produce or serve them, respectively; and (2) provides management insight into the triggers or drivers of cost and how best to manage them. In particular, he notes ABC’s ability to aid management in more accurately assigning and controlling indirect costs [139:31].

Horngren, Foster, and Datar define ABC as an

[a]pproach to costing that focuses on activities as the fundamental cost objects. It then uses the cost of these activities as the basis for assigning costs to other cost objects such as products, services, or customers [100:989].

The focus on activities distinguishes ABC from other methods of improving the accuracy of cost data [100:105-107]. In fact, Beaujon and Singhal assert that understanding the physical activities of the enterprise is key to the proper application of ABC [24:51].

The above definitions illustrate that ABC is typically defined in terms of what it does—how it allocates or assigns cost, particularly indirect costs, to final cost objects (typically products or customers) based on their relative consumption of activities [48]
In other words, ABC “assumes that activities cause cost and that cost objects create the demand for activities” [161:51].

**History**

Activity-Based Costing (ABC) was originally developed to better manage and control indirect costs by more accurately assigning them to products, services, and other cost objects [111] [139]. Yet ABC is also an approach to analyze the activities of an organization, the resources those activities consume, and the reasons those activities are performed. The approach stems from a belief that activities cause costs by consuming or requiring resources, and cost objects create the demand for activities [161] [23]. This is contrasted with traditional cost systems, which assume products cause costs and which generally do not define activities at all [161].

Like most traditional cost management systems, ABC uses “a two-stage procedure to assign an organization’s indirect and support expenses to outputs” [48]. However, while conventional cost systems allocate expenses to cost pools and then to production outputs; ABC allocates organizational resources to the activities that consume them, and then traces the amount of activity (and the costs) required by cost objects (products, services, customers, etc.). This focus on activities, combined with the diversity of cost drivers, “represents an evolutionary extension of the two-stage procedure that underlies most modern cost systems” [59:45] and creates the potential for more accurate costing of a variety of cost objects [48] [161].

As further illustration of the differences in focus between conventional cost systems and ABC systems, Cooper states:
Conventional cost systems focus on the product in the costing process. Costs are traced to the product because each product item is assumed to consume the resources. Conventional allocation bases thus measure only attributes of the individual product item: the number of direct labor or machine hours or material dollars consumed. By contrast, activities are the focus of the costing process in activity-based cost systems. Costs are traced from activities to products based on the product's demand for these activities during the production process. The allocation bases used in activity-based costing are thus measures of the activities performed. These might include hours of setup time or number of times handled [59:45].

Turney refers to the assignment of costs to activities as the first innovation of ABC, allowing ABC systems to report total costs of individual activities and facilitating the prioritization of cost reduction efforts and the modeling of their effects [161:53]. He goes on to assert that “[b]y and large, ... activities are not defined in conventional cost systems” [161:53]. Conventional cost systems assign costs to departments or cost centers; only in cases where departments or cost centers are “defined so narrowly that they are equivalent to activities” would conventional systems provide cost information on individual activities.

As Cooper stated above, ABC systems track the amount of individual activities required by products. To Turney, this second-stage allocation of “activity costs to cost objects based on activity drivers that accurately measure consumption of the activity” is ABC’s second innovation [161:54]. In effect, “the cost of a product [in an ABC system] is the sum of the costs of all activities required to manufacture and deliver the product” [59:46]. The differences, however, between conventional cost systems’ second-stage cost drivers and ABC’s second-stage drivers, go further. As Cooper points out:
Not only the nature of allocation base used by activity-based cost systems but the number of allocation bases used to trace costs in the second stage differs. Whereas a conventional cost system uses, at most, three second-stage allocation bases—direct labor hours, machine hours, and material dollars are the most common bases—an activity-based system makes use of many bases...[59:45].

Turney points out that the types of activity drivers can vary across ABC systems, recognizing the different levels of activities that exist in firms. Turney asserts that conventional cost systems have only unit activity drivers which reflect activities that are performed on each unit of a particular product, while ABC systems also incorporate different types of activity drivers. These include batch drivers—reflecting activities that are performed on entire batches of products, product drivers—reflecting activities that are performed on all units of a particular product, and customer drivers—reflecting activities that are performed for individual customers [161:56-57].

Cooper provides another way of viewing these different types of drivers. In a conventional cost system, the unit-level drivers can also be classified as volume-related, in that the drivers reflect activities that are performed on individual units of a product (e.g. direct labor, direct material), and the total amount of cost assigned to a product line as a whole is directly determined by the number of units produced. In other words, volume-related drivers assign costs in direct proportion to the number of units produced—if production volume doubles, assigned costs double; if production volume goes down by twenty percent, assigned costs decrease by twenty percent. When there are product-related costs that are unrelated to unit volume, cost systems that rely on such drivers will tend to distort reported product costs [59:45-46]. Therefore, Turney claims
that these three attributes of ABC’s second-stage cost drivers—the assignment of costs to cost objects based on their consumption of activities, the larger number of cost drivers used to allocate costs to cost objects, and the different types of cost drivers available, combine to make an ABC system’s product costs more accurate than conventional cost systems [161:56-57].

ABC’s third innovation, according to Turney, is the amount and quality of nonfinancial information about activities that emerges when ABC is implemented properly. Such information includes the drivers themselves that influence the cost of an activity, performance measures for determining the effectiveness of the activity, and analysis to determine if an activity truly adds value [161:60-61].

ABC’s first stage assigns costs to activities, while traditional cost systems assign costs to departments or cost centers. Only in cases where departments and cost centers are defined very narrowly do conventional cost systems provide cost information about activities. Knowledge of activity costs is important, allowing one to see which activities consume the most resources and have the greatest potential for cost reduction, and it “allows you to model the impact of cost reduction actions and to subsequently confirm that savings were achieved” [161:53].

In the second stage, ABC “assigns activity costs to cost objects based on activity drivers that accurately measure consumption of the activity” [161:54]. Turney defines cost objects as “the reason[s] for performing an activity [which include] products, services, customers, projects, and contracts.” [161:316]. ABC differs significantly from conventional cost systems in the types of drivers used to assign costs to cost objects and
in the number and types of cost objects to which costs are traced. This will be discussed in detail in the section on ABC System Design below.

**Comparison to Traditional Management Accounting**

Some argue that traditional accounting systems systematically distort product costs and are not very useful in managing activities [24:51] [139:62]. Beaujon and Singhal note the serious nature of such assertions by pointing out that product cost information is important in make or buy decisions, pricing decisions, adding or dropping product lines, and other strategic decisions [24:51]. O’Guin states

> There is probably no more strategic information for an executive than the knowledge of which products are making money and which ones are not. Product profitability drives all strategic decisions like which markets to pursue and where to invest R&D and capital [139:63].

In addition, Beaujon and Singhal indicate that the focus of management initiatives is often improving the efficiency and effectiveness of activities, while eliminating activities that add little or no value to the customer. Design for manufacturability, investments in new technology, synchronous manufacturing, just-in-time (JIT), and statistical process control (SPC) are examples of such initiatives [24:51] [125:B4-2].

By tracing costs to the activities that cause them, ABC provides more accurate product costs and also provides key management information about the activities themselves [24:51-52].

33
Use of ABC with Other Initiatives

Companies are continually striving to improve their performance to remain competitive [125:B4-2]. “Global competition, technological changes, and economies of scale are several of the forces that have caused many industries to restructure and reevaluate how to compete” [125:B4-2]. Total Quality Management (TQM), continuous improvement (kaizen in Japanese), and Just-in-Time (JIT) are examples of initiatives firms use to help improve their performance [125:B4-2]. As Maisel and Morrissey note:

Many companies that have implemented such programs have adopted activity-based costing (ABC) as a way to measure the success or failure of these improvement programs. The linkage of ABC with continuous improvement programs has become an important basis for competition [125:B4-2].

O’Guin asserts that ABC “places a business in an environment of continuous improvement” by helping them “reduce overhead spending, improve product design, raise quality levels and focus on profitable products and customers” [139:62].

Motivations for ABC Use

Cooper points out that “redesigning a cost system is expensive and time consuming” [62:77]. Therefore, whether one is considering redesigning an existing cost accounting system to make it activity-based (i.e. replacing the current cost system) or designing an activity-based system to use in conjunction with the existing management accounting system, it is important to ensure that the redesign or additional system development is truly necessary. Cooper enumerates several signals that may indicate a cost system needs replacement [62]:

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• "functional managers want to drop seemingly profitable lines" [62:77]:

Production, sales, and/or marketing managers often know when products are priced incorrectly. If functional managers believe certain products are troublesome, but the cost system indicates they are highly profitable, it may be an indication that the cost system is faulty.

• "profit margins are hard to explain" [62:77]: This is related to the bullet above. Managers should be able to understand and explain profit margins — why certain products have high margins and others have low margins. If managers cannot adequately explain or seem baffled by profit margins reported by the cost system, it may indicate the cost system is not accurately reflecting product costs.

• "hard-to-make products show big profits" [62:77-78]: Products that are more difficult to make (special handling, more inspections, more rework, etc.) consume more resources than other products; margins should be low unless the products are priced at a premium. If such hard-to-make products are showing high profitability without premium pricing, the cost system may not be accurately reporting their costs.

• "departments have their own cost systems" [62:78-79]: With the growth of the power of personal computers, it is relatively easy for departments to design their own cost tracking systems. When departments lose faith in the existing cost system and feel it is necessary to have their own internal cost system, the existing cost system may need to be improved.

• "the accounting department spends a lot of time on special projects" [62:79]: While some decisions are momentous enough to require special study and deliberation, a
good cost system should provide much of the information management needs on a daily
basis for decision making. If significant amounts of the accounting department’s
resources are constantly engaged in special studies, it may indicate the existing cost
system is obsolete.

- “you have a high-margin niche all to yourself” [62:79]: Unless there are barriers
to entry, a high-margin niche without competition generally indicates the margins being
reported are erroneously high.

- “competitors’ prices are unrealistically low” [62:79]: If competitors’ prices are
substantially lower, it could indicate the firm’s cost accounting system is attaching too
much overhead to the product, thereby subsidizing lower volume products. This is
especially likely if the competitor is small and has prices set lower on a product
competing with one of the firm’s high-volume products.

- “customers don’t mind price increases” [62:79]: If price increases do not have a
substantive effect on sales volume, the market may be confirming that the cost
information used to justify the former lower prices was faulty.

- “the results of bids are hard to explain” [62:79]: If management’s cost
information is accurate, management should have a fairly good idea of how its bids
compare with competitors. If management finds itself winning bids it expected to lose
and losing bids it expected to win, it may indicate the cost system is providing distorted
information.
• "vendor bids are lower than expected" [62:79]: If vendors can make a product at a substantially lower price than it can be manufactured in-house, and the vendor has no apparent efficiency advantages; it may indicate the firm's cost system is inaccurate.

• "reported costs change because of new financial accounting regulations" [62:79]: Cost systems designed with the primary goal of facilitating external reporting generally do not do a good job of meeting other requirements. If nothing substantial in the business environment has changed but a new financial accounting regulation changes reported costs, it may be an indication that the existing cost system is too skewed toward external reporting rather than providing information for management decisions.

In addition, Cooper asserts that one's cost system may be obsolete if one has experienced the following [62:79-82]:

• "increased automation" [62:79-80]: While increasing automation reduces the amount of direct labor oversight over production processes, the newer technology typically requires a greater amount of overhead (e.g. engineering support, programming). Cost systems that use direct labor as an allocation base will fail to assign adequate overhead costs to products produced with the new technology.

• "changes in the use of support functions" [62:80]: If newer products require different types and levels of support than existing product lines, cost distortions between product lines could be introduced.

• "changes in product market strategy" [62:80]: Changes in marketing strategy are often accompanied by changes in production volume. "Most cost systems are designed
with one type of production in mind and don't differentiate well between the overhead consumed by high- and low-volume products” [62:80].

• “simplification of manufacturing processes” [62:80]: Changes in the production environment do not necessarily require a more complex cost system. In fact, implementing Just-In-Time (JIT) methodologies or cellular manufacturing can simplify a firm’s cost accounting practices. Cooper explains:

    In one company, the cost system measured the value of work in process at every inventory stage, requiring hundreds of thousands of measurements a year. But the introduction of JIT reduced inventory levels so much that those measurements were no longer important.... Cellular manufacturing ... creates a series of mini-factories, each specializing in similar items. Companies should be able to trace overhead directly to the mini-factories and then spread those costs evenly over all the units they produce [62:80].

• “intensified competition” [62:80-81]: Firms may not be overly concerned about the profit margins of individual products if overall margins are good and competitive pressures are light. However, as competition intensifies, the risks associated with poor cost data escalate. For example, a product that is overcosted may appear to have a relatively poor margin; the company may decide not to defend its position against a competitor’s onslaught. Alternatively, if the firm sets the price of the product too high (due to the overcosting error), it might attract competitors. Cooper reports:

    One company redesigned its cost system and discovered that a particular product line was considerably more profitable than it had thought. To avoid attracting competition, the company increased the discount, added more field support, and increased advertising spending [62:81].

• “unbundling of products” [62:81]: Firms that have traditionally bundled products together may find that costs of the individual products may be hidden and/or
distorted, resulting in poor pricing or marketing decisions and the potential loss of profitable markets.

- "deregulation" [62:81-82]: When regulators set prices, a firm competes by controlling overall efficiency. Internal transfer pricing systems and captive supplier relationships are similar to regulated environments. Under deregulation, when companies have much greater freedom to pick and choose the products and services they will provide and the markets they will serve, along with the freedom to set prices, accurate cost data becomes much more critical for competitive success.

- "technological improvements" [62:82]: A firm's cost system can quickly become obsolete if the firm fails to take advantage of technological improvements in production, communication, and computing technology. Advanced Manufacturing Technologies (AMTs) and communication technologies (e.g. bar coding) can provide increased amounts of electronic data quickly and efficiently, where the collection and analysis of such data could be done at relatively little cost. The increased volume, accuracy, and availability of real-time data can improve the accuracy and usefulness of cost data for decision making. Firms that fail to integrate such technologies and improvements into their cost systems could find themselves at a competitive disadvantage.

- "changes in strategy and behavioral goals" [62:82]: Changes in a firm's competitive strategy may logically require different behavioral goals from the firm's employees. The cost system may need to be redesigned to track and report the necessary data to support and encourage these new goals. For example, a firm that wishes to
encourage its engineers to design new systems using existing parts when possible may need to redesign its cost system to incorporate cost drivers tied to the number of new, unique parts.

**ABC System Design**

Design decisions have an important effect on the accuracy of product costs, the cost of ABC implementation, the usefulness of information to help manage activities, and management’s understanding of the cause and effect relationships between activities and costs [24].

O’Guin recommends three general guidelines for firms designing ABC systems:

First, the system should be kept as simple as possible. Unnecessary detail in the number of activities tracked and/or the number of cost drivers used and the specificity of cost data wastes time and effort and makes the system harder to understand in exchange for little or no added benefits [139:84-85].

It is better to be approximately right rather than precisely wrong. In the words of John Tukey of Princeton University: “Far better an approximate answer to the right question, which is often vague, than the exact answer to the wrong question, which can always be made precise.” [139:84]

O’Guin distinguishes between first- and second-stage drivers’ contributions to system complexity. He asserts that system complexity is relatively insensitive to the number of first stage drivers (those which “assign indirect support costs to activity centers” [139:93]), since these drivers are used primarily for budgeting and variance reporting, and their interpretation is straight-forward. However, O’Guin claims second-stage drivers (those which assign activity costs to cost objects) are the “crux of an ABC design”
[139:93], the primary differentiation between traditional cost systems and ABC systems, the primary causes of user confusion, and the main component of system complexity. As the number of second-stage drivers increases, the cost of designing and maintaining the system increases [139:93, 111].

The ABC system “should reflect how the company incurs its costs, but not to extreme detail” [139:84]. Rather than reporting on individual activities that account for extremely small percentages of overall costs, such activities should be combined in logical ways into larger, more significant, activities. If activities add no value, they should be eliminated rather than tracked. In addition, tracking costs in minute detail dilutes management attention; the focus should be on significant costs of the firm. Finally, many costs cannot be perfectly measured in terms of activity. For example, ABC systems often rely on personnel estimates of how their time is divided among several activities. While their estimates are not precise, they are often good enough to support the necessary decisions. The cost of alternatives (e.g. requiring all personnel to keep meticulous time records of exactly how their time is spent on a daily basis) often is not justified by the relatively small increases in accuracy [139:84].

Second, cost drivers should be specifically tailored to individual firms. Firms operate in different and unique ways; a significant cost or activity in one firm may be unimportant or nonexistent in another [139:85].

Third, the objectives management wants to achieve with the ABC system and the decisions management wants the ABC data to support must be taken into account when designing an ABC system. These considerations affect the structure and complexity of
the ABC system [139:85-86]. ABC systems used only for product costing will require fewer cost drivers than systems which must provide more detailed information (e.g. to support continuous improvement) [139:111].

In summary, O’Guin defines these basic nine steps in designing an ABC system [139:86]:

1. Develop fully “burden” [sic] department cost from the general ledger.
2. Segregate costs into product driven or customer driven.
3. Split support departments into major functions.
4. Split department costs into function cost pools.
5. Identify activity centers (homogeneous processes).
6. Identify first-stage drivers.
7. Identify second-stage drivers.
8. Identify activity levels.
9. Choose number of cost drivers.

Activity-Based Management

Overview / Definitions

The definition of ABM varies in the literature and can lead to some confusion [99]. Turney defines ABM as

A discipline that focuses on the management of activities as the route to continuously improving the value received by customers and the profit achieved by providing this value. This discipline includes cost driver analysis, activity analysis, and performance analysis. ABM draws on activity-based costing as a major source of information [161:157].

In defining ABM this way, Turney focuses on the management of activities using ABC data, rather than the cost information provided by an ABC system. To Hixon, ABM is
"the management and control of enterprise performance using activity-based information as the primary means of decision support" [99]. Hixon points out that ABM and ABC are not synonymous; and like Turney, emphasizes the aspect of activity analysis and management using data provided by the ABC system [99]. Miller also focuses on activities in pointing out the close linkage between ABC and ABM:

The similarities and differences between ABC and ABM can be expressed in their definitions: Activity-based costing is defined as a methodology that measures the costs and performance of activities, resources, and cost objects. Resources are assigned to activities, and then activities are assigned to cost objects based on their use. Activity-based management is defined as a discipline that focuses on the management of activities as the route to improving the value received by the customer and the profit achieved by providing this value. This discipline includes cost driver analysis, activity analysis, and performance measurement. Activity-based management draws on ABC as its major source of information [157].

Richard M. Miske, as the time manager of manufacturing and distribution planning at AT&T, defined ABM as "using ABC to improve processes" [2], while Rosen states that ABM "involves analysis and forecasting based on the ABC cost structure" [151]. Cooper, et al. appear to view ABM (and Activity-Based Cost Management) more generally as simply acting on the information from an ABC system (i.e. using ABC data in decision making) [49:54, 57]. This is consistent with O'Leary, who says ABM is simply ABC data influencing business decisions [141].

A common thread running through all these definitions of ABM is the idea of using the information an ABC system provides in decision making. This is consistent with Turney's statement that ABM is "using ABC to improve a business" [161:139]. To Turney, ABM has two main goals: to improve customer value and to improve
profitability [161:140-142]. In other words, ABM uses ABC information to help determine which activities are contributing the most to customer value, which activities have the greatest need for improvement, which activities add no value to the customer, and which activities unnecessarily waste resources and reduce profitability. The activity-based information from an ABC system facilitates the “deploy[ment] of resources to activities that yield the maximum strategic benefits [and] the improve[ment] of what matters to the customer” [161:143]. The ABC information supporting such decisions is used by ABM’s many analysis tools, which include strategic analysis, value analysis, cost analysis, activity-based budgeting, life-cycle costing, and target costing [161:140-184]. The various ways ABC data can be used to improve a business via ABM are presented in detail in the following section.

**Criticisms of ABC**

Studies by Miller and Vollman (1985) and Cooper and Kaplan (1987) have shown that factors other than output volume (e.g. product line diversity, process complexity) can drive overhead costs [19:576] [136]. Banker’s study of the airline industry, for example, found “both volume- and operations-based cost drivers to be statistically significant” [19]. However, it may be that in some industries, using volume-based cost drivers to allocate overhead costs may be reasonably accurate and sufficient for management decision making. For example, Foster and Gupta studied the correlation of manufacturing overhead with output volume and other operationally-based measures. In a study of 37 different plants of a single manufacturing firm, they found most volume-
related measures were highly correlated with manufacturing overhead, while few of the operationally-based measures exhibited high correlations [82:309-337]. “[T]heir findings leave the impression that systems based on just volume may not significantly distort information generated for managerial decision making” [82].

In addition to disagreements on how much ABC increases cost accuracy (if at all), Merchant and Shields state that there are many situations when “the reporting and use of more accurate cost measurements is not in an organization’s best interests” [134:76]. They define accuracy in terms of precision (lack of randomness or measurement noise) and freedom from bias. These are desirable measurement qualities, whose “subversion can actually benefit an organization” [134:76] in certain circumstances.

Merchant and Shields describe three different scenarios, along with illustrations from firms’ actual practices, to support their assertion. The scenarios are: deliberately biasing costs of products/services upward, deliberately biasing costs of products/services downward, and deliberately defining costs less precisely to introduce measurement noise of unknown directional bias. Companies use the first scenario in competitive pricing situations to prevent company personnel (especially salespersons) from discounting prices to the “true cost level” [134:77]. Companies use the second scenario to motivate cost reduction efforts (similar to “target costing”) or to encourage particular activities or the use of particular services (e.g. understating the costs of personal computer support to increase the use of PCs within the firm). Companies deliberately choose the third scenario (lower precision) to motivate or induce certain behaviors. For example, a firm may understand that direct-labor is a poor (inaccurate) driver of many types of overhead.
costs. However, management, believing that the firm’s competitiveness is best served by increasing automation and reducing direct labor may still elect to allocate the majority of overhead based on direct labor hours to encourage engineers to design more highly automated processes [134:77-79].

Note that in all of these scenarios, management is attempting to influence behavior:

An important similarity among the examples of less accurate cost systems we discussed is that the managers of each of these firms had already formulated a competitive strategy and were using their cost systems to help implement the chosen strategy by directing and motivating their employees in directions deemed to be desirable. These cost systems were being used to implement, not develop, competitive strategies [134:80].

At the same time, Merchant and Shields concede that there are management scenarios where accurate cost data is essential [134:80].

There are also potential problems associated with how ABC systems may be implemented or used, rather than blanket criticisms of the overall philosophical framework or methodology of ABC.

One potential danger of ABC is that firms may concentrate too much on reducing costs, rather than concentrating on what activities actually should be performed and add value in meeting customer requirements [107] [139:84, 112]. For example, while O’Guin acknowledges that increased ABC system complexity (i.e. larger numbers of second-stage cost drivers) provides more detailed cost information, increasing the potential for managers to use the information to improve processes [139:112], he warns:

Do not become overly enamored with tracking costs and create an extremely complex ABC system which measures a large number
of activities. Many of the activities should probably not even be
performed and by tracking these activities one only helps to
institutionalize them [139:84].

Peter Drucker strikes a similar theme in discussing cost control:

The only truly effective way to cut costs is to cut out an activity
altogether. To try to cut back costs is rarely effective. There is
little point in trying to do cheaply what should not be done at all
[72:69].

Levitt adds his agreement in asserting:

No amount of low-cost production or high-yield selling is good
enough in the service of what is not itself good enough. Nothing
is more wasteful than doing with great efficiency that which
should not be done [123:8].

Johnson goes even further by contending that any use of management accounting
information to control people or business operations is inappropriate and an impediment
to customer-focused, competitive improvements. Rather, a firm must establish
performance measurements that encourage workers to achieve control over and
continuously improve processes which satisfy customer requirements and expectations
[107]. He concedes that ABC provides more accurate product cost information, is a
useful tool in restoring management accounting’s legitimate role in marketing decisions
(e.g. product pricing, product mix), and helps many firms discover higher profits, at least
in the short run [107:141-147]. At the same time, however, he adds that “activities” in
ABC never refer to customer-focused processes and often lead management to economize
an activity driver by producing potentially unwanted output. In other words, rather than
focusing on customer requirements and the key processes the firm uses to meet those
requirements, Johnson feels ABC wrongly focuses management attention on improving efficiencies of existing processes [107:148-149]. Johnson warns:

No accounting information, not even activity-based cost management information, can help companies achieve competitive excellence.... The pathway to global competitive excellence is not reached by doing better what should not be done at all.... I firmly believe that the use of activity-based cost driver information to control operating activities—not just to reconfigure costs of products and other objects—leads companies to make decisions every bit as damaging to their long-term competitiveness as traditional standard cost information did in the last thirty years.... My main point is that activity-based cost driver information in itself will not cause managers to change the way people work—from cost-oriented practices associated with remote control to time- and people-oriented practices associated with global competitive excellence—and it often will prompt actions that impede responsiveness and flexibility [107:132, 149].

Summary

The literature presents a reasoned, logical, and theoretical basis for improved information that can be provided to management by an ABC system. In addition, the literature provides many examples of hypothetical situations and actual business situations where firms benefit from using ABC data.

However, most of the examples of actual implementation and use of ABC data by firms involve manufacturing firms, and there have been few examples in the literature emphasizing the use of ABC within logistics. Pohlen [148] provides perhaps the only research project that focused exclusively on the use of ABC applications within logistics; Cooper, et al. [48] included one logistics application in their case study research. In
addition, little is known about the longer-term effects of ABC use within logistics, nor how ABC data compares to non-ABC data in terms of support for management decisions in many different areas of logistics.

This research seeks to fill this gap by using a case study methodology to study firms that have implemented ABC at least two years prior to this research along with firms that have not implemented ABC. The management accounting system characteristics and capabilities of these firms are investigated, analyzed, and compared, particularly in relation to the perceived capabilities or benefits derived from the information the cost systems provide to decision makers.
CHAPTER 3

METHODOLOGY

Introduction

This chapter outlines and explains the research methodology used during this research project. It begins with an overview of the methodology, and then moves to specifics of the research design: research variables, research objectives, research questions, research guiding hypotheses, and research execution. Throughout this chapter, care is taken to provide clear traceability from the research objectives to the research questions or guiding hypotheses to the investigative questions to the measurement questions (interview protocol).

Overview

The research was both exploratory and descriptive, focusing on the nature, extent, and impact of ABC use in logistics in a selected group of firms. The research studied why these firms implemented ABC in logistics, how these firms implemented ABC systems, what types of decisions are supported by the ABC systems, and the perceived impact or efficacy of the ABC information.
The research consisted of eleven exploratory case studies of organizations performing logistics functions. In particular, this study investigated the longer-term effects of ABC use in the logistics operations of firms by including firms in the research sample that have implemented ABC within their logistics functions at least two years prior to this study. The case studies obtained information on each firm’s business environment, reasons for implementing ABC in logistics, development of their ABC system, current capabilities of their ABC system, the decision areas in which they use ABC information, the usefulness of the ABC information, and management satisfaction with the existing accounting information.

**Research Design Classification**

Cooper and Emory classify research designs from eight different perspectives: degree of problem crystallization, method of data collection, researcher control of variables, purpose of the study, time dimension, topical scope, research environment, and subjects’ perceptions of the research [49:114-115]. This framework will be used to discuss the research design.

**Degree of Problem Crystallization**

Research can be classified as exploratory or formal based on the degree of structure and/or the study’s immediate objectives. Formal studies begin “…with a hypothesis or question and involves precise procedures and data source specifications. The goal of a formal research design is to test the hypotheses or answer the research questions posed” [49:115]. Exploratory studies are typically less structured and seek to
discover important factors or relationships and to clarify concepts and priorities. Such studies are appropriately used early on to help scope and define key issues and to develop theory and hypotheses for future research. Exploratory studies generally rely more heavily on qualitative research techniques to investigate management questions, including in-depth interviewing, document analysis, and case studies [49:115-119].

Due to the limited number of firms using ABC in logistics, the relatively short-term experience of most firms using ABC in logistics, and the lack of research focusing on ABC use within the logistics function, this research was an exploratory study. The study used a case study approach with in-depth, elite interviewing (interviews of influential and/or knowledgeable people within an organization), and document analysis of a limited amount of additional documentation provided by the participating organizations. The case study approach was appropriate for this exploratory research, since it allowed flexibility and a conversational interview style guided by an interview protocol. The flexibility allowed the researcher to pursue important factors or issues that arose during the interview process but were unforeseen in the interview protocol design. A case study approach allowed the researcher to investigate and analyze the circumstances and conditions of ABC use contextually and in-depth. Multiple case studies were used in this research to allow the researcher to examine similarities and differences in ABC use within the firms studied and to explore possible relationships between ABC use and contextual, environmental factors of each firm [49:116-117].

While lacking the broader, more generalizable results of a statistical study, a case study approach still has scientific value. For this research, it provides a means of
investigating ABC use in logistics, still a relatively rare occurrence, in contextual detail, while also aiding theory development and evaluation [49:116-117]. This is discussed in more detail in the section, Topical Scope, on page 55.

**Method of Data Collection**

Data may be collected by monitoring or by interrogation. The former includes observational studies in which the researcher observes the actions of the study subjects and/or reviews existing documentation without requesting specific responses from the subjects. The latter includes surveying subjects and collecting their responses via interviews (face-to-face or telephone conversations), survey instruments in various forms, or other means [49:115].

This research followed an interrogation approach in conducting case studies of eleven organizations. The primary data gathering technique was loosely structured interviews using an interview protocol (sometimes referred to as an interview schedule) as a guide. The protocol contained basic identification and background questions, along with structured and unstructured questions. Structured questions limit the subject being interviewed to a closed set of possible responses, while unstructured questions do not limit the possible responses—they are open-ended questions [49:299]. Most of the questions were in the latter form. The intent of the interview protocol was to provide an overall guide or framework for the conversation, but the researcher sought to encourage a relaxed, flexible environment to allow the specific questions and direction of the interview to evolve contextually [49:299] [66:71].

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Researcher Control of Variables

This classification speaks to the researcher's ability to manipulate variables. In experimentation, the researcher attempts to control and/or manipulate variables. This method is appropriate in studying causation or the effects of certain variables on other variables. In ex post facto designs, the researcher has no means of manipulating the variables. Rather, the researcher simply reports what he or she finds. The selection of study participants is the only means of setting or selecting the existence or state of certain variables [49:115-116].

This research was an ex post facto design, since the research was exploratory and sought to determine through observation and questioning the important variables and factors affecting ABC use within logistics. Care was taken to accurately analyze and report the similarities and differences between the organizations studied, and these characteristics were taken account in the reporting and analysis of the collected data.

Purpose of the Study

Studies can be described as causal or descriptive. Causal studies are “concerned with learning why, that is, how one variable produces changes in another,” while descriptive studies are concerned “with finding out who, what, where, when, or how much” [49:116]. Descriptive studies can be quite complex and may produce evidence suggesting correlation or causation between variables [49:122].

This research was primarily descriptive, although it also has some causal elements. For example, research objectives 2, 3, and 4 are descriptive, while research objective 1 is at least partially causal in nature.
**Time Dimension**

Studies may be cross-sectional or longitudinal. Cross-sectional studies represent a “snapshot” of a point in time, while longitudinal designs study changes in a subject over time [49:116].

This research was primarily cross-sectional, with some longitudinal aspects. It was cross-sectional in that each subject was interviewed at only one point in time and the researcher studied the subjects for the first time. However, information about “past attitudes, history, and future expectations” may provide some of the benefits of a longitudinal study [49:116]. Some of the interview protocol questions used in this study were intended to obtain this type of information. In addition, some of the study participants had participated in Pohlen’s 1993 research [148], allowing some comparisons between their earlier experiences and attitudes and their current experiences and attitudes.

**Topical Scope**

Studies may be classified as statistical studies or case studies. As Cooper and Emory state:

Statistical studies are designed for breadth rather than depth. They attempt to capture a population’s characteristics by making inferences from a sample’s characteristics. Hypotheses are tested quantitatively. Generalizations about findings are presented based on the representativeness of the sample and the validity of the design [49:116].

Case studies, by contrast, place emphasis on an in-depth study of fewer events and place an emphasis on detail and qualitative data. Case studies can use hypotheses, although the methodology makes hypothesis testing more difficult. The detail of case studies,
however, can provide meaningful insight and aid grounded theory development for future inquiries [49:116] [66]. Finally, while lacking the breadth of statistical studies, case studies' scientific contributions are still well founded:

Although case studies have been maligned as “scientifically worthless” because they do not meet minimal design requirements for comparison, they nonetheless have a significant scientific role. It has been observed that “important scientific propositions have the form of universals, and a universal can be falsified by a single counter-instance.” Thus, a single, well-designed case study can provide a major challenge to a theory and provide a source of new hypotheses and constructs simultaneously [49:117].

This research used a case study approach to study the use of ABC in the logistics operations of eleven different firms or organizations.

**Research Environment**

The research environment may be characterized as field conditions or laboratory conditions [49:117]. Clearly, this research studied organizations in their operating environments and is properly classified as field research.

**Subjects’ Perceptions**

Research designs may be characterized by the degree to which the subjects realize that research is being conducted and the effect of their perceptions of the research and the researcher on their responses to the research [49:117]. The subjects of this research were aware that research was being conducted and interacted with the researcher. Care was taken to avoid influencing the responses of the study participants by ensuring anonymity and confidentiality of responses in the reporting of research results. In addition, the
researcher was careful not to lead or give the impression of trying to lead the responses in any particular way.

**Research Design Hierarchy and Traceability**

The research generally followed the question hierarchy outlined by Cooper and Emory [49:56-59]. The basic approach begins with a management question that expresses a management problem or decision that needs to be resolved. The general, management question is then broken down into more specific research questions, which are in turn each broken down into more specific investigative questions. Finally, the investigative questions are further broken down into measurement questions. In research designs using surveys, the measurement questions would be the questions the researcher asks the research subjects [49:56-59].

This research generally followed this hierarchy, with some specific tailoring. The research began with the problem statement outlined in Chapter 1. From the problem statement, four main research objectives were established. Each research objective was accomplished by evaluating a research question or guiding hypothesis. Based on the research questions and guiding hypotheses, relevant variables were defined. Then investigative questions were developed to guide the collection of data pertinent to the variables and the overarching research questions and guiding hypotheses. Finally, the investigative questions were either directly transferred to the interview protocol or broken down into measurement questions that appeared on the interview protocol.
Note that the primary means of accomplishing the research objectives was through the use of research questions and guiding hypotheses. This research, as explained and justified above, was an exploratory and descriptive study employing qualitative research techniques. Cooper and Emory point out that researchers often use research questions rather than descriptive hypotheses [49:39].

Qualitative studies require flexibility in the research design to allow the researcher to modify the structure and pursue promising or significant issues that may be uncovered during the conduct of the research [127:26] [66:70]. Marshall and Rossman state:

> In qualitative research, questions and problems for research most often come from real-world observations, dilemmas, and questions. They are not stated as if-then hypotheses derived from theory. Rather, they take the form of wide-ranging inquiries...[127:28].

Creswell points out that “one typically finds research questions, not objectives or hypotheses, written into qualitative studies” [66:70] in the form of grand tour questions or guiding hypotheses. This emerging methodology allows flexibility and does not unnecessarily limit the inquiry [66:70].

Guiding hypotheses are drawn from possible relationships and constructs suggested by the literature review [128:36]. Marshall and Rossman stress that while guiding hypotheses help guide and focus the research effort, they are still used only as a guide during the conduct of the research:

> It is essential, however, that the researcher explain that guiding hypotheses are merely tools used to generate questions and to search for patterns. Guiding hypotheses may be discarded when the researcher gets into the field and finds other exciting patterns of phenomena. This approach retains the flexibility needed to allow the precise focus of the research to evolve during the
research process itself. By avoiding a precise problem statement, the researcher retains her right to explore and generate hypotheses in the area of the problem statement. The guiding hypotheses illustrate for the reader some possible directions the researcher may follow. The researcher, however, is still free to discover and pursue other patterns [128:37].

This research design sought to retain much of the flexibility described above through an extensive use of open-ended investigative and measurement questions in the interview protocol. Through interaction with the study participants and content analysis of key organizational documents (if available) and transcriptions of the interviews, the researcher sought to discover additional patterns and relationships for use in the development of grounded theory [66:12, 71]. Most of the descriptive aspects of the research, particularly research objectives two, three, and four, were studied with investigative questions. Relationships between variables in these objectives, and the primary evaluation of the first research objective, were addressed with guiding hypotheses.

The following sections describe the research objectives, research questions and guiding hypotheses, variables derived from the research questions and guiding hypotheses, investigative questions, and measurement questions that were used in this research. The research design will be clearly traceable from the research objectives to the individual questions in the interview protocol. A research traceability matrix is included as Appendix C.
Research Objectives

The research objectives were developed from the problem statement outlined in Chapter 1. Despite a great deal of interest in ABC within the literature and the logistics community, very few firms were apparently using ABC in logistics and little was known about the nature, extent, and impact of ABC use in logistics. Therefore, the overall objective of this research is to study the nature, extent, and impact of ABC use in logistics.

ABC

The research objectives of this study covered four major areas. Specifically, the objectives of this study were as follows:

1. Discover motivations for ABC use within logistics.
2. Discover characteristics of ABC systems used in logistics.
3. Explore capabilities and deficiencies of ABC systems used in logistics.
4. Discover the impact of ABC use within logistics in terms of logistics decision making and attitudes of logistics practitioners.

Guiding Hypotheses and Research Questions

This research used five guiding hypotheses and three research questions to accomplish the research objectives. The guiding hypotheses are presented in Table 5 and the research questions are outlined in Table 6. Guiding Hypothesis One and Research Questions One through Three are the primary means of addressing the research objectives and are outlined below. Guiding Hypotheses Two through Five are used to investigate some relationships of interest across research objectives.
Table 5: Guiding Hypotheses

<table>
<thead>
<tr>
<th>Guiding Hypothesis One:</th>
<th>Firms’ primary motivation in implementing ABC within logistics is to better understand product and/or service costs due to difficulty in costing logistics operations and/or intense price competition in the marketplace.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guiding Hypothesis Two:</td>
<td>Greater complexity in ABC system design will be associated with greater price sensitivity.</td>
</tr>
<tr>
<td>Guiding Hypothesis Three:</td>
<td>Greater complexity in ABC system design will be associated with the use of ABC as part of the day-to-day, management information system.</td>
</tr>
<tr>
<td>Guiding Hypothesis Four:</td>
<td>Greater complexity in ABC system design will be associated with larger numbers of different decisions the ABC data supports.</td>
</tr>
<tr>
<td>Guiding Hypothesis Five:</td>
<td>Greater complexity in ABC system design will be associated with more favorable attitudes of logistics practitioners toward the usefulness and impact of ABC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Question One:</th>
<th>What are the key characteristics in terms of design, training, advocacy, and philosophy of use of your ABC system?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Question Two:</td>
<td>What decisions or decision-making areas are supported by ABC data? What decisions or decision-making areas does ABC fail to adequately support?</td>
</tr>
<tr>
<td>Research Question Three:</td>
<td>What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?</td>
</tr>
</tbody>
</table>

Table 6: Research Questions

Investigative Questions

Investigative questions support the study and evaluation of the guiding hypotheses and research questions. The guiding hypotheses and research questions are listed below, with key phrases underlined. These phrases are further broken down into investigative
questions. The investigative questions were derived from the literature review. In particular, several investigative questions were taken or derived from Pohlen [148] to facilitate a longitudinal view of the firms that participated in both Pohlen’s research and this research, as well as to facilitate comparisons of the results of the two studies.

**Guiding Hypothesis One:**

Firms’ **primary motivation** in implementing ABC within logistics is to better understand product and/or service costs due to **difficulty in costing logistics operations** and/or **intense price competition** in the marketplace.

**Supports:** Research Objective One

**Investigative Questions:**

*Primary Motivation*

H1-1. What were the primary reasons or motivations for implementing an ABC system within the logistics function?

*Difficulty in Costing Logistics Operations*

H1-2. How often does the firm receive special or unique requests from its customers and/or suppliers that involve the logistics function?

H1-3. To what extent is there diversity in the consumption of logistics overhead resources?
Intense Price Competition

H1-4. What are the primary ways the firm differentiates its products and services from its competition?

H1-5. How price sensitive are the markets in which the firm’s products and services compete?

Research Question One:

What are the key characteristics in terms of design, training, advocacy, and philosophy of use of your ABC system?

Supports: Research Objective Two

Investigative Questions:

Design

Q1-1. Describe the overall process the firm uses to allocate and/or assign costs to cost objects.

Q1-2. How many unique resources are used in the ABC system, what are they, and how were they selected?

Q1-3. How many resource drivers are used in the ABC system, and how were they derived?

Q1-4. How many activity centers are used in the ABC system, how did the firm decide how many activity centers to use, and how did the firm select the activity centers?
Q1-5. What are the number and type of cost drivers used in the ABC system, and how were they derived?

Q1-6. How many cost objects are used in the ABC system, and why were these cost objects selected?

Q1-7. Does the firm maintain different accounting systems for financial accounting and for managerial accounting, or does it have one accounting system to meet all its requirements, and which accounting systems are activity based?

Training

Q1-8. What type and extent of training did firm personnel receive prior to or during the initial ABC system design, and who provided the training?

Q1-9. What type and extent of training did firm personnel receive in the use of the ABC system after or just prior to implementation, and who provided the training?

Q1-10. How satisfied are personnel with the current level of training?

Q1-11. What additional training (if any) would be beneficial, who should receive it, and who should provide it?

Advocacy

Q1-12. Who championed the effort to implement ABC within logistics?

Q1-13. Is top management supportive of the ABC implementation in logistics? If so, how does top management demonstrate their support?
Q1-14. Was ABC being used elsewhere in the firm prior to the implementation in logistics?

Q1-15. Was/is the accounting/finance department supportive of the use of ABC in logistics?

**Philosophy of Use**

Q1-16. Is the ABC system in logistics used by and/or available to the entire firm (e.g. other functions, firm executives) or used only within logistics?

Q1-17. Is ABC data used regularly as part of a management information system for day-to-day management decision making or primarily as a diagnostic tool for addressing specific issues or questions on an ad hoc, case-by-case basis?

**Research Question Two:**

What decisions or decision-making areas are supported by ABC data?

**Supports:** Research Objective Three

**Investigative Questions:**

*Decisions or Decision-Making Areas*

Q2-1. To what extent does the firm break out logistics overhead costs based on actual consumption to major logistics processes?

Q2-2. To what extent does the firm break out logistics overhead costs to the activity or task level?
Q2-3. To what extent does the firm accurately determine the logistics costs of individual products and/or services?

Q2-4. To what extent does the firm accurately determine the logistics costs incurred serving individual customers?

Q2-5. To what extent does the firm accurately determine the logistics costs incurred working with individual suppliers?

Q2-6. To what extent does the firm accurately determine the logistics costs incurred within individual distribution channels?

Q2-7. To what extent does the firm base its logistics charges on how individual services, products, customers, suppliers, or distribution channels consume logistics resources?

Q2-8. To what extent has the firm obtained a competitive advantage by pricing logistics services according to their actual consumption of logistics overhead (e.g. material handling, MIS, warehousing, etc.)?

Q2-9. To what extent can the firm’s performance measurement system directly translate productivity improvements at the activity or task level into cost savings within the logistics system?

Q2-10. To what extent is the firm’s cost system useful in performing customer cost and profitability analysis?

Q2-11. To what extent is the firm’s cost system useful in performing product and/or service cost and profitability analysis?
Q2-12. To what extent is the firm’s cost system useful in performing distribution channel cost and profitability analysis?

Q2-13. To what extent is the firm’s cost system useful in performing competitive studies and analyses?

Q2-14. To what extent is the firm’s cost system useful in making product and/or service pricing decisions?

Q2-15. To what extent is the firm’s cost system useful in menu pricing?

Q2-16. To what extent is the firm’s cost system useful in performing market analyses?

Q2-17. To what extent is the firm’s cost system useful in performing strategic planning and analyses?

Q2-18. To what extent is the firm’s cost system useful in performing activity analyses?

Q2-19. To what extent is the firm’s cost system useful in facilitating internal communication?

Q2-20. To what extent is the firm’s cost system useful in supporting total quality, continuous improvement, and/or JIT strategies and analyses?

Q2-21. To what extent is the firm’s cost system useful in performance measurement of key processes or units?

Q2-22. To what extent is the firm’s cost system useful in performance measurement of personnel?

Q2-23. To what extent is the firm’s cost system useful in budget analyses, planning, and forecasting?
Q2-24. To what extent is the firm’s cost system useful in accurately determining or forecasting new product costs?

Q2-25. To what extent is the firm’s cost system useful in providing visibility of logistics costs?

Q2-26. To what extent is the firm’s cost system useful in helping us understand, identify, and control cost drivers?

Q2-27. To what extent is the firm’s cost system useful in outsourcing analyses and decisions?

Q2-28. To what extent is the firm’s cost system useful in evaluating supply chain and partnership costs/performance?

Q2-29. To what extent is the firm’s cost system useful in transfer pricing decisions and analyses?

Q2-30. To what extent is the firm’s cost system useful in determining scrap, rework, repair, and warranty costs?

Q2-31. To what extent is the firm’s cost system useful in performing value analysis and eliminating waste?

Q2-32. To what extent is the firm’s cost system useful in performing life cycle costing and/or target costing?

Q2-33. To what extent is the firm’s cost system a source of real competitive advantage for the firm?

Q2-34. What other capabilities and key decisions does the firm’s cost system support?
Q2-35. How does the firm’s current ABC cost system in logistics compare to the firm’s cost system prior to the ABC implementation?

**Research Question Three:**

What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?

**Supports:** Research Objective Three

**Investigative Questions:**

*Opinion or Attitude*

Q3-1. Overall, has ABC implementation benefited the firm’s logistics operations?

*Decision Making*

Q3-2. What decisions does ABC data support (i.e. what types of decisions are typically made based on ABC data)?

Q3-3. What changes have occurred in logistics decisions since the ABC system was implemented? Are these changes due to the ABC data?

*Cost Management*

Q3-4. Has the firm’s ABC system made it easier to identify and manage logistics costs? If so, in what areas?
Competitiveness

Q3-5. Has the ABC system enhanced the firm’s competitive position in the marketplace?

Customer Satisfaction

Q3-6. Has the firm’s customer satisfaction increased due to the ABC system (either directly or indirectly)?

Conduct of the Research

The research was conducted in three phases. Phase 1 involved discussion of the research with experts to validate research design, the interview protocol, and the selection of firms to be studied. Phase 2 involved data collection via interviews of key personnel in each of the participating firms. Phase 3 included coding, analyzing, interpreting results, and the reporting of the results.

Phase 1: Validation of the Instrument & Selection of Research Participants

The research methodology, structure, and interview protocol was reviewed by experts (academics and practitioners) in logistics prior to beginning the actual research. These experts included members of the dissertation committee and practitioners recommended by the committee. In particular, the interview protocol was reviewed for clarity and validity, and the willingness of firms to supply the requested information was assessed.
A purposive sample of eleven firms was selected. One of the main objectives of the research was to investigate firms that had been using ABC for at least two years. This provided a longitudinal, longer-term study of the effects of ABC use in logistics. Because of the difficulty in identifying firms that have implemented ABC within logistics, firm selection began with the firms that participated in Pohlen’s study [148]. Other ABC firms were identified through lists of participants in the ABC track at the Council of Logistics Management (CLM) annual conferences, through the literature review, and through the recommendations of experts in the field.

A logistics or financial executive (depending on points of contact identified or recommended during the search for potential participating firms) at each potential participant organization was contacted by phone to solicit their participation. An introductory letter on Ohio State stationery, signed by the dissertation committee chairperson, was provided that introduced the researcher and the research project and encouraged their participation. If they indicated a willingness to participate, summary background information was obtained to verify the organization met the criteria discussed above.

When an organization agreed to participate, a copy of the interview protocol was provided in advance to the organizational point of contact, and discussions were held to determine the most knowledgeable people (in terms of knowledge of the ABC model implementation and its use within the firm) to interview. It was anticipated that the individuals necessary to adequately address all the areas in the interview protocol would typically include the lead logistics executive, a logistics manager involved in day-to-day
management of logistics functions, and an accounting person very familiar with the
management accounting system. However, the final determination on the best and/or
most appropriate individuals within each participating organization to address the
interview protocol questions was ultimately left to the individual firms. In some cases,
several individuals were identified and interviewed (either individually or collectively).
In other cases, one or two individuals were so intimately involved in the development and
use of the ABC model that they were able to address the entire interview protocol.

In addition to discussions regarding the people to be interviewed, the scheduling
of the interview(s) was discussed, particularly the option of telephone interviewing versus
site visits. Again, the final decision on whether to conduct face-to-face interviews at the
organization’s site or to conduct interviews over the telephone was ultimately left to the
participating organizations.

**Phase 3: Data Collection**

An interview protocol was developed to guide the interviews. The protocol
consisted of four parts. Part 1 addressed background information on the firm, its
industry, annual sales, size of the logistics system, functions within its logistics
organization, and its competitive environment. Part 2 addressed the design details of the
firm’s ABC system. Part 3 addressed issues related to the implementation of the firm’s
ABC system. Finally, Part 4 addressed the various uses of the ABC data in various
decision-making areas and attitudes of logistics practitioners toward their ABC cost
system and the usefulness of the data it provides.
Potential interviewees were questioned to ensure they had expertise in the areas being addressed. With the exception of the first set of interviews on the first day at the first firm interviewed, all interviews were recorded on audio tape (with the permission of the interviewees) and the interviewer also took careful notes during all interviews.

As outlined above, the research methodology allows a combination of on-site, face-to-face interviews and telephone interviews. While telephone interviews limit the interviewers ability to use visual aids to observe non-verbal signals, and to observe first-hand some firm operations and environmental conditions, all other advantages of personal interviews are shared by telephone interviewing [165:227]. In addition, Lavrakas claims that telephone surveys provides greater control over data quality than mail surveys and face-to-face interviews, while offering faster data collection and greater cost efficiency [121].

When geographical, schedule, or budgetary constraints made completing a site visit difficult, or when preferred by the participating firm, telephone interviews were used. Most firms participating in the research actually preferred and chose to be interviewed by telephone. Since the interview protocol was provided to all interviewees well in advance of the actual interviews, participants were able to collect data in advance and prepare for the interviews as their schedules permitted. Most interviewees appreciated the flexibility and convenience of telephone interviews and did not believe there was a compelling benefit to face-to-face interviews. Nine of the eleven firms were interviewed strictly via telephone interviews, while two of the eleven firms were
interviewed via face-to-face interviews at their respective locations, followed by supplementary telephone interviews at later times.

After the interviews at a particular firm were complete, the interview audio tapes and notes were transcribed into a textual database. The database structure followed the outline of the interview protocol, with each question's response recorded. In addition, various pieces of information not necessarily tied to one particular interview protocol question were documented, along with preliminary analysis and observations.

Phase 4: Data Analysis

The primary method employed to analyze the collected data was content analysis of the textual database. Content analysis is “a systematic research method for analyzing textual information in a standardized way that allows evaluators to make inferences about that information” [3:6]. In content analysis, the researcher systematically classifies the many units of the textual database into fewer content categories [163:12]. These “units” of analysis may be syntactical, referential, propositional, or thematic; the unit of analysis depends on the type or attributes of the question or questions asked. The responses to a single question could be analyzed both referentially and propositionally, for example, while the next question might most appropriately be analyzed thematically [49:385-387]. The recording units may also be referred to as word, word sense, sentence, paragraph, theme, and whole text [163].

The transcribed data from the interviews was loaded (full text) into a textual database. The primary software tool that was used in the content analysis was askSam,
which is frequently used to facilitate qualitative data analysis of large volumes of textual material [135] [3].

The nature of the question asked determined the appropriate unitization scheme. Key variables were isolated for each investigative/measurement question. Responses were then systematically coded, or assigned to variable categories [49:381-383]. Some categorizations (or coding schemes) were predefined, while others fell out of the data analysis itself. For example, Question 10 in the interview protocol lists several code categories as part of the question itself. The “other” category simultaneously makes the coding scheme exhaustive while also allowing additional categories to be created.

Using askSam, the transcriptions for each question were reviewed, and the appropriate analytical units were coded. Passages of text were marked off or delineated by special coding characters. The software was then able to quickly present a summary of all the similarly coded segments from the entire database, helping the researcher to see common themes and connections. The investigative and/or measurement questions were then evaluated based on the coded summaries of the responses, which were in turn used to evaluate the research questions and/or guiding hypotheses to accomplish the research objectives. Coding and analysis of individual questions is addressed in Chapter Four.

Where appropriate and useful, summary tables were constructed showing the overall responses and trends to particular research questions. Research questions and guiding hypotheses were evaluated based on the weight of the evidence of the data collected.
Summary

This chapter outlined the research methodology used to accomplish the research objectives. The methodology employed a case study methodology and the use of an interview protocol to guide discussions. The research design was traced in detail from research objectives to research questions and guiding hypotheses to investigative and measurement questions. In addition, the rationale for the variables used, how the variables were measured, and how the data would be analyzed to answer research questions and evaluate guiding hypotheses was presented. The results of the research are presented in Chapter Four.
CHAPTER 4

DATA ANALYSIS AND FINDINGS

Introduction

This chapter presents the data analysis and findings from the in-depth interviews of representatives from eleven participating firms. The first section reports data analysis and findings related to the research guiding hypotheses and research questions. The second section reports additional data analysis and findings that are not explicitly related to the guiding hypotheses and research questions.

Section One reviews each guiding hypothesis and research question, along with its supporting investigative questions. In conjunction with this research structure, the purposive sample of firms that participated in this research was organized into a two-by-two matrix by classifications of two variables: size of the organization (measured by the most recent fiscal year’s gross sales) and price-sensitivity of their respective markets as classified by the organizational representatives interviewed. Using $5 billion as a natural breakpoint between large and small firms, the number of firms in each quadrant of the matrix is shown in Table 7.
<table>
<thead>
<tr>
<th></th>
<th>Price Sensitive</th>
<th>Non-Price Sensitive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Small</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 7: Research Matrix

Section Two presents additional findings not explicitly related to the guiding hypotheses or research questions. The categories of related findings include management strategies resulting from ABC data, handling of cost categories (e.g. fixed versus variable, excess capacity) in ABC models, and ABC model design issues.

Section 1: Data Analysis and Findings Related to Guiding Hypotheses and Research Questions

Guiding Hypothesis One:

Firms’ primary motivation in implementing ABC within logistics is to better understand product and/or service costs due to difficulty in costing logistics operations and/or intense price competition in the marketplace.

Evaluation. Guiding Hypothesis One is partially supported by the data. The primary motivation of firms implementing ABC within logistics is apparently to gain a better understanding of product and/or service costs, and this motivation seems to be
strongly linked with difficulty in costing logistics operations. However, the hypothesized relationship between price competition in the marketplace and the firms’ motivations in implementing ABC is not supported. These conclusions were drawn from an analysis of the research variables (key phrases underlined in the guiding hypothesis above) through the analysis of the applicable investigative questions. The specific investigative questions are outlined below, along with the data and data analysis relating to each investigative question. After all the investigative questions associated with Guiding Hypothesis One are summarized, there is an overall discussion and analysis of the evaluation of the hypothesis.

**Investigative Questions Supporting Guiding Hypothesis One:**

**Primary Motivation**

H1-1. What were the primary reasons or motivations for implementing an ABC system within the logistics function?

This investigative question was evaluated from data collected by question 16 in the interview protocol. Table 8 provides a summary of the reasons firms gave as their primary motivations for developing an ABC model in logistics.

While the analysis of product / service costs and profitability was listed most often by firms as a primary motivation in implementing ABC within logistics, a large majority of firms also listed customer cost / profitability analysis as a motivating factor.

79
A large majority of firms also indicated that potential cost savings, improving operating efficiency, and strategic planning and analysis were important motivators.

<table>
<thead>
<tr>
<th>Motivation Factor</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>analysis of product / service costs and/or profitability</td>
<td>10</td>
</tr>
<tr>
<td>potential cost savings</td>
<td>9</td>
</tr>
<tr>
<td>analysis of customer costs and/or profitability (customer value analysis)</td>
<td>9</td>
</tr>
<tr>
<td>improve operating efficiency</td>
<td>9</td>
</tr>
<tr>
<td>strategic planning / analysis</td>
<td>9</td>
</tr>
<tr>
<td>process analysis and improvement</td>
<td>7</td>
</tr>
<tr>
<td>analysis of channel costs and/or profitability</td>
<td>6</td>
</tr>
<tr>
<td>competitive studies / analysis</td>
<td>6</td>
</tr>
<tr>
<td>current cost accounting system inadequate</td>
<td>6</td>
</tr>
<tr>
<td>product / service pricing decisions</td>
<td>6</td>
</tr>
<tr>
<td>improved performance measurement</td>
<td>6</td>
</tr>
<tr>
<td>market segmentation / analysis</td>
<td>4</td>
</tr>
<tr>
<td>potential budgeting improvement</td>
<td>4</td>
</tr>
<tr>
<td>analysis of supplier costs and/or processes (analysis of sourcing issues)</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 8: Primary Motivations for Implementing ABC
**Difficulty in Costing Logistics Operations**

H1-2. How often does the firm receive special or unique requests from its customers and/or suppliers that involve the logistics function?

H1-3. To what extent is there diversity in the consumption of logistics overhead resources?

Investigative questions H1-2 and H1-3 were evaluated with data collected from questions 15 and 12 respectively in the interview protocol. Question 15 asked about the number of unique or special requests the firm receives from its customers and suppliers, the nature of these requests, and the demands these requests place on the firm’s logistics system. Question 12 asked the respondents to discuss the extent of diversity in how different products, services, suppliers, customers, and supply channels consume logistics overhead. Table 9 summarizes the number of unique/special requests firms reported, and Table 10 summarizes the extent of diversity in the consumption of logistics resources by products, services, or customers. A firm was categorized as “low” or “high” based upon the individual assessments of the interviewees and the detailed responses to the interview protocol questions. The researcher then made a final categorization decision based on the weight of the evidence and comparing all firms’ responses to one another.
<table>
<thead>
<tr>
<th>Amount of Unique / Special Requests</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>4</td>
</tr>
<tr>
<td>High</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 9: Unique / Special Requests

<table>
<thead>
<tr>
<th>Diversity</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>2</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 10: Diversity

The majority of firms reported high levels of diversity in the way different products, services, suppliers, customers, and/or supply channels consume logistics resources and high levels of unique or special requests from their customers or suppliers. Only one manufacturing firm reported low levels of diversity and low levels of unique/special requests.
**Intense Price Competition**

H1-4. What are the primary ways the firm differentiates its products and services from its competition?

H1-5. How price sensitive are the markets in which the firm’s products and services compete?

Investigative questions H1-4 and H1-5 were evaluated with data collected from questions 13 and 14 respectively in the interview protocol. Table 11 summarizes the primary ways firms differentiate themselves from their competitors, and Table 12 summarizes the degree of price sensitivity the firms reported in the respective markets where their products and services compete. Firms were categorized as “high” or “low” price sensitivity by the researcher via a content analysis of their respective responses and by comparing responses across firms.
<table>
<thead>
<tr>
<th>Differentiation Category</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics Services / Customer Service</td>
<td>6</td>
</tr>
<tr>
<td>Quality of Products and Services</td>
<td>5</td>
</tr>
<tr>
<td>Breadth / Customization of Product Offerings</td>
<td>5</td>
</tr>
<tr>
<td>Breadth / Customization of Service Offerings</td>
<td>4</td>
</tr>
<tr>
<td>Price / Low-Cost Supplier</td>
<td>4</td>
</tr>
<tr>
<td>Brand Loyalty / Identification</td>
<td>3</td>
</tr>
<tr>
<td>Technical Design / Support</td>
<td>3</td>
</tr>
<tr>
<td>Geographic Coverage</td>
<td>2</td>
</tr>
<tr>
<td>Product Uniqueness / Design</td>
<td>2</td>
</tr>
<tr>
<td>Value of Products / Services</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 11: Primary Means of Differentiation

<table>
<thead>
<tr>
<th>Price Sensitivity</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>5</td>
</tr>
<tr>
<td>High</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 12: Price Sensitivity

**Rationale for Evaluation of Guiding Hypothesis H-1.** As stated above, Guiding Hypothesis H-1 is partially supported by the data. The hypothesis suggests that the primary motivation for a firm to implement ABC will arise from a need to
better understand product and/or service costs, particularly due to difficulty in accurately understanding and assigning logistics costs and intense price competition in the marketplace. First, the most often mentioned motivation for implementing ABC was for the analysis of product and services costs and profitability, listed by ten of the eleven firms. In addition, note that three of the four motivations listed by nine of the eleven firms are concerned with reducing costs, improving operating efficiencies, and analyzing customer costs and profitability. For many firms, their ABC models built customer costs and profitability information from the bottom up, determining the total costs and profitability per customer as a function of the products and services provided to each customer.

Part of the challenge in accurately understanding the costs associated with individual products, services, and customers is driven by the diversity in the products and services provided to customers. Typically, when products, services, or customers have diverse characteristics or requirements, their consumption of logistics and other overhead resources can vary significantly. Table 9 and Table 10 taken together show the vast majority of firms in the study report high levels of unique/special requests and diversity in the way individual products, services, suppliers, customers, and supply channels consume logistics overhead resources. As stated earlier, only one manufacturing firm reported both low levels of diversity and low levels of unique/special requests.

Guiding Hypothesis H-1 also suggests another contributing factor to the need to better understand product and/or service costs through the implementation of ABC:
intense price competition in the marketplace. This study attempted to measure this variable with two investigative questions (H1-4 and H1-5). H1-4 asked the firms to describe the primary ways they attempt to differentiate themselves from their competitors in the marketplace, suggesting that a low cost or price differentiation strategy would provide an incentive for firms to more accurately understand their product and service costs. Likewise, H1-5 sought to classify the price sensitivity of the markets in which the firms’ products and services compete. From Table 11 and Table 12, it would appear that this relationship does not hold. Price or low-cost differentiation strategies were listed by only four firms, with the primary differentiation strategies being related to customer service and quality. In addition, roughly half of the firms indicated that the markets in which they competed had relatively low price sensitivity.

**Guiding Hypothesis Two:**

| Greater complexity in ABC system design will be associated with greater price sensitivity. |

**Evaluation.** Guiding Hypothesis Two is not supported by the data. This hypothesis was evaluated using the data collected from interview protocol questions 14 and 17-23.

Firms’ price sensitivity was categorized as low or high based upon their own categorizations and other comments in their responses to question 14. Model complexity was categorized as either low or high based on the three operational
definitions described below. The numerical measures of model complexity were converted into categorical values to mask the actual numbers of activities, cost objects, etc. in order to protect each firm's specific information.

As stated above, the complexity of the firms' ABC systems was measured in three different ways: as the total number of resources, activities, cost objects, and drivers (both Stage 1, or resource drivers, and Stage 2, or activity drivers), as the total number of resources, activities, and drivers (cost objects excluded), and as the number of activities only. The second method of measuring model complexity was selected to remove a potentially large source of variation between firms that may not be substantively related to the overall complexity of a given ABC system. Since most activities will only have one activity cost driver used to drive activity costs to individual cost objects [110:95], it can be argued that a larger number of cost objects merely adds to size, not necessarily to the overall complexity of the system. For example, suppose a firm identifies an activity, *prepare order*, and drives the costs of this order preparation activity to customers (cost objects) on the basis of the *number of orders* (the activity cost driver). One could argue that the fact that the firm adds ten additional customers has not changed the overall complexity of their ABC model at all; the firm simply must apply the same activity cost drivers it was using before to ten additional customers or cost objects. The third approach (measuring complexity as simply the number of activities) recognizes that the total size of the ABC system is in a sense driven by the number of activities the firm identifies. Kaplan and Cooper
associate the level of detail and complexity of an ABC system with the number of activities [110:85-86].

Figure 1 graphically depicts the findings from the interview protocol. Categorical values of low, moderate, and high complexity were assigned numerical values of one, two, and three respectively; categorical values of low or high price sensitivity were assigned numerical values of one or two respectively. There is relatively strong evidence of correlation between complexity (measured as the total number of resources, activities, cost objects, and drivers) and price sensitivity. All the firms with relatively low price sensitivity also had relatively low complexity ABC models. With the exception of Firm K (with high price sensitivity and low model complexity), firms with high price sensitivity had either moderate or high complexity ABC models.
Figure 1. Complexity (measured as total number of resources, activities, drivers, and cost objects) versus Price Sensitivity

Figure 2 depicts the results when the number of cost objects is excluded from the complexity measure. While one could argue that excluding cost objects results in a better measure of ABC model complexity, this figure shows far less evidence of correlation between price sensitivity and ABC model complexity. There are now no firms with high model complexity and low price sensitivity. However, there are two firms with low price sensitivity that have moderately complex ABC models, and two firms with high complexity ABC models have low price sensitivity.
Figure 2. Complexity (measured as total number of resources, activities, and drivers) versus Price Sensitivity

Finally, Figure 3 shows graphically the relationship between price sensitivity and ABC model complexity when complexity is measured as simply the number of activities in the ABC model. Again, there is relatively weak correlation between the two variables. Now three firms with high price sensitivity have low model complexity (Firms D, F, and G) and three firms with low price sensitivity have moderately complex ABC models.

**Summary Evaluation of Guiding Hypothesis Two:** Guiding Hypothesis Two is not supported by the data by two of three means of assessing complexity. Despite evidence that only firms with high price sensitivity have relatively high complexity ABC models, there is insufficient evidence of correlation between the variables.
Figure 3. Complexity (measured as total number of activities) versus Price Sensitivity

Guiding Hypothesis Three:

Greater complexity in ABC system design will be associated with the use of ABC as part of the day-to-day management information system.

Evaluation. Guiding Hypothesis Three is not supported by the data. This hypothesis was evaluated using interview protocol questions 17-23 and 34. As before, complexity of the ABC model is defined three ways. Further, ABC data use is categorized in one of two ways:
- ABC data is used primarily as a diagnostic tool, with data collected and analyzed primarily for special studies or analyses.

- ABC data is used routinely as part of the firm’s day-to-day management information.

The former is depicted graphically with a value of one, while the latter is depicted graphically with a value of two.

Figure 4 shows complexity compared with ABC data use, with complexity defined as the total number of resources, drivers, activities, and cost objects.

Figure 5 is the same except that the complexity measure does not include the total number of cost objects.

Figure 6 shows the relationship between ABC data use and ABC model complexity where complexity is measured strictly as the number of activities in the model.
Figure 4. Complexity (measured as total number of resources, activities, drivers, and cost objects) versus ABC Data Use

Figure 5. Complexity (measured as total number of resources, activities, and drivers) versus ABC Data Use
Summary Evaluation of Guiding Hypothesis Three: Guiding Hypothesis Three is not supported by the data. There is insufficient evidence of correlation between the variables (complexity of the ABC model and use of the ABC data).

![Graph showing complexity and use of ABC Data across different firms](image)

Figure 6. Complexity (measured as total number of activities) versus ABC Data Use
Guiding Hypothesis Four:

Greater complexity in ABC system design will be associated with larger numbers of different decisions that the ABC data supports.

**Evaluation.** Guiding Hypothesis Four is not supported by the data. This hypothesis was evaluated using interview protocol questions 17-23 and 36. Again, complexity is defined in three different ways as used above. The number of decision areas supported by the ABC data is simply the sum of all the decision areas and benefits reported by the firms in response to interview protocol question 36. Figure 7, Figure 8, and Figure 9 graphically summarize the results.

![Bar chart showing complexity and decision areas for different firms.](chart.png)

**Figure 7.** Complexity (measured as total number of resources, activities, drivers, and cost objects) versus Number of Decision Areas Supported by ABC Data

95
Figure 8. Complexity (measured as total number of resources, activities, and drivers,) versus Number of Decision Areas Supported by ABC Data
Figure 9. Complexity (measured as total number of activities) versus Number of Decision Areas Supported by ABC Data

Summary Evaluation of Guiding Hypothesis Four: Guiding Hypothesis Four is not supported by the data. There is insufficient evidence of correlation between the variables (complexity of the ABC model and the number of decision areas supported by the ABC data). Nine of the eleven firms report at least fifteen decision areas supported by the data, while their model complexity ranges from low to high. Firm H reports no decision areas supported by ABC data since they elected not to implement their ABC model after it was developed.
Guiding Hypothesis Five:

Greater complexity in ABC system design will be associated with more favorable attitudes of logistics practitioners toward the usefulness and impact of ABC.

**Evaluation.** Guiding Hypothesis Four is not supported by the data. This hypothesis was evaluated using interview protocol questions 17-23, 37, and 39. To evaluate this hypothesis, the data is presented in tabular form. For simplicity, complexity is defined as the total number of activities in the ABC model and then categorized as low, moderate, or high complexity. Whether the firm’s overall competitive position was improved by the ABC system was used as a measure of the impact of ABC. The results are summarized in Table 13.

<table>
<thead>
<tr>
<th>Firm</th>
<th>Complexity</th>
<th>Improvement over Previous Cost System?</th>
<th>Improved Overall Competitive Position?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Low</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>D</td>
<td>Low</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>E</td>
<td>Low</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>F</td>
<td>Low</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>G</td>
<td>Low</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>B</td>
<td>Moderate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>C</td>
<td>Moderate</td>
<td>Yes</td>
<td>Unsure</td>
</tr>
<tr>
<td>H</td>
<td>Moderate</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>I</td>
<td>Moderate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>J</td>
<td>Moderate</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>K</td>
<td>High</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Table 13: Effect of ABC Model Complexity on Attitudes
**Summary Evaluation of Guiding Hypothesis Five:** Guiding Hypothesis Five is not supported by the data. With the exception of Firm H (which did not implement their ABC model), all firms reported that their ABC systems were an improvement over their previous cost systems, even though the ABC model complexity ranged from low to high. In addition, the complexity of the ABC model is not a good predictor of whether the ABC system provides an overall competitive advantage.

**Research Question One:**

What are the key characteristics in terms of design, training, advocacy, and philosophy of use of your ABC system?

**Evaluation.** Research Question One is addressed via an analysis of the research variables (key phrases underlined in the guiding hypothesis above) through the analysis of the Investigative Questions Q1-1 through Q1-17. The specific investigative questions are outlined below, along with the data and data analysis supporting each investigative question. After all the investigative questions associated with Guiding Hypothesis One are summarized, there is an overall discussion and analysis of the research question.
Variable Analysis and Investigative Questions Supporting Research Question

One:

Design

Q1-1. Describe the overall process the firm uses to allocate and/or assign costs to cost objects.

Investigative question Q1-1 was evaluated with data collected from question 17 in the interview protocol. The question referred to the traditional, two-stage allocation model for a cost management system (see Figure 10), and asked if their ABC system conformed to that basic two-stage design or was unique in some way.
Table 14 shows the responses of the firms and refers to the overall, top-level structure of the firms’ ABC systems. The nine firms that indicated they followed a two-stage allocation procedure all allocated costs from resources to activities, and then from activities to cost objects. However, some firms had interim steps in their cost allocation process. In one firm, for example, resource costs were allocated in an intermediate step to either primary activities or sustaining activities. Then the sustaining activities’ costs were driven or loaded onto the primary activities. Then the primary activities’ costs were grouped and allocated into cost pools. Finally, costs were driven from the cost pools to cost objects. If one counts the interim steps, the design looks like it has four different stages, but in effect these are just variations on an overall two-stage design that drives costs from resources to activities to cost objects.

The two firms shown in Table 14 as using a one-stage allocation model drive or allocate resource costs to the activity level and then stop; they do not drive costs from activities to cost objects. In other words, their models provide information about their activities and their activity costs, but they make no attempt to drive those costs in a second stage to any type of cost objects. Again, one of these firms has some interim steps to drive resource costs down to the final list of activities, but the overall structure is one-stage—from resources to activities.
<table>
<thead>
<tr>
<th>Model</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two-stage allocation model</td>
<td>9</td>
</tr>
<tr>
<td>One-stage allocation model</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 14: Allocation Models Used

Investigative questions Q1-2 through Q1-6 addressed details of each firm’s ABC system design, specifically the number of resources, resource drivers, activities, cost drivers, and cost objects. These investigative questions are listed below:

Q1-2. How many unique resources are used in the ABC system, what are they, and how were they selected?

The number of resources used in the ABC models ranged from one to over one hundred resources or resource pools. The firm that identified one resource had dramatically simplified its model to focus on activities and key performance indicators (KPIs). Costs were assigned to activities from legacy systems using standard costs. Another firm identified only two resources: labor and non-labor. Labor was broken out to various activities based upon an activity analysis, and the remaining non-labor costs were allocated to activities based on direct labor, much like a traditional management accounting system. However, most firms identified resource pools by grouping homogeneous line items or categories of costs from their general ledger or income statement.
Q1-3. How many resource drivers are used in the ABC system, and how were they derived?

The number of resource drivers identified ranged from one to eleven. Labor tended to be a large part of the costs tracked by the ABC systems, and the most common resource driver identified was a percentage of labor hours or full-time equivalents (FTEs). For breaking out various categories of labor to individual activities, most firms used surveys of personnel to determine estimates of appropriate percentage breakouts across activities. Two firms reported detailed work studies to determine the amount of labor costs per activity.

Q1-4. How many activity centers are used in the ABC system, how did the firm decide how many activity centers to use, and how did the firm select the activity centers?

The number of activities in the firms’ ABC models ranged from 15 to 1,000. The average number of activities was 189; the median number of activities was 100. Five of the eleven models had 35 or fewer activities; five models had from 100 to 305 activities. The model with 1,000 activities was unique among the eleven firms. It addressed only indirect labor, and the model’s cost objects and activities are essentially synonymous. The firm has several products that are distributed from various locations in various quantity categories and via various shipment modes. Every possible
combination of product, location, quantity category, and shipment mode is defined as a unique activity (e.g. Product A shipped in full truckload quantity from Location B).

Q1-5. What are the number and type of cost drivers used in the ABC system, and how were they derived?

For the eight firms that provided a response to this question, the number of cost drivers ranged from zero to 77. The average number of cost drivers was 32, and the median was 15.5. The firm reporting zero cost drivers is the firm that identified 1,000 activities (discussed above as part of the analysis for Investigative Question 1-4). As stated above, for that firm’s model, the intent is to drive indirect labor costs accurately to a large number of narrowly defined activities. In effect, the firm’s model is a one-stage allocation model that drives costs from one resource category (labor) to activities.

Q1-6. How many cost objects are used in the ABC system, and why were these cost objects selected?

The number of cost objects identified ranged from zero to 46,200. For the ten firms responding to this question, the average number of cost objects was 10,376; the median was 1,525.5. The large number of cost objects is due primarily to firms’ models that drive costs to the stock keeping unit (SKU) level. Six of the firms’ models had products and/or services as cost objects, seven of the firms’ models had customers as cost objects, and two of the models primarily or exclusively used activities as their cost objects.
Investigative question Q1-7 asked if each firm maintained separate accounting systems for financial accounting and managerial accounting purposes, or whether they had one overall accounting system for both financial and managerial accounting. In addition, Q1-7 asked which accounting systems were ABC systems. Q1-7 was evaluated based on the responses to interview protocol question 35.

Q1-7. Does the firm maintain different accounting systems for financial accounting and for managerial accounting, or does it have one accounting system to meet all its requirements, and which accounting systems are activity based?

Only two of the eleven firms have one, consolidated accounting system for both financial (external) and managerial (internal) purposes. For one of these firms, its ABC system was separate and distinct from its main accounting system, and the main accounting system is not activity-based. For the other firm with one, consolidated accounting system, its system was an ABC system. All the remaining firms (nine out of eleven) indicated that their ABC systems did not replace any legacy accounting systems and that their ABC systems were stand-alone and distinct from their financial accounting systems. One of these nine firms emphasized, however, that they did not keep two sets of books and stated that there was tight integration between their financial accounting system and their ABC system.
Training

The next key variable to address in Research Question One is training. This variable was explored using investigative questions Q1-8 through Q1-11. These questions are listed below, followed by a summary of the research findings.

Q1-8. What type and extent of training did firm personnel receive prior to or during the initial ABC system design, and who provided the training?

Q1-9. What type and extent of training did firm personnel receive in the use of the ABC system after or just prior to implementation, and who provided the training?

These investigative questions were evaluated using Interview Protocol Questions 24-26. The firms listed a variety of training audiences and training sources and providers. Their responses are summarized in Table 16. In general, the ABC training within the firms appeared to be ad hoc, sporadic, and informal.
<table>
<thead>
<tr>
<th>Training Sources</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Experts / Implementation Teams</td>
<td>10</td>
</tr>
<tr>
<td>Consultants</td>
<td>8</td>
</tr>
<tr>
<td>ABC Software Vendors</td>
<td>4</td>
</tr>
<tr>
<td>Conferences / Seminars</td>
<td>3</td>
</tr>
<tr>
<td>Books / Literature</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Training Recipients</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation Team</td>
<td>7</td>
</tr>
<tr>
<td>End-users of ABC information</td>
<td>7</td>
</tr>
<tr>
<td>Working-level</td>
<td>4</td>
</tr>
<tr>
<td>Mid-level Management</td>
<td>5</td>
</tr>
<tr>
<td>Top Management / Executives</td>
<td>5</td>
</tr>
</tbody>
</table>

Table 16: ABC Training
Q1-10. How satisfied are personnel with the current level of training?

This investigative question was evaluated using Interview Protocol Question 27. The responses are summarized in Table 17. In general, the majority of the firms (nine out of eleven, or 82%) indicated they were satisfied or very satisfied with their current levels of training.

<table>
<thead>
<tr>
<th>Satisfaction</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>2</td>
</tr>
<tr>
<td>Satisfied</td>
<td>7</td>
</tr>
<tr>
<td>Not Satisfied</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 17: ABC Training Satisfaction

Q1-11. What additional training (if any) would be beneficial, who should receive it, and who should provide it?

This investigative question was evaluated using Interview Protocol Question 28. The results are shown in Table 18 and seem to reflect the overall satisfaction the firms had with their training to date. Three firms indicated no additional training requirements. For the remaining firms, training recipients most often identified for further training were top management and middle managers and end users. In general, the firms indicated additional training should emphasize general ABC knowledge and how to interpret and use the ABC data from their models in decision making. For example, one firm reported that while management was supportive of the ABC effort,
understood the model, and believed the data, momentum was lost because there was no framework, guidance, or plan for how the data should be used.

<table>
<thead>
<tr>
<th>Type of Training</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Training Recipients</td>
<td></td>
</tr>
<tr>
<td>• Top Management</td>
<td>3</td>
</tr>
<tr>
<td>• Middle Management / End Users</td>
<td>4</td>
</tr>
<tr>
<td>• Financial / Accounting Personnel</td>
<td>2</td>
</tr>
<tr>
<td>Training Content</td>
<td></td>
</tr>
<tr>
<td>• Use of ABC data in decision making (Activity-Based Management)</td>
<td>4</td>
</tr>
<tr>
<td>• Model Development</td>
<td>1</td>
</tr>
<tr>
<td>• General Education on ABC</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 18: Additional Training

Advocacy

The next key variable to address in Research Question One is advocacy. This variable was explored using investigative questions Q1-12 through Q1-15. These questions are listed below, followed by a summary of the research findings.

Q1-12. Who championed the effort to implement ABC within logistics?

Interview protocol question 29 was used to evaluate this investigative question. The results are summarized in Table 19; the number of firms column does not sum to
eleven, since some firms reported multiple champions for their ABC effort. All firms identified at least one champion of their ABC work.

While the champions ranged from an operational or logistics manager to the CEO of the firm, most champions identified were associated with accounting or financial management. Of the seventeen champions identified by the firms, over half (nine) were associated with accounting and/or financial management. Further, champions tended to be from upper levels of management. Seven of the champions listed were at the CEO/VP level. An expanded management grouping that adds senior and director-level management contains fourteen of the seventeen champions identified, or 82%. All nine of the champions associated with financial management were in this management group.

In summary, ABC champions were primarily senior-level managers (82%), and the majority of the senior managers (64%) were controllers and/or financial managers.

<table>
<thead>
<tr>
<th>ABC Champion</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Director of Finance/Accounting</td>
<td>5</td>
</tr>
<tr>
<td>Chief Executive Officer</td>
<td>3</td>
</tr>
<tr>
<td>Operations and/or Logistics Manager</td>
<td>3</td>
</tr>
<tr>
<td>Corporate Controller</td>
<td>2</td>
</tr>
<tr>
<td>VP Sales</td>
<td>2</td>
</tr>
<tr>
<td>Senior Controller</td>
<td>1</td>
</tr>
<tr>
<td>Director of Logistics Accounting</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 19: ABC Champion
Q1-13. Is top management supportive of the ABC implementation in logistics? If so, how does top management demonstrate their support?

Interview protocol question 30 was used to evaluate this investigative question. The results are summarized in Table 20.

Eight of the eleven firms indicated that top management was supportive of their ABC efforts. In general, most firms identified top management support for their ABC modeling efforts, including providing resources necessary to implement ABC and ensuring cross-functional support and cooperation for the ABC effort.

Even the organization that decided not to implement ABC reported that top management was supportive of the initial pilot study and ABC design effort. Only when the results of the pilot study were disappointing did top management decide to cancel the project.

Finally, one organization reported that top management support was not really applicable to their initial ABC implementation. The initial model was limited in scope—a narrowly focused effort. There was no company-wide or corporate direction to develop an ABC model; rather, the development was funded internally by the implementing cost center. They received no information systems support, and they developed the necessary software within the cost center to supplement Excel spreadsheets, Access databases, other off-the-shelf software tools, their general ledger system, and other legacy systems. They did report a mixed upper management response, however, once the ABC system was in place and the data was later shared with external organizations and upper management.
<table>
<thead>
<tr>
<th>Top Management Support of ABC</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management Supportive</td>
<td>8</td>
</tr>
<tr>
<td>Mixed Top Management Support</td>
<td>2</td>
</tr>
<tr>
<td>Top Management Unsupportive</td>
<td>0</td>
</tr>
<tr>
<td>Top Management Support is not applicable</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 20: Top Management Support of ABC

Q1-14. Was ABC being used elsewhere in the firm prior to the implementation in logistics?

Interview protocol question 31 was used to evaluate this investigative question. The results are summarized in Table 21. Seventy-three percent (eight out of eleven) of the respondents had no knowledge of ABC implementations or models elsewhere in the firm prior to the ABC models studied in this research. Of the remaining three firms that reported other ABC implementations prior to an ABC model in logistics, two did not indicate the area or areas where ABC had previously been implemented. One firm indicated that an ABC model in manufacturing had preceded their ABC logistics model.
Q1-15. Was/is the accounting/finance department supportive of the use of ABC in logistics?

Interview Protocol Question 32 was used to evaluate this investigative question. The results are summarized in Table 22.

Seven of the eleven firms (64%) indicated that the accounting or financial division or department was supportive of the ABC implementation. Two firms indicated that the financial division’s support for their ABC model was not applicable, primarily because their models were developed and implemented without accounting/finance involvement and with no modifications to legacy accounting systems. Therefore, no accounting or financial support was necessary.

<table>
<thead>
<tr>
<th>Accounting / Finance Support</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>7</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
</tr>
<tr>
<td>Not Applicable</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 22: Accounting / Finance Support of ABC Implementation
Philosophy of Use

The final key variable to address in Research Question One is philosophy of use. This variable was explored using investigative questions Q1-16 and Q1-17. These questions are listed below, followed by a summary of the research findings.

Q1-16. Is the ABC system in logistics used by and/or available to the entire firm (e.g. other functions, firm executives) or used only within logistics?

Interview protocol question 33 was used to evaluate this investigative question. Two firms are not included in the analysis of this question: one firm simply did not respond, and the other firm elected not to use their ABC model. The results are summarized in Table 23.

While one firm shares the ABC data only within their logistics organization, most shared the data at least with management from other functional areas and with senior management. The majority of firms (6) reported that the ABC data was shared widely on a company-wide basis.

<table>
<thead>
<tr>
<th>Access to ABC Data</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Management Only</td>
<td>2</td>
</tr>
<tr>
<td>Internal Logistics Only</td>
<td>1</td>
</tr>
<tr>
<td>Company-Wide</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 23: Access to ABC Data
Q1-17. Is ABC data used regularly as part of a management information system for day-to-day management decision making or primarily as a diagnostic tool for addressing specific issues or questions on an ad hoc, case-by-case basis?

Interview protocol question 34 was used to evaluate this investigative question. Five firms reported they used their ABC system as part of their day-to-day management activities, while seven firms reported using their ABC systems as a diagnostic tool to answer specific questions or for special studies and analyses. The results are summarized in Table 24. The number of firms does not sum to eleven, since one firm reported using its ABC system for both day-to-day management and as a diagnostic tool. In addition, one firm, included in the count for diagnostic tool use, is no longer using its ABC system. However, when its ABC system was originally designed, its purpose was primarily as a diagnostic tool; therefore, it is included in the total for diagnostic tool use.

<table>
<thead>
<tr>
<th>ABC Data Use</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day-to-Day Management Tool</td>
<td>5</td>
</tr>
<tr>
<td>Diagnostic Tool for Special Studies</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 24: ABC Data Use
Summary Evaluation of Research Question One: Most of the firms (nine out of eleven) followed a traditional, two-stage allocation process in their ABC model design. Two firms scoped their models to stop after the first stage allocation of costs to activities, and they did not drive activity costs in a second stage to any type of cost objects.

In terms of model complexity as measured by the number of resources, resource drivers, activities, activity drivers, and cost objects, the ABC models varied significantly among the firms in the research. There was large variability between the model designs, particularly in the number of activities and in the number of cost objects.

Most firms reported that their managerial accounting systems and their financial accounting systems are distinct. Only two firms had a consolidated accounting system for both external (financial) and internal (managerial) purposes, and only one of these firms indicated that its consolidated accounting system was activity-based. The ABC systems implemented by the remainder of the firms did not replace any legacy accounting systems and were separate and distinct from the financial accounting system.

Training in ABC system design and ABC use was generally informal and ad hoc, with internal experts and consultants providing the majority of the training. Implementation teams and end-users of ABC information were the only two groups identified by a majority of firms as training recipients. Firms were generally very satisfied or satisfied with their current levels of training. By and large, the firms that
felt that additional training was necessary recommended training for managers and end users in general ABC knowledge and how to appropriately use ABC data in decision making.

ABC implementations were primarily championed by senior-level managers, and the majority of these senior-level managers were controllers and/or financial managers. Eight of the eleven firms said that top management was supportive of their ABC implementations. Seven of the eleven firms reported that the accounting/finance division or department was supportive of their ABC efforts.

Finally, in terms of the use of the data generated by the ABC systems, a small majority of firms (seven) said that they used the data as a diagnostic tool for special studies, while five firms stated they used their ABC data as a day-to-day management tool. At the same time, results were fairly mixed as to who used the data within the firms. Of the ten firms responding to the question, one firm had decided not to use their ABC model, one firm used its model’s data only within logistics, two firms’ senior managers were the only users of their models’ data, and six firms reported that their ABC data was used on a company-wide basis.

Research Question Two:

What decisions or decision-making areas are supported by ABC data?

Evaluation. Research Question Two was addressed via an analysis of the research variable (key phrase underlined in the guiding hypothesis above) through the
analysis of the Investigative Questions Q2-1 through Q2-34 and were addressed with Interview Protocol Question 36 (a multi-part question). The results are summarized in Table 25.

Thirteen out of the sixteen items (81%) mentioned by a majority of the firms are related to cost or pricing knowledge or decisions. The predominant decision-making areas supported by the ABC models studied tend to be related to cost or pricing issues.
<table>
<thead>
<tr>
<th>Decision-Making Area</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providing visibility of logistics costs</td>
<td>11</td>
</tr>
<tr>
<td>Understanding and costing key processes</td>
<td>11</td>
</tr>
<tr>
<td>Accurately breaking out logistics costs to the activity or task level</td>
<td>10</td>
</tr>
<tr>
<td>Performing activity analyses</td>
<td>10</td>
</tr>
<tr>
<td>Accurately breaking out logistics costs to major processes</td>
<td>9</td>
</tr>
<tr>
<td>Accurately determining logistics costs incurred providing individual products or services</td>
<td>9</td>
</tr>
<tr>
<td>Accurately determining logistics costs incurred serving individual customers or working with individual suppliers</td>
<td>9</td>
</tr>
<tr>
<td>Performing strategic planning and analyses</td>
<td>9</td>
</tr>
<tr>
<td>Understanding, identifying, and controlling cost drivers</td>
<td>9</td>
</tr>
<tr>
<td>Accurately determining logistics costs incurred within individual distribution channels</td>
<td>8</td>
</tr>
<tr>
<td>Performing customer cost and profitability analysis</td>
<td>8</td>
</tr>
<tr>
<td>Performing product cost and profitability analysis</td>
<td>7</td>
</tr>
<tr>
<td>Performing service cost and profitability analysis</td>
<td>7</td>
</tr>
<tr>
<td>Performing channel cost and profitability analysis</td>
<td>7</td>
</tr>
<tr>
<td>Facilitating internal communication</td>
<td>7</td>
</tr>
<tr>
<td>Making service pricing decisions</td>
<td>6</td>
</tr>
<tr>
<td>Making product pricing decisions</td>
<td>5</td>
</tr>
<tr>
<td>Menu pricing of logistics services</td>
<td>5</td>
</tr>
<tr>
<td>Performance measurement of key processes and/or units</td>
<td>5</td>
</tr>
<tr>
<td>Outsourcing analyses and decisions</td>
<td>5</td>
</tr>
<tr>
<td>Translating productivity improvements at the activity or task level into cost savings within the logistics system</td>
<td>5</td>
</tr>
<tr>
<td>Basing logistics charges according to how individual services, products, customers, suppliers, or distribution channels consume logistics resources</td>
<td>5</td>
</tr>
<tr>
<td>Supporting total quality, continuous improvement, and/or just-in-time strategies and analyses</td>
<td>4</td>
</tr>
<tr>
<td>Budget analyses, planning, and forecasting</td>
<td>4</td>
</tr>
<tr>
<td>Evaluating supply chain and partnership costs</td>
<td>4</td>
</tr>
<tr>
<td>Transfer pricing decisions and analyses</td>
<td>4</td>
</tr>
<tr>
<td>Performing value analysis and eliminating waste</td>
<td>4</td>
</tr>
<tr>
<td>Performance measurement of personnel</td>
<td>3</td>
</tr>
<tr>
<td>Obtaining a competitive advantage by pricing logistics services according to their actual consumption of material handling, warehousing, management information systems, and other overhead costs</td>
<td>3</td>
</tr>
<tr>
<td>Performing competitive studies and analyses</td>
<td>2</td>
</tr>
<tr>
<td>Accurately determining or forecasting new product costs</td>
<td>2</td>
</tr>
<tr>
<td>Performing market analyses</td>
<td>1</td>
</tr>
<tr>
<td>Determining scrap, rework, repair, and warranty costs</td>
<td>1</td>
</tr>
<tr>
<td>Performing life cycle costing and/or target costing</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 25: Decision-Making Areas Supported by ABC Data
Research Question Three:

What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?

Evaluation. Research Question Three was addressed via an analysis of the research variables (key phrases underlined in the research question above) through the analysis of the Investigative Questions Q3-1 through Q3-6. The specific investigative questions are outlined below and were addressed with Interview Protocol questions 36 through 39.

Investigative Questions:

Opinion or Attitude

Q3-1. Overall, has ABC implementation benefited the firm’s logistics operations?

Competitiveness

Q3-5. Has the ABC system enhanced the firm’s competitive position in the marketplace?

Customer Satisfaction

Q3-6. Has the firm’s customer satisfaction increased due to the ABC system (either directly or indirectly)?

Based on the responses to interview protocol question 37, 91% of the firms believed their ABC systems were an improvement over their previous logistics cost systems (see Table 26). This is also consistent with Table 25. Six of the top ten decision-making areas supported by the firms' ABC systems refer directly to logistics costs, including:

120
• enhanced visibility of logistics costs;
• breaking out logistics costs to the activity or task level or to major processes;
• determining the logistics costs associated with individual products, services, customers, suppliers, or distribution channels.

However, while believing their activity-based cost systems were an improvement over their previous cost systems, firms were much more cautious in declaring that the improvements to their cost systems had resulted in improvements to their competitiveness or improvements to their logistics operations. As Table 26 shows, firms were basically evenly split between those who felt their ABC systems had benefited their logistics operations and their competitiveness and those who were either unsure or felt their ABC systems definitely had not improved their competitiveness or logistics operations.

In terms of customer satisfaction, the results were also mixed. Most firms reported using the information about product, service, customer, distribution channel, and/or activity costs to evaluate their costs to serve and the particular services provided to individual customers. However, only approximately half of the firms reported using the ABC data to support product or service pricing decisions. In particular, slightly less than half of the firms (5) reported that they had menu pricing of their logistics services based on the activity-based costs of providing those services (i.e. they charged different prices to different customers based on the activity-based costs of providing logistics
services to each customer). Similarly, roughly half of the firms reported that their cost system was useful in making product or service pricing decisions.

<table>
<thead>
<tr>
<th>Opinions</th>
<th>Number of Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC system better than previous logistics cost system?</td>
<td>Yes 10, No 1, Unsure 0</td>
</tr>
<tr>
<td>ABC system is a source of competitive advantage?</td>
<td>Yes 6, No 5</td>
</tr>
<tr>
<td>ABC implementation worth the investment?</td>
<td>Yes 9, No 1, Unsure 1</td>
</tr>
<tr>
<td>ABC has benefited logistics operations?</td>
<td>Yes 5, No 3, Unsure 3</td>
</tr>
<tr>
<td>ABC has benefited overall competitive position in the marketplace?</td>
<td>Yes 5, No 5, Unsure 1</td>
</tr>
</tbody>
</table>

Table 26: Opinions Concerning ABC Systems

Decision Making

Q3-2. What decisions does ABC data support (i.e. what types of decisions are typically made based on ABC data)?

Q3-3. What changes have occurred in logistics decisions since the ABC system was implemented? Are these changes due to the ABC data?

Table 25 (page 119) shows the decisions and decision-making areas supported by the ABC data from the firms' models. As discussed earlier, the majority of firms reported ABC data supporting decision areas associated primarily with understanding and controlling logistics costs. The firms reported improved visibility of logistics
costs, including the capability to determine the logistics costs incurred for individual products or services, customers, suppliers, and distribution channels. The majority of firms also described an improved ability to perform cost and profitability analyses in these areas. Most firms indicated that the abilities listed above primarily existed as a direct result of their ABC systems, but a few firms indicated some basic capabilities in activity costing prior to their ABC systems. For example, one firm’s general ledger categories were closely aligned with their major activities, so that their ABC system added little additional capability in terms of the costing of major business activities. Benefits related to avoiding wrong decisions were also mentioned. For example, one firm stated that their current year logistics costs were going to be over budget by three to four million dollars. Such budget overruns were taken very seriously within the firm, and there was a lot of pressure to explain why the budget overrun had occurred.

Without the ABC model in place, they believed high customer service costs would have been blamed, and there would have been a concerted effort to cut back on services offered to customers. Their ABC model showed them, however, that their spending on these items was actually below what they had budgeted for these customer services, and was able to point them elsewhere to explain the budget overrun. They were convinced that without the ABC information, they would have “chased the wrong issues.”

Cost Management

Q3-4. Has the firm’s ABC system made it easier to identify and manage logistics costs? If so, in what areas?
Again referring to the summary of decision making areas supported by ABC data (Table 25, page 119), most firms indicated significant improvement in their ability to identify and classify logistics costs in terms of customers, products and services, and distribution channels. They also reported improvements in their ability to perform cost and profitability analyses in these areas.

**Summary Evaluation of Research Question Three:** In summary, while most firms believed their ABC systems gave them better information and data, particularly data related to logistics costs, they were much more cautious in declaring that they had used that data to produce increased customer satisfaction or a competitive environment.

**Section Two: Other Findings**

This section presents additional findings that were not directly related to the research hypotheses and research questions. These other findings pertain to the following areas: ABC model design, and ABC model use.

**ABC Model Design**

**Software**

Over half the firms did not report using specialty software specifically designed for ABC models and applications. Rather, many reported that they used a combination of legacy accounting systems and in-house developments. For example, one firm’s model was built primarily by in-house expertise using Microsoft Access database
software and Microsoft Excel spreadsheet software. Two other firms reported primarily using legacy systems combined with spreadsheets.

Five firms reported using third party application software for their ABC systems. Of those, one firm used a combination of in-house spreadsheets combined with a software package provided by their primary consultant on the project. The other four firms all used software products from ABC Technologies, the leading supplier of third-party ABC application software. The software packages identified from ABC Technologies were Easy ABC, specifically identified by one firm and used in combination with an Access database, and Oros, specifically identified by three firms.

**Model Complexity**

Model complexity varied substantially among the participating firms. For example, using the number of activities as a measure of model complexity, the complexity varied from 15 to 1,000 activities. Interestingly, over half of the firms indicated that their initial models were too complex and that subsequent revisions had reduced their models’ scope and overall complexity. Simplifications typically involved eliminating certain categories of costs from the models and/or the specific activities or cost objects included. For example, one firm used their model to analyze their logistics costs to serve individual customers. The defined purpose of the model was to identify potential “tactical” changes that could be made in the relationship to drive costs to serve down. In particular, the model focused on identifying those things they or their customers could realistically change in the short-term. Therefore, as an example,
differences in the cost to serve a customer due to geographical separation were specifically left out of the model.

**Resource Capacity Measures**

None of the ABC systems studied by this research incorporated excess capacity measures. All relevant costs in the models were fully allocated to cost objects. The potential dangers and implications of the lack of capacity measures is discussed in Chapter Five.

**ABC Model Use**

A significant issue mentioned by most firms in the study was the proper management use of ABC data. Firms generally indicated fairly dramatic improvement in cost visibility and their ability to perform cost and profitability analysis by customer, product, service, distribution channel, etc. However, there was considerable variation in attitudes and opinions about how best to convert the added intelligence of an ABC model into demonstrable competitive advantages and logistics system improvements.

**Summary**

This chapter has presented the results of the case studies and interviews of personnel from eleven firms using ABC within logistics. Findings were presented regarding firms' motivations in implementing ABC within logistics; price competition; diversity in consumption of logistics resources; ABC model design, training, advocacy, complexity, and philosophy of use; decision-making areas supported by ABC data; and
overall opinions of practitioners regarding the usefulness of the ABC model. In addition, other findings related to ABC model design and use of ABC data were discussed. Chapter Five presents conclusions drawn from the research.
CHAPTER 5

SUMMARY, CONCLUSIONS AND IMPLICATIONS

Introduction

Chapter Five summarizes the research by reviewing the objectives and methodology, reviewing the findings of the research along with conclusions and implications drawn from the findings, reviewing conclusions related to the research methodology, summarizing implications for theory and practice, and providing recommendations for future research.

Section 1: Research Summary

The overall objective of this research was to study the nature, extent, and impact of ABC use in logistics. The research specifically studied why firms implement ABC in logistics, how firms implement ABC, what types of decisions are supported by the ABC system, and the perceived impact or efficacy of the ABC information.

The research focused on the use of ABC systems within the logistics operations of firms. Therefore, the research was limited to firms that performed logistics functions within a supply chain. While some of the models studied incorporated or included other
functions beyond logistics, all of the models studied included logistics functions. Finally, the research sought to study the longer-term impacts of ABC by including firms in the research sample that had implemented ABC within their logistics functions at least two years prior to the research.

The research objectives focused on four major areas: why ABC is used within logistics, how ABC is implemented in logistics, the capabilities of ABC systems in logistics, and the impact of ABC systems within the firm. Specifically, the research objectives were:

1. Discover motivations for ABC use within logistics.
2. Discover characteristics of ABC systems used in logistics.
3. Explore capabilities and deficiencies of ABC systems used in logistics.
4. Discover the impact of ABC use within logistics in terms of logistics decision making and attitudes of logistics practitioners.

The research sought to address these objectives through a qualitative, case study approach by studying and evaluating five guiding hypotheses and three research questions. These hypotheses and research questions were further broken down into variables (key phrases or concepts) that were addressed specifically with investigative questions. The investigative questions were then incorporated into an interview protocol to guide the interviews with representatives from the participating firms.

The variables addressed included motivation for implementing ABC, difficulty in costing logistics operations, extent of price competition, ABC system design, training, advocacy of the ABC system, philosophy of use of the ABC system, decisions and decision-making areas supported by ABC data, attitudes toward ABC, cost management,
competitiveness, and customer satisfaction. In addition, ABC complexity was defined as a key variable, and its relationship to various other variables was studied. ABC complexity was originally defined as the total number of resources, resource drivers, activities, activity drivers, and cost objects in a given ABC model. The study also evaluated two modifications to this variable definition: as defined above minus the number of cost objects, and strictly defined as the number of activities only.

The research was conducted via interviews with selected key personnel from each firm during on-site interviews and/or telephone interviews. Interviews were recorded (with the permission of the interviewees) and transcribed. The content of the interviews, along with additional, applicable documentation provided by some of the firms, was then studied using qualitative, content analysis. Participating firms’ ABC applications and experiences were then studied to determine overall patterns and relationships and to evaluate the research hypotheses and research questions.

Section 2: Conclusions

This section presents conclusions based on the evaluation of the research hypotheses, research questions, and other findings.

Motivation in Implementing ABC Within Logistics

Guiding Hypothesis One: Firms’ primary motivation in implement ABC within logistics is to better understand product and/or service costs due to difficulty in costing logistics operations and/or intense price competition in the marketplace.

Findings: The motivational factors for implementing ABC mentioned most often by firms were almost exclusively related to
obtaining a more accurate understanding of the costs and profitability associated with products, services, customers, and channels. Firms indicated they were motivated to obtain this data to identify cost savings, improve operating efficiency, make process improvements, and perform strategic planning and analysis related to costs and profitability. Most firms also reported a high level of unique or special requests made on their logistics systems, as well as high levels of diversity in the way different products, services, suppliers, customers, and/or supply channels consume logistics resources. There was no apparent correlation, however, between price differentiation or price sensitivity and ABC use.

Conclusions:

The hypothesis was partially supported. The findings indicated that the primary motivational factor behind the firms' implementations of ABC was the analysis of product and/or service costs and profitability, listed by ten of the eleven firms. In addition, most of the motivational factors listed by a majority of firms were related to cost and/or profitability measures or improving operating efficiency. However, competitive studies/analysis and strategic planning/analysis were also identified as motivations by a majority of firms. In addition, a large majority of the eleven firms studied reported high diversity in the way different products, services, suppliers, customers, and/or supply channels consume logistics resources, and the majority of firms also indicated a high number of unique or special requests were made by their customers and/or suppliers.

These results were consistent with one another. Firms with high levels of diversity in the way overhead resources are consumed by cost objects (e.g. customers,
products, services) should benefit more from an ABC system than firms with relatively homogeneous demands on their resources. High levels of unique or special requests are additional indicators of diversity in resource consumption between customers or suppliers.

It was also hypothesized that ABC use would be correlated with intense price competition. Price competition was measured in terms of the primary means the firms differentiated themselves from their competitors and the degree of price sensitivity in the markets in which the firms’ products and services compete. It was expected that ABC use would be higher in firms that primarily differentiated themselves on the basis of price, and that ABC use would be higher in firms with greater price sensitivity in the marketplace. This part of the hypothesis was not explicitly supported by the findings. Only four of the eleven firms said that their primary means of differentiating themselves from their competitors was on the basis of price or being the low-cost supplier. Actually, only one of the four firms specifically referred to price as part of their differentiation strategy; the other three emphasized the strategy of being a low-cost supplier. Further, the firms were practically evenly split between low and high price sensitivity.

However, these results appears to be related more to the wording of the questions and the specific definition of “price sensitivity” used by the study rather than a fundamental flaw with Guiding Hypothesis H1. The interview protocol defined a highly price sensitive market as one in which relatively small price changes often result in significant changes in the amount (volume) of products or services sold. Firms responded based on this definition, but few thought of their markets in these terms. In
responding to the question on price sensitivity, most firms took exception to the definition and redefined it in terms of cost rather than price.

All firms indicated that the need to understand and control costs is extremely important, and ten firms indicated that their markets were price competitive. But they tended to view prices as set by the market and/or the necessary condition of entry into the marketplace. In the interview protocol, “price differentiation” was defined as a firm that generally strives to have lower prices than its competitors, and “price sensitivity” was defined as a market where relatively small price changes often result in significant changes in the amount of products or services sold. So of the four firms indicating they used a price / low-cost supplier differentiation strategy, only one specifically referred to price. The firms indicated a strategy of being the low-cost supplier, which does not necessarily imply a low-price strategy, and all four firms were operating in commodity markets. Finally, of the five firms indicating their markets had relatively low levels of price sensitivity, three stated that their markets were highly price competitive.

Therefore, the weight of the evidence supports Hypothesis H1: the primary motivations listed by the firms were related to understanding product/service costs and profitability, along with potential cost savings and increased operational efficiency, and these motivations are associated with highly price competitive markets and environments of diversity in logistics resource consumption.

**Characteristics of ABC Systems Used in Logistics**

Guiding Hypothesis Two: Greater complexity in ABC system design will be associated with greater price sensitivity.
Findings: On balance, examining results across three slightly different operational definitions of ABC model complexity, there was insufficient evidence of correlation between the degree of price sensitivity in a firm’s markets and the complexity of the firm’s ABC system.

Conclusions:

One measure of ABC model complexity supported the hypothesis; two other measures of model complexity did not. Figure 2 and Figure 3 show weak evidence of correlation between ABC system complexity and price sensitivity, while Figure 1 shows relatively strong evidence of correlation between the two variables. Given the earlier discussion on the firms’ views on the differences between price sensitivity and cost competitiveness, the results shown in Figure 2 and Figure 3 are as expected. However, the results in Figure 1 need explanation.

The results in Figure 1 are obtained when the number of cost objects is included in the operational definition of model complexity. For the firms participating in this research, the number of cost objects ranged from zero to 46,200. This wide range means that when the model’s complexity definition includes the number of cost objects, the firms whose models get categorized as moderately and highly complex are those with large numbers of cost objects. This is true since the numerical measures of complexity are converted into the categorical values of low, moderate, and high complexity based on their relative numerical measures. For example, Firms D, F, J, G, and I have models classified as moderately or highly complex in Figure 1. These firms are either manufacturers or wholesalers with large numbers of SKUs and or customers as cost
objects in their models, and they are in industries with typically tighter margins than the industries of the other firms in this research.

Therefore, there are two possible explanations, then, for the results shown in Figure 1. One possible explanation is the figure is providing evidence of correlation between ABC model complexity (when measured as the total number of resources, activities, drivers, and cost objects) and low margins. A more prosaic and more likely explanation is that, of this research’s limited purposive sample of eleven firms, the firms with large numbers of SKUs and/or customers were from relatively low margin industries compared with other firms in the sample.

The evaluation of Guiding Hypothesis Two in Chapter 4 presented a strong argument (see page 87) for excluding the number of cost objects from the measure of model complexity. Therefore, the definitions of model complexity reflected in Figure 2 and Figure 3 are preferred. Based on those definitions, there is insufficient evidence of correlation between model complexity and price sensitivity.

Guiding Hypothesis Three: Greater complexity in ABC system design will be associated with the use of ABC as part of the day-to-day management information system.

Findings: On balance, examining results across three different operational definitions of ABC model complexity, there was insufficient evidence of correlation between the complexity of the ABC model and the use of ABC as part of the day-to-day management information system.
Conclusions:

Guiding Hypothesis Three predicted that ABC model complexity and the use of ABC as part of the day-to-day management information system would be correlated. The rationale was that either: (a) firms would decide up front that they want their ABC system to be useful on a day-to-day basis to support managerial decisions, and this would necessitate a more complex ABC model, or (b) only firms with more complex models would find the models useful for supporting managerial decisions on a day-by-day basis, or (c) firms where management made regular, day-to-day use of the ABC data in managerial decision making would naturally, over time, develop more complex ABC models. Whatever the evolutionary steps involved in getting firms through an initial ABC implementation to longer-term use of an ABC model, Guiding Hypothesis Three predicted that models used routinely as part of the day-to-day management information system would tend to be more complex than ABC models used only as a diagnostic tool for occasional or special studies. The hypothesis was not supported by the findings.

In short, the research found little evidence that model usefulness was correlated with model complexity (see Figure 4, Figure 5, and Figure 6). In fact, over half the firms had simplified their models one or more times since their original development and believed the simplifications had made their models more useful. There appears to be a practical point of diminishing returns for ABC model development. ABC models are typically more complex than the traditional management accounting systems they replace. They use multiple activities and drive costs to cost objects on the basis of a variety of cost drivers, rather than the more traditional overhead pool being allocated to
cost objects on the basis of one or two volume-based allocation bases. Therefore, ABC systems tend to be more complex and require more detailed data on drivers and activities than a traditional management accounting system.

Because ABC systems also tend to provide a more accurate picture of the operating costs of providing various products and services to different customers, ABC model outputs often challenge traditional views of which customers and products are truly profitable, or which business processes are truly efficient. Therefore, the outputs of an ABC model are often challenged or not believed by many in the organization; they simply find it too hard to believe that many of their traditional assumptions were incorrect.

So, if ABC systems are to be relied upon and used regularly for management decision making, managers must understand the underlying assumptions and concepts of the model and believe the outputs of the model. Overly complex ABC models that are harder to understand are less likely to be accepted and relied upon by decision-makers. Therefore, it is not surprising that the regular use of ABC data in decision making is not highly correlated with model complexity.

Guiding Hypothesis Four: Greater complexity in ABC system design will be associated with larger numbers of different decisions that the ABC data supports.

Findings: On balance, examining results across three different operational definitions of ABC model complexity, there was insufficient evidence of correlation between the complexity of the ABC model and number of different decisions or decision areas the ABC data supports.
Conclusions:

Guiding Hypothesis Four predicted that ABC model complexity and the number of decisions or decision areas supported by the ABC data would be correlated. The rationale was either: (a) as management sought for ABC data to support a wider number or variety of decision and decision areas, the ABC model would have to become more complex, or (b) management simply would be unable to use a relatively simple ABC model in a large number of decision areas. The hypothesis was not supported by the findings.

As a logical extension of the previous discussion on model complexity in Guiding Hypothesis Three above, a prerequisite for management use and reliance on ABC data is that they understand and trust the model. This becomes more difficult as an ABC model becomes more and more complex. Again, the research found over half the firms had simplified their models since their original development.

Guiding Hypothesis Five: Greater complexity in ABC system design will be associated with more favorable attitudes of logistics practitioners toward the usefulness and impact of ABC.

Findings: There was insufficient evidence of correlation between the complexity of the ABC model and favorable attitudes of logistics practitioners toward the usefulness and impacts of ABC.
Conclusions:

Guiding Hypothesis Five predicted that ABC model complexity and favorable attitudes of logistics practitioners toward the usefulness and impacts of ABC would be correlated. This hypothesis was not supported by the findings.

The argument has been made more than once in the analysis of other guiding hypotheses above that increasing model complexity does not in any way guarantee an increase in the ABC model’s usefulness. All but one firm indicated that the ABC system was an improvement over their previous cost systems, yet the ABC models ranged from low to moderate to high complexity. In addition, Table 13 shows no correlation between model complexity and the attitudes concerning whether ABC had improved the firms’ competitive positions.

The latter result is interesting. While all but one of the firms believed their individual ABC systems were an improvement over their previous cost system, most firms stopped short of saying that the ABC system had resulted in an improved overall competitive position. Only five firms believed their ABC systems had improved their overall competitive position, compared with five firms that felt their ABC systems had not improved their overall competitive position and one firm that was unsure. In fact, one firm even felt it had hurt its competitiveness due to a new pricing model that was applied (based on the ABC data) compared with competitors’ pricing strategies.

Research Question One: What are the key characteristics in terms of design, training, advocacy, and philosophy of use of the ABC system?
Conclusions:

Research Question One addressed several aspects of ABC system design and implementation within the firms. Key conclusions are summarized below.

**Design.** Most firms followed a traditional, two-stage design model (as shown in Figure 10) for their ABC system. Two firms’ models were basically one-stage models, since their focus was on activity identification and management; these models focused on accurately allocating costs to the activity level only.

Resources were generally identified from the existing general ledger or income statement. Some firms had the advantage that their general ledger or income statement line items or categories aligned with the main activities within the organization, aiding model design, particularly the allocation and assignment of resource costs to activities. The primary type of resource cost being tracked in the ABC system was labor. For most firms, the dominant resource driver was a percentage breakout of labor hours or full time equivalents (FTEs) to the various activities, derived either through surveys of worker-level personnel, more detailed work studies or analyses, or standard costs.

The number of activities in the models varied widely from 15 to 1,000. The overall complexity of the individual models (as measured by the number of activities) was determined based on the specific purposes or focus identified for each model.

For example, one firm’s model was developed strictly to accurately associate loading costs for individual products based on quantity, mode of shipment, and loading facility location. Because of significant differences between the different modes, quantity categories, and the sophistication of loading facilities, the activities were specifically
defined as a certain quantity of a certain product loaded for a specific shipment mode at a specific facility. Therefore, the overall number of activities in the model was equal to the total number of products multiplied by its different quantity categories multiplied by the number of different shipping modes multiplied by the number of distinct facilities the product ships from. The result was a model with 1,000 very specifically defined activities, where the activities themselves were also, in a sense, the cost objects of interest.

Another firm was interested in modeling its distribution costs from its shipping depots, starting with the pick and load operations, shipment via third-party logistics service provider or company-owned logistics network to customers (resellers), and any returns of products from the resellers. The receiving and storing functions (getting the products from the manufacturing facilities) were not part of the model. In addition, indirect costs like depreciation, rental, and utilities were also not included in the model. These costs were excluded since the model attempts to capture only costs that are influenced or driven by customer behavior. The firm was only trying to capture variation among resellers; if the costs were not incremental or they were simply spread across all resellers with no reasonable rationale on why the costs would be different from one reseller to the next, they were excluded from the model. In short, they were interested only in short-term variable costs between resellers only. The model was used only by senior management to reveal reseller-level customer profitability for strategic purposes only; the model was not used to evaluate operational efficiency. Accordingly, this model only tracked 15 activities.
Most firms did not consolidate their managerial and financial accounting systems (accounting systems for internal and external reporting purposes) into one overall accounting system. Only two of the firms had such a consolidated accounting system; of these two, only one of them was an ABC system. For the other nine firms in the sample, their ABC system did not replace any legacy accounting systems; rather their ABC systems were stand-alone and distinct.

**Training.** The most frequently used source of ABC training was from internal experts and implementation teams within the firms, although eight firms also used consultants at some point in the initial design and implementation of the ABC system. The main recipients of training in the firms were implementation teams (often cross-functional in nature) and end-users of the ABC system outputs. Interestingly, only about half of the firms (5) indicated that they had provided training to mid-level management, and only five firms reporting training to the top management or executive level. Nine firms said they were either satisfied or very satisfied with the ABC training they received. Finally, when asked what groups should receive additional training and what the content of that training should be, most firms identified top management and/or middle management as the recipients in most need of additional training, and the most often identified topic for additional training was training in the use of ABC data in decision-making (or Activity-Based Management).

**Advocacy.** Accounting and Finance or controller positions were identified most often as champions of the ABC implementations within the firms. Seventeen champions were mentioned across the eleven firms, and nine of these were related to accounting,
finance, or a controller position. Positions mentioned included the Director of Finance or Accounting, Corporate Controller, Senior Controller, and Director of Logistics Accounting. The Chief Executive Officer (CEO) was listed by three firms, an Operations or Logistics Manager was listed by three firms, and the Vice-President for Sales was listed by two firms. Interestingly, though the ABC applications studied in this research all included logistics operations in the models to some extent, a logistics executive was rarely mentioned as an overall champion of the implementation. Of course, it is possible that a logistics executive could have been a key initiator of ABC modeling, but understood that top management support was needed for the effort to succeed.

Eight of the eleven firms said top management was supportive of their ABC efforts. Most firms also defined top management support as the willingness of top management to act based upon the ABC data. Seven of the eleven firms specifically discussed the extent to which top management used the data in decision making in evaluating the level of top management support. For example, one firm reported mixed top management support. Top management had been supportive of the original ABC model development, but the final model’s design and results were considered questionable in several areas. Management believed the model was inappropriate and insufficient for comparing the costs of services provided to individual customers in order to differentially price their services, and they decided not to use the model at all. The other firm indicating mixed top management support also primarily defined top management support as their willingness to act upon the ABC data. While top management still supported using ABC, the extent of ABC use had declined somewhat.
due to management concerns about the model’s credibility in certain areas, combined with uncertainty about exactly what should be done with the ABC information from the model.

One firm reported top management support was not applicable to their ABC implementation, since their ABC model did not require the commitment of any additional corporate resources nor the modification of any existing management information systems (including existing accounting systems). This firm’s model was limited in scope to one particular cost center and was only used internally by the cost center manager to cost activities and provide information for improvement efforts within that organization.

Another interesting example of top management support at one firm was their willingness to restate business results using the ABC data rather than their former management accounting system. This was described as “a rather dramatic step,” since it represented roughly a $12 million shift between business units. This level of support from top management was not provided immediately after model development, however. The ABC manager reported it took approximately one year to convince top management that this was the correct way to go.

Seven of the eleven firms (64%) indicated that the accounting or financial division or department was supportive of the ABC implementation, however many of the models were separate and distinct from legacy accounting systems, requiring very little interaction between users of the ABC models and the working-level accounting/finance personnel.
Philosophy of Use. The use of the ABC system as part of the management information system used for day-to-day management and decision making was reported by five of the firms. Seven firms reported using their ABC systems as a diagnostics tool for special studies and analyses.

Capabilities and Deficiencies of ABC Systems Used in Logistics

Research Question Two: What decisions or decision-making areas are supported by ABC data?

Conclusions:

Research Question Two sought to discover the various decisions and decision making areas that were supported by the ABC models at the firms. Table 25 summarizes the responses of the firms.

The majority of the motivational factors that led firms to design and implement ABC systems were, as was outlined earlier, related primarily to a better understanding of costs and key processes and activities, particularly to support cost and profitability analyses related to products and services, customers, suppliers, and/or distribution channels. It is therefore not surprising that of the sixteen decision-making areas identified by at least six or more of the firms, twelve are directly related to understanding and accurately costing key processes or activities. All eleven firms agreed on two decision-making areas that were supported by all their ABC systems: providing visibility of logistics costs and understanding and costing key processes. Determining logistics
costs of major processes; determining the logistics costs incurred serving individual customers or providing individual products or services; and understanding, identifying, and controlling cost drivers were each listed by nine of the eleven firms.

However, even though performing strategic planning and analyses was listed as supported by their ABC systems by nine of the firms, most specific long-term or more strategic decision making areas were supported by less than half of the firms’ ABC systems. For example, the ability to perform life cycle costing or target costing was not supported by any firms’ ABC system. Evaluating supply chain and partnership costs was supported by the ABC system in only four of the firms, as was performing transfer pricing decisions and analyses, performing value analysis and eliminating waste, and supporting total quality or continuous improvement initiatives. Budget analyses, planning, and forecasting was listed by only four firms. It is possible that the limited scope of many of the ABC models in this research is related to this finding. In other words, if an ABC system is not being used on a company-wide basis or for more general purposes, it may be difficult to use the system’s data for strategic purposes.

Finally, only three firms indicated that their ABC cost system enabled them to obtain a competitive advantage by pricing logistics services according to their actual consumption of logistics overhead resources, yet most of the firms said their models had this capability. A minority of firms actually differentially price their products and/or services based on the ABC data.

In summary, despite the longer-term use of ABC by these firms (an average of four years ABC experience when the one firm that elected not to implement their model
is eliminated from the sample), their main uses for the ABC data tends to be for shorter-term, tactical decisions and basic information on their cost structures rather than as a more strategic business planning tool. In addition, few firms have attempted to price their products and services based on the ABC data at their disposal.

**Impact of ABC Use Within Logistics**

Research Question Three: What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?

Conclusions:

Research Question Three investigated the overall opinions and attitudes toward ABC and its impact on decision making, cost management, competitiveness, and customer satisfaction.

The vast majority of the firms (91%) believed their ABC systems were an improvement over their previous logistics cost systems. In general, they believed the ABC data was more detailed and accurate information on various aspects of their business processes, their costs to provide various products/services, and their cost to serve various customers or work with various suppliers. The firms were much more cautious, however, in declaring that the improvements to their cost systems had resulted in improvements to their competitiveness or improvements to their logistics operations.
Results were also mixed in evaluating the impact of the ABC systems to overall customer satisfaction.

In general firms were genuinely pleased with the accuracy and content of the information their ABC systems were providing, they felt the ABC systems were improvements over their previous cost systems, and they believed the information from the ABC systems was important and needed. There were more mixed results when firms attempted to describe specific uses of the ABC information to improve their overall competitiveness or customer satisfaction. These issues are discussed more fully in the section that follows.

**Other Findings**

Finally, conclusions derived from other findings of the research are summarized and presented.

**ABC Model Design**

**Software.** Success of ABC implementation and use of the ABC data was not dependent on specialized ABC software applications. Over half of the firms used no specialty software at all, but rather used various combinations of spreadsheets, databases, legacy accounting systems, and internally-developed applications. Five firms did report using specialized, third-party ABC software. All but one of the specialty packages identified were from ABC Technologies. The remaining specialty package was a proprietary software program owned and used by a consultant in one of the firms.
Typically, firms were happy with the training provided by the third-party software vendors.

**Model Complexity.** As stated earlier, model complexity varied significantly among the eleven firms, and over half of the firms said that their initial ABC models were too complex and required simplification; some firms simplified their ABC models more than once. The simplifications typically involved limiting further the scope of the ABC model, reducing the number of resources included, reducing the number of activities defined, and/or reducing the number of drivers. Of those firms that did not report simplifying their initial ABC model, most had carefully scoped the projects ahead of time and kept the projects limited to their specific, defined purposes.

**Resource Capacity Measures.** None of the firms had built capacity measures into their ABC models, but were fully allocating all costs included in the models to the applicable cost objects. In other words, each of the models fully allocated all the costs in the model to the cost objects. After analyzing the particular business elements the models were intended to address and determining the relationships between the resources supplied, the activities performed, and the cost objects, historical costs were inserted into the models to determine activity costs and to drive costs to cost objects. Put another way, historical resource costs were assigned to activities, and historical activity or cost driver levels were used to fully allocate the activity costs to cost objects.

This approach is reasonable in establishing the logic of the ABC model for managers, supervisors, and employees. In addition, this approach often discovers and highlights actual inefficiencies, unprofitable customers or products, poor supplier
relationships, and other problematic business processes that are based on what has historically occurred rather than on a model based on theoretical or hypothetical results [110:112-113]. However, the strategic use of ABC to enable managers to make informed decisions requires an ABC model that can be used proactively to influence future cost incurrence rather than simply a model that more accurately assigns historical costs [110:135].

Firms’ abilities to use their ABC data for more strategic, long-term issues to improve profitability, logistics operations, and customer satisfaction, documented at length earlier, are in large part related to the absence of capacity measures in their models. Activity-Based Budgeting and differential pricing strategies are significantly handicapped without capacity measures in ABC models, as are firms’ capabilities to translate productivity improvements at the activity or task level into cost savings within the logistics system. By fully allocating all costs with no excess capacity measures, changes in volume of products or services simply results in changes to the driver quantities in driving costs from activities to cost objects. Activity costs and cost object costs may fluctuate wildly in the short term, and differential pricing based on such numbers may ultimately hurt a firm’s competitive position.

As an example, consider a telephone technical support activity for a software manufacturer. The firm knows that the total cost of performing this activity (salaries, telephone lines, etc.) is, say, $1,000,000 per year. The firm determines that an appropriate cost driver for this activity is number of phone calls. Therefore, the cost of this activity will be allocated to cost objects (different software programs) based upon the
number of phone calls. The company may look back over the past year, discover that the technical support activity handled 80,000 calls last year, and therefore arrive at a cost driver of $12.50 per call ($1,000,000 divided by 80,000 calls). It could then elect to use this cost driver quantity for the coming year.

However, management could be more proactive by forecasting the number of phone calls expected over the coming year. For example, suppose the software managers for the various software programs developed by the company understand that technical support costs are allocated to their individual software programs based upon the number of phone calls to technical support. If technical support costs are too high or rising, a manager might take steps to reduce the number of phone calls to technical support. Possible ways include eliminating troublesome errors or bugs in the code, improving the built-in diagnostics and help files in the software, establishing frequently-asked-questions databases on the internet, and/or improving the printed documentation that accompanies the software. If various software managers take such steps, management might forecast that the number of technical support calls will decrease from 80,000 calls to 60,000 calls. Without capacity measures in the ABC model, however, this would just result in the cost driver quantity increasing from $12.50 per call to $16.67 per call ($1,000,000 divided by 60,000 calls). In other words, positive steps were taken to reduce the amount of telephone support activity needed, but fully allocating all costs to cost objects without capacity measures simply offsets the decline in the amount of activity required with a greater cost per unit of activity.
A better method is to add capacity measures into the ABC model. To do this, the company must first determine a reasonable definition of full capacity. For this example, assume the firm looks at the average length of a technical support phone call, the number of technical support workers, the number of phones, and other resources and determines that the technical support activity can reasonable handle 100,000 calls per year without imposing unnecessary stress on the workers and without using overtime. With this estimate of capacity, the cost driver quantity becomes $10 per call ($1,000,000 divided by 100,000 calls). Then each phone call is allocated $10 of technical support cost no matter what actual call volumes turn out to be. The difference between the $1,000,000 budget or total cost for this activity and the amount allocated to cost objects then is shown appropriately as the cost of excess capacity.

When the software managers improve their individual software products so that the number of technical support calls drops from 80,000 class to 60,000 calls, managers will see the cost of excess capacity grow from $200,000 to $400,000. It is then up to managers to act on this information if the firm is actually going to realize cost savings associated with the improvements made to its software products. In other words, managers will either have to reduce the amount of resources supplied (e.g. lay off workers) or use the excess capacity resources in some other value-adding activity. This necessity to act may be hidden in an ABC model with no excess capacity measures.
Model Use.

As related earlier, a significant issue for most firms was the proper management use of the resulting ABC data. All but one firm indicated significant improvement in cost visibility and their ability to perform cost and profitability analyses as a result of their ABC implementations. However, there was considerable variation in attitudes and opinions on how best to convert the added intelligence of the ABC model data into demonstrable competitive advantages and logistics systems improvements.

For example, the accuracy of an ABC model helps point out differences in the costs to provide certain products and services to particular customers, potentially revealing differences in profitability. However, most firms were not currently differentially pricing their products and services. Should firms differentially price their products and services based on this data? Most firms in this study did not. One firm’s decision to differentially price their products led to widespread customer anger and dissatisfaction and a loss of market share. Yet another firm, a direct competitor of the former, differentially priced and reported increased customer satisfaction and a gain in market share.

According to Table 25, less than half (5) of the firms said their cost systems were useful in the menu pricing of logistics services, while fewer still (3 firms) thought they had gained any competitive advantage by pricing logistics services according to their actual consumption of material handling, warehousing, management information systems, and other overhead costs. One respondent said they did not believe the marketplace was offering any real advantages to firms that differentially priced. One firm stated that the
ability to differentially price would be critical in the future for business success, while others were skeptical. For example, one interviewee stated that the optimization of a firm's business base on a product by product and customer by customer basis was not in his firm's long-term best interests. Rather, the relationship with a customer should be viewed from a market basket perspective, with the goal of optimizing and improving the entire relationship rather than focusing on the economics of each individual product or service. Such disagreements illustrate the complexities involved in attempting to integrate and translate more accurate ABC data into improved business performance.

Section 3: Research Methodology

The research used eleven case studies guided by an interview protocol to collect data that was then analyzed and discussed in the findings and conclusions. Every organization contacted that was actively using ABC within logistics agreed to participate. Organizations that declined to participate either were not currently using ABC or, after reviewing the interview protocol, felt their use of ABC was too limited to be considered useful for this research effort. Several aspects of the research methodology contributed to this successful response rate.

First, the methodology called for a purposive sample of firms to ensure that the participating firms met the criteria for the research. For example, one goal of the research was to study the longer-term experience of ABC use within logistics. While some firms were included with less than two years experience with ABC, most firms had been using
their ABC models for over two years. The average age of the ABC models studied by this research was 3.77 years, when the one firm that had developed a model and decided not to implement it was included. When that one firm is excluded, the average number of years of experience with ABC was four years. To select firms that were more likely to have longer-term experience with ABC, the researcher first attempted to contact all the firms that had originally participated in Pohlen’s study in 1993 [148]. This provided a ready list of firms that were known to have ABC experience in logistics, along with key points of contact within the firms. When the researcher contacted these firms, they were told of Pohlen’s referral. Since they had participated earlier in a similar research project conducted out of The Ohio State University, they were potentially more inclined to trust the researcher and to be interested in this research. Beyond the firm’s that participated in Pohlen’s research, additional firms recommended by research committee members and practitioners were contacted. In these cases as well, the committee member or practitioner provided not only a firm name, but also a point of contact and a referral. Potential firms were also identified by their participation in the ABC track of the annual meeting of the Council of Logistics Management (CLM). By focusing on these firms with known ABC experience and existing connections to referring individuals, the probability of securing their agreements to participate in this research was enhanced.

Secondly, the process of asking for a firm’s participation was as personal and non-threatening as possible. The process was designed to allow the firm to make a final decision on participation based on a complete understanding of the objectives and bounds of the research project and an estimate of the time required for participation. The initial
contact with a point of contact at a firm was via telephone. This allowed the researcher to briefly outline the research project and solicit his or her participation. The initial telephone conversation did not request a final decision on participation; but after briefly describing the research, offered to fax an introductory letter on Ohio State College of Business letterhead (signed by the researcher and the dissertation committee chairperson) introducing the researcher and the research project. For firms indicating a definite interest in participating or at least willing to consider participation, the researcher also provided them a one-page synopsis of the research objectives and a copy of the interview protocol that they could review prior to a final decision on their participation. The researcher gave the firm from two to seven days to review the material. Then, the researcher called the potential participant again to answer any further questions and to ask for a final decision on participation.

Third, the introductory conversation and introductory letter made it clear to firms up front that the research did not require them to share any detailed cost information, and each firm was guaranteed anonymity in the published results. Many participating firms made it clear that their participation was indeed contingent on their anonymity in any published results, since they regarded their experiences with and use of ABC at least a potential source of competitive advantage. None of the firms required the researcher to sign a non-disclosure agreement. In addition, participating firms were promised an executive summary of the research results to help them identify current best practices in ABC use and logistics cost analysis and benchmark their ABC experience with other firms, along with an overview of ABC and key sources of ABC information. In other
words, the firms could see potential benefits to their participation in the research, and they were assured that their competitive position in the marketplace would not be compromised by their participation.

Finally, the methodology allowed the interviews of personnel to be conducted face-to-face at the firm's location or via one or a series of telephone interview(s). The firms were allowed to choose the method of interviewing that was most convenient for them. Nine of the eleven participating firms preferred to schedule telephone appointments for the interviews. Since the interview protocol was supplied to each participating firm in advance, the firms were able to investigate questions in advance at their own pace prior to the scheduled interview, shortening the overall amount of time necessary for the interview. In addition, it allowed the firms to determine the best or most knowledgeable people to address the various items or sections in the interview protocol. The overall flexibility in the method and scheduling of their participation was potentially an additional factor encouraging firms' involvement in the research.

The combination of all the above aspects of the research methodology resulted in a high response rate and enthusiastic participation. All participating firms shared a large amount of detailed data concerning their ABC implementation and their use of the ABC information in decision making.
Section 4: Implications for Theory and Practice

The results and findings of this research have implications for the role of ABC within logistics and the way logistics managers use ABC data in decision making. This section explores some of these implications.

According to Robert Delaney, Senior Vice President with Cass Information Systems, the cost of business logistics systems within the United States increased to $862 billion, 10.7% of the nominal Gross Domestic Product, in 1997. Delaney states that the increasing trend is disturbing in that increases in total logistics costs reflect $40 billion in lost productivity since 1993 [91] [159]. Therefore, increasing the efficiency and effectiveness of logistics will continue to be a key concern for individual firms and for the nation. Besides, logistics excellence remains an important source of competitive advantage that is more difficult for competitors to duplicate and thus more sustainable in the marketplace.

Activity-Based Costing (ABC) and Activity-Based Management (ABM) should experience continuing growth, both in logistics and in the firm as a whole. Logistics managers cannot afford to ignore the potential improvements in management information that can be gained from an ABC system. However, it is important that logistics managers carefully define the scope and extent of their ABC models and meticulously define exactly what decisions the ABC system should support. The goals of the ABC system and the decisions it will be called upon to support are critical determinants of the model's structure and complexity. The theme of "different costs for different purposes [100:43]" certainly applies. The specific decisions that managers want the ABC system to support
must be considered to determine what costs should be included versus what costs should be excluded and to determine the level of detail and degree of accuracy required.

The evidence is substantial that an ABC system can provide a better, clearer understanding of costs and what drives them, a clearer understanding of the main activities that consume organizational resources, and a much better understanding of the drivers of these activity levels. This information not only allows managers to understand the main activities being performed and the proportion of total organizational resources consumed by them, but also helps managers to evaluate which activities are truly adding value and which activities most need to be eliminated or improved. The knowledge of the drivers of activities gives managers insight to what must be done to reduce activity levels to become more efficient.

Most firms in this research reported that they gained a better understanding of product and service costs as a result of their ABC models, and that they were able to more accurately allocate or assign costs to various cost objects. However, the mere existence and knowledge of this more accurate data does not tell managers what to do with it.

Logisticians and other managers must become more knowledgeable about the design of management accounting systems in general and ABC systems in particular if they are to exploit these systems for maximum benefit. Managers must evaluate existing market conditions and their competition in the context of a global economy and global competition. Certainly more accurate, detailed, and timely information about activities, activity costs, cost drivers, product and service costs, the costs to serve individual customers, and/or the costs of operating within one supply chain versus another is
important information. A firm that has a more detailed and accurate understanding of its costs and activities versus its competitors should be able to exploit that knowledge to create competitive advantages in the marketplace. Managers must devote themselves to determining how to do just that.

The answers to these questions are not obvious, but the answers may be critical to a firm’s long-term viability in the supply chain. In this research, two firms that decided to set their product and service prices in the marketplace based on their ABC data saw dramatically different results: one firm experienced an increase in profitability combined with no negative impacts to market share, while the other experienced widespread customer dissatisfaction and loss of market share.

Logistics managers will continue to forge relationships in the supply chain to improve the effectiveness and efficiency of the entire value chain. ABC data will be a critical source of objective information on supply chain costs, the drivers of those costs, and where supply chain activities are most economically performed to reduce total supply chain costs. ABC systems and data will provide greater visibility into the true costs of the supply chain, facilitating trust and more open communication between firms. ABC data can provide a foundation for negotiations and discussions between supply chain partners as they refine their relationship. This can be accomplished by defining the activity or cost drivers influenced or controlled by one firm and the way in which these drivers determine the activity levels and costs of another firm. For example, with objective, accurate data on the costs per order at Firm A, Firm B understands how much can be saved at Firm A if Firm B consolidates orders and orders less often. At the same
time, Firm B can also encourage Firm A to examine its processes and drivers that drive costs from resources to activities in order to simultaneously investigate how Firm A can lower its costs per order. Likewise, Firm B can review its processes and drivers to discover the effects of ordering less frequently on total costs and customer service. If the ABC systems at the two firms are linked together, the ABC model can be used to simulate and evaluate various changes to avoid local optimization within a single firm to potentially achieve a more global optimum point for the entire supply chain. Linked ABC systems will also give firms more confidence that the savings from overall supply chain improvements are shared equitably among the supply chain participants.

It will be very important that logistics practitioners and other managers avoid the pitfalls associated with focusing too narrowly on cost reduction and efficiency. Firms and supply chains must first be effective in meeting the overall goals of customer service and customer satisfaction. The challenge then becomes to maintain or improve upon effectiveness while simultaneously increasing efficiency. Johnson warns that ABC can lead firms to focus on costs and cost control and ignore the activity analysis and how those activities support customer service and global competitive excellence [107]. O’Guin also cautions managers against a single-minded focus on improving the efficiency of activities, since many of the activities are probably adding no value and should not be done at all [139]. Drucker and Levitt both point out the absurdity of doing efficiently what should not be done at all [72] [123].

Ultimately, the ABC literature does not dispute these warnings. Managers must understand that ABC systems provide information related both to effectiveness and
efficiency; it is up to managers to properly exploit both aspects of an ABC system. Not only should resources, activities, and cost objects be linked in a logical way to provide accurate measures of costs, but activities must also be linked in a meaningful way to key performance indicators that are truly tied to customer satisfaction and competitive excellence.

The ABC literature is also clear that managers must make hard decisions in order to truly reduce costs. Once a manager acts to reduce the quantity of a given cost driver and thereby reduce the amount of the associated activity required, managers must then either reduce the overall supply of resources to the activities or find other, productive areas in which to employ those resources. Without these decisions, no costs are ultimately reduced. For ABC systems to provide managers the data they need to determine when resources are no longer needed and can either be employed in new, productive ways or eliminated, ABC models must incorporate measures of practical and excess capacity.

In addition, managers must understand the marketplace and the relationship between the cost structure and the market price. Managers will have to carefully consider how best to obtain a more competitive market position and increased market share. Firms will not necessarily achieve marketplace dominance by optimizing the profitability of each individual product or service. Rather, managers must understand the relationship of the entire marketing mix of products and services—when losses in one area might actually lead to an optimal overall competitive position.
Therefore, managers (including logistics managers) will find it essential to form cross-functional teams to develop ABC models that are useful for strategic decision making. The cross-functional perspective will protect against pursuing sub-optimal decisions or strategies and help ensure that the overall effects of potential strategies or decisions are evaluated in terms of the overall supply chain, customer service, and marketplace competitiveness.

Section 5: Suggestions for Future Research

While this research has been able to examine in some detail the experiences of eleven firms in implementing ABC within logistics, there remains much that can be studied and learned concerning the application of ABC to logistics management. In particular, there are two primary areas ripe for additional research.

Survey of ABC Implementation Within Logistics

Future research should attempt to identify ABC trends and practices within logistics as a whole through research methodologies that produce results that can be generalized to the larger population of firms with logistics functions. For example, survey-based investigation of a random sample of firms with logistics functions could provide statistically valid descriptions of the use of ABC within logistics in the total population of firms with logistics functions. This would help researchers identify the
state of the art in ABC implementation and use within logistics, along with the impacts to
logistics operations and decision making of the availability and use of ABC data, or
Activity-Based Management (ABM). Such research could provide valuable
benchmarking information for firms seeking to improve the effectiveness and efficiency
of their logistics operations, and could further attempt to quantify the effects of various
ABC models on the overall logistics operations and competitiveness of firms in a variety
of industries and business situations.

Such research is not without formidable challenges, however. As this research
has illustrated, the specific details of model development (what costs are specifically
included in the model, number of activities identified, methods of assigning costs to
activities, etc.) can vary widely among firms. Also, the purposes for developing ABC
models and the individual decisions supported by the outputs of the models are also
highly variable between firms. Further, there is a wide variety of training and expertise in
ABC across firms, and this must account for some of the variability in expectations,
model design, and use of ABC data across firms. The high degree of variability in these
areas means a large number of distinct variables must be considered when characterizing
and studying many different ABC applications across a large variety of firms.

Furthermore, the firms with logistics functions that have implemented an ABC
model apparently represent a minority of firms. Therefore, there is a need for additional
broad research comparing overall logistics cost management capabilities and practices,
which can then be extended to specific comparisons and contrasts between those firms
using ABC as at least part of their logistics cost management system and those firms that
do not use ABC. Although ABC systems implemented correctly are theoretically more accurate than more traditional cost management systems, such research could also address whether there are demonstrable benefits and competitive advantages with firms that opt for ABC models. Conversely, it is possible that firms using standard costs and more traditional cost management systems, though potentially sacrificing some degree of precision, could possibly provide more actionable data supporting effective management decisions.

Once the overall proportion of firms using ABC within logistics is reliably estimated based on this type of research, and the differences between firms using ABC and firms not using ABC have been exhaustively studied, a natural progression would be to focus on the subset of firms using ABC in logistics. This research would confine itself to statistically sampling from the population of firms using ABC within logistics to characterize their best practices and experiences. If the domain is small enough, then a census of these firms may be appropriate.

**Longitudinal Studies**

Another logical extension of the research would be to focus on the longer-term development and use of ABC within individual firms, going much further in depth to focus on the specific business environment and ABC implementations of individual firms. What is envisioned is specific, individual, long-term studies of individual firms' experiences, from the initial goals and motivations for pursuing ABC, to the specifics of the model development and implementation, to the types of data produced by the model,
to the levels within the organization that share in the ABC information, to the changes in key decisions and strategy driven by the ABC data, to the actual effects of these changes on the competitive position of the firm in the marketplace. This is in contrast to this current research project, which studied eleven organizations, and therefore, by necessity, was limited in the total amount of time and depth that could be devoted to each individual firm. What is suggested is the development entire research projects around a single firm’s ABC implementation, studied in-depth and over the long-term. Such research, while lacking in much of the ability to generalize results to a larger population, can provide invaluable anecdotal evidence and support for the development of grounded theory and prescriptive guidelines for ABC implementation and use.

In-Depth Study of Failed ABC Applications

In addition to the study of successful ABC applications within logistics, much can be learned by studying firms that have failed in their ABC implementations and/or their use of ABC information. The careful study of such experiences can help researchers determine factors related to the success or failure of an ABC system, develop guidelines on situational characteristics either conducive or not conducive to ABC implementation, and illustrate proper and improper interpretation and use of ABC information.

Proper Use of ABC Data in Decision Making (ABM)

Another fascinating area for study is the proper and improper use of ABC data in various decision-making situations. For example, what industries and/or market situations or factors reward firms that differentially price products and services? Are
there certain situations, markets, industries, and/or economic conditions where products and/or services should not be differentially priced? Is there value in more accurately determining the costs and profitability of individual suppliers, customers, products, or services without differential pricing? Are there factors that would favor one strategy over another (differential pricing versus national or global pricing) for the long term, or are there other related strategic decisions and factors that inhibit the emergence of a dominant strategy? These are questions of immense, practical importance to firms. It would seem axiomatic that firms with more accurate knowledge of their true cost structure should have a competitive advantage over competitors with less accurate understanding of their costs. However, the specific ways in which that superior knowledge can or should be converted into measurable, competitive advantages in the marketplace are less obvious.

Summary

Chapter Five summarized the overall research objectives and execution, the main findings of the research, the conclusions drawn from the research findings and methodology, implications for theory and practice, and suggestions for future research. The following appendices contain the interview protocol that guided the interviews of representatives of the participating firms; the pre-notification letter that formally introduced potential participants to the research effort; and a research traceability matrix that shows the relationships between the research objectives, hypotheses, research questions, investigative questions, and interview protocol items.
Logistics will continue to be an important potential source of competitive advantage in the marketplace and a key component of customer service and profitability. Accurately understanding these costs as they apply to individual products, services, customers, and/or suppliers will continue to be important strategically to firms. Activity-Based Costing will continue to be an important tool for more accurately understanding key components and drivers of costs and for refining business processes. This research has studied and analyzed the experiences of eleven firms in implementing and using ABC within logistics.
APPENDIX A

THE OHIO STATE UNIVERSITY
LOGISTICS COSTING AND ACTIVITY-BASED COSTING
CONFIDENTIAL QUESTIONNAIRE

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Interview Protocol

Part 1
Background Information

1. Date:  

2. Company:  

3. Point of Contact:  

4. Other Persons Contacted:  

5. Industry:  

   • Public  
   • Private  

7. Annual dollar sales in most recent fiscal year: $  

8. Please indicate the size of your logistics system:

<table>
<thead>
<tr>
<th>Elements</th>
<th>Number of:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suppliers</td>
<td></td>
</tr>
<tr>
<td>Plants</td>
<td></td>
</tr>
<tr>
<td>Distribution Centers</td>
<td></td>
</tr>
<tr>
<td>Warehouses</td>
<td></td>
</tr>
<tr>
<td>Customer Destinations</td>
<td></td>
</tr>
<tr>
<td>Outbound SKUs</td>
<td></td>
</tr>
<tr>
<td>Inbound SKUs</td>
<td></td>
</tr>
</tbody>
</table>
9. How has your firm organized its logistics function (in terms of the level or levels within your firm exercising logistics planning, control, and cost management)? (select only one) □ Centralized □ Decentralized

10. What functions has your firm placed under logistics? (check all that apply)

☐ traffic management
☐ facility location
☐ global logistics
☐ purchasing
☐ packaging
☐ sales forecasting
☐ product planning
☐ warehousing
☐ inventory control
☐ order processing
☐ order entry
☐ material handling
☐ customer service
☐ other (please specify): _______________________

11. Please indicate the proportion of direct and overhead (indirect) logistics costs in your firm:

<table>
<thead>
<tr>
<th>Direct logistics labor and material costs (direct costs):</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics overhead costs (indirect costs):</td>
<td>%</td>
</tr>
<tr>
<td>Total logistics costs:</td>
<td>100 %</td>
</tr>
</tbody>
</table>

12. Please discuss the extent of diversity in how different products, services, suppliers, customers, and supply channels consume logistics overhead.

13. What are the primary ways your firm differentiates itself from your competitors? Possible areas include price, product/service uniqueness or design, product/service quality, breadth of product/service offerings, customer service. (For your responses, please note the emphasis on the term "differentiation." For example, most firms would indicate that they are under competitive pressure to reduce costs and lower prices. However, a firm that differentiates itself from its competitors on price is one that generally strives to have lower prices than its competitors.)

14. What is the degree of price sensitivity in the markets your firm's products and services compete? (For example, a market where substantial and relatively large price changes result in insignificant changes in the amount (volume) of products or services sold could be referred to as very price insensitive. A market where relatively small price changes often result in significant changes in the amount (volume) of products or services sold could be considered very price sensitive.)
15. Does your business unit receive a number of unique, special requests from your customers and/or suppliers? If so, please discuss the nature of these special requests and the demands they place on your logistics system.

16. What factors in the competitive environment or in the management of your logistics operations were your primary reasons for implementing ABC in your logistics operations? Please discuss why these factors were important to you.

| ☐ potential cost savings | ☐ current cost accounting system inadequate |
| ☐ improve operating efficiency | ☐ analysis of product / service costs and/or profitability |
| ☐ analysis of customer costs and/or profitability (customer value analysis) | ☐ analysis of supplier costs and/or processes (analysis of sourcing issues) |
| ☐ analysis of channel costs and/or profitability | ☐ product / service pricing decisions |
| ☐ improved performance measurement | ☐ process analysis and improvement |
| ☐ competitive studies / analysis | ☐ market segmentation / analysis |
| ☐ strategic planning / analysis | ☐ potential budgeting improvement |
| ☐ Other (please specify) | |

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**Part 2**

**ABC Cost System Design**

The following questions ask for details about the structure and design of your current logistics cost system. These questions are probably best addressed by a person who is very familiar with the design of your ABC system — someone familiar with the overall software design or who was/is involved with the detailed design of the cost system.

17. Most cost accounting systems use a two-stage allocation process to assign and/or allocate costs to cost objects. The system first delineates resource pools or groups (e.g., labor, material, utilities, etc.), assigns these costs to cost or activity pools, and then allocates these costs to cost objects. Describe your cost system and compare/contrast it to this two-stage process.

18. How many resources do you identify? How did you decide on this set of resources?

19. How many resource drivers are in your system? How were these drivers derived?

20. How many cost pools or activity centers? Are the cost pools differentiated categorically or on the basis of activities? How did you decide how many cost pools to use?
21. How many cost allocation bases or cost drivers are in your system? Describe how they were determined.

22. What are the types of cost drivers and numbers of each (unit, batch, product, facility)?

   Unit
   Batch
   Product
   Facility
   Other

23. How many cost objects are in your system? Explain why these cost objects were selected.

---

**Part 3**

**ABC Cost System Implementation**

*The following questions refer to the initial implementation of your ABC system in logistics.*

24. What type and extent of training did your personnel receive prior to or during the initial ABC system design?

25. Who / what levels within the organization received the training?

26. Who provided the training?

27. How satisfied are you with the current level of training?

28. What additional training (if any) would be beneficial? Who should receive it? Who should provide it?

29. Who championed the effort to implement ABC within logistics?

30. Was/is top management supportive of your ABC implementation in logistics?

31. Was ABC being used elsewhere in your firm prior to the implementation in logistics?
32. Was/is the accounting/finance department supportive of your use of ABC in logistics?

33. Was/is your ABC system in logistics used by and/or available to the entire firm (other functions, firm executives) or used only within logistics?

Part 4
USE OF ABC DATA

34. Is ABC data routinely used as part of your day-to-day management information, or is ABC data collected and analyzed only for special studies or occasional diagnostics?

35. Does your firm maintain separate accounting systems for external financial reporting and internal managerial accounting or is there one accounting system for both financial and managerial accounting?

36. Please assess the capability of your current logistics cost system to provide useful data (in terms of accuracy and timeliness) in the following areas. Several possible areas have been listed to aid your discussion; but if there are other areas of interest, feel free to address them. In general, please discuss the extent your ABC system provides useful data in these areas, whether the ABC data is better than the previous cost system in these areas, and in what areas the ABC data is inadequate. In particular, please discuss any examples where the ABC data has led to significant changes or significantly different management decisions or actions.

Cost System Accuracy

☐ My firm accurately breaks out logistics overhead costs:

☐ to major processes (such as customer service, warehousing, transportation, etc.).
☐ to the activity or task level (such as order processing, receiving, storage, order picking, shipping/transportation).

☐ My firm can accurately determine the logistics costs we incur:

☐ providing individual products or services
☐ serving individual customers or working with individual suppliers.
☐ within individual distribution channels.

Cost System Usefulness

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My firm’s cost system is useful in:

- performing customer cost and profitability analysis.
- performing product and/or service cost and profitability analysis.
- performing channel cost and profitability analysis.
- performing competitive studies and analyses.
- making product and/or service pricing decisions.
- menu pricing of our logistics services.
- performing market analyses.
- performing strategic planning and analyses.
- performing activity analyses.
- facilitating internal communication.
- supporting total quality, continuous improvement, and/or just-in-time strategies and analyses.
- performance measurement of key processes and/or units.
- performance measurement of personnel.
- budget analyses, planning, and forecasting.
- accurately determining or forecasting new product costs.
- providing visibility of logistics costs.
- helping us understand and cost key processes.
- helping us understand, identify, and control cost drivers.
- outsourcing analyses and decisions.
- evaluating supply chain and partnership costs.
- transfer pricing decisions and analyses.
- determining scrap, rework, repair, and warranty costs.
- performing value analysis and eliminating waste.
- performing life cycle costing and/or target costing.
- translating productivity improvements at the activity or task level into cost savings within our logistics system.
Cost System Benefits

☐ My firm has obtained a competitive advantage by pricing logistics services according to their actual consumption of material handling, warehousing, management information systems, and other overhead costs.

☐ My firm bases our logistics charges according to how individual services, products, customers, suppliers, or distribution channels consume our logistics resources.

☐ My firm’s cost system is a source of real competitive advantage for my firm.

37. In general, would you say that your ABC system is an improvement over your previous logistics cost system? Why or why not?

38. In what areas does your logistics cost system still need improvement? Explain.

39. Overall, was implementing ABC worth the investment? Has ABC benefited your logistics operations and/or your overall competitive position in the marketplace? Why or why not?
APPENDIX B

PRE-NOTIFICATION LETTER
Dear ________,

I am writing to ask for your assistance in an important research project that is being undertaken at The Ohio State University. The purpose of this study is to investigate the extent to which firms are using Activity-Based Costing (ABC), how firms are using ABC data, and their degree of success with ABC. In particular, the study examines current logistics cost analysis capabilities of firms and how ABC is being used to support logistics decision-making.

We want to emphasize that the study does not ask for any detailed cost information, and no individual firms participating in the study will be revealed.

Major Mark Caudle, the doctoral student conducting this study, seeks to interview knowledgeable people within your firm who are familiar with your ABC cost system, how it was originally implemented, how it is designed, and how the data from it is used in logistics decision making. As a minimum, he would like to interview the lead logistics executive, a logistics manager involved in day-to-day management of logistics functions, and an accounting person very familiar with your management accounting system. These interviews can be conducted face-to-face at your location or via telephone. Your participation will not only assist Major Caudle in his research, but will also help identify current “best practices” in ABC use and logistics cost analysis.

To thank you for your participation, we will send you an executive summary of the survey results prior to the release of the findings and an overview of Activity-Based Costing along with key sources of ABC information. We believe you will find these results useful in benchmarking your firm’s current practices against other firms and in your future business planning.

Major Caudle will be contacting you soon to answer any questions you may have and to request your participation in this research effort. He can be reached at (937) 255-7777, ext. 3370 and via e-mail at mcaudle@afit.af.mil. We thank you in advance for your consideration and look forward to speaking with you.

Sincerely,

Dr. Martha Cooper
Professor of Logistics

Major Mark Caudle
Instructor
Air Force Institute of Technology
APPENDIX C

RESEARCH TRACEABILITY MATRIX
## Research Traceability Matrix

<table>
<thead>
<tr>
<th>Research Objective</th>
<th>Guiding Hypothesis (H) or Research Question (Q)</th>
<th>Investigative Questions</th>
<th>Measurement Questions (Interview Protocol)</th>
</tr>
</thead>
</table>
| 1. Discover motivations for ABC use within logistics. | H-1. Firms primary motivation in implementing ABC within logistics is to better understand product and/or service costs due to difficulty in costing logistics operations and/or intense price competition in the marketplace. | primary motivation  
H1-1. What were the primary reasons or motivations for implementing an ABC system within the logistics function?  
difficulty in costing logistics operations  
H1-2. How often does the firm receive special or unique requests from its customers and/or suppliers that involve the logistics function?  
H1-3. To what extent is there diversity in the consumption of logistics overhead resources?  
intense price competition  
H1-4. What are the primary ways the firm differentiates its products and services from its competition?  
H1-5. How price sensitive are the markets in which the firm’s products and services compete? | |
| 2. Discover characteristics of ABC systems used in logistics | Q-1. What are the key characteristics, in terms of design, training, advocacy, and philosophy of use, of the ABC system? | design  
Q1-1. Describe the overall process the firm uses to allocate and/or assign costs to cost objects.  
Q1-2. How many unique resources are used in the ABC system, what are they, and how were they selected?  
Q1-3. How many resource drivers are used in the ABC system, and how were they derived?  
Q1-4. How many activity centers are used in the ABC system, how did the firm decide how many activity centers to use, and how did the firm select the activity centers?  
Q1-5. What are the number and type of cost drivers used in the ABC system, and how were they derived?  
Q1-6. How many cost objects are used in the ABC system, and why were these cost objects selected?  
Q1-7. Does the firm maintain different accounting systems for financial accounting and for managerial accounting, or does it have one accounting system to meet all its requirements, and which accounting systems are activity-based? | |
<p>| | | | |
| | | | |</p>
<table>
<thead>
<tr>
<th>Research Objective 2 — continued</th>
<th>Research Question 1 — continued</th>
<th>Investigative Questions</th>
<th>Measurement Questions (Interview Protocol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Discover characteristics of ABC systems used in logistics</td>
<td>Q-1. What are the key characteristics, in terms of design, training, advocacy, and philosophy of use, of the ABC system?</td>
<td>Training</td>
<td>24, 25, 26</td>
</tr>
<tr>
<td></td>
<td>Q-8. What type and extent of training did firm personnel receive prior to or during the initial ABC system design, and who provided the training?</td>
<td>Q-9. What type and extent of training did firm personnel receive in the use of the ABC system after or just prior to implementation, and who provided the training?</td>
<td>24, 25, 26</td>
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<td></td>
<td>Q-10. How satisfied are personnel with the current level of training?</td>
<td>Q-11. What additional training (if any) would be beneficial, who should receive it, and who should provide it?</td>
<td>27, 28</td>
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<tr>
<td></td>
<td>Advocacy</td>
<td></td>
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<td></td>
<td>Q-12. Who championed the effort to implement ABC within logistics?</td>
<td>Q-13. Is top management supportive of the ABC implementation in logistics? If so, how does top management demonstrate their support?</td>
<td>29, 30</td>
</tr>
<tr>
<td></td>
<td>Q-14. Was ABC being used elsewhere in the firm prior to the implementation in logistics?</td>
<td>Q-15. Was the accounting/finance department supportive of the use of ABC in logistics?</td>
<td>31, 32</td>
</tr>
<tr>
<td></td>
<td>Philosophy of use</td>
<td></td>
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<td></td>
<td>Q-16. Is the ABC system in logistics used by and/or available to the entire firm (e.g. other functions, firm executives) or used only within logistics?</td>
<td>Q-17. Is ABC data used regularly as part of a management information system for day-to-day management decision making or primarily as a diagnostic tool for addressing specific issues or questions on an ad-hoc, case-by-case basis?</td>
<td>33, 34</td>
</tr>
<tr>
<td>3. Explore capabilities and deficiencies of ABC systems used in Q-2. What decisions or decision-making areas are supported by ABC data?</td>
<td>Decisions or decision-making areas</td>
<td>Q-1. To what extent does the firm break out logistics overhead costs based on actual consumption to major logistics processes?</td>
<td>36, 1</td>
</tr>
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<td></td>
<td></td>
<td>Q-2. To what extent does the firm break out logistics overhead costs to the activity or task level?</td>
<td>36, 2</td>
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<tr>
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<td>Q-3. To what extent does the firm accurately determine the logistics costs of individual products and/or services?</td>
<td>36, 3</td>
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<td>Q-4. To what extent does the firm accurately determine the logistics costs incurred serving individual customers?</td>
<td>36, 4</td>
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<tr>
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<td></td>
<td>Q-5. To what extent does the firm accurately determine the logistics costs incurred working with individual suppliers?</td>
<td>36, 4</td>
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<tr>
<td></td>
<td></td>
<td>Q-6. To what extent does the firm accurately determine the logistics costs incurred with individual distribution channels?</td>
<td>36, 5</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Research Objective 3 — continued</th>
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<th>Measurement Questions (Interview Protocol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Question 2 — continued</td>
<td>3. Explore capabilities and deficiencies of ABC systems used in Q-2. What decisions or decision-making areas are supported by ABC data?</td>
<td>Q2-7. To what extent does the firm base its logistics charges on how individual services, products, customers, suppliers, or distribution channels consume logistics resources? Q2-8. To what extent has the firm obtained a competitive advantage by pricing logistics services according to their actual consumption of logistics overhead (e.g. material handling, MIS, warehousing, etc.)? Q2-9. To what extent can the firm's performance measurement system directly translate productivity improvements at the activity or task level into cost savings within the logistics system? Q2-10. To what extent is the firm's cost system useful in performing customer cost and profitability analysis? Q2-11. To what extent is the firm's cost system useful in performing product and/or service cost and profitability analysis? Q2-12. To what extent is the firm's cost system useful in performing distribution channel cost and profitability analysis? Q2-13. To what extent is the firm's cost system useful in performing competitive studies and analyses? Q2-14. To what extent is the firm's cost system useful in making product and/or service pricing decisions? Q2-15. To what extent is the firm's cost system useful in menu pricing? Q2-16. To what extent is the firm's cost system useful in performing market analyses? Q2-17. To what extent is the firm's cost system useful in performing strategic planning and analyses? Q2-18. To what extent is the firm's cost system useful in performing activity analyses? Q2-19. To what extent is the firm's cost system useful in facilitating internal communication? Q2-20. To what extent is the firm's cost system useful in supporting total quality, continuous improvement, and/or JIT strategies and analyses? Q2-21. To what extent is the firm's cost system useful in performance measurement of key processes or units? Q2-22. To what extent is the firm's cost system useful in performance measurement of personnel? Q2-23. To what extent is the firm's cost system useful in budget analyses, planning, and forecasting? Q2-24. To what extent is the firm's cost system useful in accurately determining or forecasting new product costs? Q2-25. To what extent is the firm's cost system useful in providing visibility of logistics costs and key processes? Q2-26. To what extent is the firm's cost system useful in helping personnel understand, identify, and control cost drivers?</td>
<td>36.32 36.31 36.30 36.6 36.7 36.8 36.9 36.10 36.11 36.12 36.13 36.14 36.15 36.16 36.17 36.18 36.19 36.20 36.21 36.22 36.23</td>
</tr>
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<tr>
<td>Research Objective 2 — continued</td>
<td>Research Question 2 — continued</td>
<td>Q2-27. To what extent is the firm’s cost system useful in outsourcing analyses and decisions?</td>
<td>36.24</td>
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<tr>
<td></td>
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<td>Q2-28. To what extent is the firm’s cost system useful in evaluating supply chain and partnership costs and performance?</td>
<td>36.25</td>
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<td>Q2-29. To what extent is the firm’s cost system useful in transfer pricing decisions and analyses?</td>
<td>36.26</td>
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<td>Q2-30. To what extent is the firm’s cost system useful in determining scrap, rework, repair, and warranty costs?</td>
<td>36.27</td>
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<td>Q2-31. To what extent is the firm’s cost system useful in performing value analysis and eliminating waste?</td>
<td>36.28</td>
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<td>Q2-32. To what extent is the firm’s cost system useful in performing life cycle costing and/or target costing?</td>
<td>36.29</td>
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<td>Q2-33. To what extent is the firm’s cost system a source of real competitive advantage for the firm?</td>
<td>36.30</td>
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<td></td>
<td>Q2-34. What other capabilities and key decisions does the firm’s cost system support?</td>
<td>36.34</td>
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<td>Q2-35. How does the firm’s current ABC cost system in logistics compare to the firm’s cost system prior to the ABC implementation?</td>
<td>37</td>
</tr>
<tr>
<td>4. Discover the impact of ABC use within logistics in terms of logistics decision making, and attitudes of practitioners.</td>
<td>Q3. What is the overall opinion or attitude of logistics practitioners toward ABC in terms of decision making, cost management, competitiveness, and customer satisfaction?</td>
<td>opinion or attitude Q3-1. Overall, has ABC implementation benefited the firm’s logistics operations?</td>
<td>36, 37, 39</td>
</tr>
<tr>
<td></td>
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<td>decision making Q3-2. What decisions does ABC data support (i.e., what types of decisions are typically made based on ABC data)?</td>
<td>36, 37, 39</td>
</tr>
<tr>
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<td></td>
<td>Q3-3. What changes have occurred in logistics decisions since the ABC system was implemented? Are these changes due to the ABC data?</td>
<td>36, 37, 39</td>
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<tr>
<td></td>
<td></td>
<td>cost management Q3-4. Has the firm’s ABC system made it easier to identify and manage logistics costs? If so, in what areas?</td>
<td>36, 37, 38, 39</td>
</tr>
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<td>competitiveness Q3-5. Has the ABC system enhanced the firm’s competitive position in the marketplace?</td>
<td>36, 33, 37, 39</td>
</tr>
<tr>
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<td>customer satisfaction Q3-6. Has the firm’s customer satisfaction increased due to the ABC system (either directly or indirectly)?</td>
<td>36, 37, 38, 39</td>
</tr>
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</table>
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<tr>
<td>Other guiding hypotheses to investigate relationships across research objectives</td>
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<tr>
<td>H-2. Increasing degree of price sensitivity will be associated with greater complexity in ABC system design.</td>
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<td></td>
<td>14, 17-23</td>
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<tr>
<td>H-3. Greater complexity in ABC system design will be associated with the use of ABC as part of the day-to-day management information system.</td>
<td></td>
<td></td>
<td>17-23, 34</td>
</tr>
<tr>
<td>H-4. Greater complexity in ABC system design will be associated with larger numbers of different decisions the ABC data supports.</td>
<td></td>
<td></td>
<td>17-23, 36</td>
</tr>
<tr>
<td>H-5. Greater complexity in ABC system design will be associated with more favorable attitudes of logistics practitioners toward the usefulness and impact of ABC.</td>
<td></td>
<td></td>
<td>17-23, 37, 39</td>
</tr>
</tbody>
</table>
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