12-2004

An Examination of the Logistics Leverage Process: Implications for Marketing Strategy and Competitive Advantage

Lisa Michelle Bobbitt
University of Tennessee, Knoxville

To the Graduate Council:

I am submitting herewith a dissertation written by Lisa Michelle Bobbitt entitled "An Examination of the Logistics Leverage Process: Implications for Marketing Strategy and Competitive Advantage." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

John T. Mentzer, Major Professor

We have read this dissertation and recommend its acceptance:

Mary Holcomb, Ernest Cadotte, Robert T. Ladd

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

To the Graduate Council:

I am submitting herewith a dissertation written by Lisa Michelle Bobbitt entitled "An Examination of the Logistics Leverage Process: Implications for Marketing Strategy and Competitive Advantage." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted for partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

John T. Mentzer
Major Professor

We have read this dissertation
and recommend its acceptance.

Mary Holcomb

Ernest Cadotte

Robert T. Ladd

Acceptance for the Council:

Anne Mayhew
Vice Provost and Dean of Graduate Studies

(Original signatures are on file with official student records.)

AN EXAMINATION OF THE LOGISTICS LEVERAGE PROCESS: IMPLICATIONS FOR MARKETING STRATEGY AND COMPETITIVE ADVANTAGE

A Dissertation
Presented for
Doctor of Philosophy Degree
The University of Tennessee, Knoxville

Lisa Michelle Bobbitt
December 2004

DEDICATION

This dissertation is dedicated to my mother, Opal Kittrell, and

to the memory of my father, Thomas Kittrell.

ACKNOWLEDGEMENTS

There are many people who have had an impact on the dissertation process and to whom I am grateful. First, I would like to thank the faculty and staff in the Department of Marketing and Logistics at the University of Tennessee for their knowledge, support, and involvement with the Ph.D. students in the program. In particular, I would like to thank the dissertation committee chaired by Dr. John T. Mentzer, and including Dr. Mary Holcomb, Dr. Ernie Caddotte, and Dr. Tom Ladd. I appreciate the guidance they provided throughout the entire process and the unique strengths of each member which ensured the development of a theoretically and methodologically sound dissertation. I would also like to acknowledge Dr. Pratibha Dabholkar who, through various research projects, was instrumental in the development of my research skills.

I would like to recognize Dr. Ron Moser at Middle Tennessee State University and Dr. John Parnell at the University of North Carolina at Pembroke for encouraging me to pursue this career path. I am forever grateful for their confidence in my abilities and for providing opportunities that would prepare me for a life in academia.

To my colleagues in the Ph.D. program, I am fortunate to have gone through the process with such a supportive network of friends who made the adventure all the more enjoyable. I would like to thank Geoff Stewart who always helped me see things from a different perspective and who has "seen me through" since the initial GTA meeting.

My greatest source of strength throughout the process has been my friends and family. I would like to thank Katie and Laurie for their friendship and for the periodic reality checks (GRD). I am especially grateful to my husband, Stan, who has supported me throughout the program with his love, words of encouragement, and willingness to

help with any aspect of the dissertation. Finally, I would like to acknowledge my mother, Opal Kittrell, who has always inspired me by what she has accomplished in life both personally and professionally. She has always believed I could accomplish anything I put my mind to and that belief has sustained me.

Finally, I am grateful to the Graduate School at the University of Tennessee for the Yates Fellowship Grant that provided funding for the dissertation.

ABSTRACT

Based on preliminary research on logistics leverage and the lack of research on linking specific logistics capabilities and competitive advantage, it was the primary purpose of this dissertation to develop and test a theoretical model of the logistics leverage process. The model was developed based on the extant literature in logistics, marketing, and strategic management and the data from in-depth interviews with logistics professionals. The nomological network consisted of eight constructs: resource commitment, process capabilities, value-added service capabilities, relational capabilities, logistics performance, competitive advantage, firm performance, and marketing signals of value. Resource commitment and logistics performance were tested as second-order constructs in the model.

The survey method was utilized to obtain data on the eight constructs in order to test the hypothesized relationships among the constructs. Logistics professionals in manufacturing organizations were selected as target respondents based on their perceived knowledge on the constructs of interest. The recommended two-step approach was used to analyze the measurement and structural models in structural equation modeling and to test the hypotheses. Four of the nine hypothesized relationships were supported and the overall fit of the structural model was supported by the goodness of fit measures. The findings of this research provide both theoretical and managerial implications.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1 - INTRODUCTION

Companies today are facing a great variety of internal and external challenges as they attempt to remain profitable and stay ahead of the competition. Externally, they are faced with opportunities and threats presented by increasing domestic and global competition, more informed and demanding customers, and rapid advances in technology. Internally, they are confronted with greater pressure to become more efficient through the reduction of costs while simultaneously becoming more effective through the improved deliverance of customer service as well as the creation of customer value. As a result of these challenges, companies are finding it more difficult to compete with and stay ahead of the competition for any length of time.

Companies that have traditionally competed on the marketing elements of product, price, or promotion may find it difficult, in today's marketing environment, to differentiate their offerings from competitors' in the minds of their customers. Competitors can easily take away any advantage that may have been initially gained through product innovations, pricing cuts, or promotional endeavors. Consequently, companies are forced to find new ways to compete in the marketplace. Academics and practitioners alike are interested in determining how a company can create and sustain a competitive advantage. Therefore, the main research issues are,

1) How can a firm achieve a competitive advantage?
2) How can a firm determine if it has obtained a competitive advantage?

In addressing the first question, logistics has been suggested as a means of developing a differential advantage when companies have similar product offerings (Mentzer and Williams 2001). Since the area of logistics incorporates many activities

such as inventory management, order processing, transportation, and warehousing that are managed in an integrated fashion, the unique aspects that lead to improved performance are harder to isolate and identify. In addition, the increasing focus on potential benefits accruing from supply chain relationships has also added a degree of complexity to logistics management. As companies become more logistically integrated internally and externally, it may be more difficult for competitors to duplicate the benefits that arise from such integration. As a result, the role of logistics within the firm has taken on greater strategic importance.

The second question has primarily been the focus of the strategic management literature. Studies have examined how various resources or capabilities of the organization can be used to create a sustainable competitive advantage. While researchers have attempted to measure competitive advantage, there is no consensus on a set of measures to use. In addition, studies often focus on one or two specific resources without considering how the resources are related or how other resources may affect the attainment of competitive advantage.

The remainder of this chapter presents background information on the theory of competitive advantage and the resource-based theory of the firm as antecedent justification for viewing logistics as a competitive weapon of the firm. In addition, the logistics leverage process is introduced as a means of obtaining competitive advantage through logistics. Based on the preceding discussion, research questions and objectives for this dissertation are presented. The chapter concludes with a summary of the remaining chapters of the dissertation.

THEORETICAL JUSTIFICATION

The subjects of competitive advantage (Porter 1985) and the resource-based theory of the firm (Barney 1991; Rumelt 1984; Penrose 1959) have both received a considerable amount of attention in the strategy literature. Researchers in other disciplines, such as logistics and marketing, have also recognized the applicability of these subjects to their areas (Day 1988; McGinnis and Kohn 1990; Stock 1990). Traditionally, these two subjects have been examined independently of one another as the competitive advantage literature has focused more on favorable environmental conditions in the creation of competitive advantage, while the resource-based view of the firm has taken an internal focus in identifying the unique resources that can give a firm an advantage in the marketplace.

Competitive Advantage

Most of the research in the competitive advantage literature has focused on identifying the sources of competitive advantage and how it can be sustained over time (Hall 1993; Hitt and Ireland 1985). Porter (1985) states that competitive advantage is the result of a firm creating value for its' buyers that exceeds the costs associated with creating the value. There are many different ways a firm can create the type of value identified by Porter (1985). The manufacturing, marketing, or distribution activities of the firm can all be used to construct value. However, firms have to be aware of what products/services, activities, and/or processes are valued by the customer.

Research has identified several ways in which a firm can achieve a competitive advantage. Porter (1985) identified cost leadership and differentiation as the two primary methods. To achieve a cost advantage, companies have to understand the underlying cost structure of their activities and how the interrelationships among activities affect costs. Functional areas within the firm that share activities or knowledge can realize lower costs if the activities are similar or the knowledge is significant to minimize or eliminate inefficiencies. Similarly, Porter (1985) indicated coordination of activities across companies could impact costs. Linking activities among members of the supply chain can reduce costs, but they can also increase costs. Therefore, companies should approach the identification of areas to be integrated from a strategic perspective, which can distinguish the benefits versus the costs of various activities to be coordinated.

To achieve a competitive advantage based on differentiation, companies have to understand the potential sources of differentiation. Examples include the physical product, marketing activities, distribution activities, and human resources. Porter (1985) defines differentiation as, "providing something unique that is valuable to buyers beyond simply offering a low price." The key is customers have to perceive the offering as providing value greater than what could be obtained from other firms.

While it is important to understand what can lead a firm to obtain a competitive advantage, it is also imperative to identify how a competitive advantage can be maintained over time. To achieve a *sustainable* competitive advantage, the strategy implemented must not only provide value to buyers, but also prevent imitation by competitors (Porter 1985). Barney (1991) suggests it is not the amount of "calendar" time that determines whether a firm has a sustainable competitive advantage, but rather

the inability of competitors, both current and potential, to duplicate that strategy. For example, the degree to which differentiation results in sustainable competitive advantage depends on whether buyers continue to perceive value in the form of differentiation and whether it can be easily imitated by competitors (Day 1988; Porter 1985).

Researchers, such as Porter (1985; 1980), were initially concerned with how external environmental factors influence conditions of competitive advantage within a particular industry. For example, the five forces model developed by Porter (1980) suggests firms in industries characterized by high entry barriers will have greater opportunities to achieve high levels of firm performance. The assumptions inherent in the industry focus are that firms are identical in terms of resources and strategies and any resource heterogeneity that exists within the industry will be transitory due to the ability of others to acquire the resource (Barney 1986; Rumelt 1984; Porter 1980). However, others have suggested resource heterogeneity can be a source of competitive advantage based on the resource-based view of the firm (Penrose 1959; Rumelt 1984; Barney 1991). In fact, it has been suggested that competitive advantage can only be achieved when resources are combined in such a way that they create a unique capability that is valued by customers (Morgan and Hunt 1999).

Resource-Based Theory of the Firm

The analysis of the firm as "a collection of productive resources" was first proposed by Penrose (1959), and serves as the foundation for the resource-based theory of the firm. Essentially, this theory implies a firm possesses specialized assets, skills, or

resources that can be utilized to improve firm performance and to create a competitive advantage. Penrose (1959) suggested the level of rents achieved by an organization is based on how it takes advantage of its core competencies to utilize its resources. Rents are the result of accumulating and utilizing heterogeneous resources that are better than those of the competition.

A resource can be thought of generally as a strength or weakness of the firm or, more specifically, as the tangible and intangible assets that are associated with the firm (Wernerfelt 1984). Tangible resources include physical resources, such as facilities, transportation equipment, or production equipment. Improvements in tangible resources may lead to lower costs, and thus, improved performance. However, it has been suggested that tangible resources cannot serve as a source of sustainable advantage since others can purchase them in the market (Dierickx and Cool 1989). As a result, intangible resources such as corporate culture, knowledge, distribution control, relationships, and customer loyalty have received more attention in the resource-based literature (Itami and Roehl 1987; Winter 1987). Intangible resources have been classified as both assets (e.g., trademarks, data bases) and competencies (e.g., knowledge, skills) (Hall 1993), and are the major source of firm heterogeneity (Mahoney 1995).

Not all firm resources may lead to a sustainable competitive advantage. Researchers have investigated the link between the resources of the firm and sustainable competitive advantage (Rumelt 1984; Lippman and Rumelt 1982) and found a resource needs to possess certain attributes in order to lead to a sustainable competitive advantage. Resources should be valuable, rare, imperfectly imitable, and imperfectly substitutable (Barney 1991; Lippman and Rumelt 1982). A resource creates value if it can enable a

firm to improve performance through the implementation of a particular strategy. Valuable resources enable a firm to take advantage of opportunities and minimize threats in the environment, which should lead to improved performance (Barney 1991). The resource must not only be valuable, but also rare in that not all competitors within an industry possess the resource. If competitors do possess common resources, those resources cannot be used to gain a competitive advantage since each of the competitors can implement a common strategy based on the resources.

For a resource to be imperfectly imitable, it must be causally ambiguous (Barney 1986; Lippman and Rumelt 1982; Rumelt 1984). For example, the resource must be difficult for competitors to understand exactly how a firm achieves its benefits from the resource. Causal ambiguity has been identified as a source of "isolating mechanisms and firm heterogeneity" and is most likely to be created by intangible assets (Itami and Roehl 1987; Hall 1992).

The final requirement for a resource to contribute to the creation of competitive advantage is other resources must not be equally as valuable from a strategic perspective. It must not be possible for another firm to use some other resource to implement the same strategy to achieve the same benefits. If two different resources used by two different companies are strategically equivalent, then neither company will have a competitive advantage.

How resources of the firm are converted into a sustainable competitive advantage has commonly been thought to depend upon the competitive situation of the industry (Seth and Thomas 1994). However, the resource-based view may be able to explain differences in firm profitability that cannot be attributed to industrial differences (Peteraf

1993). Day and Wensley (1988) indicated that firms have to identify "the skills and resources that exert the most leverage on positional advantages and future performance and then allocate resources toward those high leverage sources" in order to get the greatest performance improvement at the least cost. Positional advantages refer to the ability of the firm to provide superior customer value or to achieve low costs relative to competitors (Day and Wensley 1988). As a result of achieving positional superiority, the firm should be able to realize greater performance in terms of profitability or market share. However, there is a lack of research on how to convert positional advantages into superior performance outcomes. Research on how to identify distinctive capabilities and how positional advantages are linked to particular capabilities has been called for in the literature (Day 1994).

Role of Logistics in the Firm

The view of logistics within the organization has evolved over the past 30 years from a cost center and revenue generator to a core competency and differentiator for the firm (Langley 1986). It has predominantly been viewed as a cost center, and the focus has been on how to reduce costs associated with the activities of inventory management, warehousing, transportation, materials handling, and order processing. However, it has also been recognized that firms should not consider logistics simply from a cost perspective, but should also recognize the revenue generating capabilities of the area (Christopher 1986). By focusing only on costs in logistics, managers may fail to recognize the impact of cost reductions on customer service levels. Companies that

attempt to improve logistics processes may improve customer service. The revenue generated from better customer service may offset any costs incurred as a result of improving logistics processes. Of course, managers need to have a good understanding of the customer service levels desired by customers.

Logistics is increasingly viewed as a core competency of the firm. Firms are recognizing the strategic importance of logistics just as they have manufacturing and marketing. While marketing has long played a role in the strategic decisions of the firm, logistics has only recently been recognized in terms of its value at the strategic level. As Bartels indicated back in 1976, "distribution is becoming an increasingly important aspect of the strategic plans of marketing-oriented companies." Hutt (1995) also indicated many organizations are recognizing that various functional areas participate to differing degrees in the design, development, and implementation of strategy.

How logistics is considered within the organization has evolved from an operational perspective to a tactical perspective to a strategic perspective (La Londe 1990). Fuller et al (1993) stated, "logistics has the potential to become the next governing element of strategy as an inventive way of creating value for customers and as an immediate source of savings." Cooper, Innis, and Dickson (1992) indicated that organizational structure and management style indicate how logistics fits into corporate strategy. Similarly, Sharma et al (1995) developed a framework that examines the impact of a firm's logistics policy on customer satisfaction, profitability, and strategic planning. As a competence, logistics can be used to create superior service or value to customers.

Finally, logistics is also viewed as a resource that can differentiate the firm in the marketplace. According to the resource-based view of the firm, the way to achieve a

sustainable competitive advantage is through the implementation of strategy based on the firm's unique resources. Essentially, resources should determine a firm's strategy (Mahoney 1995). Coyne (1986) indicated that companies can develop different types of capability differentials as sources of sustainable competitive advantage. For example, if a firm has the appropriate knowledge and skills in the logistics area, it can develop the functional capability to do specific things through logistics to gain a competitive advantage. Similarly, if an organization can improve its logistics performance through integrated decision-making, it may be able to provide a higher level of customer service and create value for its customers. A study by Sterling and Lambert (1987) revealed that physical distribution/customer service could provide firms with an opportunity to gain a competitive advantage in the market place. Imitating logistics activities is somewhat more difficult due to the interdependence and integration of several processes within the company and often across companies.

While the potential for an organization to differentiate itself through its logistics capabilities alone may exist, the importance of integrating logistics capabilities with other areas of the firm should not be ignored. It has become necessary to integrate business processes and recognize that horizontal decision-making across functional boundaries is essential to organizational performance (Smart 1995). Driven by needs to reduce costs and improve customer service, many companies pursuing a market orientation are discarding their traditional organizational structures. Often functional units within an organization develop their plans in isolation without knowledge or consideration of the plans being developed by other functional areas. However, each functional area needs to

understand the impact it can have on other areas, the decision-making process of the firm, and the market response to the firm's product/service offering (Lim and Reid 1992).

Traditionally, the provision of customer service, and more recently the creation of customer value, has been viewed as the responsibility of the marketing area within the organization. However, it has been recognized in the literature that customer service should be the responsibility of the entire firm, not just one area (Barwise 1995; Webster 1988; Christopher 1973). Similarly, the firm should be viewed as a collection of activities that are aimed at providing value to its customers (Porter 1985). Barwise (1995) suggested this is particularly important if organizations have adopted a market orientation. "Marketing can no longer be the sole responsibility of a few specialists. Everyone in the firm must be charged with responsibility for understanding customers and contributing to developing and delivering value for them" (Webster 1988). Some organizations, though, fail to implement cross-functional management even though they are aware of the value that can be created (Ames and Hlavacek 1989).

While there is a considerable amount of literature on the subject of interfunctional relationships, some areas of the organization have received more attention than others. For example, marketing's relationship with areas such as manufacturing and research and development has received quite a bit of attention in the literature (Song et al 1996; Ruekert and Walker 1987; La Londe 1990; Gupta et al 1986). Rinehart, Cooper, and Wagenheim (1989) indicated that marketing and logistics activities should be the focus of integration within a firm since they are the primary functions that interface with the customer. "Three of the marketing mix elements (product, price, and promotion) are dependent on the cost of making the product available to the customer" (Voorhees and

Coppett 1986). Essentially, companies must consider all of the interfaces where customer contact can be enhanced by service and consider all of the costs and benefits received from such service offerings. "The logistics service package should be considered a marketing tool and subjected to the same cost-effective scrutiny as any other marketing expenditure" (Christopher 1973).

Logistics and Marketing Integration

The marketing and logistics areas, especially marketing's role in the distribution process, should be integrated in order to enable companies to successfully cope with future strategic problems (Schneider 1985). Research has addressed the importance of a logistics-marketing relationship from a strategic perspective. In considering the impact of integration of logistics and marketing on strategy, three levels of decision-making (strategic, tactical, and operational) within an organization should be considered (Christopher 1973). These levels are interdependent and decisions in one area impact decisions and performance of other areas. If the company does not consider itself as a total system, but rather as separate functional silos, then total performance will be diminished. To change to an integrated, process-oriented organization, Fawcett and Fawcett (1995) suggested change has to begin with top management and the strategic planning process. Strategic planning can be defined as, "the process of identifying the long-term goals of the entity and the broad steps necessary to achieve these goals over a long term horizon, incorporating the concerns and future expectations of the major stakeholders" (Cooper et al 1992).

Remmel (1991) presented a framework for integrating the concepts of marketing and logistics to create a competitive strategy. The steps of the strategy are to: (1) investigate customer wants; (2) assess logistics and marketing performance; (3) assess competitors' performance; (4) develop an integrated strategy; and, (5) implement the strategy. The fourth and fifth steps focus on the integration of logistics and marketing to satisfy customer requirements. Porter (1980) stated, "the fundamental basis of above average performance in the long run is sustainable competitive advantage." The marketing manager can succeed in achieving above average performance in the marketplace by developing a competitive advantage for the product/service offered to the consumer. Competitive advantage is often derived by taking into account the expected utilities or benefits associated with the product (Barry 1980). Once again, this can be accomplished through the addition of a service component - service components that fall within the boundaries of logistics such as timeliness of delivery and delivery reliability. By recognizing the potential benefits of integrating logistics and marketing decisions, organizations may be able to achieve logistics leverage. This may provide them with a competitive advantage, especially if competitors are not integrating their functional activities.

Logistics Leverage

The literature presented in the areas of competitive advantage, the resource-based theory of the firm, and the strategic importance of the integration of the logistics and marketing areas culminates into the idea of logistics leverage. Bowersox, Mentzer, and

Speh (1995) first introduced the concept and defined it as "the ability to effectively influence market demand through the application of excellent logistics systems, techniques, and programs." They indicated that it is not only becoming necessary for companies to develop logistics superiority, but also to strategically integrate logistics and marketing to create a competitive advantage. By doing so, firms may be able to more effectively implement marketing strategies as well as recognize improvements in sales, market share, and customer satisfaction.

To "influence market demand" or to create a competitive advantage, the logistics superiority of the firm has to be valued by its customers. To create value, the logistics processes of the firm have to provide customers with the opportunities to improve performance, reduce costs, and/or improve customer service. Mentzer and Williams (2001) extended the logistics leverage concept to include such a focus. Through the extant literature and case studies, they developed a revised definition of logistics leverage as,

> "the achievement of excellent and superior, infrastructure-based logistics performance, which - when implemented through a successful marketing strategy - creates recognizable value for customers."

The definition suggests it is not sufficient to simply develop "excellent and superior" logistics performance to create customer value. This capability has to be communicated to customers in such a way that they recognize the value that can be received by working with a company that possesses such a capability. In trying to achieve logistics leverage, a company must strive to create and maintain logistics service that is superior to its competitors' service offerings in providing value to customers.

The Mentzer and Williams (2001) conceptualization of logistics leverage recognizes that factors such as technology, people, facilities, and strategic relationships provide the infrastructure to create logistics leverage. Through the development of these infrastructure components, companies should be able to achieve improved company performance through reduced costs and improved customer satisfaction. In addition, it is recognized that to achieve logistics leverage, coordination between the marketing and logistics areas of the firm has to occur.

Only one study has empirically examined the concept of logistics leverage. Kent (1996) examined the coordination of the information technology and logistics areas of the firm and the resulting impact on performance. The logistics leverage concept was extended to what is referred to as "Leverage^2." Leverage^2 is defined as,

> "the maximization of customer value, process efficiency, and differential advantage through the interfunctional coordination between logistics and information technology" (Kent 1996).

This definition extended the one developed by Bowersox, Mentzer, and Speh (1995) in two ways. First, there is the recognition that decisions in logistics and information technology are interrelated; thus, there should be interfunctional coordination between the two areas. Second, logistics leverage can do more than stimulate temporary demand for a company's product/services. By creating customer value, companies may be able to develop customer loyalty and ensure sales and profitability in the long run. In addition, competitors may not be able to imitate the logistics service, which creates differential advantage. Using in-depth interviews, Kent (1996) found some support for improved internal efficiencies through the coordination of information technology and logistics.

Achieving superior logistics performance can result in many benefits to customers. The benefits may include improved satisfaction with the company's products/services and overall improved customer value. These benefits are the result of improved customer service and reduced costs, which may be realized as a result of logistics leverage. La Londe, Cooper, and Noordewier (1988) defined customer service as, "a process for providing significant value-added benefits to the supply chain in a cost-effective way." Logistics plays an important role in the creation of customer service.

In addition to the benefits received by consumers, there are also benefits to the company. Mentzer and Williams (2001) identified reduced operating costs, improved market share, and improved profitability as potential outcomes of achieving logistics leverage. Another potential outcome as a result of improved service and reduced costs may be customer loyalty. If customers are consistently provided with desired levels of service, they may develop loyalty for the company and its products/services. The fact that logistics leverage may be difficult to duplicate enhances the possibility of building customer loyalty.

THEORETICAL MODEL OF LOGISTICS LEVERAGE

Figure 1-1 illustrates the potential drivers, facilitators, and outcomes of logistics leverage based on a review of the marketing and logistics literature. Several factors may influence the resources dedicated to the achievement of logistics leverage. Such drivers

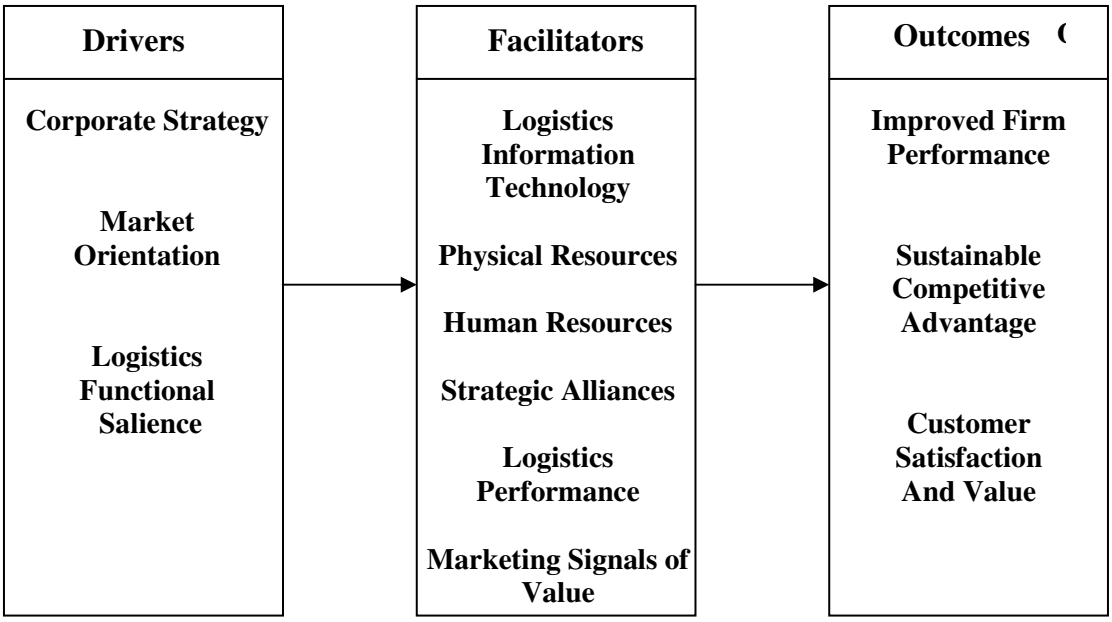


Figure 1-1: Drivers, Facilitators, and Outcomes of Logistics Leverage

include the corporate strategy of the firm, whether the firm is market oriented, and the importance of the logistics function within the organization (i.e., logistics functional salience – (Zacharia 2001). In addition, there are facilitators that aid in the creation of logistics leverage. The facilitators include the infrastructure components as conceptualized by Mentzer and Williams (2001), logistics performance and marketing signals of value. Logistics leverage can result in outcomes for both the company and its customers.

The facilitators and outcomes of logistics leverage are conceptualized into the relationships presented in Figure 1-2. The infrastructure components previously identified are incorporated into the model through process and value-added service capabilities, relational capabilities, and resource commitment. The potential drivers of

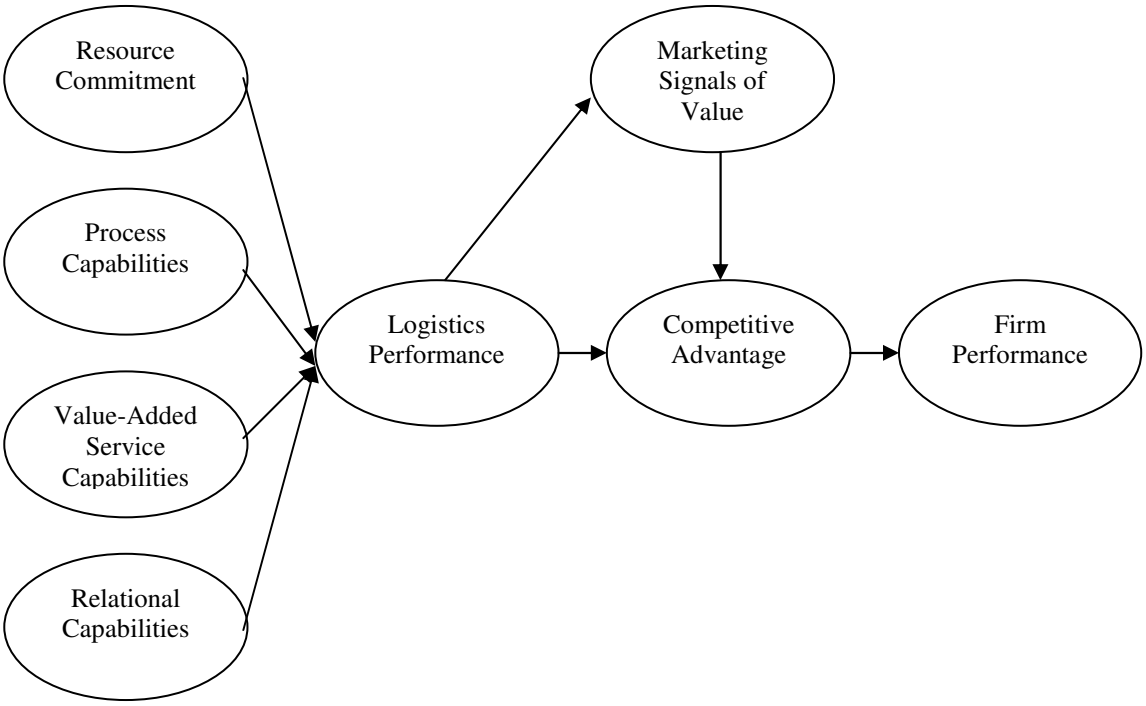


Figure 1-2: A Process Model of Logistics Leverage

logistics leverage are set aside for future research. At the heart of the model is logistics performance, which is defined as the efficiency, effectiveness, and differentiation of logistics processes. The realization of superior logistics performance is dependent upon the logistics capabilities of the firm and the resources that need to be dedicated to logistics processes.

While achieving superior logistics performance in relation to the competition is proposed as a necessary component of logistics leverage, it is not the only component. To realize logistics leverage, the superior logistics performance has to be conveyed to customers through the firm's marketing efforts. Firms have to make customers aware of the superiority of its logistics processes over other firms. Thus, competitive advantage is

proposed to be greater for a company that has communicated its logistics capabilities through marketing signals of value.

As suggested in Figure 1-1, the potential outcomes of achieving logistics leverage are improved firm performance and greater levels of customer satisfaction and value. Firms should be able to identify improved performance through measures such as reduced costs, improved service, and customers that are more loyal. Similarly, if a customer firm values the superior logistics capabilities of a firm with which it does business, it should be more satisfied with the benefits it receives from the relationship. Therefore, logistics leverage can be ascertained from the company or customer's perspective. The outcomes of logistics leverage considered in this study include firm performance indicators such as profitability, market share, and return on assets. Customer satisfaction and value are left to future research.

STATEMENT OF PURPOSE

Despite the amount of attention logistics has received as a potential competitive weapon, only one study has empirically examined the relationships among logistics capabilities, firm performance, and competitive advantage. Morash et al (1996) found a direct correlation between logistics capabilities (i.e., delivery speed, delivery reliability, responsiveness to target markets, and low cost distribution) and the performance outcomes related to the firm and to competitors. The majority of the work in this area has been normative in nature, identifying a need for a deeper theoretical foundation of how logistics can create a sustainable competitive advantage. Based on the lack of such

research in the logistics area, and the call for more research linking particular capabilities with competitive advantage, it was the overriding purpose of this study to develop and test a model of logistics leverage. This study developed measures of logistics leverage incorporating the components of the model as previously discussed.

A second purpose of this study was to determine the specific infrastructure capabilities that lead to superior logistics performance. While Mentzer and Williams (2001) identified the infrastructure components through case studies, an in-depth analysis was warranted to narrow the categories and specifically identify relevant capabilities.

Another purpose of this dissertation was to investigate the relationship between logistics performance and organizational (operational) performance. While studies have identified measures of logistics performance and operational performance, there is a need for more research that investigates the specific relationship between the two areas and the impact on competitive advantage.

Finally, this dissertation sought to explore the relationship between the logistics and marketing areas of the firm. Specifically, the role the communication element of marketing strategy plays in the development of logistics leverage and a sustainable competitive advantage was examined.

This research is important because it develops a method to quantify whether and to what degree a firm has logistics leverage in the marketplace. This research was guided by the following research question:

How can the logistics leverage process be measured within an organization? Other secondary research questions were:

What are the capabilities or resources that influence the achievement of logistics leverage?

What is the perceived value of logistics leverage to the organization?

The primary outcome of this dissertation was to develop measures for logistics leverage and empirically test the achievement of logistics leverage from the company's perspective. The perspective of the customer was not examined in this study, but is suggested for future research.

POTENTIAL CONTRIBUTIONS OF THIS RESEARCH

This dissertation attempted to make several contributions to theory and research. The first contribution is the development and testing of the logistics leverage process model. It extends the logistics discipline's understanding of how logistics activities and processes can create a sustainable competitive advantage for the firm. In addition, it provides a means for assessing whether a firm has a sustainable competitive advantage based on logistics.

A second contribution is the empirical testing of the theoretical assertion that valuable, rare, and inimitable resources create superior firm performance and competitive advantage. While research has examined such relationships based on the resource-based view of the firm, it has not considered them within the realm of logistics.

The third contribution is the addition to the knowledge base on inter-functional relationships. Through an examination of the role of marketing in creating logistics leverage, insight can be gained into how marketing can facilitate the logistics leverage process.

Finally, managers will benefit from the study in several ways. In general, they can gain greater insight into how other areas of the organization, such as logistics, can create a sustainable competitive advantage. Through testing of the logistics leverage process model, evidence is provided as to the elements necessary to achieve logistics leverage. Another benefit is the understanding of how resources and capabilities may ultimately affect the achievement of logistics leverage. With this knowledge, managers can alter the manner in which resources are allocated to logistics and determine the logistics capabilities that need to be developed. Finally, this study demonstrates the importance of marketing in signaling the value that can be obtained through superior logistics systems and processes.

ORGANIZATION OF THE DISSERTATION

This dissertation is organized into five chapters. Chapter 1 provides the foundation for studying the process of logistics leverage. The theory of competitive advantage and the resource-based theory of the firm are discussed as antecedent justification for viewing logistics as a potential means for achieving competitive advantage. The various components of the logistics leverage process are introduced in the theoretical model. In addition, the chapter provides the statement of purpose, presents the potential theoretical and managerial contributions of the research, and outlines the organization of the dissertation.

Chapter 2 presents the theoretical foundation for the logistics leverage model. In addition to a literature review on the various components of the model, in-depth

interviews with logistics professionals were conducted to build upon the information presented in the literature. Research hypotheses based on the relationships identified in the model are presented.

Chapter 3 contains a discussion of the research methodology used to test the proposed model and associated hypotheses. Included are discussions on the research design, sample, measurement development, pretest procedures and results, and data analysis procedures.

Chapter 4 provides an evaluation of the logistics leverage model and the results of hypotheses testing.

Chapter 5 presents the conclusions based on the results of the hypotheses tests and structural equation modeling process. Theoretical and managerial implications as well as directions for future research are provided.

CHAPTER 2 - THEORY DEVELOPMENT

The theoretical logistics leverage model presented in Chapter 1 has been theoretically grounded in the literature on competitive advantage, resource-based theory of the firm, and the integration of the logistics and marketing areas of the firm. The model is proposed to consist of several components, which when implemented together, provide firms with a means of creating a sustainable competitive advantage and enhancing firm performance. The objective of this chapter is to provide supporting information from the literature and in-depth personal interviews for the development of a testable logistics leverage model. The procedures for the qualitative investigation are presented first. This is followed by a discussion of the antecedent justification for the constructs in the model. The discussion of the constructs is organized according to whether they serve as facilitators or outcomes of the logistics leverage process. Hypotheses representing the proposed relationships between the relevant constructs are identified in Figure 2-1 and are presented throughout the chapter.

QUALITATIVE INVESTIGATION

As discussed in Chapter 1, the literature on the conceptual development of logistics leverage is limited to a few studies (Bowersox et al 1995; Mentzer and Williams 2001). The study by Mentzer and Williams (2001) was the only research found to qualitatively investigate through case studies the logistics leverage concept. Their definition of logistics leverage and the results of their study along with extant literature were used as the foundation for the development of the model in Figure 2-1.

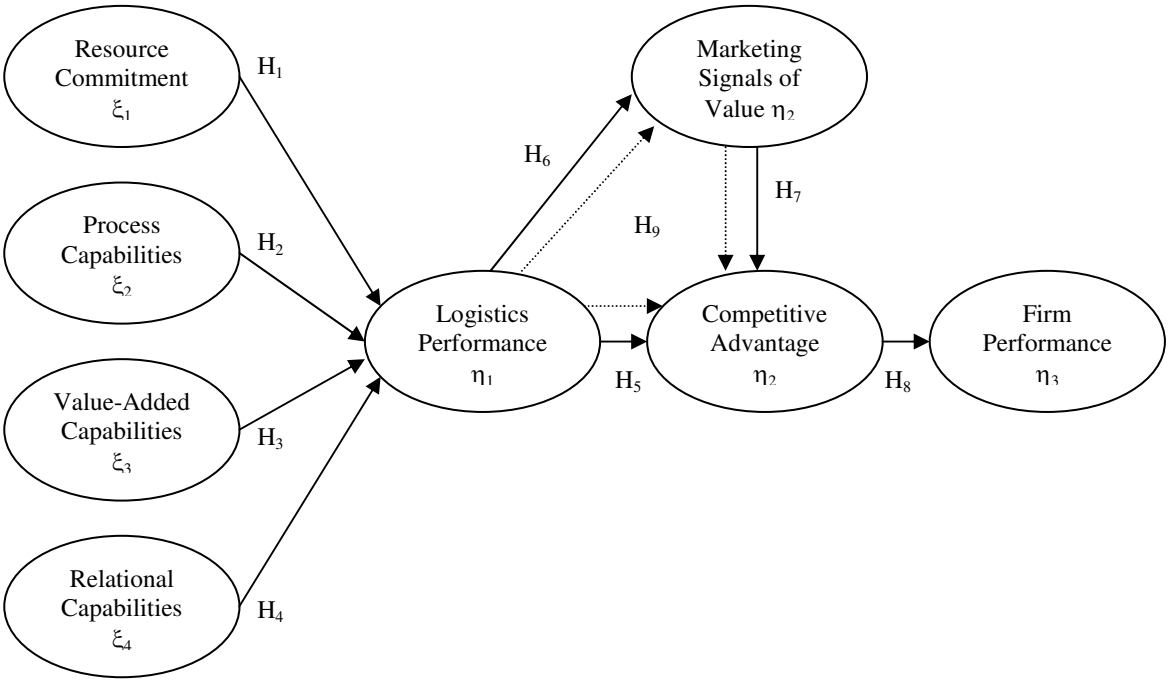


Figure 2-1: The Logistics Leverage Conceptual Model

While Mentzer and Williams (2001) identified resources such as technology, people, and facilities as well as strategic relationships as factors that can aid in the creation of logistics leverage, the interviews were used to verify these factors and identify other factors that might be important. Thus, an iterative process was utilized in which the interviews served as the catalyst for identifying relevant ideas which were then researched in the appropriate literature bases. All of the constructs in the model have been discussed in the literature to varying degrees; however, a few of the constructs (i.e., marketing signals of value and relational capabilities) have not been empirically tested and existing measures were not found. In addition, for purposes of this study, it was necessary to develop new measures for the resource commitment construct. The

qualitative interview was selected to provide a greater understanding of the specific factors that needed to be examined for these constructs. The qualitative interview is deemed an appropriate technique when the "purpose is to gather descriptions of the life-world of the interviewee with respect to the interpretation of the meaning of the described phenomena" (Kvale 1983). The objectives for the interview process were:

1) To identify if, and how, a company competes on logistics processes and capabilities;

2) To identify the resources that need to be dedicated to logistics in order to achieve a competitive advantage;

3) To understand the impact of relationships on logistics performance; and,

4) To determine if, and how, the firm markets or communicates its logistics capabilities.

Data Collection

Since the purpose of the qualitative study was exploratory in nature and focused on gaining insights into existing constructs, a purposive sample was used. Thirteen interviews were conducted among middle- and top-level executives of manufacturing firms identified through personal contacts. The interviewees represented various industries including the beverage, electronics, apparel, agricultural equipment and appliance industries. The number of interviews conducted was not predetermined, but rather was based on achieving theoretical saturation. This process involves collecting data until no new information emerges, the dimensions of the categories being studied appear to be well developed, and the relationships among the categories are determined

(Strauss and Corbin 1998). The data were analyzed after each interview for information related to the predetermined categories. Patterns emerged in the data as the interviews progressed and no substantially new information was gathered after the tenth interview. Each interview lasted approximately one hour and was audio recorded to ensure accuracy of responses. The audio tapes were transcribed to aid in analysis of the information.

A semi-structured format was used in which an interview protocol was created that focused on the specific themes related to the logistics leverage process. While specific questions were designed to guide the interview, other questions were asked when necessary to provide clarification or to encourage the interviewee to expand on the information provided. Questions such as the interviewee's position, length of time in position, length of time with the company, and the role of logistics within the organization were initially asked to obtain background information as well as to allow the respondent to become comfortable with the interview process. The questions developed to guide the interview are presented in Appendix A.

Data Analysis

The objectives of the qualitative research phase guided the development of the themes or categories for the analysis. The categories were capabilities, resources, relationships, and signals of value. The transcript for each interview was analyzed to identify potential indicators for the constructs in question. The data were coded according to the categories and patterns were examined to identify common themes that could be used as items to measure the constructs. The results of the qualitative phase are

presented throughout the following sections as support for the constructs and the hypothesized relationships. Information related to the specific items used to measure the constructs is presented in Chapter 3.

FACILITATORS OF LOGISTICS LEVERAGE

The facilitators conceptualized in Chapter 1 include the resources (i.e., logistics information technology, physical resources, human resources, and relationships), capabilities, superior logistics performance, and marketing signals of value. These variables were proposed to facilitate the achievement of logistics leverage and lead to desired firm outcomes. Research from the literature and in-depth interviews are provided as antecedent justification for the constructs and the proposed hypotheses.

Firm Resources

Based on the theory of the resource-based view of the firm, various tangible and intangible resources of the organization take on strategic importance as firms attempt to find new ways to create a sustainable competitive advantage. Firm resources include "all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" (Daft 1983). Studies have examined how various resources (e.g., physical, informational, human, and relational) are used to develop capabilities or competencies that potentially lead to an advantage that is difficult to imitate (Barney 1991; Hunt and Morgan 1995). While strength or excellence in one

particular resource area might provide an advantage, the combination of several resources to create a competency could have longer lasting effects (Hunt and Morgan 1995; Teece and Pisano 1994).

The infrastructure components proposed by Mentzer and Williams (2001) can be categorized into three categories identified by Barney (1991). The first category consists of physical capital resources and includes plants, distribution facilities, manufacturing equipment, and technology. The first two infrastructure components – information technology and facilities fall into this category. The second category is the human capital resources of the firm and includes the training, experience, and relationships of management and employees of the organization. Finally, strategic alliances are an example of organizational capital resources, which consist of the degree of centralization as well as relationships internal and external to the firm. While these infrastructure components have been previously identified in the literature (Mentzer and Williams 2001), the specific characteristics associated with each component have not been established. The in-depth personal interviews provided more insight into the resources needed to achieve logistics leverage. Each component is discussed to understand how it pertains to logistics performance, firm performance, and competitive advantage.

Logistics Information Technology

Information technology has a profound impact on the way organizations operate today. The drivers influencing the role of information technology within the firm include the growth of inter-organizational linking, the desire to obtain a competitive advantage, the ability to capitalize on critical business information, and the development of flexible

and responsive infrastructures (Frenzel 1996). Information technology has an impact on both the internal and external processes of the firm. For example, the movement of companies to adopt a supply chain orientation has a significant impact on how firms communicate and coordinate activities with their supply chain partners. Information technology is a primary tool enabling firms to more effectively work together.

Within the firm, information technology is changing the way in which functional units manage and integrate processes. Gustin, Daugherty, and Stank (1995) suggested that functionally-integrated information systems lead to better decisions at all levels of the firm - strategic, tactical, and operational. While information technology has an impact on various areas of the firm, including manufacturing and marketing, it has greatly transformed the manner in which logistics activities are now managed. In addition, it is viewed as critical to logistics performance (Fox 1994). A study by Jayaram, Vickery, and Droge (2000) provided support that certain information technology systems improve time-based performance by influencing customer responsiveness.

Logistics information technology is defined as, "the hardware, software, and network investment and design to facilitate processing and exchange" (Michigan State University 1995). Early applications of logistics information technology included systems for vehicle routing and scheduling, order processing, and inventory replenishment (Stenger 1986). Advances such as electronic data interchange (EDI), point-of-sale systems, value-added networks, and expert systems provide opportunities for companies to achieve objectives of efficiency, effectiveness, and/or differentiation. The reduction of costs and the improvement of service are driving the development of

logistics information systems, with leading firms placing more emphasis on service enhancement (Michigan State University 1995).

Logistics information technology has been described as including coordinating and operational activities (Closs 1994). The coordinating activities direct the allocation of resources within the firm. They include the planning activities in the areas of strategy, manufacturing, capacity, logistics, and procurement. Operational activities consist of those activities necessary to process customer orders and include order management, order processing, distribution operations, transportation and shipping, and procurement. A key problem in applying logistics information technology is the integration between coordination and operations activities.

As companies recognize the value logistics processes can provide, interest is growing in regards to the application of logistics information technologies. There has been a shift from viewing the use of information technologies as simply a means to reduce costs, to one in which information technologies are instrumental in achieving strategic objectives. As a result, companies are making investments in logistics information technology to improve their logistics capabilities. Most of the research in this area has been conceptual in nature, describing the strategic value of logistics information systems (Kerr 1989; Langley 1986). Stock (1990) indicated the strategic use of information technology in general could create a competitive advantage, while others have suggested integrated logistics information systems can differentiate a company and provide a competitive advantage (Burbridge Jr. 1990).

Several empirical studies have examined the link between logistics information technology and competitive advantage. A study by the Global Research Team at

Michigan State University (1995) indicated technology such as bar coding, electronic data interchange, and real time communication systems is necessary to maintain logistical competitiveness. Closs and Xu (2000) examined the differences among logistics information technologies in various industrial settings and global regions. They focused on the capabilities of logistics information systems, EDI, barcoding, and real-time communications. The findings suggest there is less within-group variance among world-class logistics firms in terms of logistics capabilities than between-group variance associated with world-class logistics firms and other firms.

Clemons (1986) suggested information technology applications internal to the firm produced advantages based on factors such as economies of scale, efficiencies, and managerial expertise. Those applications that connected a firm to its suppliers and/or customers were more likely to have an advantage based on switching costs. Similarly, Porter (1985) proposed that firms have an advantage through information technology when they can achieve first-mover advantages.

Other research has suggested information technology by itself does not explain significant variance in financial performance among firms and is not enough to produce a sustainable competitive advantage. Powell and Dent-Micallef (1997) provided evidence that competitive advantage can be gained by leveraging information technology and complementary human and business resources. Similarly, Zhang and Lado (2001) argued that information systems "may hold a greater potential to gain and sustain competitive advantage through facilitating the development and leveraging of organizational competencies." Therefore, there is a need to identify the interactions of other organizational resources in maintaining a competitive advantage.

Physical Resources

Physical resources are "the tangible assets, other than labor and cash, that are used by the firm to produce and market goods and services" (Morgan and Hunt 1999). Examples of physical resources include access to raw materials, land, facilities, production equipment, and transportation equipment. For example, facility location could be a driver of differentiation (Porter 1985). A firm's location of its distribution centers or manufacturing facilities may be a source of advantage if customers perceive the location to be advantageous (e.g., more convenient) compared to the competitors.

While physical resources may provide uniqueness to a firm, it is not clear if and for how long such resources can lead to improved performance or create competitive advantage. Due to certain characteristics (e.g., tangibility) associated with physical resources, they may provide only short-term advantages for most firms. Specific studies examining this phenomenon were not found; however, Morgan and Hunt (1999) proposed that firms will not be able to maintain a sustainable competitive advantage through relationships formed to gain physical resources only. The rationale is that physical resources such as equipment or buildings are not imperfectly imitable. The fact that physical resources are tangible implies that competitors can observe these resources and more easily duplicate them than intangible resources. Even facility location may suffer from imitation as competitors can find similar locations that are just as advantageous. However, when physical resources are combined with other organizational resources such as human, relational, or informational resources, competitive advantage is proposed to be more sustainable (Morgan and Hunt 1999).

Physical resources are very important in the implementation of logistics strategies. To effectively acquire inputs for the production process or to distribute finished goods to customers, the logistics area of the organization must have the capability to do so. This capability arises from the specific physical resources the firm provides for logistics functions. Without the necessary resources, logistics may not be able to effectively implement the marketing strategies developed by the firm. For example, if marketing promotes faster delivery service to the firms' customers, and logistics does not possess the ability to do so, customers may not be very satisfied nor perceive the logistics function to deliver any value to them. As a result, firm performance may suffer due to the lack of necessary resources committed to logistics.

Human Resources

Organizational culture and capabilities, resulting from human resource management, may be more important now in achieving competitive advantage than some of the traditional methods such as economies of scale, process technology, and access to financial resources (Pfeffer 1994). Companies now have greater access to financial resources on a global basis and the technology that facilitates first-mover advantages. In addition, the attainment of economies of scale is easily duplicated by competitors. Human resource factors, however, contribute to the culture of the organization and may be difficult for competing firms to imitate. Human capital has been asserted as a vital resource in most organizations (Pfeffer 1994).

Barney (1991) indicated that human resource factors relate to the "training, experience, judgment, intelligence, relationships, and insight" of employees and

managers within the firm. These intangible aspects of human resources make it difficult for competitors to completely duplicate any advantage gained through the employees of the organization. However, there is always the possibility that competitors can lure away good employees. Research, particularly within strategic management, has examined human resources in terms of specific employee attributes, firm policies (i.e., human resource management), and firm performance.

Attributes of employees and management, particularly top management, have been found to affect firm performance (Hitt et al 2001; Huselid et al 1997; Huselid 1995). Human resource factors such as CEO commitment, functional interactions, and goal directedness in relation to the performance of the firm have been examined (Powell 1995). Hansen and Wernerfelt (1989) found that human resource factors such as goal directedness and organizational climate better explained performance variance than economic and strategic factors. The results of a study by Hitt et al (2001) indicated the leveraging of human capital had a direct effect on firm performance.

Human resource management (HRM) has also received a considerable amount of attention in the literature. Porter (1985) indicated that HRM activities, such as hiring, training, and development, support the entire value chain including both primary (e.g., technology development) and support (e.g., inbound and outbound logistics) activities. Since the management of human resources is important to all areas of the firm, some researchers have broadened their view by considering the relationships between human resource policies and organizational strategy (Harris and Ogbonna 2001; Lado and Wilson 1994). Research has primarily concentrated on strategic human-resource management effectiveness (SHRM), defined as,

> "the perceptions of how well the human resource management function develops a firm's employees to support its business needs including facilitating teamwork, communications, and involvement, enhancing quality, and developing talent to serve the business in the future" (Huselid et al 1997).

Richard and Johnson (2001) examined whether strategic human resource management effectiveness affects organizational performance as measured by productivity, turnover, and return on equity. A significant relationship was found between human resource management effectiveness and turnover.

Human resource factors have also been examined within the context of competitive advantage. Castanias and Helfat (1991) found human resource factors have a positive impact on the creation of a sustainable competitive advantage. However, Morgan and Hunt (1999) proposed human resources gained through inter-firm relationships would only lead to a moderately sustainable relationship-based competitive advantage (Morgan and Hunt 1999).

In summary, the attributes of employees and the policies that govern employees can have an effect on the performance of the firm. Most of the performance variables studied related to employee performance rather than other measures of firm performance such as profitability, market share, or customer value. While human resource factors can affect firm performance and competitive advantage, specific studies related to such effects on logistics performance were not found.

Resource Commitment

The previously discussed resources are conceptualized into the construct identified as resource commitment. Resource commitment refers to a firm having a sufficient allocation of resources such as people, time, and money that are dedicated to the implementation of strategy (Day 1986; Ramanujam and Camillus 1986; Menon et al 1999). Menon et al (1999) suggested little empirical research has examined the relationship between resource commitment and performance. In their study on the marketing strategy making (MSM) process and its effect on firm performance, Menon et al (1999) found that resource commitment as a component of the MSM process did have a positive effect on market performance.

The in-depth interviews during the qualitative phase of the study confirmed the above resources, along with financial resources, as necessary for achieving excellent logistics performance. One of the most discussed resources was the human resources of the firm. Several of the interviewees indicated that having the right people with the right skill sets such as communication and analytical skills was important not only in logistics operations but also in the firm's ability to compete on logistics. Similarly, a few interviewees discussed the role of senior management as a "resource" necessary for the excellent performance of logistics operations. They indicated that senior management commitment to and understanding of the role of logistics in creating value was very important. The other area of primary emphasis was technology. This included information, transportation, and network system resources that need to be committed to logistics operations. Therefore, based on Day's (1986) discussion of resources, resource

commitment is defined as *the adequate level of resources allocated to the pursuit of logistics strategy.* The above discussion leads to the following hypothesis:

> **H1: There is a direct, positive relationship between a firm's resource commitment and logistics performance.**

Capabilities

While various resources have been identified as important for achieving logistics leverage, the interviews also revealed capabilities within logistics as a necessary component. When asked what logistics leverage meant, one interviewee indicated,

> "You can leverage talent, you can leverage information, any capabilities that an organization has can probably be better leveraged than it's currently being leveraged. It's getting the most value out of an asset or a resource."

Several of the interviewees discussed capabilities in relation to performing well and being able to compete in the logistics area. One interviewee indicated his/her firm has capabilities that range from being "very strategic to kind of mundane operational capabilities." This firm examined the capabilities that would be required to be successful and identified 23 capabilities that the firm felt it "had to become excellent at to some degree." In the strategic management literature, Cockburn et al (2000) suggested the resource-based view helps to identify the internal capabilities that can shape the external environment of a firm. Similarly, Reed and DeFillippi (1990) confirmed that the extent to which a capability has an enduring effect for the organization depends on its ability to be imitated, scarcity, and immobility.

The link between capabilities and firm performance and competitive advantage has been examined to some degree (Peteraf 1993; Reed and DeFillippi 1990).

Capabilities are, “complex bundles of skills and accumulated knowledge, exercised through organizational processes, that enable firms to coordinate activities and make use of their assets” (Day 1994). Capabilities have commonly been referred to as distinctive or dynamic depending upon the literature base in which the subject is referred. In the strategy literature, Eisenhardt and Martin (2000) suggested dynamic capabilities themselves do not lead to a sustainable competitive advantage, but rather, it is how managers use a firm’s dynamic capabilities to configure and utilize resources. Therefore, dynamic capabilities are defined as:

> “The firm’s processes that use resources-specifically the processes to integrate, reconfigure, gain and release resources-to match and even create market change. Dynamic capabilities are thus the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die” (Eisenhardt and Martin 2000).

In the marketing literature, researchers have referred to a distinctive capability as a capability that is valuable and difficult to match by competitors (Day 1994). According to Day (1994), a capability can be considered distinctive if, “it makes a disproportionate contribution to the provision of superior customer value – as defined from the customer’s perspective – or permits the business to deliver value to customers in an appreciably more cost-effective way.” One of the interviewees indicated, "the big are looking for every way they can to take advantage of any capability that you have that gives them an edge over [competitors]."

The functional activities of the firm have been considered from a distinctive competency perspective, and their impact on firm performance at both the business unit level of analysis (Snow and Hrebiniak 1980; Miles and Snow 1978) and the corporate

level of analysis (Hitt and Ireland 1985) has been examined. For example, Hitt and Ireland (1985) examined the relationship between 55 distinctive competence activities and performance. They found the strategy used by the firm and the industry type moderated the relationship between distinctive competencies and performance (measured as market returns).

The in-depth interviews revealed many different types of capabilities that firms may need to develop to enhance logistics performance and achieve competitive advantage. A theme that emerged was that some of the firms were focused on capabilities that allowed them to provide greater value to their customers. For example, e-business capabilities were discussed which allowed the firm to provide more efficient solutions for its customers. Another theme was the logistics capabilities that allow the firm to be more efficient and effective in its logistics operations. Several of the respondents identified the use of Collaborative Planning and Forecasting Requirement (CPFR) systems as a tool for developing improved operations planning.

When asked if external influences affected the creation of logistics leverage, several interviewees indicated relationships with other parties such as third-party providers and suppliers were very important in achieving an advantage in the marketplace. In particular, they identified resources that enabled their firms to improve logistics capabilities and compete more effectively on those capabilities. According to one interviewee,

> "What we have been focused on for quite a while is identifying relationships that we believe to be strategic in nature, in other words we believe that these people have the breadth, the scope, the capabilities, the value adding opportunities to provide long-term support to us, and they have the ability to grow with us."

As a result of the in-depth interviews, the logistics literature was examined to identify studies that had focused on specific logistics capabilities and whether studies had linked the capabilities to performance. The strategic management literature was also reviewed for information on relationships and capabilities. As a result, research was found in which various logistics capabilities have been empirically tested and for which the concept "relational capabilities" had been conceptually discussed.

Logistics Capabilities

An examination of the logistics literature revealed several studies that focused on the effects of logistics processes and capabilities on performance. Tracey (1998) surveyed manufacturing managers to test relationships among logistics processes, manufacturing flexibility, customer service, and firm performance. Logistics processes consisted of three constructs: physical supply (i.e., inbound transportation, material warehousing, inventory input controls, production support), physical distribution (i.e., finished goods warehousing, inventory output controls, packaging, outbound transportation) and the logistics spanning processes of purchasing and participation in strategy. Each of the logistics processes examined was found to have a positive, significant effect on firm performance, with participation in strategy the most important.

Morash, Droge, and Vickery (1996) identified four strategic logistics capabilities (i.e., delivery speed, reliability, responsiveness to target market, and low cost distribution) as significantly related to firm performance or performance relative to competitors. It is suggested that the performance objectives of the firm should guide the logistics capabilities that are developed. For example, if a firm is more demand or

customer oriented, the logistics capabilities of delivery speed, reliability, and responsiveness to target market should be emphasized. If the firm is supply-oriented, or stresses the customers internal to the company, the logistics capability of low cost distribution should be stressed.

Similarly, Lynch, Keller and Ozment (2000) examined the relationships among strategy, logistics capabilities, and firm performance. They proposed strategies (i.e., cost or differentiation) have to be properly matched with resources (i.e., capabilities) for a firm to realize superior performance. Results of the study indicate firms pursuing a differentiation strategy should focus on value-added logistics service capabilities (e.g., accommodating customer service requests) while firms pursuing a cost leadership strategy should focus on logistics process capabilities (e.g., efficient operations, technology, or scale economies). Process capabilities refer to the "simple, consistent, efficient, and proactive processes" that can allow a firm to control costs and achieve economies of scale while value-added service capabilities "focus on the customer by regularly providing new services and flexibility in accommodating special requests" (Lynch et al 2000). "Firms pursuing a given strategy with the proper capabilities should outperform firms pursuing the same strategy without adequate capabilities" (Lynch et al 2000).

Based on existing logistics research and the information provided in the interviews, capabilities were included in the theoretical model of logistics leverage. As Morgan and Hunt (1999) suggested, "Competitive advantages are realized only when the firm combines assortments of basic resources in such a way that they achieve a unique competency or capability that is valued in the marketplace." In particular, the two types

of capabilities proposed by Lynch et al (2000) were further examined in terms of their relation to logistics performance. For purposes of this dissertation, process capabilities are defined as *the logistics skills and knowledge of a firm that allow it to focus on simple, consistent, efficient, and proactive processes* while value-added service capabilities are defined as *the logistics skills and knowledge of a firm that allow it to focus on and provide value to the customer*. The following hypotheses are proposed:

H2: There is a direct, positive relationship between a firm's process capabilities and logistics performance.

H3: There is a direct, positive relationship between a firm's value-added service capabilities and logistics performance.

Relational Capabilities

The strategic management literature provides many reasons why firms establish relationships. Firms form relationships to share costs and risks (Hagedoorn 1993), gain complementary resources, expand into foreign markets (Doz and Hamel 1998), change competitive positions (Kogut 1988), and block or neutralize competitors (Barringer and Harrison 2000). Doz and Hamel (1998) indicated a central theme in the inter-organizational relationship literature is the value created by relationships through the combination of resources, increased speed to market, and sharing of knowledge.

Consistent with the basic premises of the resource-based view of the firm, the relationships developed among members of the supply chain can also be considered strategic resources used to gain a sustainable advantage. Firms may not possess all the technological, human, or physical resources necessary to develop a logistics competency in the industry. Thus, they may need to rely on others outside of the firm for the

resources lacking. Research has suggested firms develop relationships, or engage in relational exchange, when potential partners possess resources that are complementary to their own and needed to create a competitive advantage (Morgan and Hunt 1999; Kogut 1991). Similarly, the resource dependence theory suggests the need to acquire resources creates dependencies between firms. Interorganizational relationships may be formed to exert power or control over other firms that possess scarce resources in an attempt to reduce dependency (Barringer and Harrison 2000).

As Barney (1991) proposed, for a firm to obtain a sustainable competitive advantage through resources, the resources must be rare, valuable, imperfectly imitable, and non-substitutable. Interfirm relationships are unique in their ability to produce such resources due to the knowledge and experience firms bring to the relationship and the market power that may be possessed by the firms (Barringer and Harrison 2000). In addition, the intangible characteristics of relationships such as trust, commitment and loyalty are thought to be more sustainable due to the length of time required for development (Dierickx and Cool 1989). The idiosyncratic characteristics of a firm's relationships make imitation by competitors difficult.

Various types of inter-firm relationships have been identified and examined within the literature. These relationships range from arms-length to complete vertical integration, with joint ventures and strategic alliances falling between the two extremes (Cooper and Gardner 1993). Many of the relationship classifications, including partnerships, are used interchangeably among practitioners and academicians. However, there are unique aspects associated with each type of relationship that may make certain types more appropriate in achieving the goals of the organization. Strategic alliances

formed to bring together complementary assets or to take advantage of logistics competencies will be the focus of this research.

Strategic alliances describe, "an exchange relationship between organizations where the goal is the creation or acquisition of strategic resources" (Perks and Easton 2000). Alliances are established for many reasons including co-option, co-specialization, and learning and internalization (Doz and Hamel 1998). Co-option is the development of alliances with competitors to create new businesses. Co-specialization is the value that results from the combination of resources, skills, and knowledge. Each alliance member brings together unique resources that are more valuable when combined than when kept separate. Alliances also provide opportunities for skills to be learned and internalized. The knowledge and skills one partner learns from the other can be transferred to other activities within the organization.

A strategic alliance is generally more central to firm strategy than other types of relationships such as joint ventures (Doz and Hamel 1998). As previously mentioned, companies may form relationships for many different purposes. However, when the main goals of the relationship are strategic in nature (e.g., resource acquisition), instead of simply buyer-seller exchange situations, strategic alliances are generally formed (Perks and Easton 2000). One type of relationship applicable to this study is the resource exchange strategic alliance. In this type of alliance, partners exchange strategic resources, which are long term in nature and create value in the product offering (Perks and Easton 2000). The risks involved in such relationships are high, but the potential value to be received is also high.

The relationship between strategic alliances and firm performance has been examined (e.g., Hagedoorn and Schakenraad 1994; Powell et al 1996). For example, Stuart's (2000) research provided supported for the proposition that strategic alliances improve performance. He suggested the attributes of the firms an organization is associated with are more important determinants of the strength of the relationship than the fact that the firms are associated.

While strategic alliances have been studied in relation to obtaining general firm resources (e.g., human and physical), they may also be formed for the primary purposes of taking advantage of complementary logistics resources and strengthening logistical competencies. La Londe and Cooper (1989) defined a strategic partnership/alliance as "a type of logistic channel relationship where the intent of the relationship is to yield differentiated and intermediate or long-term benefits to the parties involved in the relationship." Similarly, Frankel et al (1996) identified a logistics alliance as an, "alliance that reflects a willingness of participants to modify their basic business practices to reduce duplication and waste while facilitating improved performance". Common characteristics of logistics alliances include viewing partners as extended links of the organization with common values and objectives, focusing on long-term development instead of as a series of transactions, and combining resources to strengthen competitive positions (Bowersox 1990).

Such inter-firm relationships, based on logistics resources or capabilities, may result in benefits from both a logistics and a company standpoint. Such benefits include lower inventory levels, reduced total costs, and improved quality and customer service (Christopher 1992; Carter and Ellram 1994). It has been suggested that these benefits

lead to better performance (Saunders 1994; Groves and Valsamakis 1998). Groves and Valsamakis (1998) examined three types of logistics relationships (i.e., adversarial, semi-adversarial, and partnerships) and the effect on company financial and non-financial performance measures. The results of the study indicate that performance variability was lower for firms in the partnership category, especially for profitability measures.

While various types of relationships formed for logistics purposes have been examined, strategic alliances specifically formed to combine resources to support logistics activities have not been studied. In addition, the relationship between this type of strategic alliance, firm performance, and a sustainable competitive advantage has not been empirically tested in the literature.

Lorenzoni and Lipparini (1999) acknowledged a lack of research linking a firm's "relational capability" and sustainable competitive advantage. Relational capability refers to a firm's capability to interact with other firms. They found the ability of firms to integrate internal and external knowledge could become a distinctive organizational capability. The relationships become strategic assets, which can be used to enhance performance and create sustainable competitive advantage. Similarly, Barringer and Harrison (2000) called for research identifying the indigenous qualities of interfirm relationships that meet the resource criteria identified by Barney (1991). Based on the preceding discussion, relational capabilities are defined as *the enhanced logistics skills and knowledge of the firm through the sharing of resources with another firm*. The following hypothesis is proposed.

H4: There is a direct, positive relationship between a firm's relational capabilities and logistics performance.

Logistics Performance

As noted in Chapter 1, the role of logistics in the organization has changed for many firms from strictly a cost center to a function that can improve profitability and differentiate the firm. Many factors have contributed to the increased importance of logistics within the firm including customers demanding higher levels of customer service, continued concern over reducing costs, and time and quality based competition. As a result, the effective measurement of logistics performance has become more important.

Chow, Heaver, and Henriksson (1994) defined logistics performance as the extent to which goals such as cost-efficiency, profitability, sales growth, customer satisfaction, and flexibility are achieved by the organization. There are many measures of logistics performance including both hard and soft measures. Measures such as net income, return on investment, cost accounting, and productivity (input/output ratios) are examples of hard measures, while customer satisfaction is an example of a soft measure.

While there are many ways to measure logistics performance, Mentzer and Konrad (1991) suggested that the efficiency and effectiveness used to accomplish a goal should be used in analysis. Logistics efficiency is the measure of how well a firm uses resources in creating planned outputs (Koota and Takala 1998; Mentzer and Konrad 1991). It is also been described as "the contribution of logistics activities to the sale turnover and profitability of the firm, to customer satisfaction, and to employee motivation" (Halley and Guilhon 1997). Logistics effectiveness is the extent to which an objective or goal has been achieved (Gleason and Barnum 1986; Mentzer and Konrad 1991). Logistics factors such as responsiveness, timeliness, initiative, adequacy,

consistency, and accuracy have been identified as elements of effective organizations (Rhea and Schrock 1987a; Rhea and Schrock 1987b). Mentzer and Konrad (1991) suggest efficiency by itself is not an adequate measure of logistics performance. Therefore, logistics performance is a function of how well resources are utilized and how well the results achieve the goals desired.

In addition to the previously mentioned measures, the value customers receive from logistics activities could also serve as an indicator of logistics performance. Langley and Holcomb (1992) proposed logistics could create value through efficiency, effectiveness, and differentiation. For example, value can be created through product availability, timeliness and consistency of delivery, ease of placing orders, and other customer service elements. In creating value through logistics, firms need to develop objectives based on satisfying customers, determine what systems/processes are needed to create and sustain value, and incorporate marketing into the logistics delivery process (Langley and Holcomb 1992). If logistics can create value through the inimitability of its logistics systems, a firm may be able to differentiate itself from its competitors.

Only one empirical study was found to define and measure logistics performance as efficiency, effectiveness, and differentiation. Based on the definition by Mentzer and Konrad (1991), Smith (2000) defined logistics performance as "the degree of efficiency and effectiveness associated with the accomplishment of a given logistics task." The measures for efficiency and effectiveness were developed from common performance measures identified by Mentzer and Konrad (1991). In addition, differentiation was incorporated into the construct and viewed from a comparative perspective by Smith (2000). Measures for differentiation were based on logistics managers' perceptions of

their performance on logistics activities as compared to their competitors. Logistics performance is thus defined as *the degree of efficiency, effectiveness and differentiation associated with performing logistics activities*. The definitions for the three dimensions of logistics performance are adapted from the previous studies. Logistics efficiency is defined as *the degree to which the logistics resources of the firm are utilized* and logistics effectiveness is *the degree to which a firm's logistics goals are achieved*. The definition for logistics differentiation is based on Smith's (2000) study and is *the perceived difference in logistics performance when evaluated against competitors*. The following hypothesis is proposed:

H5: There is a direct, positive relationship between logistics performance and competitive advantage.

Marketing Signals of Value

A firm may be able to develop a differentiation strategy by informing customers of activities or services that provide value (Porter 1985). Customers may not have complete knowledge of how various activities of the firm, such as logistics, provide value to their operations through reduced costs or improved performance. Customers use many indicators to determine whether and how a supplier helps them achieve their goals. For example, indicators such as advertising, packaging, reputation, facilities, and information provided send signals as to the value a supplier creates. Porter (1985) refers to these indicators as "signals of value." Firms do not control all signals of value such as word-of mouth communication and competitor marketing communications. It is important, though, that firms take advantage of opportunities to signal value to customers, especially

if the value is subjective, indirect, or hard to quantify (Porter 1985). In realizing differentiation, signals of value may be as important as the actual value created (Porter 1985).

The marketing area has the primary responsibility for informing customers of the strengths of the organization and how these strengths create value for customers. The objectives of the communication efforts (e.g., advertising, promotion, salespeople) should complement the strategic objectives of the firm. While marketing communication efforts may be easily duplicated by competitors, it is the message delivered that can differentiate a firm. For example, the reputation a firm possesses in the area of logistics can influence perceived value. If the firm has an unfavorable reputation in terms of its logistics processes, customers will not perceive the logistics functions of the supplier as an aid in achieving their goals, even if marketing communications indicate otherwise. If a firm has a favorable reputation in logistics, and this is communicated to customers, customers may perceive they receive greater value through business with this firm as opposed to other firms. If this value results in improved performance or reduced costs for the customer, the supplier may realize greater firm performance than if the logistics value had not been emphasized. Thus, marketing communications can facilitate the creation of a sustainable competitive advantage (Schultz et al 1993).

The role of marketing in creating logistics leverage was supported in the interviews. Several of the interviewees indicated their organization communicates to customers the firm's logistics capabilities and how these capabilities change over time. One interviewee commented, "we're reminding [customers] of what we've done to make sure that they see that we [logistics] are creating value for them." Similarly, another

interviewee commented, "their [customer is] looking for every way they can take advantage of any capability that you have that gives them an edge over [the competition]." By communicating the logistics capabilities, the firm can help customers identify the capabilities they should take advantage of to create value.

In addition to communicating logistics capabilities to customers, some interviewees suggested the importance of communicating this information within the firm so everyone is aware of how logistics can add value. When asked how logistics capabilities would be communicated to customers, one interviewee responded,

> "When it comes to communicating to the field sales force or to the trade partners themselves, we obviously go through their [marketing] organization. They have routine meetings with the field sales force where they would communicate this kind of information. We [logistics] participate in those meetings. There are actually weekly teleconferences that we in logistics have with field sales people and we're communicating new capabilities that are being developed."

Other interviewees reiterated the role of sales and/or marketing in communicating the firm's logistics capabilities and performance. Either the logistics organization will meet with sales and/or marketing to provide information on logistics capabilities to be communicated to customers, or a representative from the logistics organization will actually meet with the customer to discuss what they can do for them from a logistics standpoint. This information is not necessarily communicated to only new customers; a few interviewees indicated they also continue to meet with their larger, existing customers to discuss changing capabilities.

In summary, customers can learn about the uniqueness of a firm's logistics systems through marketing efforts. Based on Porter's (1985) discussion of signals of value, marketing signals of value is defined as *the indicators a firm uses to send signals*

(i.e., to communicate) to customers as to the value that can be created by the firm's logistics capabilities. Customers may not understand or even be aware of how the superior logistics performance of a supplier firm provides value to them. Marketing signals of value can be instrumental in providing such information. The belief that superior logistics performance can improve firm performance has received support in the literature (Morash, Droge, & Vickery 1996). However, if customers value logistics capabilities and such capabilities are emphasized in marketing efforts, it stands to reason that firm performance can be even more enhanced. Based on the preceding discussion of logistics performance and marketing signals of value, the following hypotheses are offered.

H6: There is a direct, positive relationship between logistics performance and marketing signals of value.

H7: There is a direct, positive relationship between marketing signals of value and competitive advantage.

H8: Logistics performance has a greater positive effect on competitive advantage when communicated to customers through marketing signals of value than when marketing signals of value are absent.

OUTCOMES OF LOGISTICS LEVERAGE

Competitive Advantage and Firm Performance

Literature on the theory of competitive advantage was presented in Chapter 1 as antecedent justification for viewing logistics as a competitive weapon of the firm. The logistics function is included in the value chain concept introduced by Porter (1985) as a tool to examine the activities of the firm and how they can serve as a source of

competitive advantage. According to Porter (1985), the value chain can be viewed as a theory of the firm in that, "the firm is a collection of discrete but related production functions, if production functions are defined as activities". The generic value chain consists of primary and support activities a firm performs in creating value for its customers. Inbound and outbound logistics activities represent two of the primary activities of the firm with the others being marketing, operations, and service. Depending on industry characteristics, different primary activities may serve a strategic role in creating competitive advantage. In general, the differences among value chains of competing firms are a major source of competitive advantage (Porter 1985).

While there has been a considerable amount of literature on the conceptual development of competitive advantage, empirical research, in particular in the logistics area, has been lacking. Only a few logistics' studies were found that quantitatively assessed a firm's logistics performance in relation to the competition. Stank, Daugherty, and Ellinger (1999) examined the relationship between inter-functional integration and performance. The results of the study provided support for a positive relationship between the degree and frequency of integration between logistics and marketing within the firm and logistics performance relative to competitors. Morash, Droge, and Vickery (1996) focused on the strategic logistics capabilities that may contribute to firm performance and competitive advantage. They examined demand-oriented (i.e., delivery speed, delivery reliability) and supply-oriented logistics capabilities (i.e., widespread distribution coverage and low total cost distribution) and used subjective measures for firm performance and performance relative to competitors. The

study identified key logistics capabilities that were significantly related to firm performance and competitive advantage. Following the previously discussed studies, the following hypothesis is presented.

H9: There is a direct, positive relationship between competitive advantage and firm performance.

SUMMARY

This chapter provided the theoretical justification for the proposed logistics leverage process model. Literature was reviewed in the areas of logistics, strategic management, marketing, and information technology. In addition, information obtained through in-depth interviews was used to supplement the literature and provide greater insights into the development of several of the constructs. The constructs considered facilitators of the logistics leverage process include resource commitment, process capabilities, value-added service capabilities, relational capabilities, logistics performance, and marketing signals of value. The constructs considered outcome variables include competitive advantage and firm performance. Antecedent justification was provided for each of the constructs and the hypothesized relationships that comprise the logistics leverage process model. The next chapter presents the research methodology used to test the logistics leverage process model.

CHAPTER 3 - RESEARCH METHODOLOGY

This chapter presents the research methodology used to investigate the logistics leverage process model and test the hypothesized relationships developed in Chapter 2. First, the hypotheses are reviewed and the proposed relationships are presented in the structural equation model. Next the research design for the pretest and final test is presented, including a discussion of the sampling plan and the data collection methods used in this dissertation. This will be followed by a discussion of the measurement development process including construct operationalization and scale development. The pretest results are presented next with a focus on the scale purification process. Finally, structural equation modeling, as the method of analysis, is described.

STRUCTURAL EQUATION MODEL

This section presents the structural equation model that was derived from the theoretical logistics leverage model introduced in Chapter 2. The model identifies four exogenous (independent) variables, four endogenous (dependent) variables and the proposed relationships among these variables. The exogenous variables include resource commitment, process capabilities, value-added service capabilities, and relational capabilities. The endogenous variables include logistics performance, competitive advantage, firm performance, and marketing signals of value. The logistics performance variable represents a second-order construct comprised of logistics differentiation, logistics efficiency, and logistics effectiveness. The relationships among the eight

constructs represent the nomological network and are reflected in the structural equation model in Figure 3-1 and the hypotheses that are reviewed below.

H_1: There is a direct, positive relationship between a firm's resource commitment and logistics performance.

H_2: There is a direct, positive relationship between a firm's process capabilities and logistics performance.

H_3: There is a direct, positive relationship between a firm's value-added service capabilities and logistics performance.

H_4: There is a direct, positive relationship between a firm's relational capabilities and logistics performance.

H_5: There is a direct, positive relationship between logistics performance and competitive advantage.

H_6: There is a direct, positive relationship between logistics performance and marketing signals of value.

H_7: There is a direct, positive relationship between marketing signals of value and competitive advantage.

H_8: Logistics performance has a greater positive effect on competitive advantage when communicated to customers through marketing signals of value than when marketing signals of value are absent.

H_9: There is a direct, positive relationship between competitive advantage and firm performance.

RESEARCH DESIGN

Since the purpose of this study was to test the hypothesized relationships in the logistics leverage process model, a mail survey design was considered appropriate. There are many benefits of a survey design including: simultaneously reaching potential respondents who are geographically dispersed

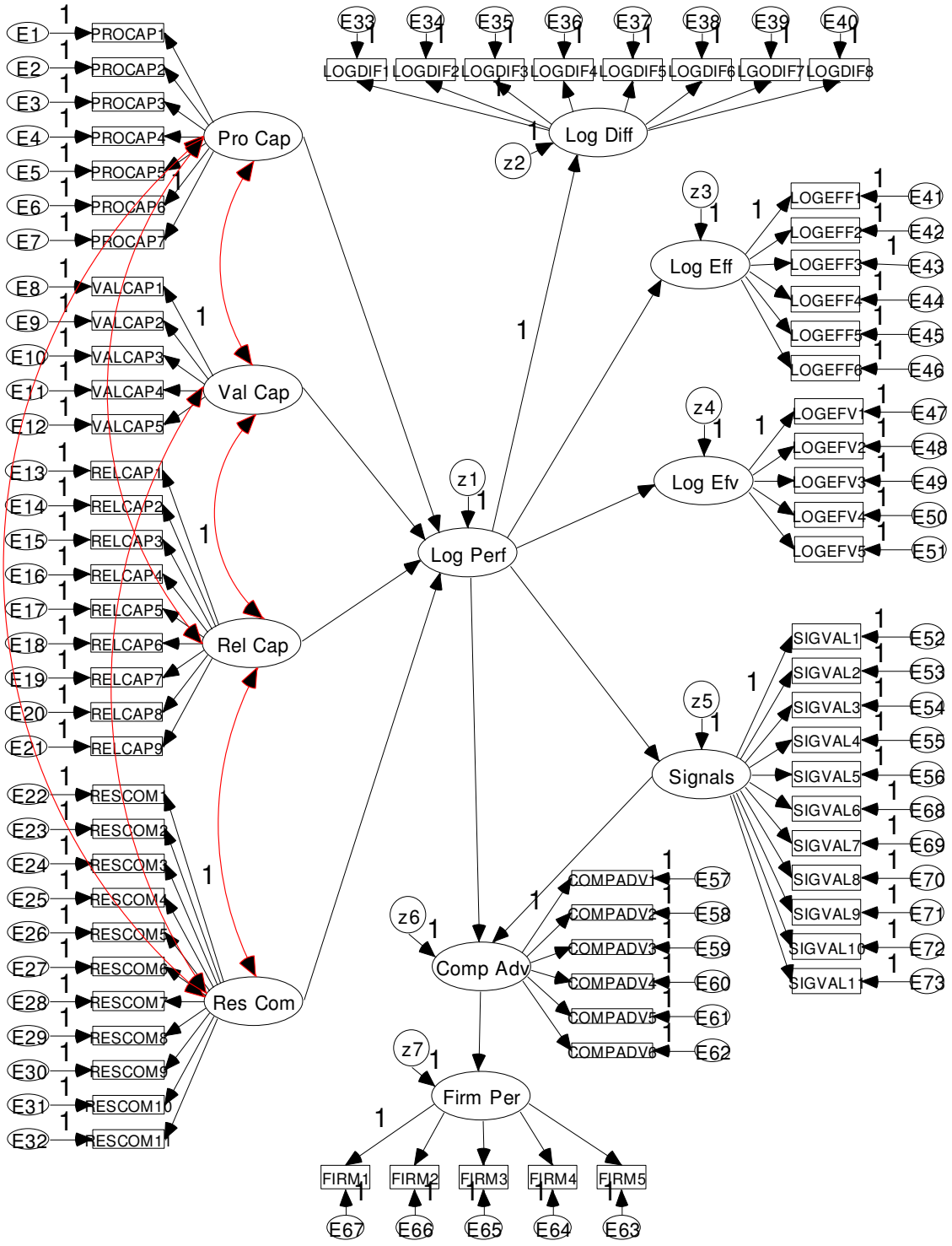


Figure 3-1: Logistics Leverage Structural Equation Model

(Kanuk and Berenson 1975); gathering a large amount of information in a quick and cost-effective manner; and reducing the degree of interviewer bias or variability (Boyd and Westfall 1955). The sampling plan and data collection methods for both the pretest and final test are discussed below.

Sampling Plan

Based on the constructs related to logistics capabilities and performance in the theoretical model, it was important to survey companies that have logistics operations and business-to-business relationships with downstream customers. Retailers were an inappropriate population for this study since one of the key constructs relates to the communication, or signaling, of a firm's logistics capabilities and performance to customers. These factors suggested that manufacturers who produce and ship products through industrial or consumer product channels would be an appropriate population. The Council of Logistics Management (CLM) membership list containing 3,441 manufacturing contacts was used for both the pretest and final test to identify manufacturing firms involved in product-oriented logistics management.

The unit of analysis within each firm was middle- and top-level logistics professionals. These individuals were viewed as having a greater degree of knowledge of logistics resources and capabilities, firm performance, and performance relative to competitors. According to the resource-based theory of the firm, "the role of senior management is to leverage corporate resources and seek to accumulate or develop the necessary resources to keep the firm competitive in the future" (Tyler 2001). In addition,

personal interviews conducted with various levels of firm management supported this unit of analysis.

The sampling frame was examined for companies that did not represent the manufacturing level of a distribution channel. There were several third-party providers such as transportation and logistics service companies that were included in the database and thus eliminated from consideration. Random sampling was first used to determine the sample for the pretest study. A sample of 300 was drawn from the database and used for pre-qualification calls. During the pre-qualification process, potential respondents were asked to verify that they worked for a manufacturing firm, their address, and whether they would agree to participate in the study. Pre-qualification calls resulted in 109 potential respondents, of those who were reached, agreeing to participate. Sixty-six pre-test surveys were returned resulting in a 61 percent response rate (i.e., 66/109).

For the final study, the database was modified to reflect the elimination of the potential respondents considered during the pre-test stage. A random sample of the remaining contacts was used to identify the sample for the final study. The sample size was based on the needed response rate to effectively analyze the structural equation model. With 73 potential measurement items used in the analysis of the model, it was estimated that 219 responses (i.e., 3 responses per item) as a minimum were needed. A total of 579 potential respondents agreed to participate in the study through pre-qualification calls. The surveys were mailed out on two separate occasions over a period of five months due to the lengthy amount of time required to pre-qualify potential respondents. A total of 243 surveys were returned. Twenty surveys were eliminated due to the following reasons: incorrect addresses, the firm was not a manufacturing firm, the

individual had left the firm or was no longer working in logistics, or the survey could not be completed due to company policy. The effective response rate was 43.5 percent (243/559). This response rate was deemed acceptable since average response rates from top-level management generally range between 15-20% (Menon, Bharadwaj and Howell 1996).

Data Collection Process

Data for both the pretest and the final test were collected in the same manner following Dillman's (2000) recommended approach for data collection. As discussed in the sampling plan, potential respondents from the sample were contacted initially to secure an agreement to participate in the survey. The second step was to mail the questionnaire to potential respondents along with a cover letter explaining the purpose of the survey, assuring confidentiality of the responses, and reminding the respondent of their commitment to participate. Respondents were asked to return the survey within two weeks of receiving it. The third step was to mail a postcard after the initial two-week period encouraging respondents to complete the survey. The postcard served as a reminder and a thank you and was mailed to all the potential respondents who received the initial survey. The next step was to mail a replacement survey and cover letter to the individuals who had not returned the survey. They were again encouraged to complete and return the survey within two weeks. The final step was a follow-up phone call to encourage participation and collect information for the determination of non-response bias in the final test. Appendix B contains the documentation for the preceding steps.

MEASUREMENT DEVELOPMENT

The development of items to measure the constructs followed an iterative approach utilizing the literature and in-depth interviews. Multi-item measures were used for each of the constructs to alleviate some of the problems associated with single-item measures. The use of multi-item measures tends to increase reliability, decrease measurement error, allows for greater distinction among respondents, and minimizes the specificity associated with each item when multiple items are averaged (Churchill 1979). A response format that increases variability among respondents was used with the items for each of the behavioral constructs. The Likert scale is a popular scale used to measure opinions, beliefs, and attitudes. While there is debate on how many points to include on the Likert scale (e.g., 3, 5, 7), a 7-point scale was used to provide greater opportunity for the respondents to discriminate between the response items.

Questionnaire items were developed based on previous studies from the literature where appropriate and on the personal interviews conducted. Several of the constructs have been previously tested in the channels, marketing, logistics, and strategic management literatures. However, since the logistics leverage process has not previously been measured, new measures were created in some instances for this study. Once the pool of items was generated for each construct, the questionnaire was subjected to review in two stages. The first stage consisted of presenting a detailed questionnaire to a panel of professional and academic experts within the logistics field to determine content and face validity. They reviewed the items to determine if they were vague, confusing, misleading, or double-barreled. Minor modifications were made to the questionnaire in regards to instructions, item wording, and question order based on the recommendations

of these experts. The second stage consisted of conducting a pretest and administering the items to a sample of respondents (reflecting the target population) to further refine the items. The methodology for developing measures was based on the guidelines provided by Churchill (1979), Dunn, Seaker, and Waller (1994), and Mentzer and Flint (1997). The next section provides information related to how the constructs were operationalized in this study.

Construct Operationalization

The eight constructs in the logistics leverage process model were defined and discussed in Chapter 2. Existing measures were adopted and/or adapted from previous studies for five of the constructs in the model including process capabilities, value-added service capabilities, logistics performance, competitive advantage, and firm performance. New measures were created for three of the constructs including relational capabilities, resource commitment, and marketing signals of value. These measures were developed from the in-depth personal interviews with logistics professionals. A total of 38 new items were generated for this study. Together, these eight constructs comprise the broader process of logistics leverage and have to be measured to determine the resources and factors that lead to the creation of logistics leverage as well as the value of communicating a firm's capabilities and performance in logistics. The definitions of these constructs and the measures appropriate for this study are presented next. A summary of this information is included in Appendix C.

Resource Commitment

The definition for resource commitment was adapted from Day (1986) and is defined as *the adequate level of resources allocated to the pursuit of logistics operations*. Fourteen items were developed for the pretest that reflect the types and level of resources a firm may commit to its logistics operations. Interviewees indicated financial, facility, transportation, and human resources as necessary resources to achieve excellent and superior logistics performance. A few of the items also represented the interviewees' thoughts on the role of senior management in allocating resources and supporting the logistics operations of the firm.

Process Capabilities and Value-Added Service Capabilities

The process and value-added service capability constructs tested by Lynch, Keller, and Ozment (2000) were based on the 32 logistics performance capabilities identified in the study by Michigan State University (1995). The authors used a panel of experts to group the initial dimensions of logistics capabilities into two groups: process capabilities and value-added service capabilities. The items included in this dissertation were the surviving capabilities of the factor analysis performed by Lynch, Keller, and Ozment (2000). The definitions for process and value-added service capabilities are derived from the basic definition for capabilities proposed by Day (1994) and the study by Lynch, Keller, and Ozment (2000). Process capabilities are defined as *the logistics skills and knowledge of a firm that allow it to focus on simple, consistent, efficient, and proactive processes*. A seven-item scale for this construct was adapted from Lynch, Keller and Ozment (2000). Value-added service capabilities are *the logistics skills and*

knowledge of a firm that allow it to focus on and provide value to the customer. A five-item scale developed by Lynch, Keller, and Ozment (2000) was adapted and used in this study.

Relational Capabilities

The definition for relational capabilities was based on the definition for capabilities by Day (1994) as well as information provided during the in-depth interviews. This construct is defined as *the enhanced logistics skills and knowledge of the firm through the sharing of resources with another firm*. Ten items were developed for the relational capability construct from the qualitative phase of the study that were believed to capture the essence of the construct. Since this construct relates to resources that may be shared between partners, respondents were asked to think about relationships formed with suppliers and/or third-party suppliers for the purpose of sharing and/or acquiring logistics resources. The items incorporated information technology, human, transportation, facility, network optimization and other resources that a firm may need to enhance its logistics operations.

Logistics Performance

Logistics performance is defined as *the degree of efficiency, effectiveness and differentiation associated with performing logistics activities*. The initial measures for each of the three dimensions developed by Smith (2000) were adapted for this dissertation to determine reliability. Logistics efficiency refers to *how well the logistics resources of the firm are utilized* and was measured by having respondents rate their firm's performance on various logistics activities such as orders shipped on time and

inventory turns per year. This dimension was measured by six items. Logistics effectiveness is *the degree to which a firm's logistics goals are achieved*. The five items for this dimension included logistics cost components for which respondents compared their actual performance to budgeted performance. Logistics differentiation is *the perceived difference in logistics performance when evaluated against competitors* (Smith 2000). For this dimension, respondents compared their performance to competitors they had experience with on logistics activities such as line item fill rate, on-time delivery, and order cycle time. Even though the logistics performance construct was not a focus of the qualitative phase, two items were identified by interviewees as measures for evaluating their performance against the competition. These two items were damage free deliveries and on-time delivery and were added to the six logistics differentiation measures developed by Smith (2000).

Marketing Signals of Value

Signals of value were identified by Porter (1985) as the indicators a firm uses to send signals to customers as to the value the firm creates. The marketing signals of value construct incorporated in the logistics leverage process model was adapted from this definition and refers to *the indicators a firm uses to send signals (i.e., to communicate) to customers as to the value that can be created by the firm's logistics capabilities*. Twelve new items were included in the study to represent to what degree firms communicate their logistics capabilities and processes to their customers. These items attempted to capture who in the firm was involved in the communication process as well as whether

the communication was focused on internal versus external customers and new versus existing external customers.

Competitive Advantage

Competitive advantage was assessed based on recommendations provided by Day and Wensley (1988). Two methods to assess advantage are to measure customer judgments or measure management judgments. While both methods have strengths and weaknesses, managers' perceptions were evaluated in this study. They can provide greater insight into the skills and resources used to create and sustain competitive advantage. Six measures for competitive advantage were adapted from Stank, Daugherty, and Ellinger (1999). Competitive advantage was measured by asking respondents to rate their performance in relation to their competitors on various firm activities such as meeting anticipated delivery dates on a consistent basis and providing desired quantities of products on a consistent basis.

Firm Performance

As with logistics performance, there are many ways to define and measure firm performance. Firm performance has often been determined by financial data such as return on investments, return on assets, and return on sales. These measures focus on the internal operations of the firm and are generally objective in nature. However, subjective measures, such as managers' perceptions, are also used to evaluate performance. Subjective measures have been found to be valid substitutes for objective data (Venkatraman and Ramanujan 1986) and have been widely used in organizational research (Powell and Dent-Micallef 1997; Powell 1992; Tracey 1998). External

measures of firm performance such as market share and competitive advantage are often based on the perceptions of managers within the firm. This is appropriate since top-level managers are likely to have access to competitive information as well as their firm's position within an industry. Multiple measures, including general profitability, return on assets, return on investment, net profit margin, and market share were utilized in this study to assess the performance of each manufacturing firm. These measures were adapted from Lynch, Keller and Ozment (2000) and Tracey (1998).

PRE-TEST DATA ANALYSES

As previously discussed, the pre-test survey was administered to identify potential problems with the design of the survey as well as to test the measures for each of the constructs in the theoretical model. The following procedures and analyses performed for the pre-test study were also performed for the final study. The results of the pre-test data analyses are presented in Appendix D.

Data Integrity

The data for the pre-test and the main survey were manually entered by the primary researcher and by a research assistant. The two sets of data for each test were compared in Excel for differences. All discrepancies were investigated by referring to the original surveys and entering the correct responses. In addition, three constructs (i.e., resource commitment, marketing signals of value, and logistics efficiency) had several negatively-worded items that required reverse coding. These items were checked to

ensure correct coding on both data sets before comparisons were made. The surveys were also examined for respondent errors including providing more than one response for an item, circling one answer for an entire section of items, and other potential problems that would jeopardize the integrity of the data.

Sample Characteristics

The respondents represented many different manufacturing industries including the food (26%), medical (12%), automotive (6%), pharmaceutical (5%), chemical (5%) and many other industries that each accounted for 1.5% of respondents. Since many firms involved in manufacturing may operate multiple strategic business units, respondents were asked to identify whether they were part of a self-contained company or a business unit of a larger organization. Seventy-four percent of the respondents indicated they were part of a strategic business unit. Of this seventy-four percent, 61% were involved with 3 or less business units, 18% with 4 to 5 business units and 18% with more than five business units. If respondents were involved with more than one business unit, they were asked to think about the one unit that was most representative of the business units in which they were involved when answering the survey questions.

The firms also varied greatly in terms of size, which was measured by number of employees and total sales. Forty-eight percent of firms had 1,000 employees or less while 39% indicated they had between 1,000 and 5,000 employees. Only 12% of firms responding indicated they had more than 5,000 employees. In terms of sales, there was

almost an even split between firms having less than $500 million (53%) and those having over $500 million (47%).

To ensure respondents were familiar with the utilization of logistics resources, respondents were asked to identify the amount spent on logistics operations for the past year. Seventy percent of respondents indicated the largest spending level of more than $251,000. Due to the heaving loading of answers on this response category, this scale was adjusted for the final survey to better capture the distinctions in logistics spending.

Missing Data Analysis

The pretest data were analyzed for missing data in order to identify potential problems with the survey instrument. Missing data were examined for each case (i.e., respondent) and for each variable. Two cases were eliminated from the data set. For case 1, 56% of the data was missing reflecting 30 items with no response and 14 items with a "don't know" response. The second case represented a nonprofit company and had 12 missing values (i.e., 15%). This case also circled a column of answers for three sections resulting in a low confidence level that the individual items in each section were read. This resulted in 64 cases for further analysis.

Of the 78 items on the survey, 38 had no missing values, 14 had one missing value, 12 had between 3 and 7 missing values, and 14 had more than 16 missing values (i.e., representing over 22% of the cases). The items that had less than 8 missing values represented only .5% of all responses and were evaluated to be missing completely at random. The items that had more than 22% missing responses were evaluated for patterns. These items represented two variables: logistics differentiation (i.e., 8 items)

and competitive advantage (i.e., 6 items). In examining the pattern of missing values, it became apparent that many respondents circled the "don't know" response that was provided as an answer alternative for all 14 items. Thirteen respondents indicated this answer for logistics differentiation items and 15 respondents did the same for the competitive advantage items. To determine if there was a commonality among the respondents that answered "don't know," the demographic data were examined for patterns. No patterns were discerned except that 62% of respondents answering "don't know" for logistics performance items (93% for competitive advantage items) indicated logistics dollars spent by the organization as greater than $251,000. Since the scale for this item was not large enough to capture the spending distinctions and no other patterns were identified, it was concluded that these respondents were not uniquely different and kept as part of the sample.

Scale Purification

The measures for each variable were tested for unidimensionality to verify the existence of one latent construct underlying a set of measures (Hattie 1985). Principle Component Factor Analysis with a Varimax rotation was used to measure unidimensionality. This approach provides a stricter interpretation of unidimensionality than other methods such as exploratory factor analysis, item-total correlations, and coefficient alpha (Gerbing and Anderson 1988). Construct validity was evaluated based on an analysis of convergent and discriminant validity. Each scale was also assessed for internal-consistency reliability using Cronbach's Coefficient Alpha. A high alpha

indicates a good correlation between the item and true scores, while a low alpha indicates the sample of items does a poor job of capturing the construct of interest (Churchill 1979). An alpha above .7 is commonly considered as acceptable for confirmatory studies (Hair et al 1998). Each scale is identified below and a summary of the process incorporated to purify each scale using these approaches is presented.

Process Capabilities (PROCAP)

All seven items loaded on one factor resulting in 49.5% of the variance explained and an alpha of .8225. The weakest loading was for item 7 (i.e., .479), which stated, "our business unit performs reverse logistics operations in a timely manner" and was accompanied by a definition of reverse logistics. Since this item was part of an existing scale used for this study, the item, along with the other six items, was retained.

Value Added Service Capabilities (VALCAP)

The five-item scale loaded on one factor accounting for 56% of the variance explained and an alpha of .8022. All items had a loading above .6 and were retained in the scale.

Relational Capabilities (RELCAP)

The principle components analysis revealed two factors for the 10 item scale. Five items (items 1, 4, 8, 9, and 10) loaded on the first factor, four items loaded on the second factor (items 2, 3, 5, and 6), and item 7 cross-loaded. The first factor appeared to consist of items related to resources a firm would need to develop logistics capabilities that would help the firm better serve its customers. When these items are considered

independently as a scale, the result was one factor with an alpha of .8488 and 63.4% of the variance explained. The second factor consisted of items that could be viewed as resources needed to operate more efficiently. These items, when considered together, also resulted in one factor with an alpha of .7560 and 58% of the variance explained. Item 7 stated, "this relationship provides my firm with resources to monitor competitors' actions" and could be viewed as very similar to item 6, "this relationship provides my firm with resources to react to competitors' actions." Due to the redundancy, this item was eliminated from the scale. In reviewing the other items, items 2 and 4 were reworded to result in greater consistency with the wording of the other items in the scale. Since this scale was a new scale developed from the interview information, it was determined that the remaining items should be retained and tested with a larger sample to determine if two dimensions of the construct exist. Item 7 was the only item eliminated leaving 9 items for the final scale.

Resource Commitment (RESCOM)

The principal components analysis for the 14 item scale resulted in three factors with seven items loading on the first factor (items 1, 4, 6, 8, 11, 13, and 14), four items on the second factor (items 5, 7, 10, and 12) and three items on the third factor (items 2, 3, and 9). Beginning with the third factor, items 2 (i.e., "my business unit does not have sufficient facilities to support logistics plans") and 3 (i.e., "my business unit has sufficient transportation equipment to support logistics plans") could have loaded together due to the similarity of the wording of the items. Respondents may also have viewed these two items as external to the firm considering the question asked respondents to think about

the internal resources of the firm that may be committed to logistics operations. Eliminating both of these items resulted in a two factor solution with item 9 shifting to factor 1.

In examining the second factor, item 5 had the highest loading (i.e., .769). Upon examination, item 5 did not appear to support the definition of the construct well. In addition, item 12 may have been vaguely worded (i.e., "systems"). When these additional two items were eliminated, the result was one factor with all loadings above .6, 53.8% of the variance explained, and an alpha of .8991. While a one factor solution is desirable for unidimensionality, the elimination of items 2 and 3 would result in respondents considering a narrower range of resources than a firm may need in developing logistics capabilities. These two items were retained and reworded to be more consistent with the wording of the other items in the scale. In addition, the question stem was reworded to allow the respondent to think about the "firm's resources" and not "internal resources" only. In examining the remaining items, it was also determined that item 11 represented a possible future action by the firm where as the rest of the items reflected past or current actions. Since this item represented the technology dimension and there were other items that captured this idea, item 11 was eliminated. A total of three items (5, 11, and 12) were eliminated from the scale resulting in 11 items for the final scale.

Marketing Signals of Value (SIGVAL)

The 12 items for this scale loaded on three factors with five items (items 1, 2, 3, 7, and 10) loading on the first factor, five items (items 4, 5, 6, 9 and 12) on the second

factor, and two items (8 and 11) on the third factor. The analysis began with item 11 (i.e., "my firm's decision-makers are frequently reminded of the impact on performance of our logistics capabilities") since it had the highest loading (i.e., .8) on factor 3. This item reflected a different idea upon examination of the rest of the items. It related to an outcome of logistics capabilities and was not viewed as consistent with the definition of marketing signals of value. Item 11 was eliminated from the scale. After the elimination, the principle factors analysis identified two components resulting in the same items loading on each factor except that item 8 loaded on the second factor. In examining the items for each factor, two dimensions appear to exist for the construct. The first factor reflects communications or promotions to customers, which is more consistent with the definition of the construct. When considered independently, this scale resulted in an alpha of .8666 with 65.7% of the variance explained. For the second factor, items 4, 5, and 8 reflect communications about logistics capabilities within the firm and items 6, 9, and 12 reflect communications to the firm's external customers. The items for factor 2 accounted for 56.4% of the variance explained and resulted in an alpha of .8351. Since this was a new scale based on the in-depth interviews, it was determined that the two dimensions of the construct should be maintained and examined further in the final study. Only item 11 was eliminated leaving 11 items for the final scale.

Logistics Differentiation (LOGDIF)

The eight items for this scale loaded on one factor and explained 59.8% of the variance. All loadings were above .6 and were retained. The resulting coefficient alpha was .8767.

Logistics Efficiency (LOGEFF)

The principle components analysis resulted in one factor with all loadings above .5 and 42.3% of the variance explained. All six items were retained and coefficient alpha was .7083. Changes were made to four of the items (items 1, 2, 3 and 6) based on the means for each item. With the improved logistics operations of many firms today, the ranges of the scales were not acutely capturing the distinctions among the respondents. On a scale from 1 to 7, the means were 6.28, 5.97, 5.87 and 5.1 for items 1, 2, 3, and 6 respectively (e.g., item 6 was reverse coded). The scales for items 1, 2, and 3 were changed from a range of <50% to 95-100% to a range of <89% to 100%. The scale for item 6 was changed from an end point of "less than one day" for average order cycle time to "1 day or less." Originally, respondents did not have an answer choice if their average order cycle time was one day.

Logistics Effectiveness (LOGETV)

The five items loaded on two factors with only item 1 loading heavily on factor 2 (i.e., .969 loading). The first factor of four items resulted in a coefficient alpha of .8454 and explained 55.06% of the variance. Since this scale was an adapted scale and the sample size was small, all items were retained to test with a larger sample.

Competitive Advantage (COMPADV)

All six items loaded on one factor with all factor loadings above .6. The coefficient alpha was .9099 and 61.6% of the variance was explained. All items were retained.

Firm Performance (FIRMPER)

All five items loaded on one factor with all factor loadings above .6. The coefficient alpha was .9229 and 77% of the variance was explained. All items were retained. A confidentiality statement was added to this question to encourage respondents to provide answers.

As a result of the scale purification process, five items (i.e., RELCAP7, RESCOM 5, 11, 12, and SIGVAL11) were eliminated from the survey. Five constructs were identified as consisting of multiple dimensions. These constructs were Relational Capabilities, Resource Commitment, Marketing Signals of Value, Logistics Efficiency, and Logistics Effectiveness. The multiple dimensions were retained for further testing with a larger sample. Table 3-1 provides an overview of the scale reliability results while Appendix D provides more detailed information regarding the factors for each construct. The documents for the final study are presented in Appendix E.

Table 3-1: Summary of Scale Reliability Results

CONSTRUCT	N ITEMS (Beginning)	N ITEMS (Retained by Factor)	VARIANCE EXPLAINED	COEFFICIENT ALPHA
PROCAP	7	7	49.5%	.8225
VALCAP	5	5	56.0%	.8022
RELCAP	10	5	63.4%	.8488
RESCOM	14	7	57.1%	.8690
SIGVAL	12	5	65.7%	.8666
LOGDIF	8	8	59.84%	.8767
LOGEFF	6	6	42.31%	.7083
LOGETV	5	4	55.06%	.8454
COMPADV	6	6	61.66%	.9099
FIRMPER	5	5	77.02%	.9229

METHOD OF ANALYSIS

Structural equation modeling (SEM) was used to assess the logistics leverage process model through the analysis of the data from the main survey. SEM is an appropriate technique when multiple relationships among latent variables need to be measured simultaneously, especially when there is more than one dependent variable in the model. The two-step approach recommended by Anderson and Gerbing (1988) was used to examine the constructs and their relationships as identified in the theoretical model. The first step involved assessing the measurement model that specifies the indicators (i.e., observed measures) for each latent construct. The measurement model can be thought of as a single, multiple-factor confirmatory factor analysis (CFA) (Loehlin 1998). CFA was used to test the measurement model and provide an assessment of construct validity and reliability. Construct validity refers to the correspondence between a measure and its underlying construct and can be assessed through convergent and discriminant validity (Campbell and Fiske 1959). Cronbach's coefficient alpha is commonly used to estimate internal consistency reliability and was used in this study (Cronbach 1951). Low alpha scores indicate the items perform poorly in capturing the construct of interest.

The second step of the process involved testing the structural model that specifies the causal relationships among the latent constructs. The correlation matrix was used to understand the patterns of relationships. The coefficients from the correlation matrix were standardized, providing easier interpretation of the coefficients. The maximum likelihood estimation was used as the estimation procedure. It is recommended that

sample sizes ranging from 100 to 200 be used with this procedure; with 200 proposed as the critical sample size (Hair et al 1998).

The measurement model provides an estimation of both discriminant and convergent validity while the structural model assesses nomological validity. The two-step approach is viewed to be superior to the one-step approach of estimating the measurement and structural models simultaneously. Anderson and Gerbing (1988) indicated the two-stage approach allows significance testing for all pattern coefficients, provides an assessment of whether the structural model achieves acceptable fit, and permits an independent test of the theoretical model under investigation.

Since there is not a single test in structural equation modeling to examine the magnitude of the proposed relationships, many goodness-of-fit measures have been developed. To overcome the weaknesses associated with some of the measures, it has been recommended that multiple measures be used to assess goodness-of-fit (Hair et al 1998; Garver and Mentzer 1999). To determine overall goodness-of-fit, several types of measures can be employed, including absolute fit measures, parsimonious fit measures, and incremental fit measures. Since each type of measure provides a different assessment, measures were selected from each of the three types.

The absolute fit measures identify how well the model (i.e., structural and measurement) predicts the observed covariance/correlation matrix. The likelihood-ratio chi-square statistic and the root mean square error of approximation (RMSEA) were selected to assess absolute fit. Low chi-square values, with significance levels > .05 or .01, provide evidence that there are no statistically significant differences between the actual and predicted input matrices. The chi-square test only indicates there is a good fit

between the proposed model and the covariances and correlations; it does not indicate that the proposed model is the best model (Hair et al 1998). Due to the sensitivity of the chi-square statistic to large sample sizes, the RMSEA was selected because of its appropriateness for use with large samples in a confirmatory model test. The RMSEA considers the goodness-of-fit of the model as if it were estimated in the population. Acceptable values range between .05 and .08 (Hair et al 1998).

In addition to the above measures, two additional measures, the noncentrality parameter (NCP) and the expected cross-validation index (ECVI), were examined. These measures are appropriate for comparing alternative models with the NCP being less sensitive to sample size than the Chi-square measure, and the ECVI providing an estimation of the goodness-of-fit that could be achieved in a different sample of the same size (Hair et al). While value ranges are not specified, lower values for these measures are desired.

Incremental fit measures compare the structural model to a null model. The Tucker-Lewis Index (i.e., nonnormed fit index (NNFI)), the comparative fit index (CFI), and the normed fit index (NFI) were used to examine incremental fit. The Tucker-Lewis Index measures the parsimony between the null model and the proposed model through a comparison of the degrees of freedom. The CFI and NFI also represent comparisons between the proposed and null models with values ranging between 0 and 1.0. It is recommended that the values for all three measures exceed .90 (Hair et al 1998).

The final set of measures, the parsimonious fit measures, allow for comparisons to be made between the goodness-of-fit of the model and the number of coefficients required to achieve a particular level of fit. The parsimonious goodness-of-fit index

(PGFI) and the Akaike information criterion (AIC) were calculated to determine the parsimony of the proposed model. Higher values (i.e., closer to one) of the PGFI measure indicate greater model parsimony while lower values of the AIC suggests greater parsimony.

In addition to the calculation of the goodness-of-fit statistics, the model was examined for association with the proposed theory. It was assessed in terms of whether the relationships in the logistics leverage process model were found to be statistically significant, if the hypothesized directions of the relationships were supported, and whether competing models provided additional insight for the theory. The results of the analyses are provided in Chapter 4.

SUMMARY

This chapter has described the research methodology used to test the relationships conceptualized in the logistics leverage process model. The research design was presented, including the sampling plan and the data collection methods for the pretest and the final test of the survey instrument. Measurement issues were discussed next, including the operationalization of the constructs and the development of the scales for each construct. The results of the pretest were presented including the scale purification process. Finally, structural equation modeling as the selected method of analysis for the model was discussed. The results of the analyses of the logistics leverage process model are presented in Chapter 4.

CHAPTER 4 - FINDINGS AND ANALYSES

This chapter presents the results of the data analyses of the survey instrument described in Chapter 3. First, the data are examined and information is provided in relation to the response rate, missing data, demographic characteristics, and descriptive characteristics of the final sample. Next, the scale confirmation process is discussed including the unidimensionality, convergent and discriminant validity, and reliability associated with each of the constructs in the logistics leverage process model. Finally, the results of the measurement and structural model analyses are presented, followed by the testing of the hypotheses.

DATA EXAMINATION

Response Rate

As discussed in Chapter 3, a total of 579 contacts agreed to participate in the survey and 243 completed surveys were returned. Twenty surveys were returned and eliminated for lack of completion due to various reasons identified in Chapter 3. This resulted in an effective response rate of 43.5% (243/579-20). Non-response bias was tested through two methods. The first method involved testing the different waves of surveys based on their return dates using an independent samples t-test for equality of means (Armstrong and Overton 1977). The surveys were mailed during two different time periods (i.e., T1 and T2) in two waves for each time period. Therefore, the two waves representing early and late respondents were compared for each time period and all four waves representing both time periods were compared. The results of the t-test for

T1 indicated that the means for 6 items between the first and second wave of the mailings were significantly different. The six items were SIGVAL6 and 7, LOGDIF1, 6, and 8, and LOGEFF3. The results of the t-test for T2 revealed only one item had statistically different means (i.e., LOGEFF5), as did the results for the comparison between T1 and T2 (i.e., VALCAP5). With an alpha of .05, four or less instances of significance could be attributed to chance, suggesting the results of T1 could be of concern. However, the primary comparison test between T1 and T2, and the comparison between the waves for T2, support the hypothesis that the groups are not significantly different.

The second test of non-response bias involved randomly selecting 30 non-respondents to respond to five substantive items (Mentzer and Flint 1997). Each of the five items selected represented different constructs and were selected based on the ability of the item to capture the construct of interest. The independent samples t-test for equality of means revealed significantly different means for two of the five items. For RESCOM1, the mean was 5.47 compared to a mean of 4.73 for the original data with a significance level of .013. For SIGVAL3, the mean was 5.17 compared to a mean of 4.28 for the original data with a significance level of .005. The test for the other three items (i.e., PROCAP6, VALCAP2, and RELCAP1) revealed no significant differences. The two items for which significant differences were found represent only one item each for the two constructs with the greatest number of items (i.e., 11 items for both RESCOM and SIGVAL). It may have been easier for respondents to agree with each item taken out of the context of the survey. In addition, the respondents did not have the opportunity to read at their own pace the instructions for each set of questions. The implication of the independent t-test analysis relates to the ability to generalize the results to the population.

Missing Data

The data set was examined for degree and patterns of missing responses for cases and variable items. Of the 243 returned surveys, 180 were complete with no missing data. Seventeen cases contained more than 10% missing values and were eliminated from the data set. A total of 226 cases were left for further analysis. The final study included 73 items, representing the eight constructs of interest. The analysis revealed 12 items had no missing values, 13 items had only one missing value, 38 items had between 2 and 10 missing values, and 10 items had between 11 and 16 missing values. The items with the highest number of missing values represented the construct firm performance. This may be due to the unwillingness or lack of comfort or knowledge with answering questions related to firm performance. Thirteen respondents did not answer all five items related to this construct. The total number of missing responses represents .02% of the total responses. The missing responses were determined to be missing completely at random through Little's MCAR test ($\chi^2 = 3495$, df = 3317, p-value = .016).

The expectation maximization (EM) method was used to estimate and replace missing values for the remainder of the cases. When compared to other methods, such as pairwise and listwise options, the EM method introduces the least amount of bias into the estimation of the model. The EM method is a two-stage method in which the first stage determines the estimates of the missing data and the second stage identifies the estimates of the parameters (i.e., mean, standard deviations, or correlations) (Hair et al 1998). This iterative process continues until there are insignificant changes in the estimates at which point the missing data are replaced.

Demographic Characteristics

Of the 243 respondents, 74% represented a business unit of a company while the remainder represented a self-contained company. Of the 74% of respondents, 35% were involved with only one business unit, 28% with two to three business units, and 35% with more than 4 business units. The largest percentage of respondents represented the food (14%), automotive (9%), chemical (5%), pharmaceutical (4.5%), consumer goods (4%), computers (3.3%), electronics (3.3%), and medical devices (2.5%) industries. These firms also varied in terms of size as measured by number of employees and sales. Approximately two-thirds of the firms (32.9%) had more than 4000 employees while only 9.5% had less than 100 employees. The largest categories of sales fell in the $1-$5b range (28.8%) followed by the $501m-$1b range (20.6%) and the $100-$500m range (20.2%). There was also a good distribution of responses regarding dollars spent on logistics operations. Almost 30% indicated their firms spent more than $100 million on logistics, while 15.2% spent between $50-100 million and only 3.3% spent less than $1 million. It appears that the new scale for this question better captured the differences among the respondents on logistics dollars spent.

Descriptive Statistics

Analyses were conducted to ensure the assumptions inherent in structural equation modeling were met. Specifically, the data were examined for the presence of outliers and the condition of normality through an examination of the means, skewness, and kurtosis levels associated with each item. The statistics for these tests are included in

Appendix F. The Mahalanobis D^2 measure was used to identify potential outliers among the cases. This measure examines each observation's position in comparison to the centroid of all observations for a set of variables. One observation (243) was identified as statistically different and eliminated from the data set resulting in 225 cases for further analysis.

There were 73 items in the final study serving as indicators for the constructs in the structural model. All items were measured by a 7-point Likert scale. The mean values for the items ranged from 3.35 to 5.76 and the standard deviations ranged from 1.005 to 1.938 (Appendix F). For 23 of the 73 items, the means were greater than 5 and slightly skewed to the high-end of the scale. The mean values for these 23 items were between 5.00 and 5.76 and 19 of the items represented measures from existing scales. The results of the normality tests suggested the data were normally distributed. The highest levels of skewness (-1.618) and kurtosis (2.434) were identified with the same item, PROCAP1, which also had the highest mean (5.76). The complete range of responses (1 to 7) were represented in the data for this item; however, 88% of respondents agreed with the statement. This item asked respondents to indicate the degree to which their business unit seeks to attain the lowest total cost logistics through efficient operations, technology, and/or scale economies. It would be difficult for respondents to disagree with this statement since a focus of most manufacturers is to reduce costs in logistics as well as other areas of the firm. In addition, respondents are given three methods for reducing costs in the question which also increases the probability of agreement with the statement. To determine the impact of this one item on the scale for the construct, skewness and kurtosis levels were examined. The results

indicate a negatively skewed (-1.161) and kurtotic (1.301) scale. Since this item was part of an existing scale, it was analyzed further in the scale confirmation process.

The second highest level of skewness (-1.525) and kurtosis (2.027) was identified with LOGEFF6, which inquires about the firm's average order cycle time. All possible responses were identified for this item with 21.3% and 50.7% of respondents indicating an average order cycle time of 20-25 days and 26-30 days respectively. In examining the industries in which the manufacturing firms compete, it is not surprising that a large percentage of the firms would have order cycle times in these ranges. The skewness and kurtosis for the Logistics Efficiency scale was -.488 and .054 respectively. This item was kept for further analysis.

The only other items to cause concern were for the construct Marketing Signals of Value. Eight out of 11 items were identified as having a kurtosis value greater than -1 (range -1.013 to -1.146). An examination of the scale for the construct revealed skewness and kurtosis levels that were acceptable (.269 and -.427 respectively). These items were further analyzed in the scale confirmation process.

SCALE CONFIRMATION

As the first stage of the structural equation modeling analysis, the initial unconstrained measurement model consisting of all 73 items was examined. The results revealed the model was a good fit with the data (X^2=4949.97, df 2520, CMIN=1.964, CFI=.950, RMSEA=.066) suggesting that further analysis was appropriate. This model is presented in Appendix H.

The test for unidimensionality identifies if a set of indicators underlies a specific latent construct identified in a theoretical model. It is an assumption of the reliability of the construct and can be assessed through an examination of convergent and discriminant validity (Gerbing and Anderson 1988; Garver and Mentzer 1999; Hair et al 1998). Since the analyses of the constructs in the pretest suggested a lack of unidimensionality for several of the constructs, a factor analysis was performed in SPSS to examine these issues with the final study data. The variance extracted by the factors and construct reliability were examined to determine if there were multi-dimensional constructs. The factor analysis resulted in one factor for six of the 10 constructs (Process Capability, Value-Added Services Capability, Relational Capability, Logistics Effectiveness, Competitive Advantage, and Firm Performance). The results of the factor analysis for each construct are presented in Appendix G. Each of these constructs, along with the multidimensional constructs, will be discussed next. This is followed by an analysis of the confirmatory measurement model in order to provide further support of convergence and discriminant validity.

Unidimensionality

Process and Value-Added Services Capability

The factor analysis for both the Process Capability (PROCAP) and Value-Added Services Capability (VALCAP) constructs resulted in a one factor solution for each construct. The total variance explained by the PROCAP scale was 54.720% and the coefficient alpha was .8575. All factor loadings were above .5. The item PROCAP1 was examined further due to the high levels of skewness and kurtosis identified earlier. When

eliminated from the scale, the total variance explained improved slightly; however, the reliability of the scale was not improved. Based on this information, and that the item was adapted from an existing scale, PROCAP1 was retained for further analysis. The total variance explained for the VALCAP construct was 58.052% with all loadings above .7 and the coefficient alpha was .8191.

Relational Capability

In the pretest, two factors were identified for the Relational Capability (RELCAP) construct, which were retained for analysis with the larger final data set. The factor analysis for the final data resulted in one factor with all loadings above .5 with the exception of item 3 (.448). The reliability for the scale was .8460. When item 3 was eliminated from the scale, the total variance explained increased from 45.608% to 49.325% and the reliability for the scale increased to .8503. Since Hair et al (1998) suggested that loadings above .4 could be considered important, it was determined the item should be retained at this point to more fully tap the definition of the construct.

Resource Commitment

The analysis resulted in three factors for the Resource Commitment (RESCOM) construct. The patterns of item loadings were the same as those of the pretest and verified the multi-dimensional characteristics of the construct. The first factor contained six items (1, 4, 5, 6, 7, and 11), which related to the financial and human resources or "soft" resources of the firm. The three items (8, 9, and 10) on the second factor related to technological investments, while the two items (2, and 3) on the third factor related to facilities and transportation equipment or "hard" resources. When items 2 and 3 were

eliminated, items 8, 9 and 10 continued to load on factor two, supporting the distinction of the factors. When examined independently, each factor resulted in explaining more than 64% of the variance and achieving an alpha of greater than .6. Since these resources were identified in previous research (Mentzer and Williams 2001) and in the in-depth interviews, the items were retained for further evaluation in the structural equation modeling process.

Marketing Signals of Value

The factor analysis for the Marketing Signals of Value (SIGVAL) construct resulted in the identification of two factors. The first factor consisted of 6 items (1, 2, 3, 7, 8, and 10) and the second factor consisted of 5 items (4, 5, 6, 9, and 11). The loading patterns for these two factors were consistent with the patterns for the pretest analysis, suggesting two dimensions of the construct. The first factor represents communication about the firm's logistics capabilities with external customers, while the second factor predominately represents meetings between the firm and its internal and external customers. The first factor explained 61.54% of the total variance, while the second factor explained 62.04%. The first factor had a coefficient alpha of .8724, compared to .8448 for the second factor. Since the definition of the construct relates to communication about the firm's logistics capabilities to its customers, the first dimension consisting of six items was retained for further analysis.

Logistics Performance

The Logistics Effectiveness (LOGEFV) scale was the only scale for the three dimensions of Logistics Performance to result in a one factor solution. All loadings were

above .7 with the exception of LOGEFV1 at .323, which asked about sales. Even though loadings above .3 meet the generally accepted minimum standard (Hair et al 1998), this item was further examined. When this item was eliminated, the variance explained increased from 54.300 to 66.171 and the coefficient alpha increased from .7645 to .8254. Upon further examination, the item does not support the definition of Logistics Efficiency, which relates to the degree to which the firm's logistics goals are achieved. It could be viewed as a more indirect outcome of successfully achieving the firm's goals. Therefore, LOGEFV1 was eliminated from the scale.

The Logistics Differentiation (LOGDIF) scale asked respondents to compare their firm's performance to competitors' performance on various logistics activities. Since respondents may not be familiar with certain aspects of their competitors' logistics operations, a question was asked at the end of the section to measure their level of confidence in the answers provided for this scale. The analysis revealed a mean of 5.37 with a variance of 1.153 suggesting respondents were fairly confident in their responses. Two factors were identified for logistics differentiation with 5 items (1, 4, 5, 6, and 8) loading on the first factor and 3 items (2, 3, and 7) loading on the second factor. The second factor represented the items in the study by Smith (2000). The items for the first factor appear to represent activities related to customer service, while the items for the second factor relate to internal measures of differentiation. When examined independently, the second factor had a higher level of variance explained at 74.36% and a higher coefficient alpha at .8245. Since two items in the first factor were new items and the second factor represented items from an existing scale, the second factor was retained for further analysis.

The factor analysis for the Logistics Efficiency (LOGEFF) scale also resulted in two dimensions with 4 items (1, 2, 3, & 5) loading on the first factor and 2 items (4 & 6) loading on the second factor. LOGEFF4 asked about the percentage of shipments requiring expediting and LOGEFF6 asked about the average order cycle time in days. These two items were the only items in the scale that were reverse coded. The analysis for factor 1 revealed that only 48.251% of the variance was explained by the 4 items and the coefficient alpha was .6375. The Pearson Correlation Coefficient was examined for items 4 and 6 for the second factor. They were found to be correlated (.257) at a significance level of <.01. These two items were not significantly correlated with items 1 and 2, while item 4 was also not correlated with item 3 and item 6 was not correlated with item 5. Since the items for the second factor were not correlated to all of the items for the first factor, items 4 and 6 were eliminated from the scale.

Competitive Advantage

Similar to the logistics differentiation scale, the competitive advantage scale asked for comparisons to competitors on key logistics activities. A question asking the respondents to indicate their level of confidence in the answers provided was also included at the end of this scale. The mean was 5.24 with a variance of 1.143 suggesting respondents were confident in their answers. The six items for the competitive advantage scale loaded on one factor with all loadings above .6. The total variance explained by the factor was 53.012% and the coefficient alpha was .8200. No changes were made to the scale.

Firm Performance

The factor analysis resulted in a one-factor solution with 71.409% of the variance explained and a coefficient alpha of .8892. Four of the five items had loadings above .9 while item 1 (market share) had a loading of .497.

Convergent Validity

The standardized regression weights (*r*) and the squared multiple correlations (R^2) were evaluated to assess convergent validity for each construct and are presented in Appendix H. The loadings for all 73 items were significant and positive. Thirty-three (45%) of the items exceeded the recommended levels of .7 and .5 for the standardized regression weights and squared multiple correlations respectively (Garver and Mentzer 1999). Seven items had loadings below .5 indicating these items were not strong indicators of the underlying latent constructs. These items were RELCAP3, RESCOM2, 3 and 9, and LOGEFF4, 5, and 6.

RELCAP3 ($r = .358$, $R^2 = .128$) asked respondents to think about a strategic relationship and indicate the degree to which the relationship provided the firm with access to storage/warehouse facilities to serve their markets. This item was also problematic in the pretest. Based on the lack of convergence on the construct and the results of the factor analysis, this item was eliminated.

RESCOM 2 ($r = .468$. $R^2 = .219$) and 3 ($r = .247$, $R^2 = .061$) related to the "hard" resources invested in by the business unit (i.e., warehouse facilities and transportation equipment). These items were also problematic in the pretest and loaded as one component in the factor analysis. With the increase in outsourcing logistics activities,

manufacturing firms may be less willing to make capital investments in these particular logistics areas that do not support the core competency of the firm. These resources may not be viewed as necessary to invest in as opposed to human, financial, and technological resources that were captured by the other two components of the factor analysis. RESCOM9 (r = .453, R^2 = .205) was negatively-worded and asked the question, "my business unit does not have the right software tools in-house for determining logistics solutions." It was determined that this item was vaguely worded and somewhat redundant with RESCOM10 which indicates the business unit has made technological investments towards integrating logistics systems with customers. RESCOM9 could have been viewed as determining logistics solutions for customers rather than within the business unit. The elimination of RESCOM 2, 3, and 9 resulted in an improved fit of the measurement model.

The r and R^2 values for items LOGEFF4 (r = .123, R^2 = .015) and 6 (r = .245, R^2 = .060) support the prior elimination of these items from the scale. These two items loaded on a separate factor in the factor analysis stage and LOGEFF6 was highly skewed and kurtotic. LOGEFF5 (r = .49, R^2 = .240) referred to the inventory turns per year achieved by the business unit. This item was retained for further analysis since it loaded on the first factor for the logistics efficiency scale and did not present any problems in the pretest or other stages of analysis.

The remaining 33 items were lower than the recommended levels with standardized regression weights ranging from .551 to .693 and R^2 values greater than .303. All of the latent constructs were represented by these items. Based on theoretical justification, these items were retained for further analysis.

Discriminant Validity

Discriminant validity was established through an examination of the modification indices in the measurement model. The modification indices are presented in Appendix H. The largest modification index values for the relationships between the constructs and the indicators were examined for model fit improvements. The modification indices indicated potential problems with a few of the Marketing Signals of Value items. SIGVAL1 had a high modification index and wanted to load on seven out of the ten constructs in the model. This item asked, "when soliciting new business, my firm's salespeople use our logistics capabilities as a selling point." It was determined that with the removal of this item, the substantive content of the construct would not be lessened due to the similarity of this item with other items in the scale. In addition, the measurement model fit was significantly improved. There was also a modification index above 10 for SIGVAL9 and SIGVAL11 which further supports the prior elimination of these items.

As a further test of discriminant validity, the correlations for the exogenous constructs were also examined since high correlations may mean there is no discrimination in what is being measured by the constructs. The four exogenous constructs in the study were Process Capabilities (PROCAP), Value-Added Service Capabilities (VALCAP), Relational Capabilities (RELCAP), and Resource Commitment (RESCOM). The results are summarized in Table 4-1. The highest intercorrelation was between the PROCAP and the VALCAP constructs (.887) indicating they may be measuring one latent construct. There were, in fact, high estimated correlations among all three of the capabilities constructs. The lowest intercorrelation was between RELCAP

Table 4-1: Direct Structural Model Correlations of Exogenous Variables

Path			Estimate	Significance
Pro Cap	<-->	Val Cap	0.887	0.000
Val Cap	<-->	Rel Cap	0.633	0.000
Rel Cap	<-->	Res Com	0.476	0.000
Pro Cap	<-->	Res Com	0.618	0.000
Val Cap	<-->	Res Com	0.665	0.000
Pro Cap	<-->	Rel Cap	0.493	0.000

and RESCOM. A possible explanation is that the three capability constructs are dimensions of a second-order construct related to logistics capabilities. The real distinction among the exogenous variables is between capabilities and resources. This is supported in the literature on the resource-based view of the firm as well as by the definitions for capabilities and resources.

To summarize the scale purification process, eighteen items were eliminated from further analysis. During the factor analysis stage, four constructs were identified as multi-dimensional. These constructs were Resource Commitment, Marketing Signals of Value, Logistics Differentiation, and Logistics Efficiency. Based on theoretical reasons and analyses, SIGVAL4, 5, 6, 9 and 11, LOGDIFF1, 4, 5, 6, 8, and LOGEFF4 and 6 were eliminated as second factors resulting in unidimensional constructs. The factor analysis for Resource Commitment revealed three dimensions; however, with the elimination of RESCOM2 and 3, two dimensions were left for further analysis and retained based on theoretical justification. The removal of LOGEFF4 and 6 and RESCOM2 and 3 was also supported by the weak loadings in the confirmatory factor analysis (CFA) in AMOS. The results of the CFA are presented in Appendix G.

Table 4-2: Measurement Model Comparisons

	Initial Model	Final Model
Chi-square / df	4949.97 / 2520	2615.89 / 1394
RMSEA	.066	.063
Tucker Lewis Index	.947	.964
CFI	.950	.967

The CFA also supported the removal of RELCAP3, RESCOM9 and LOGEFV1 due to weak loadings. In addition to these items, SIGVAL1 was eliminated due to a lack of discriminant validity as reflected in the modification indices. Two other items (i.e., PROCAP1 and LOGEFF5) were further analyzed and retained for theoretical reasons. After the elimination of these items, the fit of the measurement model was improved and is identified as the final model consisting of six unidimensional constructs and two second-order constructs. The initial and final measurement models are presented in Appendix H while a comparison of the fit measures for each measurement model is presented in Table 4-2.

STRUCTURAL MODEL ANALYSIS

Before testing the structural model and hypothesized relationships, the logistics performance construct as a second order construct consisting of logistics differentiation, efficiency, and effectiveness was tested. The first order logistics structural model, in which the effect of logistics differentiation, logistics efficiency, and logistics effectiveness on competitive advantage was directly measured, was compared to the theoretical second order model as proposed earlier in the dissertation. A third model was

also evaluated (i.e., the alternative logistics model) in which differentiation, efficiency, and effectiveness were set as antecedents to logistics performance. The fit statistics for each model is presented in Table 4-3 while the models and the path estimates are presented in Appendix H.

As depicted in Table 4-3, the first order logistics model had good fit, but the fit of the more parsimonious second order logistics model was significantly better when comparing the goodness-of-fit measures. The chi-square measure, along with two parsimonious fit measures (i.e., the parsimonious normed fit index (PNFI) and the Akaike information criterion (AIC)), were selected based on their applicability in comparing competing models. The second order model had the lowest chi-square value and the best performance on both the PNFI and the AIC. In addition, the comparative fit index (CFI) was above .9 while the root mean square error of approximation (RMSEA) was below the acceptable level of .8 or less. In addition, the path loadings for the three dimensions of logistics performance in the second order model were all significant and larger than those in the first order model.

In the alternative logistics model, LOGEFV5 (Total Logistics Costs) was used as a proxy measure for logistics performance since there are no direct measures for this construct. A composite score was created for logistics performance using the means of differentiation, efficiency, and effectiveness. LOGEFV5 was significantly correlated (.560, alpha .000) with logistics performance indicating it was a suitable proxy measure. The fit statistics for this model also lend support to the second order model as the best fitting model. Therefore, logistics differentiation, efficiency, and effectiveness were

Table 4-3: Logistics Performance Model Comparisons

	First Order Model	Second Order Model	Alternative Model
Chi-square / df	2129.31 / 1151	1940.67 / 1157	2005.32 / 1142
PNFI	.849	.859	.846
AIC	2477.31	2276.67	2371.32
CFI	.972	.977	.975
RMSEA	.062	.055	.058

viewed to be dimensions of logistics performance and the second order model was used for further analysis.

Structural Model

The proposed structural model consists of two competing routes to achieving competitive advantage. The paths comprising each route are depicted in Figure 4-1 and are identified as A, B, and C. Three models were tested to determine the most parsimonious and best fitting model. Model I (Figure 4-1), the "direct" model, incorporates paths A and B. This model tests a direct relationship between logistics performance and competitive advantage (i.e., path A) while also testing the relationship between logistics performance and marketing signals of value (i.e., path B). Model II (Figure 4-2), the "complete mediation" model, incorporates the marketing signals of value construct as a mediating construct between logistics performance and competitive advantage (i.e., path C). The final model, Model III or the "saturated" model (Figure 4-3), simultaneously tests the direct path and the complete mediation path. The complete structural models for Models I, II, and III are presented in Appendix H.

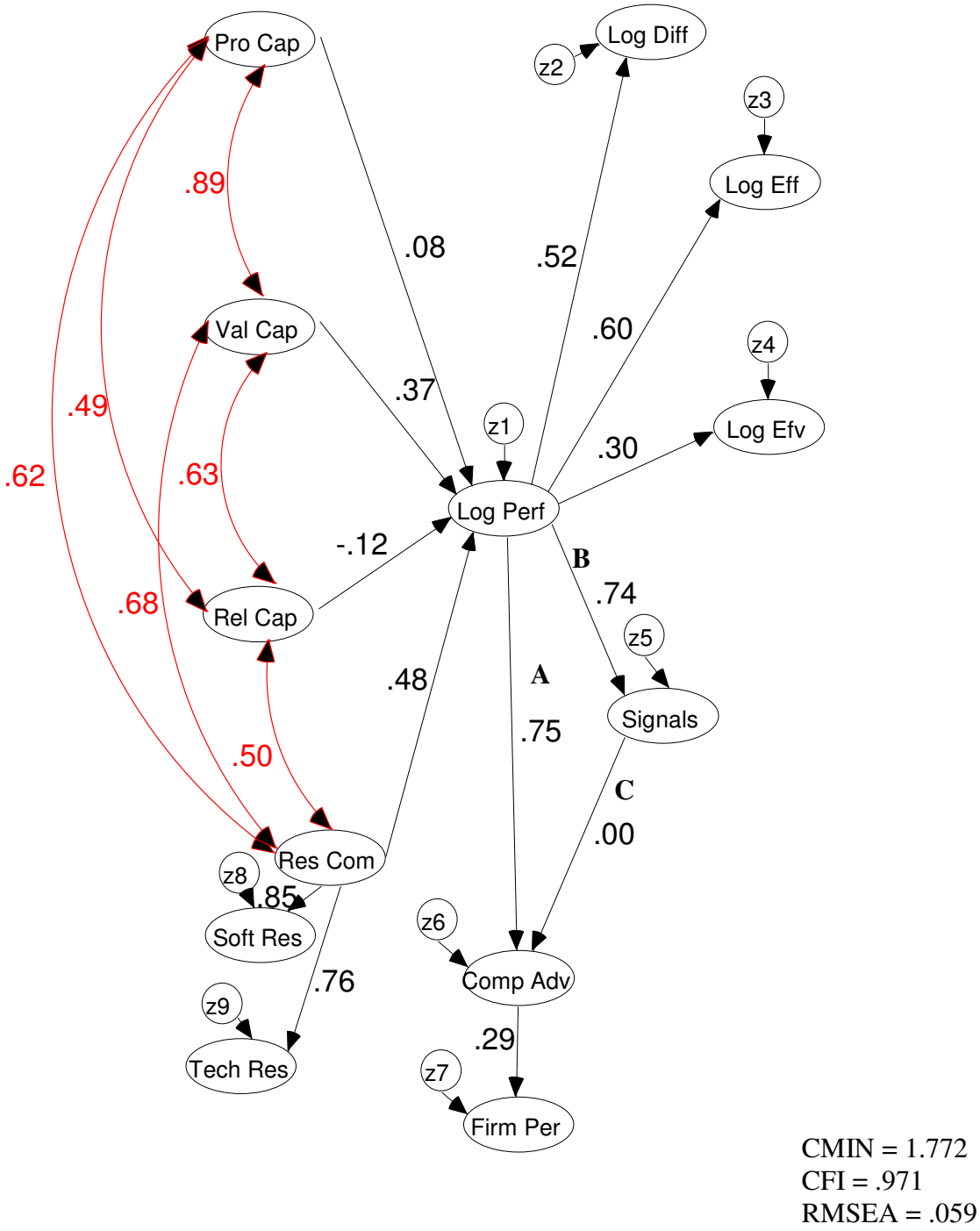


Figure 4-1: Model I – Direct Model

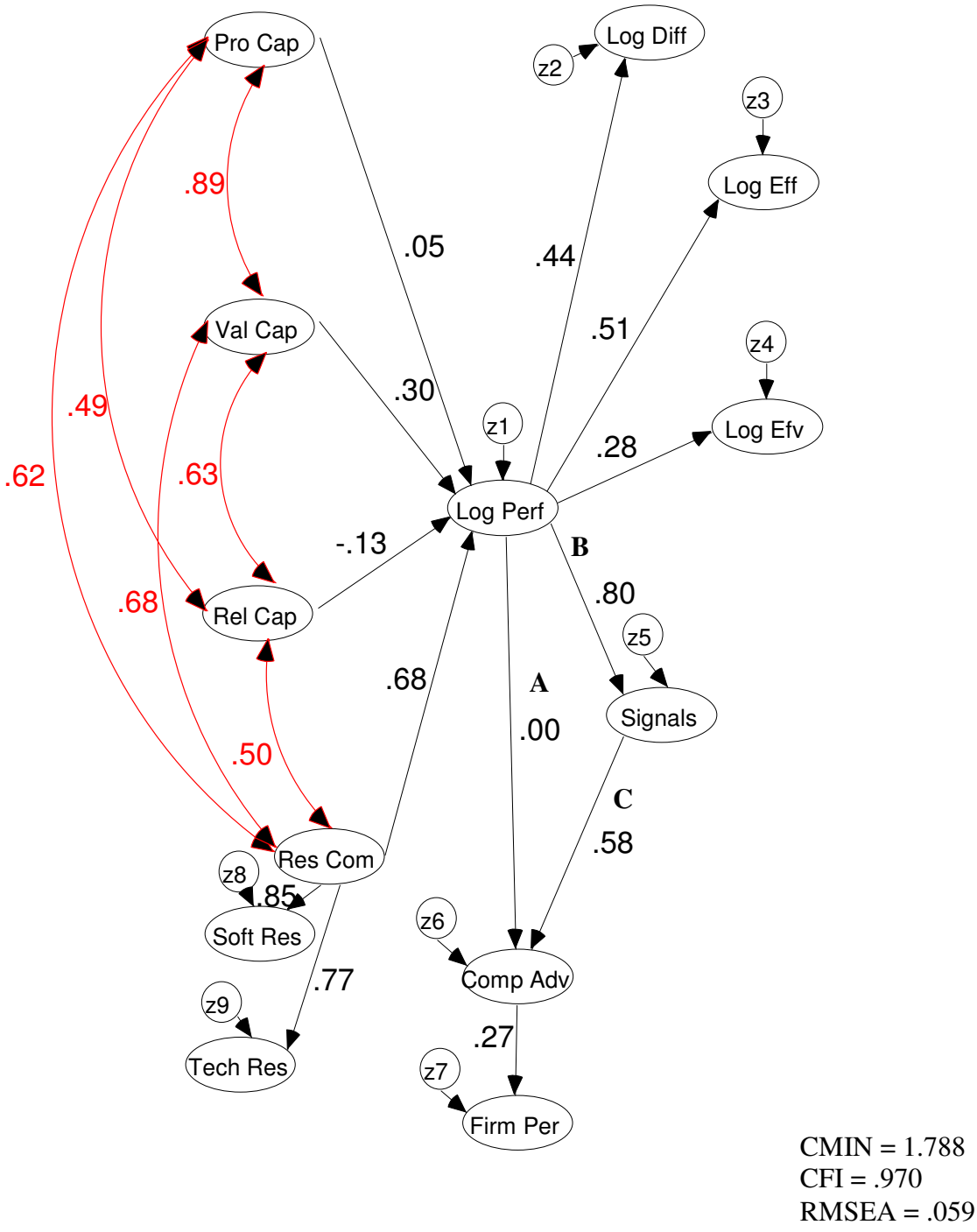


Figure 4-2: Model II – Complete Mediation Model

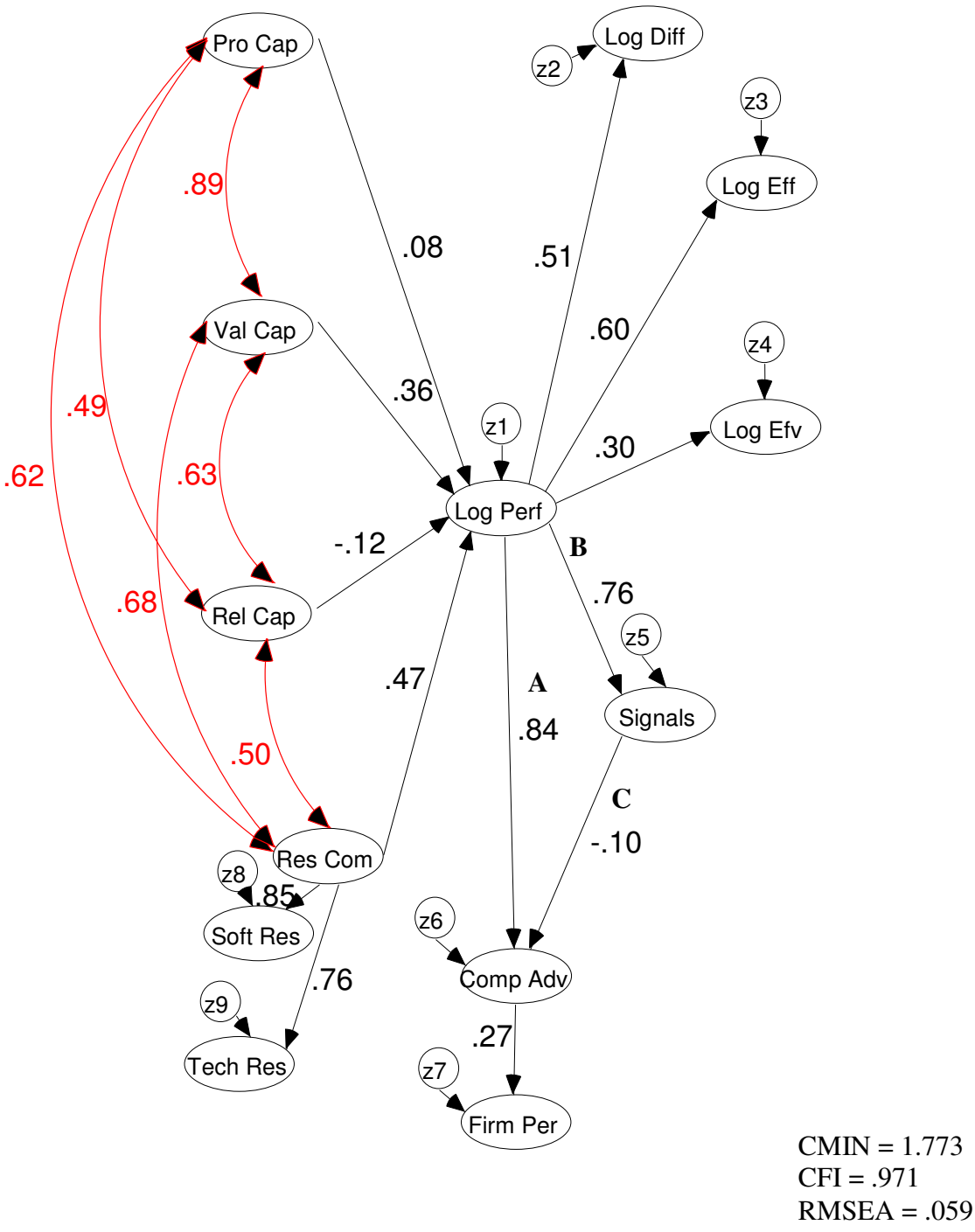


Figure 4-3: Model III – Saturated Model

Absolute, incremental, and parsimonious fit measures were examined to identify the best fitting model. The results depicted in Table 4-4 indicated an acceptable level of fit for each of the three models with the direct model (Model I) and the saturated model (Model III) showing no significant differences in terms of fit. For the absolute fit measures, the Root Mean Square Error of Approximation and the χ^2 values were consistent across the direct and saturated models. In addition, the noncentrality index (NCP) and the expected cross validation index (ECVI) both had their lowest values with the direct model. The incremental fit measures were also fairly consistent across models with both the Tucker-Lewis index (TLI), the normed fit index (NFI), and the comparative fit index (CFI) measures all exceeding the acceptable level of .9. The final set of measures, the parsimonious fit measures, was also similar for the direct and saturated models. The difference between the normed chi-square (CMIN) values for the direct and saturated models was negligible, while the Akaike information criterion (AIC) was slightly lower for the direct model and the parsimonious normed fit index (PNFI) was slightly higher indicating a greater degree of parsimony. In adherence to the rule of parsimony, the direct model was deemed the better model with one more degree of freedom and, thus, was used to test the hypotheses.

Hypotheses Tests

Hypothesis 1: There is a direct, positive relationship between a firm's resource commitment and logistics performance.

The path estimate from RESCOM to LOGPERF of .471 was significant (p = .002) indicating support for the hypothesis.

Table 4-4: Structural Equation Model Fit Measures

	Model I Direct Model	**Model II** Complete Mediation Model	**Model III** Saturated Model
Absolute Fit Measures			
Chi-square / df	2502.456 / 1412	2525.325 / 1412	2502.091 / 1411
RMSEA	.059	.059	.059
NCP	1090.456	1113.325	1091.091
ECVI	12.806	12.908	12.813
Incremental Fit Measures			
TLI	.968	.968	.968
NFI	.936	.935	.936
CFI	.971	.970	.971
Parsimonious Fit Measures			
CMIN	1.772	1.788	1.773
AIC	2868.456	2891.325	2870.091
PNFI	.858	.857	.857

Hypothesis 2: There is a direct, positive relationship between a firm's process capabilities and logistics performance.

The path estimate from PROCAP to LOGPERF of .081 was not significant ($p = .719$) indicating a lack of support for the hypothesis.

Hypothesis 3: There is a direct, positive relationship between a firm's value-added service capabilities and logistics performance.

The path estimate from VALCAP to LOGPERF of .362 was not significant ($p=.204$) indicating a lack of support for the hypothesis.

Hypothesis 4: There is a direct, positive relationship between a firm's relational capability and logistics performance.

The path estimate from RELCAP to LOGPERF of -.123 was not significant (p=.249) indicating a lack of support for the hypothesis.

Hypothesis 5: Logistics performance will have a direct, positive effect on competitive advantage.

The path estimate from LOGPER to COMPADV of .843 was significant (p = .000) supporting the hypothesis.

Hypothesis 6: There is a direct, positive relationship between logistics performance and marketing signals of value.

The path estimate from LOGPERF to SIGVAL of .760 was significant (p = .000) supporting the hypothesis.

Hypothesis 7: There is a direct, positive relationship between marketing signals of value and competitive advantage.

The path estimate from SIGVAL to COMPADV of -.101 was not significant (p = .579) indicating a lack of support for the hypothesis.

Hypothesis 8: Logistics performance has a greater positive effect on competitive advantage when communicated to customers through marketing signals of value than when marketing signals of value are absent.

The direct model (i.e., Model I) tested the relationship between logistics performance and competitive advantage while the complete mediation model (i.e., Model II) tested the relationships among logistics performance, marketing signals of value, and competitive advantage. A comparison of the two structural models revealed better fit for the direct model (X^2=2502.456; df=1412; CFI=.971; RMSEA=.059) than for the complete mediation model (X^2=2525.325; df=1412; CFI=.970; RMSEA=.059). Therefore, this hypothesis was not supported.

Hypothesis 9: There is a direct, positive relationship between competitive advantage and firm performance.

The path estimate from COMPADV to FIRMPER of .288 was significant (p = .001) supporting the hypothesis.

CHAPTER SUMMARY

This chapter presented the results of the data analysis process for the final study. One observation was identified as an outlier and eliminated from the sample leaving 225 cases for analysis. The unidimensionality of the ten constructs (including the three dimensions of logistics performance) in the theoretical model was examined in SPSS and AMOS. The analysis resulted in six unidimensional constructs and four multidimensional constructs. Based on construct definitions and theoretical justification, only one construct (resource commitment) in addition to logistics performance was represented by multiple dimensions in the structural equation model. As suggested by Anderson and Gerbing (1988), the measurement model and the structural model were evaluated separately. The initial measurement model with all items had good fit providing support for additional analysis. The scale purification process identified eighteen items that needed to be removed from the model. Elimination of these items resulted in improved fit of the measurement model.

Prior to the testing of the structural model, the logistics performance construct was tested and confirmed as a second order construct. The analysis of the structural model revealed the direct model (Model I) achieved the best fit of the three models and was more parsimonious than the saturated model (Model III). Model I was used to test the hypotheses resulting in the support of four out of nine hypotheses. The implications

of this study along with contributions and opportunities for future research are discussed in the following chapter.

CHAPTER 5 - CONCLUSIONS AND IMPLICATIONS

This chapter presents the results of the conceptual and empirical examination of the logistics leverage process. First, the research questions guiding the dissertation are reviewed and discussed in light of the findings of the structural equation modeling process and the testing of the hypotheses. Next, the limitations of the study are addressed followed by the contributions to research from both a theoretical and managerial perspective. The chapter concludes with suggestions for future research in the area of logistics leverage.

DISCUSSION OF FINDINGS

The primary goal of this dissertation was to develop and test a theoretical model of the logistics leverage process. Two research issues were identified in the literature, which served as the foundation for the theory. The first issue focused on how a firm can achieve a competitive advantage. It has been acknowledged in the literature and by practitioners that traditional methods for achieving competitive advantage, such as product quality and manufacturing efficiency, are no longer providing a sustainable competitive advantage due to the relative ease of competitors to imitate these methods. The area of logistics has been recognized by firms as an area that not only can improve efficiencies but can also add value to the firm through improved service levels. In addition, the logistics processes and capabilities of a firm are more difficult to duplicate by competitors.

The second issue related to identifying how a firm can determine if it has obtained a competitive advantage. While there has been a great deal of research on the conceptual development of competitive advantage (i.e., Barney 1991; Day and Wensley 1988; Porter 1985), few studies have actually attempted to measure this construct. The strategic management discipline has been predominant in researching this area. Many researchers have focused on identifying the resources and capabilities of the firm that are needed to obtain a competitive advantage (Hall 1993; Hitt and Ireland 1985). The majority of the work examining the areas of logistics capabilities and resources, firm performance, and competitive advantage in some combination has been normative in nature, identifying a need for a deeper theoretical foundation of how logistics can create a sustainable competitive advantage.

The preceding research issues led to the development of the three research questions presented in Chapter 1 which guided the development of the logistics leverage process model. The first question asked, "How can the logistics leverage process be measured within an organization?" A desired outcome of this dissertation was the development of measures for logistics leverage and the empirical test of the achievement of logistics leverage from the company's perspective. Based on the initial studies on logistics leverage and the in-depth interviews, logistics leverage was proposed to be more than a construct. It is the process of achieving competitive advantage through superior logistics operations. This research identified several facilitators and outcomes of the logistics leverage process.

The second question asked, "What are the capabilities or resources that influence the achievement of logistics leverage?" This dissertation expanded on the work by

Mentzer and Williams (2001) by identifying specific logistics capabilities and resources that may lead to improved logistics performance. Four constructs (i.e., process capabilities, value-added service capabilities, relational capabilities, and resource commitment) were identified in the logistics and strategic management literatures and further developed through the interviews. These constructs were viewed as facilitators necessary to the achievement of logistics leverage and hypothesized to have a positive effect on the logistics performance of an organization. Only one of the four constructs (i.e., resource commitment) was found to have a direct, positive effect on logistics performance.

The final question asked, "What is the perceived value of logistics leverage to the organization?" This question focused on the outcomes of logistics leverage (i.e., competitive advantage and firm performance) and was answered through the testing of the relationships among logistics performance, competitive advantage, and firm performance. While researchers have examined relationships among various combinations of these variables, this study is unique by considering the role of marketing in enhancing the competitive advantage achieved through logistics performance. The integration of the marketing area of the firm through the construct, marketing signals of value, was an important component of the model. This construct was developed based on the work of Porter (1985) and the in-depth interviews. While marketing signals of value was not found to have a significant affect on competitive advantage, the findings supported the direct effect of logistics performance on competitive advantage and the indirect effect on firm performance.

In an attempt to answer the previous research questions, nine hypotheses were proposed in the theoretical model. While some of the findings did not support the hypothesized relationships, resulting in the need for additional research to answer the previous questions, this research is important because it serves as an initial step in developing a method to quantify whether and to what degree a firm has logistics leverage in the marketplace. The hypotheses are reviewed next and insights are provided on the results of the hypotheses tests from Chapter 4.

Hypothesis 1

Hypothesis 1 states there is a direct, positive relationship between a firm's resource commitment (RESCOM) and logistics performance (LOGPERF). The path estimate from RESCOM to LOGPERF of .471 was significant ($p = .002$) indicating support for this hypothesis. The resource-based theory of the firm suggests a firm possesses specialized assets, skills, or resources that can be utilized to improve firm performance. While research has empirically studied specific types of resources such as information technology and financial resources (Closs and Xu 2000; Jayaram, Vickery, and Droge 2000), little research has empirically examined the effect of resource commitment on performance (Menon et al 1999) and research has not been found to specifically examine the relationship to logistics performance.

Based on the factor analysis and support from previous research, the resource commitment construct was identified as a second order construct consisting of "soft" resources and "technical" resources. The item loadings for the resource commitment measures all exceeded .5 with the "soft" resources accounting for 64.7% of the variance

and the "technical" resources accounting for 68%. It is recognized that other types of resources not accounted for in the study may be needed to more thoroughly tap the construct. For example, what would be considered "hard" resources (i.e., warehouse facilities and transportation equipment) were eliminated due to the low standardized regression weights and the squared multiple correlations (i.e. <.5). The issues surrounding this type of resource may be attributable to the population studied. With the increase in outsourcing logistics activities, manufacturing firms may be less willing to make capital investments in these particular logistics areas that do not support the core competency of the firm. These resources may not be viewed as necessary to invest in as opposed to human, financial, and technological resources that were captured by the other dimensions of the resource commitment construct.

Hypotheses 2 & 3

Hypothesis 2 states there is a direct, positive relationship between a firm's process capabilities (PROCAP) and logistics performance (LOGPERF). The path estimate from PROCAP to LOGPERF of .081 was not significant (p = .719) indicating a lack of support for the hypothesis. Hypothesis 3 states there is a direct, positive relationship between a firm's value-added service capabilities (VALCAP) and logistics performance (LOGPERF). The path estimate from VALCAP to LOGPERF of .362 was not significant (p=.204) indicating a lack of support for the hypothesis.

The findings suggest some relationship among process capabilities, value-added service capabilities and logistics performance. An examination of the path estimates previously identified reveals there is a stronger relationship between value-added service

capabilities and logistics performance than between process capabilities and logistics performance. In addition, the high correlation between process capabilities and value-added service capabilities (i.e., .89) suggests the process capabilities variable has more of an indirect relationship in the model to logistics performance through value-added service capabilities. A factor analysis with a quartimax rotation indicates one general factor with small variations rather than two separate factors. This is a contributing factor in the insignificant effects of the variables on logistics performance. This finding is in contrast to the study by Lynch, Keller, and Ozment (2000) in which process capabilities and value-added service capabilities were identified as two separate constructs through factor analysis. The difference in findings could be attributed to the wording of the questions as well as some of the items since they were adapted from the Lynch, Keller, and Ozment (2000) study. In addition, some of the items measuring process capabilities could also be interpreted as services that could provide value to the customer (i.e., develops creative logistical solutions for specific situations, emergencies, or customers), thus resulting in high correlations with the value-added service capability construct.

Hypothesis 4

Hypothesis 4 states there is a direct, positive relationship between a firm's relational capability (RELCAP) and logistics performance (LOGPERF). The path estimate from RELCAP to LOGPERF of -.123 was not significant (p=.249), indicating a lack of support for the hypothesis. Strategic alliances specifically formed to acquire or share resources to support logistics operations were the focus of this study. The relationship between this type of strategic alliance and logistics performance has not been

empirically tested in the literature. Researchers such as Lorenzoni and Lipparini (1999) have acknowledged a need for research that links a firm's "relational capabilities" and sustainable competitive advantage.

It has been suggested that the benefits of inter-firm relationships, such as reduced inventory levels and improved customer service lead to better performance (Saunders 1994; Groves and Valsamakis 1998). However, this study does not lend support to the idea that resources acquired or shared through strategic alliances for logistics operations leads to improved logistics performance. The lack of significance between resource capabilities and logistics performance may be attributable to the wording of the instructions and items used to measure the construct. New items were developed based on the literature and qualitative study. While the items all had loadings above .6 and together explained almost 50% of the variance (i.e., 49.325%), it is possible that the instructions and/or items were not specific enough to capture the capabilities that may accrue through the relationships. As presented, the instructions informing respondents to think about a strategic relationship formed for logistics reasons may have resulted in them thinking about a relationship in which logistics activities were outsourced. The outsourcing of functions such as warehousing or transportation would not be expected to have an effect on the firm's logistics performance since it is not performing those particular activities. Rather, it could have an effect on logistics costs and organizational performance. Many manufacturers may be focused on the reduction of logistics costs through strategic alliances rather than on how the strategic alliance can improve logistics performance.

Hypothesis 5

Hypothesis 5 states that logistics performance (LOGPERF) will have a direct, positive effect on competitive advantage (COMPADV). The path estimate from LOGPER to COMPADV of .843 was significant (p = .000), indicating strong support for the hypothesis. Smith (2000) developed and measured logistics performance as a multi-dimensional construct consisting of logistics differentiation, logistics efficiency, and logistics effectiveness. The measures used in this study were adapted from the Smith (2000) study, and this research does provide support for the delineation of logistics performance as a second order construct. While Smith (2000) tested the effect of forecasting management performance on logistics performance, this research is unique in that logistics performance is examined in terms of its effect on competitive advantage. Firms that achieve a greater level of logistics performance are likely to realize a greater level of competitive advantage. Even though logistics may not be a core competency of many manufacturing firms, it can still help them gain competitive advantage if the firms are efficient, effective, and there is perceived differentiation in their logistical offering.

Hypotheses 6, 7 & 8

Hypotheses 6 and 7 test the impact of logistics performance on competitive advantage indirectly though the moderating variable marketing signals of value. Hypothesis 6 states there is a direct, positive relationship between logistics performance (LOGPERF) and marketing signals of value (SIGVAL). The path estimate from LOGPERF to SIGVAL of .760 was significant (p = .000) strongly supporting the hypothesis. While Porter (1985) conceptualized "signals of value" as the indicators of

the firm that send signals as to the value a firm creates, the concept has not been further developed or tested in the literature. The marketing signals of value construct and corresponding measures were developed for this study from the literature and qualitative study. The interviews revealed that some firms communicate to customers the firm's logistics capabilities through the sales and/or marketing areas of the firm. The results support the idea that the better the logistics performance of the firm, the greater the likelihood that the firm will "signal" or communicate its logistics capabilities to customers.

The fact that a firm may engage in marketing signals of value does not mean it may gain greater competitive advantage. Hypothesis 7 states there is a direct, positive relationship between marketing signals of value (SIGVAL) and competitive advantage (COMPADV). The path estimate from SIGVAL to COMPADV of -.101 was not significant ($p = .579$) indicating a lack of support for the hypothesis (e.g., tested in Model III – the saturated model). It has been suggested in the literature that marketing communications can facilitate the creation of a sustainable competitive advantage (Schultz et al 1993). However, this relationship has not been previously tested and was not supported in this study.

The rationale for the outcome for hypothesis 7 is related to hypothesis 8 which states logistics performance has a greater positive effect on competitive advantage when communicated to customers through marketing signals of value than when marketing signals of value are absent. The testing of the three structural equation models in Chapter 4 revealed that the direct model (i.e., Model I) represented by the direct path from logistics performance to competitive advantage was the better fitting model. Therefore,

hypothesis 8 was not supported. This finding suggests firms may view the actual performance of their logistics operations as having a greater effect on competitive advantage than the communication of this performance to customers. However, the sample consisting of logistics professionals in manufacturing firms may also be a contributing factor as to why the link between marketing signals of value and competitive advantage is not significant and why this path does not lead to greater competitive advantage. Logistics professionals may not recognize or acknowledge the potential role of the marketing area in enhancing competitive advantage based on logistics performance.

Hypothesis 9

Hypothesis 9 states competitive advantage (COMPADV) has a direct, positive effect on firm performance (FIRMPER). The path estimate from COMPADV to FIRMPER of .288 was significant ($p = .001$) supporting the hypothesis. Morash, Droge, and Vickery (1996) examined the relationships among logistics capabilities, competitive advantage, and firm performance and found significant relationships among the three constructs. Based on the literature, if a firm achieves a competitive advantage, its overall performance should be enhanced because of its position in the marketplace compared to the competition.

LIMITATIONS

The logistics leverage model was theoretically developed from the extant literature in several fields and the in-depth interviews with logistics professionals. This study utilized the survey method to test the hypothesized relationships among eight constructs in the model. Due to the interdependency of the variables in the model (i.e., dependent variables in one relationship become independent variables in another relationship), structural equation modeling in AMOS was selected to analyze the relationships. While steps were taken to ensure the validity of the theoretical development of the model, the collection of data, and the subsequent analyses, there are limitations associated with this study as with any other study. Three limitations of this study are presented.

The first limitation of the study was the use of subjective measures in tapping the constructs of interest rather than the use of objective measures for which answers could be verified through other data. Subjective measures have been widely used in organizational research (Powell 1992; Tracey 1998) and have been established as valid substitutes for objective data (Venkatraman and Ramanujan 1986). The answers provided on the survey instrument reflected the perceptions of logistics professionals from manufacturing firms who were members of the Council of Logistics Management. This target group was viewed acceptable based on their ability to provide information on the constructs of interest. However, the generalizability of the results may be limited.

Another limitation that affects generalizability is nonresponse bias. The data were collected during two periods of time with three months between collection periods. Nonresponse bias was assessed through an independent samples t-test comparing the two

sets of data as well as the two waves within each data set. No significant differences were found between the two data sets. In addition, 30 nonrespondents were contacted to identify if there were differences between this group and the respondents who returned the surveys. Significant differences were found for two of the five items suggesting concerns about the generalizability of the results.

The final limitation of the study relates to the measures for several constructs in the model. The validity of the structural equation modeling results is affected by the validity of the measures. While a rigorous approach was taken to develop new measures for three of the constructs (i.e., relational capabilities, resource commitment, and marketing signals of value), some of the relationships incorporating these constructs were nonsignificant. This could be due to the measures for the constructs or to a true lack of relationship as hypothesized. Further refinement of these measures is needed in order to identify the most parsimonious set of measures that explains the most variance.

THEORETICAL CONTRIBUTIONS

This research adds to the body of knowledge in the logistics, marketing, and strategic management areas. Literature in these three areas served as the foundation for the development and testing of the logistics leverage process model. The outcomes of the research enhance the logistics discipline's understanding of how logistics activities and processes can create a sustainable competitive advantage for the firm. Theoretical contributions are discussed in three areas corresponding to the components of the logistics leverage model.

The first contribution relates to the development of new measures for three of the constructs in the logistics leverage model. The first construct, resource commitment, was derived from prior research in the strategic management field (Day 1986; Ramanujam and Camillus 1986; Menon et al 1999). Research was called for that empirically examined the relationship between resource commitment and performance (Menon et al 1999). Since resource commitment had not been tested from a logistics perspective, new measures were developed. The specific types of resources to be considered as items were based on the infrastructure components proposed by Mentzer and Williams (2001), which served as an initial source of inquiry during the in-depth interviews. The results of the analysis revealed multiple dimensions of this construct, suggesting there are different types of resources needed for efficient and effective logistics operations. The results also supported the relationship between resource commitment and logistics performance suggesting the firm's commitment to resources is one contributing factor to greater logistics performance. This adds to the predictive validity of the resource commitment construct.

The second construct for which new measures were developed was relational capabilities. Consistent with the resource-based view of the firm, relationships among channel members could be considered a strategic resource used to gain a sustainable competitive advantage. Firms may need to acquire or share logistics resources with firms that are part of a strategic alliance. As a result of sharing resources, firms may be able to develop capabilities that otherwise might not be possible. Lorenzoni and Lipparini (1999) acknowledged a lack of research examining the relationship between relational capability and sustainable competitive advantage. They found that a distinctive

organizational capability could be achieved through the integration of knowledge. While the research in this dissertation did not support a direct relationship between relational capability and logistics performance, it serves as a first step in the development of measures for this construct within the logistics context

The final construct for which new measures were developed is the marketing signals of value construct. The conceptual development of the construct was based primarily on the work by Porter (1985) who suggested that particular activities of the firm can send signals to customers as to the value a firm creates. Since the marketing area of the firm has the primary responsibility of communicating to customers, this research approached signals of value from the marketing perspective. The new measures related to the firm's promotion and communication of its logistics capabilities and performance to customers. It was found that firms having a high level of logistics performance are likely to "signal" information about their logistics operations to customers.

The second contribution to research is the substantiation of previous research in the logistics area. This research added support to Smith's (2000) study in which logistics performance was developed as a multidimensional construct consisting of logistics efficiency, logistics effectiveness, and logistics differentiation. Logistics performance as a second-order construct was tested against two competing models. The first model was a first order structural model in which efficiency, differentiation, and effectiveness were directly linked to competitive advantage. In the second model, efficiency, effectiveness, and differentiation were set as antecedents to logistics performance and the item, LOGEFV5, was used as a proxy measure for logistics performance. The structural model

with logistics performance as a second-order construct achieved better fit than the other two models, supporting Smith's (2000) finding.

This research also sought to substantiate previous findings that process capabilities and value-added service capabilities are distinct constructs (Lynch et al 2000) and test their relationship to logistics performance. While Lynch, Keller and Ozment (2000) indirectly tested the effect of these two constructs on firm performance, this study tested a direct relationship between the constructs and logistics performance. While the findings do not support the hypotheses, the analysis revealed that these two constructs may actually be two dimensions of a second order construct and should be further tested.

The final contribution is the development of the overall logistics leverage process model. The model serves as a first step in answering the research questions guiding this dissertation. This research is a continuation of previous research and is reflective of the iterative process needed for understanding how a firm can compete on logistics and how logistics leverage can be measured within an organization.

MANAGERIAL CONTRIBUTIONS

While it is important for research to build upon the body of knowledge within a discipline, it is also important to consider the managerial or practical contributions of the research. This research provides strategic implications for manufacturing organizations as well as operational implications for logistics and marketing managers. Three managerial contributions are presented that are hoped will aid organizations in their logistics operations.

The first managerial contribution has strategic implications for the firm and relates to the allocation of resources within the firm. The resource-based theory of the firm implies a firm possesses specialized assets or resources that can be utilized to improve performance and aid in the achievement of competitive advantage (Penrose 1959). Day and Wensley (1988) indicated that firms have to identify "the skills and resources that exert the most leverage on positional advantages and future performance and then allocate resources toward those high leverage sources" in order to get the greatest performance improvement at the least cost. This research revealed a direct, positive relationship between the firm's allocation of resources to logistics operations and logistics performance. As firms are searching for new ways to compete in the marketplace, many are realizing the value that can be created through logistics operations. Firms wanting to compete on logistics may find it necessary to alter the manner in which resources are allocated to logistics. This may mean a reevaluation of the firm's objectives as well the strategies designed to achieve those objectives. By allocating sufficient financial, human, and technological resources, the firm may be able to improve the efficiency and effectiveness of logistics operations.

The second managerial contribution has implications at the logistics operational level of the firm. As logistics has received more focus in many firms, the emphasis on logistics has shifted from that of a cost center to a function that can improve profitability and differentiate the firm. An important finding of this research was the direct, positive affect logistics performance has on competitive advantage. A firm that can achieve superiority in its logistics operations may be able to gain a competitive advantage over competitors who place less emphasis on logistics. However, firms should realize that

enhanced logistics performance is determined by more than cost reductions or meeting budgeted goals. This research supported the measurement of logistics performance by the efficiency, effectiveness, and differentiation of logistics activities. The implication is that firms not only require their logistics operations to be efficient from a cost perspective, but to also be effective in providing customer service and meeting stated goals. The third component of logistics performance, differentiation, implies that the logistics area has to perform better than the competition. By considering all three dimensions, firms will have a more balanced approach for ensuring continued value is provided by logistics operations both to customers and to the firm.

The third managerial contribution has implications for both the logistics and marketing operational areas of the firm. To compete in today's environment, it has become necessary for firms to integrate business processes. To achieve logistics leverage, it was proposed that the communication of logistics performance capabilities by the marketing area would lead to greater competitive advantage. While this relationship was not supported in this study, the findings do have implications for logistics managers. As previously discussed, the actual performance of the logistics area does have an affect on competitive advantage so firms need to be concerned with performing well on the three dimensions of logistics performance. The fact that signaling the firm's logistics capabilities to customers did not seem to influence competitive advantage could be attributed to the perceptions of the logistics professionals. The findings suggest that from a logistics professional's point of view, what is actually done in logistics may be more important than what is said about the performance. Organizations that want to compete

on logistics need to communicate this objective to other areas of the firm as well as educate logistics professionals on the role of marketing in creating value.

FUTURE RESEARCH OPPORTUNITIES

As discussed in Chapter 1, research in the area of logistics leverage is still in the initial stages of development. The research in this dissertation has attempted to advance knowledge in the area of logistics leverage by showing how firms can achieve a competitive advantage through the allocation of resources and the development of logistics capabilities that are superior to the competition. In addition, it has endeavored to further demonstrate the value that can be achieved through the integration of two functional areas of the firm – logistics and marketing. As a result of the research findings, there are many opportunities for future research that can help to further the body of knowledge in these areas. Five specific research opportunities are presented that can enhance the body of knowledge on logistics leverage.

The first area of opportunity relates to the drivers of logistics leverage. In Chapter 1, the corporate strategy of the firm, market orientation and logistics functional salience were identified as potential drivers that could affect the firm's ability to achieve logistics leverage. The corporate strategy of the firm and whether a firm is market oriented could affect the level of importance placed on providing higher customer service levels through logistics. Similarly, logistics functional salience refers to how important the logistics function is viewed within the firm. This could affect the resources that are dedicated to logistics as well as the emphasis placed on developing or improving logistics

capabilities. These drivers were not incorporated into this study, but rather were left to future research.

The second area of opportunity for research involves further developing the exogenous variables in the model or the facilitators of logistics performance. This study examined three types of capabilities and the firm's commitment of resources to the logistics area as potential facilitators. Even though the relationship between capabilities and performance was not confirmed in this study, prior research in the strategic management area has investigated these variables and found that capabilities can have an effect on performance (Peteraf 1993; Reed and DeFillippi 1990). Future research should focus on improving the measures for the capability constructs and testing whether capabilities is a second-order construct consisting of multiple dimensions related to different types of capabilities. In addition, other facilitators of logistics performance that can help a firm achieve logistics leverage need to be identified. For example, there is an opportunity to examine the affect of the logistics capabilities used in the Morash et al (1996) study on logistics performance.

In this study, a positive relationship was established between the firm's commitment of resources to logistics and logistics performance. However, only two of the possible three dimensions (i.e., soft and technical resources) were tested in the structural equation model. There is an opportunity to develop better measures of the "hard" components of resource commitment such as facilities and transportation equipment to determine if there is a third dimension of the construct.

The third area of opportunity is to test the model with marketing professionals as the target population. As previously discussed, it is possible that the perceptions of

logistics professionals account for the non-significant relationship between marketing signals of value and competitive advantage. Marketing professionals, whose responsibility it is to develop communications to customers that can create value for the firm, may have different perceptions of the impact of "signaling" value to customers.

The fourth area of opportunity is to investigate the logistics leverage process from the perspective of the customer. While it is important for the continued development of the logistics field to identify the internal factors that contribute to improved logistics performance, it is also important to understand how the customer perceives the logistics performance of the firm. What are the factors that would influence their perceptions of whether a firm had logistics leverage in the marketplace? Does the customer value the superior logistics capabilities of a firm with which it does business? By examining the customers' perspectives, it can be determined whether the signaling of the logistics capabilities of the firm is influential in their decision to use a particular firm. Thus, an investigation of customer value and satisfaction related to the logistics leverage process is warranted.

The final area of opportunity is to test the logistics leverage process model in other industries. This study focused on the manufacturing industry, but some manufacturers may not place a high degree of importance on the logistics function since it is often not a core competency for such firms. Upon further development of the model, it would be interesting to test it with logistics service providers to identify if they perceive greater competitive advantage when their capabilities are communicated to customers through marketing efforts.

CONCLUDING REMARKS

This dissertation builds on previous theory through the development and testing of a theoretical model of the logistics leverage process. Extant literature and qualitative interviews were utilized to identify the drivers, facilitators, and outcomes of the logistics leverage process. While the drivers were left to future research, the findings related to the facilitators and outcomes have both theoretical and managerial implications.

This research has added to the body of knowledge in several disciplines including logistics, marketing, and strategic management. Similarly, it is hoped that this research benefits practitioners by further explaining the value that can be created through the logistics operations of the firm. The model should serve as a foundation for continued research on identifying the relevant components of logistics leverage. Further investigations should reveal greater insights into how a firm can not only compete on logistics but also gain a sustainable competitive advantage through logistics.

REFERENCES

REFERENCES

Ames, B. C. and Hlavacek, J. D. (1989), Market Driven Management. Homewood, Illinois: Dow-Jones Irwin.

Anderson, James C. and Gerbing, David W. (1988), "Structural Equation Modeling in Practice: A Review and Recommended Two-Step Approach," Psychological Bulletin, 103 (3), pp. 411-23.

Armstrong, J. Scott and Overton, Terry S. (1977), "Estimating Nonresponse Bias in Mail Surveys," Journal of Marketing Research, 14 (3), pp. 396-402.

Barney, Jay (1991), "Firm Resources and Sustained Competitive Advantage," Journal of Management, 17 (1), pp. 99-120.

Barney, Jay (1986), "Strategic Factor Markets: Expectations, Luck and Business Strategy," Management Science, 32 (10), pp. 1231-41.

Barringer, Bruce R. and Harrison, Jeffrey S. (2000), "Walking a Tightrope: Creating Value Through Interorganizational Relationships," Journal of Management, 26 (3), pp. 367-403.

Barry, T. E. (1980), Marketing: An Integrated Approach. New York: Dryden Press.

Bartels, R. (1976), The History of Marketing Thought. Ohio State University.

Barwise, Patrick (1995), "Marketing Today and Tomorrow," Business Strategy Review, 6 (1), pp. 45-59.

Bowersox, Donald J. (1990), "The Strategic Benefits of Logistics Alliances," Harvard Business Review, 68 (4), pp. 36-45.

Bowersox, Donald J., Mentzer, John T., and Speh, Thomas W. (1995), "Logistics Leverage," Journal of Business Strategies, 12 (2), pp. 36-49.

Boyd, Jr., Harper, W., and Westfall, Ralph (1955), "Interviewers as a Source of Error in Surveys," Journal of Marketing, 19 (4), pp. 311-24.

Burbridge Jr., John J. (1990), "Strategic Implications of Logistics Information Systems," Logistics and Transportation Review, 24 (4), pp. 368-83.

Campbell, Donald. T. and Fiske, Donald. W. (1959), "Convergent and Discriminant Validation by the Multitrait-Multimethod Matrix," Psychological Bulletin, 56, pp. 81-105.

Carter, Joseph R. and Ellram, Lisa M. (1994), "The Impact of Interorganizational Alliances in Improving Supplier Quality," International Journal of Physical Distribution & Logistics Management, 24 (5), pp. 15-23.

Castanias, Richard P. and Helfat, Constance E. (1991), "Managerial Resources and Rents," Journal of Management, 17 (1), pp. 155-171.

Chow, Garland, Heaver, Trevor D., and Henriksson, Lennart E. (1994), "Logistics Performance: Definition and Measurement," International Journal of Physical Distribution & Logistics Management, 24 (1), pp. 17-28.

Christopher, Martin (1973), "Marketing and Logistics - A New Era of Management Concern," Industrial Marketing Management, 2 (2), pp. 131-44.

Christopher, Martin (1986), "Implementing Logistics Strategy," International Journal of Physical Distribution and Materials Management, 16 (1), pp. 52-62.

Christopher, Martin (1992), Logistics and Supply Chain Management Strategies for Reducing Costs and Improving Services. London: Pitman Publishing.

Churchill, Jr., Gilbert A. (1979), "A Paradigm for Developing Better Measures of Marketing Constructs," Journal of Marketing Research, 16 (1), pp. 64-73.

Clemons, E. (1986), "Information Systems for Sustainable Competitive Advantage," Information and Management, 11 (3), pp. 131-36.

Closs, David J. (1994), "Positioning Information in Logistics," in The Logistics Handbook. James F. Roberson and William C. Copacino ed. New York: The Free Press.

Closs, David J. and Xu, Kefeng (2000), "Logistics Information Technology Practice in Manufacturing and Merchandising Firms-An International Benchmarking Study versus World Class Logistics Firms," International Journal of Physical Distribution & Logistics Management, 30 (10), pp. 869-86

Cockburn, Iain M., Henderson, Rebecca M., and Stern, Scott (2000), "Untangling the Origins of Competitive Advantage," Strategic Management Journal, 21 (10/11), pp. 1123-45.

Cooper, M. C., Innis, D. E., and Dickson, P. R. (1992), Strategic Planning for Logistics. Oak Brook: Council of Logistics Management.

Cooper, Martha C. and Gardner, John T. (1993), "Building Good Business Relationships - More than Just Partnering or Strategic Alliances?," International Journal of Physical Distribution & Logistics Management, 23 (6), pp. 14-26.

Coyne, K.P. (1986), "Sustainable Competitive Advantage - What It Is and What It Isn't," Business Horizons, 29 (1), pp. 54-61.

Cronbach, Lee. J. (1951), "Coefficient Alpha and the Internal Structure of Tests," Psychometrika, 76, pp. 297-334.

Daft, R. (1983), Organization Theory and Design. New York: West Publishing.

Day, George S. (1986), Analysis for Strategic Market Decisions. St. Paul, MN: West Publishing Co.

Day, George S. (1994), "The Capabilities of Market-Driven Organizations," Journal of Marketing, 58 (4), pp. 37-52.

Day, George S. and Wensley, Robin (1988), "Assessing Advantage: A Framework for Diagnosing Competitive Superiority," Journal of Marketing, 52 (2), pp. 1-20.

Dierickx, I. and Cool, K. (1989), "Asset Stock Accumulation and Sustainability of Competitive Advantage," Management Science, 35 (12), pp. 1504-11.

Dillman, Don A. (2000), Mail and Electronic Surveys: The Tailored Design Method. New York: John Wiley & Sons.

Doz, Yves and Hamel, Gary (1998), Alliance Advantage: The Art of Creating Value Through Partnering. Boston: Harvard School Business Press.

Dunn, Steven C., Seaker, Robert F., and Waller, Matthew A. (1994), "Latent Variables in Business Logistics Research: Scale Development and Validation," Journal of Business Logistics, 15 (2), pp. 145-72.

Eisenhardt, Kathleen M. and Martin, Jeffrey A. (2000), "Dynamic Capabilities: What Are They?," Strategic Management Journal, 21 (10/11), pp. 1105-21.

Fawcett, Stanley E. and Fawcett, Stanley A. (1995), "The Firm as a Value-Added System," International Journal of Physical Distribution & Logistics Management, 25 (5), pp. 24-42.

Fox, Thomas (1994), "Logistics Information Systems Design," in The Logistics Handbook. James F. Roberson and William C. Copacino ed. New York: The Free Press.

Frankel, Robert, Whipple, Judith Schmitz, and Frayer, David J. (1996), "Formal Versus Informal Contracts: Achieving Alliance Success," International Journal of Physical Distribution & Logistics Management, 26 (3), pp. 47-63.

Frenzel, Carroll W. (1996), Management of Information Technology (2nd ed.). New York: Course Technology.

Fuller, Joseph B., O'Conner, James and Rawlinson, Richard (1993), "Tailored Logistics: The Next Advantage," Harvard Business Review, 71 (3), pp. 87-98.

Garver, Michael S. and Mentzer, John T. (1999), "Logistics Research Methods: Employing Structural Equation Modeling to Test for Construct Validity," Journal of Business Logistics, 20 (1), pp. 33-77.

Gerbing, David W. and Anderson, James C. (1988), "An Updated Paradigm for Scale Development Incorporating Unidimensionality and Its Assessment," Journal of Marketing Research, 25 (2), pp. 186-92.

Gleason, J. M. and Barnum, D. T. (1986), "Toward Valid Measures of Public Sector Productivity: Performance Measures in Urban Transit," Management Science, 28 (4), pp. 379-86.

Groves, Gwyn and Valsamakis, Vassilios (1998), "Supplier-Customer Relationships and Company Performance," The International Journal of Logistics Management, 9 (2), pp. 51-63.

Gupta, Ashok K., Raj, S. P., and Wilemon, David (1986), "A Model for Studying R&D-Marketing Interface in the Product Innovation Process," Journal of Marketing, 50 (2), pp. 7-17.

Gustin, Craig M., Daugherty, Patricia J., and Stank, Theodore P. (1995), "The Effects of Information Availability on Logistics Integration," Journal of Business Logistics, 16 (1), pp. 1-21.

Hagedoorn, J. (1993), "Understanding the Rationale of Strategic Technology Partnering: Interorganizational Modes of Cooperation and Sectoral Differences," Strategic Management Journal, 14 (5), pp. 371-85.

Hagedoorn, J. and Schakenraad, J. (1994), "The Effect of Strategic Technology Alliances on Company Performance," Strategic Management Journal, 15 (4), pp. 291-309.

Hair Jr., Joseph E., Anderson, Rolph E., Tatham, Ronald L., and Black, William C. (1998), Multivariate Data Analysis (5th ed.). Upper Saddle River, NJ: Prentice Hall.

Hall, Richard (1993), "A Framework Linking Intangible Resources and Capabilities to Sustainable Competitive Advantage," Strategic Management Journal, 14 (8), pp. 607-18.

Hall, Richard (1992), "The Strategic Analysis of Intangible Resources," Strategic Management Journal, 13 (2), pp. 135-44.

Halley, Alain and Guilhon, Alice (1997), "Logistics Behavior of Small Enterprises: Performance, Strategy and Definition," International Journal of Physical Distribution and Logistics Management, 27 (8), pp. 475-95.

Hansen G., and Wernerfelt, B. (1989), "Determinants of Firm Performance: The Relative Performance of Economic and Organizational Factors," Strategic Management Journal, 10 (5), pp. 399-411.

Harris, Lloyd C. and Ogbonna, Emmanuel (2001), "Strategic Human Resource Management, Market Orientation, and Organizational Performance," Journal of Business Research, 51 (2), pp. 157-66.

Hattie, John (1985), "Methodology Review: Assessing Unidimensionality of Tests and Items," Applied Psychological Measurement, 9, pp. 139-64.

Hitt, Michael A., Bierman, Leonard, Shimizu, Katsuhiko, and Kochhar, Rahul (2001), "Direct and Moderating Effects of Human Capital on Strategy and Performance in Professional Service Firms: A Resource-Based Perspective," Academy of Management Journal, 44 (1), pp. 13-28.

Hitt, Michael A. and Ireland, R. Duane (1985), "Corporate Distinctive Competence, Strategy, Industry, and Performance," Strategic Management Journal, 6 (3), pp. 273-93.

Hunt, Shelby D. and Morgan, Robert M. (1995), "The Comparative Advantage Theory of Competition," Journal of Marketing, 59 (2), pp. 1-15.

Huselid, M. A. (1995), "The Impact of Human Resource Management Practices on Turnover, Productivity, and Corporate Financial Performance," Academy of Management Journal, 38 (3), pp. 635-72.

Huselid, M. A., Jackson, S. E., and Schuler, R. S. (1997), "Technical and Strategic Human Resource Effectiveness as Determinants of Firm Performance," Academy of Management Journal, 40 (1), pp. 171-88.

Hutt, Michael D. (1995), "Cross-Functional Working Relationships in Marketing," Journal of the Academy of Marketing Science, 23 (4), pp. 351-57.

Itami, Hiroyuki and Roehl, Thomas W. (1987), Mobilizing Invisible Assets. Cambridge: Harvard University Press.

Jayaram, Jayanth, Vickery, Shawnee K., and Droge, Cornelia (2000), "The Effects of Information System Infrastructure and Process Improvements on Supply-Chain Time Performance," International Journal of Physical Distribution & Logistics Management, 30 (3/4), pp. 314-30.

Kanuk, Leslie and Berenson, Conrad (1975), "Mail Surveys and Response Rates: A Literature Review," Journal of Marketing Research, 12 (4), pp. 440-53.

Kent, Jr., John L. (1996), "Leverage2: Interfunctional Co-ordination Between Logistics and Information Technology," International Journal of Physical Distribution and Logistics Management, 26 (8), pp. 63-78.

Kerr, A. (1989), "Information Technology Creating Strategic Opportunities for Logistics," International Journal of Physical Distribution & Logistics Management, 19 (5), pp. 15-17.

Kogut, B. (1991), "Joint Ventures and The Option to Expand and Acquire," Management Science, 37 (1), pp. 19-33.

Kogut, B. (1988), "Joint Ventures: Theoretical and Empirical Perspectives," Strategic Management Journal, 9 (4), pp. 319-32.

Koota, Pasi and Takala, Josu (1998), "Developing a Performance Measurement System for World-Class Distribution Logistics by Using Activity-Based Costing and Management: Case: Basic Metal Industries," International Journal Technology Management, 16 (1-3), pp. 267-80.

Kvale, Steiner (1983), "The Qualitative Research Interview: A Phenomenological and a Hermeneutical Mode of Understanding," Journal of Phenomenological Psychology, 14 (2), pp. 171-95.

La Londe, Bernard J. (1990), "Update Logistics Skills for the Future," Transportation and Distribution, pp. 46-48.

La Londe, Benard J., and Cooper, Martha C. (1989), Partnerships in Providing Customer Service: Third Party Perspectives. Oak Brook: Council of Logistics Management.

La Londe, Benard J., Cooper, Martha C., and Noordewier, Thomas G. (1988), Customer Service: A Management Perspective. Oak Brook: Council of Logistics Management.

Lado, A. A. and Wilson, M. (1994), "Human Resource Systems and Sustained Competitive Advantage: A Competence-Based Perspective," Academy of Management Review, 19 (4), pp. 699-727.

Langley, Jr., C. John (1986), "Information-Based Decision Making in Logistics Management," International Journal of Physical Distribution & Logistics Management, 18 (6), pp. 41-55.

Langley, Jr., C. John and Holcomb, Mary C. (1992), "Creating Logistics Customer Value," Journal of Business Logistics, 13 (2), pp. 1-27.

Lim, Jeen-Su and Reid, David A. (1992), "Vital Cross-Functional Linkages With Marketing," Industrial Marketing Management, 21 (2), pp. 159-65.

Lippman, S. A. and Rumelt, R. P. (1982), "Uncertain Imitability: An Analysis of Interfirm Differences in Efficiency Under Competition," Bell Journal of Economics, 13 (2), pp. 418-38.

Loehlin, John C. (1998), Latent Variable Models: An Introduction to Factor, Path, and Structural Analysis (3rd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Lorenzoni, Gianni and Lipparini, Andrea (1999), "The Leveraging of Interfirm Relationships as a Distinctive Organizational Capability: A Longitudinal Study," Strategic Management Journal, 20 (4), pp. 317-38.

Lynch, Daniel F., Keller, Scott B., and Ozment, John (2000), "The Effects of Logistics Capabilities and Strategy on Firm Performance," Journal of Business Logistics, 21 (2), pp. 47-67.

McGinnis, Michael A. and Kohn, Jonathan W. (1990), "A Factor Analytic Study of Logistics Strategy," Journal of Business Logistics, 11 (2), pp. 41-63.

Mahoney, Joseph T. (1995), "The Management of Resources and the Resource of Management," Journal of Business Research, 33 (2), pp. 91-101.

Menon, Anil, Bharadwaj, Sundar G., and Howell, Roy (1996), "The Quality and Effectiveness of Marketing Strategy: Effects of Functional and Dysfunctional Conflict in Intraorganizational Relationships," Journal of the Academy of Marketing Science, 24 (4), pp. 299-313.

Menon, Anil, Bharadwaj, Sundar G., Adidam, Phani Tej, and Edison, Steven W. (1999), "Antecedents and Consequences of Marketing Strategy Making: A Model and a Test," Journal of Marketing, 63 (2), pp. 18-40.

Mentzer, John T. and Flint, Daniel J. (1997), "Validity in Logistics Research," Journal of Business Logistics, 18 (1), pp. 199-216.

Mentzer, John T. and Konrad, Brenda Ponsford (1991), "An Efficiency/Effectiveness Approach to Logistics Performance Analysis," Journal of Business Logistics, 12 (1), pp. 33-61.

Mentzer, John T. and Williams, Lisa R. (2001), "The Role of Logistics Leverage in Marketing Strategy," Journal of Marketing Channels, 8 (3), pp. 29-47.

Michigan State University, The Global Logistics Research Team (1995), World Class Logistics: The Challenge of Managing Continuous Change: Council of Logistics Management.

Miles, Raymond E. and Snow, Charles C. (1978), Organizational Strategy, Structure, and Process. New York: McGraw-Hill.

Morash, Edward A., Droge, Cornelia L. M., and Vickery, Shawnee K. (1996), "Strategic Logistics Capabilities for Competitive Advantage and Firm Success," Journal of Business Logistics, 17 (1), pp. 1-21.

Morgan, Robert M. and Hunt, Shelby (1999), "Relationship-Based Competitive Advantage: The Role of Relationship Marketing in Marketing Strategy," Journal of Business Research, 46 (3), pp. 281-90.

Penrose, E. (1959), The Theory of the Growth of the Firm. New York: Sharpe.

Perks, Helen and Easton, Geoff (2000), "Strategic Alliances: Partner as Customer," Industrial Marketing Management, 29 (4), pp. 327-38.

Peteraf, M. A. (1993), "The Cornerstones of Competitive Advantage: A Resource-Based View," Strategic Management Journal, 14 (3), pp. 179-91.

Pfeffer, Jeffrey (1994), Competitive Advantage Through People. Boston: Harvard Business School Press.

Porter, Michael E. (1985), Competitive Advantage: Creating and Sustaining Superior Performance. New York: The Free Press.

Porter, Michael E. (1980), Competitive Strategy: Techniques for Analyzing Industries and Competitors. New York: The Free Press.

Powell, Thomas (1992), "Organizational Alignment as Competitive Advantage," Strategic Management Journal, 13 (2), pp. 119-34.

Powell, Thomas (1995), "Total Quality Management as Competitive Advantage: A Review and Empirical Study," Strategic Management Journal, 16 (1), pp. 15-37.

Powell, Thomas C. and Dent-Micallef, Anne (1997), "Information Technology as Competitive Advantage: The Role of Human, Business, and Technology Resources," Strategic Management Journal, 18 (5), pp. 375-405.

Powell, W. W., Koput, K. W., and Smith-Doerr, L. (1996), "Interorganizational Collaboration and the Locus of Innovation: Networks of Learning in Biotechnology," Administrative Science Quarterly, 41 (1), pp. 116-45.

Ramanujam, V. N. and Camillus, J. C. (1986), "Multi-Objective Assessment of Effectiveness of Strategic Planning: A Discriminant Analysis Approach," Academy of Management Journal, 29 (2), pp. 347-72.

Reed, Richard and DeFillippi, Robert (1990), "Causal Ambiguity, Barriers to Imitation, and Sustainable Competitive Advantage," Academy of Management Review, 15 (1), pp. 88-102.

Remmel, Ulf. M. (1991), "Integration of Marketing and Logistics: A Way to Competitive Advantage in South Africa," Physical Distribution and Logistics Management, 21 (5), pp. 27-31.

Rhea, M. J. and Shrock, D. L. (1987a), "Measuring Distribution Effectiveness with Key Informant Reports," Logistics and Transportation Review, 23 (3), pp. 295-306.

Rhea, M. J. and Shrock, D. L. (1987b), "Physical Distribution Implementation Effectiveness: The Customer Perspective," Transportation Journal, 27 (1), pp. 36-42.

Richard, Orlando C. and Johnson, Nancy Brown (2001), "Strategic Human Resource Management Effectiveness and Firm Performance," International Journal of Human Resource Management, 12 (2), pp. 299-310.

Rinehart, Lloyd M., Cooper, M. Bixby, and Wagenheim, George D. (1989), "Furthering the Integration of Marketing and Logistics Through Customer Service in the Channel," Journal of the Academy of Marketing Science, 17 (1), pp. 63-71.

Ruekert, Robert W. and Walker, Jr., Orville C. (1987), "Marketing's Interaction with Other Functional Units: A Conceptual Framework and Empirical Evidence," Journal of Marketing, 51 (1), pp. 1-19.

Rumelt, R. P. (1984), Competitive Strategic Management (R. B. Lamb ed.). Englewood Cliffs, N.J.: Prentice-Hall.

Saunders, Malcolm J. (1994), Strategic Purchasing and Supply Chain Management. London: Pitman Publishing.

Schneider, L. F. (1985), "New Era in Transportation Strategy," Harvard Business Review, 63 (2), pp. 118-27.

Schultz, Don E., Tannenbaum, Stanley I., and Lauterborn, Robert F. (1993), Integrated Marketing Communications. Lincolnwood, Ill: NTC Business Books.

Seth, Anju and Thomas, Howard (1994), "Theories of the Firm: Implications for Strategy Research," Journal of Management Studies, 31 (2), pp. 165-91.

Sharma, Arun, Grewal, Dhruv, and Levy, Michael (1995), "The Customer Satisfaction/Logistics Interface," Journal of Business Logistics, 16 (2), pp. 1-21.

Smart, Rosemary (1995), "Putting Your Own House in Order!," Logistics-Focus, 3 (4), pp. 18-19.

Smith, Carlo D. (2000), "Assessing the Value of Improved Forecasting Management," Dissertation, The University of Tennessee.

Snow, C. C. and Hrebiniak, L. G. (1980), "Strategy, Distinctive Competence, and Organizational Performance," Administrative Science Quarterly, 25 (2), pp. 317-36.

Song, X. Michael, Neeley, Sabrina M., and Zhao, Yuzhen (1996), "Managing R&D-Marketing Integration in the New Product Development Process," Industrial Marketing Management, 25 (6), pp. 545-53.

Stank, Theodore P., Daugherty, Patricia J., and Ellinger, Alexander E. (1999), "Marketing/Logistics Integration and Firm Performance," The International Journal of Logistics Management, 10 (1), pp. 11-24.

Stenger, A. J. (1986), "Information Systems in Logistics Management: Past, Present, and Future," Transportation Journal, 26 (1), pp. 65-82.

Sterling, Jay U. and Lambert, Douglas M. (1987), "Establishing Customer Service Strategies Within the Marketing Mix," Journal of Business Logistics, 8 (1), pp. 1-30.

Stock, James R. (1990), "Managing Computer, Communication and Information Technology Strategically: Opportunities and Challenges for Warehousing," Logistics and Transportation Review, 26 (2), pp. 133-48.

Strauss, Anslem and Corbin, Juliet (1998), Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Thousand Oaks: Sage Publications.

Stuart, Toby E. (2000), "Interorganizational Alliances and the Performance of Firms: A Study of Growth and Innovation Rates in a High-Technology Industry," Strategic Management Journal, 21 (8), pp. 791-811.

Teece, David and Pisano, P. (1994), "The Dynamic Capabilities of Firms: An Introduction," Industrial and Corporate Change, 3 (3), pp. 537-56.

Tracey, Michael (1998), "The Importance of Logistics Efficiency to Customer Service and Firm Performance," The International Journal of Logistics Management, 9 (2), pp. 65-80.

Tyler, Beverly B. (2001), "The Complementarity of Cooperative and Technological Competencies: A Resource-Based Perspective," Journal of Engineering and Technology Management, 18 (1), pp. 1-27.

Venkatraman, N. and Ramanujan, V. (1986), "Measurements of Business Performance in Strategy Research: A Comparison of Approaches," Academy of Management Review, 11 (10), pp. 801-14.

Voorhees, Roy Dale and Coppett, John I. (1986), "Marketing-Logistics Opportunities for the 1990s," The Journal of Business Strategy, 7 (2), pp. 33-38.

Webster, F. E. (1988), "The Rediscovery of the Marketing Concept," Business Horizons, 31 (3), pp. 29-39.

Wernerfelt, Birger (1984), "A Resource-Based View of the Firm," Strategic Management Journal, 5 (2), pp. 171-80.

Winter, S. G. (1987), The Competitive Challenge (D. Teece ed.). Cambridge: Ballinger.

Zacharia, Zach G. (2001), "An Analysis of the Effect of Logistics Involvement in Cross-Functional Integrated New Product Development Projects," Dissertation, The University of Tennessee.

Zhang, Michael J. and Lado, Augustine A. (2001), "Information Systems and Competitive Advantage: A Competency-Based View," Technovation, 21 (3), pp. 147-56.

APPENDICES

APPENDIX A: QUALITATIVE INTERVIEW PROTOCOL

INTERVIEW PROTOCOL

1. What are the resources needed for logistics operations?

    a. Probe about human, information technology, and physical resources.

2. Are there resources that need to be obtained externally through other companies?

3. Do these resources impact logistics performance? How?

4. Are there any relationships formed between your company and suppliers or 3PLs for logistics purposes? If yes, probe for an example.

5. Do those relationships impact logistics performance? How?

6. Is it important to you that your customers know about the logistics capabilities of your firm?

7. How do customers become aware of the firm's logistics capabilities?

8. Does the marketing and logistics areas of your firm work together?

9. Are there specific actions taken by marketing to communicate the value of your logistics capabilities to customers? If yes, probe for examples.

10. Does it give your company any competitive advantage when you promote your logistics capabilities?

APPENDIX B: PRETEST SURVEY DOCUMENTS

PRENOTIFICATION PROTOCOL

Hello, Mr/Ms _____, please.

> ***If secretary answers and asks who is calling:*** "I am calling on behalf of Dr. Tom Mentzer from the University of Tennessee."
>
> ***When speaking to contact:***

My name is [First Name].

I am calling on behalf of Dr. Tom Mentzer and Michelle Bobbitt from the University of Tennessee, to ask if we could send you a short survey on logistics capabilities and performance in manufacturing firms. The survey should take about 10 minutes to complete and is aimed at people who have direct experience with logistics operations. All responses will be held in strict confidence. Neither your name nor your company's name will be recorded with any of the responses.

Would you be willing to participate in the research?
{If they say **yes** –}

> (Verify they are a manufacturing firm.)
>
> {Verify their title and address.}
>
> {Go to closing}

{If they say **no** –}

> Is there someone else in your company who would be able to fill out this survey?
>
> {Get name and number of the suggested person.}
> {Go to closing}

{CLOSING}
Thank you for your time. We appreciate your willingness to participate in this research.

INITIAL SURVEY COVER LETTER

[DATE]

[Gender, First name, Last name]
[Title]
[Business]
[Address]
[City, State, Zip]

Dear [Gender, Last name]:

Thank you for agreeing to participate in the study on logistics capabilities and performance in manufacturing firms. The data obtained as a result of this survey will provide business managers and students valuable information on how a firm can compete on its logistics capabilities and gain a competitive advantage in the marketplace.

In order for the survey results to truly represent today's management practice, it is important that each survey be completed and returned. Your response is vital to the success of this study. To express our appreciation for your assistance, we will send you an Executive Summary of the results if you enclose a business card with the survey. All business cards will be separated from the surveys to preserve anonymity.

All responses will be held in strict confidence. Neither your name nor your company's name will be recorded with any of the responses.

Thank you for your participation!

Sincerely,

L. Michelle Bobbitt
Ph.D. Candidate

Dr. John T. Mentzer
Bruce Chair of Excellence in Business

REMINDER POSTCARD

Just a Reminder...

We recently sent you a survey designed to understand the impact of logistics capabilities on firm performance.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If you have not sent it in, we would greatly appreciate your participation. **Your input is extremely important in aiding our understanding of strategic issues related to the logistics function.**

THANK YOU FOR YOUR TIME & CONSIDERATION,

L. Michelle Bobbitt
University of Tennessee

John T. Mentzer, Ph.D.
University of Tennessee

If you have any questions, we would like to hear from you:
lbobbitt@utk.edu, Tel: (865) 974-5311

REPLACEMENT COVER LETTER

[DATE]

[Gender, First name, Last name]
[Title]
[Business]
[Address]
[City, State, Zip]

Dear [Gender, Last name]:

About three weeks ago, Dr. Tom Mentzer and I sent a questionnaire to you seeking your opinions about logistics capabilities and performance in manufacturing firms. Since we have not yet received your completed survey, we urge you to take a few moments to do so now. In case you have misplaced the survey, a copy is enclosed.

This study is being conducted so that business managers like you can help identify how logistics resources and capabilities can help firms compete in the marketplace. We are writing to you again because the study's usefulness depends on our receiving a survey from each respondent. In order for the information from the study to be truly representative of manufacturing firms in the U.S., it is essential that each person in the sample return his/her survey.

Your participation in the survey will require only about 12 minutes. A return envelope is enclosed for your convenience. To express our appreciation for your assistance, we will send you an Executive Summary of the results if you enclose a business card or fill out the contact information at the end of the survey. To preserve your anonymity, the business card and information sheet will be separated from the survey as soon as it is received. All responses will be held in strict confidence.

We hope that you will fill out and return the questionnaire soon, but if for any reason you prefer not to answer it, please let us know by returning the blank survey with your name in the envelope provided. This will allow us to remove your name from our mailing list.

Thank you in advance for your participation.

Sincerely,

L. Michelle Bobbitt
Ph. D. Candidate

Dr. John T. (Tom) Mentzer
Bruce Chair of Excellence in Business

PRETEST SURVEY

INSTRUCTIONS

The following questions relate to the logistics operations of a business unit. When answering the questions, please keep in mind the following points:

For the purposes of this survey, please think about all **logistics activities** within your business unit, including warehousing, transportation, inventory management, forecasting, order processing, materials handling, and customer service.

A **business unit** is defined as a relatively independent organizational unit that has a defined business strategy and is responsible for sales and profits. If you are involved with multiple business units, please select the one unit that is most representative of those business units and answer all questions with regard to the selected business unit. **Your company does not have to consist of multiple business units for purposes of the survey.** If you are associated with a company that does not consist of business units or divisions, please answer the following questions based on your company.

SECTION 1 - RESOURCES AND CAPABILITIES

① **Please think about the logistics operations/processes of your organization. Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.**

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
Our business unit...								
a)	seeks to attain the lowest total cost logistics through efficient operations, technology, and/or scale economies.	1	2	3	4	5	6	7
b)	proactively seeks solutions to logistics problems before they occur.	1	2	3	4	5	6	7
c)	provides a consistent approach to performing key logistics work (standardizing operations).	1	2	3	4	5	6	7
d)	differentiates logistical service offerings from those offered by the competition.	1	2	3	4	5	6	7
e)	develops creative logistical solutions for specific situations, emergencies, or customers.	1	2	3	4	5	6	7
f)	continuously seeks to simplify the overall logistical process (operations).	1	2	3	4	5	6	7
g)	performs reverse logistics operations in a timely manner. (Reverse logistics - the process of collecting, moving, and storing used, damaged, or outdated products and/or packaging from end users.)	1	2	3	4	5	6	7

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
Our logistics unit...								
h)	performs services that add value for the customer during the actual sales process.	1	2	3	4	5	6	7
i)	continuously adds new logistics services to provide better logistics support.	1	2	3	4	5	6	7
j)	effectively accommodates special customer service requests.	1	2	3	4	5	6	7
k)	effectively accommodates new product/service introductions (roll-outs to market).	1	2	3	4	5	6	7
l)	provides widespread distribution coverage. (Comprehensively and effectively targets a given distribution region.)	1	2	3	4	5	6	7

② **For the following statements, please think about a strategic relationship your firm has with a supplier or third-party provider that was formed for logistics reasons (e.g., warehouse management, transportation, information technology utilization) within the past two years.** Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
This relationship provides my firm with...								
a)	information technology needed to perform logistics operations.	1	2	3	4	5	6	7
b)	a transportation network to serve our markets.	1	2	3	4	5	6	7
c)	access to facilities to serve our markets.	1	2	3	4	5	6	7
d)	network optimization tools to plan logistics activities.	1	2	3	4	5	6	7
e)	human resources needed to perform logistics operations.	1	2	3	4	5	6	7
f)	resources to react to competitors' actions.	1	2	3	4	5	6	7
g)	resources to monitor competitors' actions.	1	2	3	4	5	6	7
h)	resources to react quickly to our customers' changing logistics needs.	1	2	3	4	5	6	7
i)	resources needed to reduce our customers' inventory levels.	1	2	3	4	5	6	7
j)	resources needed to respond to customer requests	1	2	3	4	5	6	7

③ **For the following statements, please think about the internal resources of the firm which may be committed to logistics operations.** Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.

My business unit...		**Strongly Disagree**			**Neither Disagree Nor Agree**			**Strongly Agree**
a)	allocates sufficient financial resources to the implementation of logistics initiatives.	1	2	3	4	5	6	7
b)	does not have sufficient facilities to support logistics plans.	1	2	3	4	5	6	7
c)	has sufficient transportation equipment to support logistics plans.	1	2	3	4	5	6	7
d)	hires personnel with the skills necessary for logistics operations.	1	2	3	4	5	6	7
e)	provides limited internal educational opportunities for personnel in the logistics area.	1	2	3	4	5	6	7
f)	has made a sufficient investment in the number of personnel dedicated to logistics operations.	1	2	3	4	5	6	7
g)	consists of senior management who is not committed to allocating needed resources to logistics operations.	1	2	3	4	5	6	7
h)	consists of senior management who supports the logistics activities of the firm.	1	2	3	4	5	6	7
i)	has made significant technological investments toward integrating logistics systems with suppliers.	1	2	3	4	5	6	7
j)	does not have the right software tools in-house for determining logistics solutions.	1	2	3	4	5	6	7
k)	will invest in updated logistics systems when needed.	1	2	3	4	5	6	7
l)	lacks the systems necessary to facilitate the implementation of logistics initiatives.	1	2	3	4	5	6	7
m)	has made significant technological investments toward integrating logistics systems with customers.	1	2	3	4	5	6	7
n)	consists of senior management who understands the value that can be created by logistics activities.	1	2	3	4	5	6	7

SECTION 2 - MARKETING LOGISTICS

④ **This question relates to how an organization may communicate its logistics capabilities to new and existing customers as well as to other areas of the firm.** Please read the statements carefully and respond by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			**Neither Disagree Nor Agree**			**Strongly Agree**
a)	When soliciting new business, my firm's salespeople use our logistics capabilities as a selling point.	1	2	3	4	5	6	7
b)	My firm does not emphasize its logistics capabilities in communications with existing customers.	1	2	3	4	5	6	7
c)	We frequently promote to customers the benefits created by our logistics capabilities.	1	2	3	4	5	6	7
d)	There are regular meetings between the logistics and sales area of my firm to discuss logistics capabilities.	1	2	3	4	5	6	7
e)	The logistics area is not involved in training sales reps on how to communicate our logistics capabilities to customers.	1	2	3	4	5	6	7
f)	A logistics representative will meet with existing customers to determine solutions to logistics-related problems as they arise.	1	2	3	4	5	6	7
g)	Customers are not made aware of new logistics capabilities as they develop.	1	2	3	4	5	6	7
h)	Logistics initiatives are always communicated to the marketing area of my firm.	1	2	3	4	5	6	7
i)	A logistics representative always meets with new customers to work through logistics-related issues.	1	2	3	4	5	6	7
j)	The marketing area rarely promotes my firm's logistics capabilities.	1	2	3	4	5	6	7
k)	My firm's decision-makers are frequently reminded of the impact on performance of our logistics capabilities.	1	2	3	4	5	6	7
l)	A representative from the logistics area frequently meets with new customers to discuss how my firm's logistics capabilities can create value.	1	2	3	4	5	6	7

SECTION 3 - PERFORMANCE

⑤ **Please rate your firm's performance on logistics activities in comparison to the competitors you have experience with.** Please respond to the following statements by circling the number that best represents performance. **If you do not know how your competitors performed in a particular area, please circle "DK".**

		Much Worse			The Same			Much Better	Don't Know
a)	Damage Free Deliveries	1	2	3	4	5	6	7	DK
b)	Finished Goods Inventory Turns	1	2	3	4	5	6	7	DK
c)	Forecasting Accuracy	1	2	3	4	5	6	7	DK
d)	Line Item Fill Rate	1	2	3	4	5	6	7	DK
e)	Time Between Order Receipt and Delivery	1	2	3	4	5	6	7	DK
f)	Time on Backorder	1	2	3	4	5	6	7	DK
g)	Total Inventory Turns	1	2	3	4	5	6	7	DK
h)	On-Time Delivery	1	2	3	4	5	6	7	DK

⑥ **Please circle the value that best represents your business unit's logistics performance for the year 2001.**

a)	Orders Shipped to Customers from the Primary Location Designated to Serve Those Customers **(Percentage)**	<50	50-59	60-69	70-79	80-89	90-95	95-100
b)	Line Item Fill Rate **(Percentage)** (Percentage of order items the picking operation actually found.)	<83	83-85	86-88	89-91	92-94	95-97	98-100
c)	Orders Shipped on Time **(Percentage)**	<83	83-85	86-88	89-91	92-94	95-97	98-100
d)	Shipments Requiring Expediting **(Percentage)**	<4	4-6	7-9	10-12	13-15	16-18	>18
e)	Inventory Turns per Year **(Number)**	<3	3-5	6-8	9-11	12-14	15-17	>17
f)	Average Order Cycle Time **(In Days)** (Time between order receipt and order delivery.)	<1	2-7	8-13	14-19	20-25	26-30	>31

⑦ **This question is concerned with your firm's actual performance compared to budgeted performance, based on 2001 results. Please respond by circling the number that best represents your degree of performance.**

		Much Worse			On Target			Much Better
a)	Sales (Dollars)	1	2	3	4	5	6	7
b)	Transportation Costs	1	2	3	4	5	6	7
c)	Warehousing Costs	1	2	3	4	5	6	7
d)	Inventory Costs	1	2	3	4	5	6	7
e)	Total Logistics Costs	1	2	3	4	5	6	7

⑧ **Rate the performance of the logistics area of your organization as compared to the competitors you have experience with.** Please respond to the following statements by circling the number that best represents logistics performance. **If you do not know how your competitors performed in a particular area, please circle "DK".**

		Much Worse			The Same			Much Better	Don't Know
a)	Response to the needs and wants of key customers.	1	2	3	4	5	6	7	DK
b)	Accommodation of special customer service requests.	1	2	3	4	5	6	7	DK
c)	Meeting quoted or anticipated delivery dates on a consistent basis.	1	2	3	4	5	6	7	DK
d)	Providing desired quantities on a consistent basis.	1	2	3	4	5	6	7	DK
e)	Accommodation of new product introductions.	1	2	3	4	5	6	7	DK
f)	Notifying customers in advance of delivery delays or product shortages.	1	2	3	4	5	6	7	DK

⑨ **Please indicate your business unit's performance over the last year on the following factors:**

		Poor			Average			Excellent
a)	General Profitability	1	2	3	4	5	6	7
b)	Return on Assets	1	2	3	4	5	6	7
c)	Return on Investment	1	2	3	4	5	6	7
d)	Net Profit Margin	1	2	3	4	5	6	7
e)	Market Share	1	2	3	4	5	6	7

SECTION 4 - INFORMATION ABOUT YOUR FIRM

10. What is your title?_____

11. What is the title of your department within the firm?

_____

12. What is the primary industry in which your firm competes?

_____

13. Please indicate (with a check mark) whether you are part of a business unit of a larger organization or a self-contained company?

_____Division/Subsidiary/Business Unit of a Larger Company
_____Self-Contained Company

14. Indicate the size of your **business unit** by the approximate number of employees.

_____ < 100
_____ 101-500
_____ 501-1000
_____ 1001-5000
_____ 5001-10,000
_____ 10,001-50,000
_____ > 50,000

15. What were the approximate total sales for your **business unit** last year?

_____ <$10 million
_____ $10-$99 million
_____ $100-$500 million
_____ $501 million-$1 billion
_____ $1-$5 billion
_____ $>5 billion

16. How much did your **entire company** spend on logistics operations last year?

_____ <$49 thousand
_____ $50-$99 thousand
_____ $100-$149 thousand
_____ $150 thousand-$199 thousand
_____ $200-$250 thousand
_____ $>251 thousand
_____ Don't Know

17. How many business units are you involved with in your current position?
_____ one
_____ two-three
_____ four-five
_____ more than five

THANK YOU for your participation in this research. Please indicate below if you would like a copy of the study results.

____ **NO**, I do not want results.

____ **YES**, send me the aggregate results. (Please provide the information requested below. As soon as the survey is received, your contact information will be separated from the survey to protect your anonymity.)

Name: _____

E-Mail Address: _____
or
Mailing Address: _____

_____

_____

APPENDIX C: CONSTRUCT MEASUREMENT

SOURCES FOR CONSTRUCT DEVELOPMENT

Construct	Source	Adopted Modified	Item
PROCAP1	Lynch, Keller, & Ozment (2000)	Adapted	seeks to attain the lowest total cost logistics through efficient operations, technology, and/or scale economies.
PROCAP2	Lynch, Keller, & Ozment (2000)	Adapted	proactively seeks solutions to logistics problems before they occur.
PROCAP3	Lynch, Keller, & Ozment (2000)	Adapted	provides a consistent approach to performing key logistics work.
PROCAP4	Lynch, Keller, & Ozment (2000)	Adapted	differentiates logistical service offerings from those offered by the competition.
PROCAP5	Lynch, Keller, & Ozment (2000)	Adapted	develops creative logistical solutions for specific situations, emergencies, or customers.
PROCAP6	Lynch, Keller, & Ozment (2000)	Adapted	continuously seeks to simplify the overall logistical process (operations).
PROCAP7	Lynch, Keller, & Ozment (2000)	Adapted	performs reverse logistics operations in a timely manner.
VALCAP1	Lynch, Keller, & Ozment (2000)	Adapted	performs services that add value for the customer during the actual sales process
VALCAP2	Lynch, Keller, & Ozment (2000)	Adapted	continuously adds new logistics services to provide better logistics support.
VALCAP3	Lynch, Keller, & Ozment (2000)	Adapted	effectively accommodates special customer service requests.
VALCAP4	Lynch, Keller, & Ozment (2000)	Adapted	effectively accommodates new product/service introductions (roll-outs to market).
VALCAP5	Lynch, Keller, & Ozment (2000)	Adapted	provides widespread distribution coverage. (Comprehensively and effectively targets a given distribution region.)
RELCAP1	In-depth Interviews	New	the information technology needed to perform logistics operations.
RELCAP2	In-depth Interviews	New	a transportation network to serve our markets.
RELCAP3	In-depth Interviews	New	access to facilities to serve our markets.
RELCAP4	In-depth Interviews	New	network optimization tools to plan logistics activities.
RELCAP5	In-depth Interviews	New	human resources needed to perform logistics operations.
RELCAP6	In-depth Interviews	New	resources to react to competitors' actions.
RELCAP7	In-depth Interviews	New	resources to monitor competitors' actions.

Construct	Source	Adopted Modified	Item
RELCAP8	In-depth Interviews	New	resources to react quickly to our customers' changing logistics needs.
RELCAP9	In-depth Interviews	New	resources needed to reduce our customers' inventory levels.
RELCAP10	In-depth Interviews	New	resources needed to respond to customer requests.
RESCOM1	In-depth Interviews	New	allocates sufficient financial resources to the implementation of logistics initiatives.
RESCOM2	In-depth Interviews	New	does not have sufficient facilities to support logistics plans.
RESCOM3	In-depth Interviews	New	has sufficient transportation equipment to support logistics plans.
RESCOM4	In-depth Interviews	New	hires personnel are hired with the skills necessary for logistics operations.
RESCOM5	In-depth Interviews	New	provides limited internal educational opportunities for personnel in the logistics area.
RESCOM6	In-depth Interviews	New	has made a sufficient investment in the number of personnel dedicated to logistics operations.
RESCOM7	In-depth Interviews	New	consists of senior management who is not committed to allocating needed resources to logistics operations.
RESCOM8	In-depth Interviews	New	consists of senior management supports the logistics activities of the firm.
RESCOM9	In-depth Interviews	New	has made significant technological investments toward integrating logistics systems with suppliers.
RESCOM10	In-depth Interviews	New	does not have the right software tools in-house for determining logistics solutions.
RESCOM11	In-depth Interviews	New	will invest in updated logistics systems when needed.
RESCOM12	In-depth Interviews	New	lacks the systems necessary to facilitate the implementation of logistics initiatives.
RESCOM13	In-depth Interviews	New	has made significant technological investments toward integrating logistics systems with customers.
RESCOM14	In-depth Interviews	New	consists of senior management who understands the value that can be created by logistics activities.

Construct	Source	Adopted Modified	Item
SIGVAL1	In-depth Interviews	New	When soliciting new business, my firm's salespeople use our logistics capabilities as a selling point.
SIGVAL2	In-depth Interviews	New	My firm does not emphasize its logistics capabilities in communications with existing customers.
SIGVAL3	In-depth Interviews	New	We frequently promote to customers the benefits created by our logistics capabilities.
SIGVAL4	In-depth Interviews	New	There are regular meetings between the logistics and sales area of my firm to discuss logistics capabilities.
SIGVAL5	In-depth Interviews	New	The logistics area is not involved in training sales reps on how to communicate our logistics capabilities to customers.
SIGVAL6	In-depth Interviews	New	A logistics representative will meet with existing customers to determine solutions to logistics-related problems as they arise.
SIGVAL7	In-depth Interviews	New	Customers are not made aware of new logistics capabilities as they develop.
SIGVAL8	In-depth Interviews	New	Logistics initiatives are always communicated to the marketing area of my firm.
SIGVAL9	In-depth Interviews	New	A logistics representative always meets with new customers to work through logistics-related issues.
SIGVAL10	In-depth Interviews	New	The marketing area rarely promotes the firm's logistics capabilities.
SIGVAL11	In-depth Interviews	New	My firm's decision-makers are frequently reminded of the impact on performance of our logistics capabilities.
SIGVAL12	In-depth Interviews	New	A representative from the logistics area frequently meets with new customers to discuss how my firm's logistics capabilities can create value.
LOGDIF1	Smith (2000)	Adapted	Damage free deliveries
LOGDIF2	Smith (2000)	Adapted	Finished goods inventory turns
LOGDIF3	Smith (2000)	Adapted	Forecasting accuracy
LOGDIF4	Smith (2000)	Adapted	Line item fill rate
LOGDIF5	Smith (2000)	Adapted	Time between order receipt and delivery
LOGDIF6	Smith (2000)	Adapted	Time on Backorder

Construct	Source	Adopted Modified	Item
LOGDIF7	In-depth Interviews	New	Total inventory turns
LOGDIF8	In-depth Interviews	New	On-time delivery
LOGEFF1	Smith (2000)	Adapted	orders shipped to customers from the primary location designated to serve those customers
LOGEFF2	Smith (2000)	Adapted	Line item fill rate
LOGEFF3	Smith (2000)	Adapted	Orders shipped on time
LOGEFF4	Smith (2000)	Adapted	Shipments requiring expediting
LOGEFF5	Smith (2000)	Adapted	Inventory turns per year
LOGEFF6	Smith (2000)	Adapted	Average order cycle time
LOGETV1	Smith (2000)	Adapted	Sales
LOGETV2	Smith (2000)	Adapted	Transportation costs
LOGETV3	Smith (2000)	Adapted	Warehousing costs
LOGETV4	Smith (2000)	Adapted	Inventory costs
LOGETV5	Smith (2000)	Adapted	Total logistics costs
COMPADV1	Stank, Daugherty, & Ellinger (1999)	Adapted	Response to the needs and wants of key customers.
COMPADV2	Stank, Daugherty, & Ellinger (1999)	Adapted	Accommodation of special customer service requests.
COMPADV3	Stank, Daugherty, & Ellinger (1999)	Adapted	Meeting quoted or anticipated delivery dates on a consistent basis.
COMPADV4	Stank, Daugherty, & Ellinger (1999)	Adapted	Providing desired quantities on a consistent basis.
COMPADV5	Stank, Daugherty, & Ellinger (1999)	Adapted	Accommodation of new product introductions.
COMPADV6	Stank, Daugherty, & Ellinger (1999)	Adapted	Notifying customers in advance of delivery delays or product shortages.
FIRMPER1	Lynch, Keller & Ozment (2000)	Adapted	General profitability
FIRMPER2	Lynch, Keller & Ozment (2000)	Adapted	Return on assets
FIRMPER3	Lynch, Keller & Ozment (2000)	Adapted	Return on investment
FIRMPER4	Lynch, Keller & Ozment (2000)	Adapted	Net profit margin
FIRMPER5	Tracey (1998)	Adapted	Market share

APPENDIX D: PRETEST RESULTS

SAMPLE REPRESENTATION OF FIRM POSITIONS

Analysts	**Count**
Logistics	3
Sr. Distribution	1
Supply Chain	1
Director	
Logistics	10
Distribution	4
Transportation	2
Supply Chain	1
Global – Materials	1
Sales Services	1
Director	1
Logistics System Engineer	1
Managers	
Logistics	11
Traffic/Transportation	6
Distribution	6
Operations	3
Distribution Operations	2
Materials	2
Import/Export	2
Supply Chain	1
Strategic Planning	1
General	1
Assistant District	1
Supervisors	1
Vice Presidents	
Supply Chain	1
Operations	1
Total Respondents	**65***
*One respondent did not indicate a position.	

TESTS OF NORMALITY

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PROCAP1	64	6.0469	1.43017	-1.933	.299	3.512	.590
PROCAP2	64	5.1250	1.47465	-.958	.299	.761	.590
PROCAP3	64	5.3750	1.30323	-.783	.299	.066	.590
PROCAP4	64	4.8438	1.32400	.085	.299	-.448	.590
PROCAP5	63	5.6825	1.36577	-1.084	.302	.510	.595
PROCAP6	63	5.2540	1.44767	-.791	.302	.012	.595
PROCAP7	64	4.0781	1.57666	-.158	.299	-1.094	.590
VALCAP1	64	5.3750	1.35107	-.483	.299	-.430	.590
VALCAP2	64	4.7500	1.32137	-.075	.299	-.525	.590
VALCAP3	64	5.8438	1.12995	-1.114	.299	1.445	.590
VALCAP4	64	5.6094	1.31677	-.827	.299	-.119	.590
VALCAP5	63	6.0000	1.12163	-1.275	.302	1.227	.595
RELCAP1	63	4.9048	1.64331	-.856	.302	-.081	.595
RELCAP2	63	4.8889	1.74237	-.731	.302	-.282	.595
RELCAP3	62	4.5161	1.76247	-.575	.304	-.464	.599
RELCAP4	63	4.2857	1.80884	-.257	.302	-.826	.595
RELCAP5	63	4.2063	1.71482	-.411	.302	-.486	.595
RELCAP6	63	3.8095	1.58478	-.103	.302	-.792	.595
RELCAP7	63	3.0952	1.49962	.188	.302	-.966	.595
RELCAP8	63	4.8254	1.52970	-.897	.302	.113	.595
RELCAP9	62	4.2581	1.75495	-.277	.304	-.812	.599
RELCAP10	63	4.9683	1.54469	-.813	.302	.158	.595
RESCOM1	64	4.6094	1.59977	-.625	.299	-.414	.590
RESCOM2	64	4.9687	1.50099	-.585	.299	-.403	.590
RESCOM3	64	4.6250	1.52753	-.769	.299	.225	.590
RESCOM4	64	5.0938	1.30589	-.841	.299	.245	.590
RESCOM5	64	3.6406	1.71239	.213	.299	-.837	.590
RESCOM6	64	4.3125	1.45706	-.632	.299	-.475	.590
RESCOM7	64	4.8437	1.60573	-.283	.299	-1.164	.590
RESCOM8	64	5.1562	1.43890	-.745	.299	-.585	.590
RESCOM9	64	3.9844	1.94767	.076	.299	-1.342	.590
RESCOM10	64	3.7656	1.93335	.194	.299	-1.242	.590
RESCOM11	64	4.6250	1.45297	-.785	.299	-.140	.590
RESCOM12	64	4.1719	1.70485	-.019	.299	-1.163	.590
RESCOM13	64	4.4375	1.71709	-.250	.299	-1.033	.590
RESCOM14	64	4.8906	1.67253	-.746	.299	-.526	.590
SIGVAL1	64	4.2813	1.62782	-.313	.299	-.749	.590
SIGVAL2	64	4.2031	1.71065	-.032	.299	-1.058	.590
SIGVAL3	64	4.2500	1.65232	-.087	.299	-.780	.590
SIGVAL4	64	3.7188	1.89794	-.113	.299	-1.358	.590
SIGVAL5	64	2.9375	1.87612	.882	.299	-.265	.590
SIGVAL6	64	4.2031	1.96137	-.281	.299	-1.065	.590
SIGVAL7	64	3.9531	1.58795	.079	.299	-.862	.590
SIGVAL8	64	4.2344	1.73427	-.431	.299	-.634	.590
SIGVAL9	64	3.1563	1.60573	.355	.299	-.847	.590
SIGVAL10	64	3.6094	1.60967	.173	.299	-.696	.590

	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SIGVAL11	64	5.0156	1.35098	-1.185	.299	1.600	.590
SIGVAL12	64	3.2656	1.76601	.242	.299	-1.132	.590
LOGDIF1	37	4.8378	1.21366	.525	.388	-.812	.759
LOGDIF2	42	4.7381	1.56267	-.628	.365	-.507	.717
LOGDIF3	32	4.4063	1.72008	-.074	.414	-1.010	.809
LOGDIF4	42	5.1429	1.49097	-.766	.365	-.459	.717
LOGDIF5	48	4.9167	1.36574	-.523	.343	.164	.674
LOGDIF6	31	4.8065	1.40046	.057	.421	-1.016	.821
LOGDIF7	41	4.8293	1.49837	-.397	.369	-.446	.724
LOGDIF8	48	5.2708	1.42530	-.548	.343	-.517	.674
LOGEFCY1	63	6.2857	1.05385	-2.142	.302	5.433	.595
LOGEFCY2	60	5.9667	1.27514	-1.559	.309	2.965	.608
LOGEFCY3	63	5.8730	1.43113	-1.509	.302	2.512	.595
LOGEFCY4	61	5.1639	1.95090	-1.018	.306	-.012	.604
LOGEFCY5	57	3.4561	1.71204	.686	.316	-.444	.623
LOGEFCY6	60	5.1000	1.63334	-1.760	.309	1.933	.608
LOGETV1	62	4.1774	1.54203	-.141	.304	-.552	.599
LOGETV2	64	4.7656	1.17841	.114	.299	-.535	.590
LOGETV3	64	4.5312	1.12643	.195	.299	.164	.590
LOGETV4	64	4.1875	1.30779	.036	.299	-.143	.590
LOGETV5	63	4.7302	1.22087	-.228	.302	-.229	.595
COMPADV1	43	5.1860	1.45170	-.585	.361	-.005	.709
COMPADV2	41	5.4878	1.26732	-1.172	.369	2.584	.724
COMPADV3	47	5.2553	1.25919	-.576	.347	-.221	.681
COMPADV4	45	5.2000	1.28982	-.657	.354	.029	.695
COMPADV5	41	5.1220	1.53615	-.563	.369	-.336	.724
COMPADV6	36	4.7500	1.50000	-.192	.393	-.823	.768
FIRMPER1	60	4.7667	1.52234	-.783	.309	.349	.608
FIRMPER2	60	4.8167	1.29525	-.905	.309	1.472	.608
FIRMPER3	60	4.8000	1.39976	-.858	.309	1.215	.608
FIRMPER4	60	4.7000	1.57631	-.745	.309	-.081	.608
FIRMPER5	60	5.1667	1.18130	-.717	.309	1.651	.608

UNIDIMENSIONALITY TESTS

RESOURCE COMMITMENT

Initial Scale

	Component		
	1	2	3
RESCOM1	.517	.194	.458
RESCOM2	-.145	6.861E-02	.787
RESCOM3	.186	5.141E-02	.418
RESCOM4	.774	6.026E-02	-.142
RESCOM5	-.093	.733	-.396
RESCOM6	.810	-.034	.252
RESCOM7	.340	.617	.236
RESCOM8	.801	.387	4.985E-02
RESCOM9	.484	.343	.547
RESCOM10	.317	.701	.243
RESCOM11	.647	.476	.109
RESCOM12	.175	.691	.242
RESCOM13	.547	.259	.317
RESCOM14	.720	.437	.272

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.839	41.708	41.708	5.839	41.708	41.708
2	1.437	10.268	51.976	1.437	10.268	51.976
3	1.263	9.020	60.995	1.263	9.020	60.995

Final Scale

	Component	
	1	2
RESCOM1	.518	.444
RESCOM2	-.171	.762
RESCOM3	.157	.440
RESCOM4	.776	-.166
RESCOM6	.762	.119
RESCOM7	.508	.440
RESCOM8	.857	.178
RESCOM9	.516	.639
RESCOM10	.544	.400
RESCOM13	.560	.382
RESCOM14	.770	.390

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

RESOURCE COMMITMENT

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.859	44.172	44.172	4.859	44.172	44.172
2	1.213	11.023	55.195	1.213	11.023	55.195

Alpha = .8667 Standardized item alpha = **.8707**
Alpha = .4635 Standardized item alpha = **.4555**

Result: Eliminate items 5, 11, and 12. Retain two dimensions.

PROCESS CAPABILITIES

Final Scale

	Component
	1
PROCAP1	.698
PROCAP2	.832
PROCAP3	.766
PROCAP4	.604
PROCAP5	.737
PROCAP6	.754
PROCAP7	.479

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.472	49.595	49.595	3.472	49.595	49.595

Alpha = .8225 Standardized item alpha = **.8256**

Result: Retain all items.

VALUE-ADDED SERVICE CAPABILITIES

Final Scale

	Component
	1
VALCAP1	.711
VALCAP2	.864
VALCAP3	.724
VALCAP4	.768
VALCAP5	.667

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.811	56.220	56.220	2.811	56.220	56.220

Alpha = .8022 Standardized item alpha = **.8020**

Result: Retain all items.

RELATIONAL CAPABILITIES

Initial Scale

	Component	
	1	2
RELCAP1	.902	-.084
RELCAP2	6.661E-02	.578
RELCAP3	.143	.830
RELCAP4	.763	8.457E-02
RELCAP5	.105	.702
RELCAP6	.543	.643
RELCAP7	.460	.466
RELCAP8	.698	.469
RELCAP9	.654	.444
RELCAP10	.622	.524

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Total Variance Explained

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.783	47.830	47.830	3.238	32.384	32.384
2	1.308	13.082	60.911	2.853	28.527	60.911

Final Scale

	Component	
	1	2
RELCAP1	.901	-.053
RELCAP2	.063	.642
RELCAP3	.142	.816
RELCAP4	.730	.116
RELCAP5	.153	.728
RELCAP6	.491	.661
RELCAP8	.668	.525
RELCAP9	.699	.424
RELCAP10	.632	.536

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

RELATIONAL CAPABILITIES

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.503	50.030	50.030	4.503	50.030	50.030
2	1.268	14.087	64.118	1.268	14.087	64.118

Factor 1: Alpha = .8487 Standardized item alpha = **.8528**
Factor 2: Alpha = .7564 Standardized item alpha = **.7567**
Result: Eliminate item 7 and keep two dimensions.

SIGNALS OF VALUE

Initial Scale

	Component		
	1	2	3
SIGVAL1	.877	.198	1.893E-02
SIGVAL2	.760	.267	-.121
SIGVAL3	.880	.238	.149
SIGVAL4	.279	.689	.254
SIGVAL5	-.020	.533	.524
SIGVAL6	.332	.805	-.127
SIGVAL7	.557	.444	.340
SIGVAL8	-.027	.327	.671
SIGVAL9	.278	.811	.121
SIGVAL10	.639	.190	.245
SIGVAL11	.229	-.082	.800
SIGVAL12	.379	.740	.303

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.511	45.929	45.929	5.511	45.929	45.929
2	1.569	13.072	59.000	1.569	13.072	59.000
3	1.111	9.261	68.262	1.111	9.261	68.262

Final Scale

	Component	
	1	2
SIGVAL1	.885	8.867E-02
SIGVAL2	.809	6.410E-02
SIGVAL3	.882	.193
SIGVAL4	.386	.677
SIGVAL5	2.722E-02	.746
SIGVAL6	.516	.527
SIGVAL7	.593	.498
SIGVAL8	-.049	.680
SIGVAL9	.433	.687
SIGVAL10	.630	.232
SIGVAL12	.491	.729

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Factor 1: Alpha = .8666 Standardized item alpha = **.8664**
Factor 2: Alpha = .8351 Standardized item alpha = **.8374**
Result: Eliminate item 11 and keep two dimensions.

LOGISTICS PERFORMANCE

LOGISTICS DIFFERENTIATION

Final Scale

	Component
	1
LOGDIF1	.687
LOGDIF2	.893
LOGDIF3	.780
LOGDIF4	.842
LOGDIF5	.743
LOGDIF6	.665
LOGDIF7	.825
LOGDIF8	.724

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.787	59.838	59.838	4.787	59.838	59.838

Alpha = .8746 Standardized item alpha = **.8767**

Result: Retain all items. Change Scales based on the means.

LOGISTICS EFFICIENCY

Final Scale

	Component
	1
LOGEFCY1	.702
LOGEFCY2	.784
LOGEFCY3	.663
LOGEFCY4	.605
LOGEFCY5	.546
LOGEFCY6	.572

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.538	42.306	42.306	2.538	42.306	42.306

Alpha = .7083 Standardized item alpha = **.7365**

Result: Retain all items.

LOGISTICS EFFECTIVENESS

Final Scale

	Component	
	1	2
LOGETV1	3.627E-02	.969
LOGETV2	.742	-.257
LOGETV3	.853	.000
LOGETV4	.777	.206
LOGETV5	.929	.111

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.753	55.064	55.064	2.753	55.064	55.064

Alpha = .7053 Standardized item alpha = **.7406**

Result: Retain all items.

COMPETITIVE ADVANTAGE

Final Scale

	Component
	1
COMPADV1	.880
COMPADV2	.763
COMPADV3	.804
COMPADV4	.755
COMPADV5	.807
COMPADV6	.691

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.699	61.658	61.658	3.699	61.658	61.658

Alpha = .9099 Standardized item alpha = **.9105**

Result: Retain all items.

FIRM PERFORMANCE

Final Scale

	Component
	1
FIRMPER1	.922
FIRMPER2	.935
FIRMPER3	.934
FIRMPER4	.909
FIRMPER5	.654

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.851	77.017	77.017	3.851	77.017	77.017

Alpha = .9229 Standardized item alpha = **.9212**

Result: Retain all items.

APPENDIX E: FINAL STUDY DOCUMENTS

PRENOTIFICATION PROTOCOL

Hello, Mr/Ms _____, please.

> ***If secretary answers and asks who is calling:*** "I am calling on behalf of Dr. Tom Mentzer from the University of Tennessee."
>
> ***When speaking to contact:***

My name is [First Name].

I am calling on behalf of Dr. Tom Mentzer and Michelle Bobbitt from the University of Tennessee, to ask if we could send you a short survey on logistics capabilities and performance in manufacturing firms. The survey should take about 10 minutes to complete and is aimed at people who have direct experience with logistics operations. All responses will be held in strict confidence. Neither your name nor your company's name will be recorded with any of the responses.

Would you be willing to participate in the research?
{If they say **yes** –}

> (Verify they are a manufacturing firm.)
>
> {Verify their title and address.}
>
> {Go to closing}

{If they say **no** –}

> Is there someone else in your company who would be able to fill out this survey?
>
> {Get name and number of the suggested person.}
> {Go to closing}

{CLOSING}
Thank you for your time. We appreciate your willingness to participate in this research.

INITIAL SURVEY COVER LETTER

[DATE]

[Gender, First name, Last name]
[Title]
[Business]
[Address]
[City, State, Zip]

Dear [Gender, Last name]:

Thank you for agreeing to participate in the study on logistics capabilities and performance in manufacturing firms. The data obtained as a result of this survey will provide business managers and students valuable information on how a firm can compete on its logistics capabilities and gain a competitive advantage in the marketplace.

In order for the survey results to truly represent today's management practice, it is important that each survey be completed and returned. Your response is vital to the success of this study. To express our appreciation for your assistance, we will send you an Executive Summary of the results if you enclose a business card with the survey. All business cards will be separated from the surveys to preserve anonymity.

All responses will be held in strict confidence. Neither your name nor your company's name will be recorded with any of the responses.

Thank you for your participation!

Sincerely,

L. Michelle Bobbitt
Ph.D. Candidate

Dr. John T. Mentzer
Bruce Chair of Excellence in Business

REMINDER POSTCARD

Just a Reminder...

We recently sent you a survey designed to understand the impact of logistics capabilities on firm performance.

If you have already completed and returned the questionnaire to us, please accept our sincere thanks. If you have not sent it in, we would greatly appreciate your participation. **Your input is extremely important in aiding our understanding of strategic issues related to the logistics function.**

THANK YOU FOR YOUR TIME & CONSIDERATION,

L. Michelle Bobbitt
University of Tennessee

John T. Mentzer, Ph.D.
University of Tennessee

If you have any questions, we would like to hear from you:
lbobbitt@utk.edu, Tel: (865) 974-5311

REPLACEMENT COVER LETTER

[DATE]

[Gender, First name, Last name]
[Title]
[Business]
[Address]
[City, State, Zip]

Dear [Gender, Last name]:

About three weeks ago, Dr. Tom Mentzer and I sent a questionnaire to you seeking your opinions about logistics capabilities and performance in manufacturing firms. Since we have not yet received your completed survey, we urge you to take a few moments to do so now. In case you have misplaced the survey, a copy is enclosed.

This study is being conducted so that business managers like you can help identify how logistics resources and capabilities can help firms compete in the marketplace. We are writing to you again because the study's usefulness depends on our receiving a survey from each respondent. In order for the information from the study to be truly representative of manufacturing firms in the U.S., it is essential that each person in the sample return his/her survey.

Your participation in the survey will require only about 12 minutes. A return envelope is enclosed for your convenience. To express our appreciation for your assistance, we will send you an Executive Summary of the results if you enclose a business card with the survey. To preserve your anonymity, the business card will be separated from the survey as soon as it is received. All responses will be held in strict confidence.

Thank you in advance for your participation. Please return the completed survey by **Tuesday, March 18**.

Sincerely,

L. Michelle Bobbitt
Ph. D. Candidate

Dr. John T. (Tom) Mentzer
Bruce Chair of Excellence in Business

FINAL SURVEY

INSTRUCTIONS

The following questions relate to the logistics operations of a business unit. When answering the questions, please keep in mind the following points:

For the purposes of this survey, please think about all **logistics activities** within your business unit, including warehousing, transportation, inventory management, forecasting, order processing, materials handling, and customer service.

A **business unit** is defined as a relatively independent organizational unit that has a defined business strategy and is responsible for sales and profits. If you are involved with multiple business units, please select the one unit that is most representative of those business units and answer all questions with regard to the selected business unit. **Your company does not have to consist of multiple business units for purposes of the survey.** If you are associated with a company that does not consist of business units or divisions, please answer the following questions based on your company.

SECTION 1 - RESOURCES AND CAPABILITIES

① **Please think about the logistics operations/processes of your organization.** Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
Our business unit...								
a)	seeks to attain the lowest total cost logistics through efficient operations, technology, and/or scale economies.	1	2	3	4	5	6	7
b)	proactively seeks solutions to logistics problems before they occur.	1	2	3	4	5	6	7
c)	provides a consistent approach to performing key logistics work (standardizing operations).	1	2	3	4	5	6	7
d)	differentiates logistical service offerings from those offered by the competition.	1	2	3	4	5	6	7
e)	develops creative logistical solutions for specific situations, emergencies, or customers.	1	2	3	4	5	6	7
f)	continuously seeks to simplify the overall logistical process (operations).	1	2	3	4	5	6	7
g)	performs reverse logistics operations in a timely manner. (Reverse logistics - the process of collecting, moving, and storing used, damaged, or outdated products and/or packaging from end users.)	1	2	3	4	5	6	7

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
Our logistics unit...								
h)	performs services that add value for the customer during the actual sales process.	1	2	3	4	5	6	7
i)	continuously adds new logistics services to provide better logistics support.	1	2	3	4	5	6	7
j)	effectively accommodates special customer service requests.	1	2	3	4	5	6	7
k)	effectively accommodates new product/service introductions (roll-outs to market).	1	2	3	4	5	6	7
l)	provides widespread distribution coverage. (Comprehensively and effectively targets a given distribution region.)	1	2	3	4	5	6	7

② **For the following statements, please think about a strategic relationship your firm has with a supplier or third-party provider that was formed for logistics reasons (e.g., warehouse management, transportation, information technology utilization) within the past two years.** Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			Neither Disagree Nor Agree			Strongly Agree
This relationship provides my firm with...								
a)	information technology needed to perform logistics operations.	1	2	3	4	5	6	7
b)	transportation resources to serve our markets.	1	2	3	4	5	6	7
c)	access to storage/warehouse facilities to serve our markets.	1	2	3	4	5	6	7
d)	network optimization resources to plan logistics activities.	1	2	3	4	5	6	7
e)	human resources needed to perform logistics operations.	1	2	3	4	5	6	7
f)	resources to react to competitors' actions.	1	2	3	4	5	6	7
g)	resources to react quickly to our customers' changing logistics needs.	1	2	3	4	5	6	7
h)	resources needed to reduce our customers' inventory levels.	1	2	3	4	5	6	7
i)	resources needed to respond to customer requests.	1	2	3	4	5	6	7

③ **For the following statements, please think about your firm's resources that are used for logistics operations.** Please respond to the following statements by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			**Neither Disagree Nor Agree**			**Strongly Agree**
My business unit...								
a)	allocates sufficient financial resources to the implementation of logistics operations.	1	2	3	4	5	6	7
b)	invests in warehouse/storage facilities to support logistics operations.	1	2	3	4	5	6	7
c)	invests in transportation equipment to support logistics operations.	1	2	3	4	5	6	7
d)	hires personnel with the skills necessary for logistics operations.	1	2	3	4	5	6	7
e)	has made a sufficient investment in the number of personnel dedicated to logistics operations.	1	2	3	4	5	6	7
f)	consists of senior management who is **not** committed to allocating needed resources to logistics operations.	1	2	3	4	5	6	7
g)	consists of senior management who supports the logistics operations of the firm.	1	2	3	4	5	6	7
h)	has made significant technological investments toward integrating logistics systems with suppliers.	1	2	3	4	5	6	7
i)	does **not** have the right software tools in-house for determining logistics solutions.	1	2	3	4	5	6	7
j)	has made significant technological investments toward integrating logistics systems with customers.	1	2	3	4	5	6	7
k)	consists of senior management who understands the value that can be created by logistics operations.	1	2	3	4	5	6	7

SECTION 2 - MARKETING LOGISTICS

④ **This question relates to how an organization may communicate its logistics capabilities to new and existing customers as well as to other areas of the firm. (Logistics capabilities refer to those attributes, abilities, organizational processes, knowledge, and skills related to logistics that allow a firm to achieve superior performance.)** Please read the statements carefully and respond by circling the number that best represents your degree of agreement or disagreement.

		Strongly Disagree			**Neither Disagree Nor Agree**			**Strongly Agree**
a)	When soliciting new business, my firm's salespeople use our logistics capabilities as a selling point.	1	2	3	4	5	6	7
b)	My firm does **not** emphasize its logistics capabilities in communications with existing customers.	1	2	3	4	5	6	7
c)	We frequently promote to customers the benefits created by our logistics capabilities.	1	2	3	4	5	6	7
d)	There are regular meetings between the logistics and sales area of my firm to discuss logistics capabilities.	1	2	3	4	5	6	7
e)	The logistics area is **not** involved in training sales reps on how to communicate our logistics capabilities to customers.	1	2	3	4	5	6	7
f)	A logistics representative will meet with existing customers to determine solutions to logistics-related problems as they arise.	1	2	3	4	5	6	7
g)	Customers are **not** made aware of new logistics capabilities as they develop.	1	2	3	4	5	6	7
h)	Logistics initiatives are always communicated to the marketing area of my firm.	1	2	3	4	5	6	7
i)	A logistics representative always meets with new customers to work through logistics-related issues.	1	2	3	4	5	6	7
j)	The marketing area **rarely** promotes my firm's logistics capabilities.	1	2	3	4	5	6	7
k)	A representative from the logistics area frequently meets with new customers to discuss how my firm's logistics capabilities can create value.	1	2	3	4	5	6	7

SECTION 3 - PERFORMANCE

⑤ **Please rate your firm's performance on logistics activities in comparison to the competitors you have experience with.** Please respond to the following statements by circling the number that best represents performance.

		Much Worse			**The Same**			**Much Better**
a)	Damage Free Deliveries	1	2	3	4	5	6	7
b)	Finished Goods Inventory Turns	1	2	3	4	5	6	7
c)	Forecasting Accuracy	1	2	3	4	5	6	7
d)	Line Item Fill Rate	1	2	3	4	5	6	7
e)	Time Between Order Receipt and Delivery	1	2	3	4	5	6	7
f)	Time on Backorder	1	2	3	4	5	6	7
g)	Total Inventory Turns	1	2	3	4	5	6	7
h)	On-Time Delivery	1	2	3	4	5	6	7
	Indicate your level of confidence in your answers to the above items (a-h).	1	2	3	4	5	6	7

⑥ **Please circle the value that best represents your business unit's logistics performance for the year 2002.**

a)	Orders Shipped to Customers from the Primary Location Designated to Serve Those Customers **(Percentage)**	<89	90-91	92-93	94-95	96-97	98-99	100
b)	Line Item Fill Rate **(Percentage)** (Percentage of order items the picking operation actually found.)	<89	90-91	92-93	94-95	96-97	98-99	100
c)	Orders Shipped on Time **(Percentage)**	<89	90-91	92-93	94-95	96-97	98-99	100
d)	Shipments Requiring Expediting **(Percentage)**	<4	4-6	7-9	10-12	13-15	16-18	>18
e)	Inventory Turns per Year **(Number)**	<3	3-5	6-8	9-11	12-14	15-17	>17
f)	Average Order Cycle Time **(In Days)** (Time between order receipt and order delivery.)	1 day or less	2-7	8-13	14-19	20-25	26-30	>31

⑦ **This question is concerned with your firm's actual performance compared to budgeted performance, based on 2002 results. Please respond by circling the number that best represents your degree of performance.**

		Much Worse			On Target			Much Better
a)	Sales (Dollars)	1	2	3	4	5	6	7
b)	Transportation Costs	1	2	3	4	5	6	7
c)	Warehousing Costs	1	2	3	4	5	6	7
d)	Inventory Costs	1	2	3	4	5	6	7
e)	Total Logistics Costs	1	2	3	4	5	6	7

⑧ **Rate the performance of the logistics area of your organization as compared to the competitors you have experience with.** Please respond to the following statements by circling the number that best represents logistics performance.

		Much Worse			The Same			Much Better
a)	Response to the needs and wants of key customers.	1	2	3	4	5	6	7
b)	Accommodation of special customer service requests.	1	2	3	4	5	6	7
c)	Meeting quoted or anticipated delivery dates on a consistent basis.	1	2	3	4	5	6	7
d)	Providing desired quantities on a consistent basis.	1	2	3	4	5	6	7
e)	Accommodation of new product introductions.	1	2	3	4	5	6	7
f)	Notifying customers in advance of delivery delays or product shortages.	1	2	3	4	5	6	7
	Indicate your level of confidence in your answers to the above items (a-f).	1	2	3	4	5	6	7

⑨ **Please indicate your business unit's performance over the last year on the factors listed below. All responses are confidential and are used to obtain a general impression of firm performance across respondents. Responses are not identified with any respondent or company.**

		Poor			Average			Excellent
a)	Market Share	1	2	3	4	5	6	7
b)	Return on Assets	1	2	3	4	5	6	7
c)	Return on Investment	1	2	3	4	5	6	7
d)	Net Profit Margin	1	2	3	4	5	6	7
e)	General Profitability	1	2	3	4	5	6	7

(Please Continue to Last Page.)

SECTION 4 - INFORMATION ABOUT YOUR FIRM

10. What is your title?_____

11. What is the title of your department within the firm?

_____

12. What is the primary industry in which your firm competes?

_____

13. Please indicate (with a check mark) whether you are part of a business unit of a larger organization or a self-contained company?

_____Division/Subsidiary/Business Unit of a Larger Company
_____Self-Contained Company

14. Indicate the size of your **business unit** by the approximate number of employees.

_____ < 100
_____ 101-500
_____ 501-1,000
_____ 1,001-2,000
_____2,001-3,000
_____3,001-4,000
_____>4,000

15. What were the approximate total sales for your **business unit** last year?

_____ <$10 million
_____ $10-$99 million
_____ $100-$500 million
_____ $501 million-$1 billion
_____ $1-5 billion
_____ $ >5 billion

16. How much did your **entire company** spend on logistics operations last year?

_____ <$1 million
_____ $1-10 million
_____ $10-20 million
_____ $20-50 million
_____ $50-100 million
_____ $>100 million
_____ Don't Know

17. How many business units are you involved with in your current position?

_____ one
_____ two-three
_____ four-five
_____ more than five

THANK YOU for your participation in this research. If you would like to receive a summary of results when the project is finished, please enclose your business card with the survey. As soon as the survey is received, your contact information will be separated from the survey to protect your anonymity.

APPENDIX F: FINAL STUDY DESCRIPTIVE STATISTICS

DESCRIPTIVE STATISTICS

Item	Question	Mean	Standard Deviation	Skewness	Kurtosis
PROCAP1	Attain lowest total cost logistics	5.76	1.431	-1.618	2.434
PROCAP2	Proactively seeks solutions	5.27	1.396	-.812	.176
PROCAP3	Consistent approach to performing logistics work	5.16	1.302	-.684	-.073
PROCAP4	Differentiates logistics service offerings	4.88	1.447	-.519	-.280
PROCAP5	Develops creative logistical solutions	5.62	1.284	-1.210	.987
PROCAP6	Seeks to simplify logistical process	5.46	1.353	-.918	.184
PROCAP7	Performs reverse logistics in timely manner	4.41	1.509	-.369	-.498
VALCAP1	Performs services that add value	5.24	1.418	-.748	.051
VALCAP2	Adds new logistics services	4.76	1.400	-.320	-.374
VALCAP3	Accommodates special customer requests	5.48	1.239	-1.052	1.031
VALCAP4	Accommodates new product introductions	5.34	1.363	-.868	.399
VALCAP5	Provides widespread distribution coverage	5.70	1.402	-1.414	1.718
RELCAP1	Information technology	4.68	1.640	-.598	-.514
RELCAP2	Transportation resources	5.04	1.586	-.864	.076
RELCAP3	Storage/warehouse facilities	4.78	1.761	-.732	-.284
RELCAP4	Network optimization resources	4.22	1.768	-.242	-.872
RELCAP5	Human resources	4.44	1.713	-.595	-.504
RELCAP6	Resources to react to competitors' actions	4.17	1.530	-.371	-.475
RELCAP7	Resources to react to changing customer needs	4.82	1.495	-.630	-.128
RELCAP8	Resources to reduce customer inventory levels	4.10	1.658	-.252	-.603
RELCAP9	Resources to respond to customer requests	4.90	1.412	-.816	.332
RESCOM1	Allocates financial resources	4.73	1.507	-.668	-.337
RESCOM2	Invests in warehouse/storage facilities	4.64	1.658	-.608	-.489
RESCOM3	Invests in transportation equipment	3.99	1.754	-.240	-1.004
RESCOM4	Hires personnel with skills	4.92	1.538	-.883	.116
RESCOM5	Investment in personnel dedicated to logistics	4.43	1.715	-.437	-.782

Item	Question	Mean	Standard Deviation	Skewness	Kurtosis
RESCOM6	Senior management who is not committed to allocating needed resources	4.64	1.782	-.335	-1.047
RESCOM7	Senior management who supports logistics operations	5.14	1.431	-.918	.248
RESCOM8	Significant technological investments toward integration with suppliers	4.02	1.684	-.199	-.812
RESCOM9	Does not have the right software in-house	3.78	1.745	.085	-.913
RESCOM10	Significant technological investments toward integration with customers	4.13	1.666	-.143	-.920
RESCOM11	Senior management understands the value of logistics	4.81	1.632	-.596	-.522
SIGVAL1	When soliciting new business, salespeople use logistics capabilities as selling point	4.33	1.780	-.267	-1.049
SIGVAL2	Does not emphasize logistics capabilities in communications with existing customers	4.46	1.775	-.246	-1.014
SIGVAL3	Promote benefits of logistics capabilities	4.28	1.630	-.123	-1.057
SIGVAL4	Regular meetings between logistics and sales to discuss logistics capabilities	4.11	1.748	-.101	-1.039
SIGVAL5	Logistics is not involved in training sales reps on logistics capabilities	3.35	1.938	.478	-1.079
SIGVAL6	Logistics rep meets with existing customers to determine solutions	4.40	1.871	-.401	-1.038
SIGVAL7	Customers are not made aware of new logistics capabilities	4.15	1.680	.020	-.912
SIGVAL8	Logistics initiatives are always communicated to marketing	4.03	1.705	-.059	-1.146
SIGVAL9	Logistics always meets with new customers to work through logistics-related issues	3.43	1.782	.303	-1.013
SIGVAL10	Marketing area rarely promotes logistics capabilities	3.54	1.825	.392	-.922
SIGVAL11	Logistics frequently meets with new customers to discuss how logistics capabilities create value	3.57	1.710	.292	-.872

Item	Question	Mean	Standard Deviation	Skewness	Kurtosis
LOGDIF1	Damage free deliveries	5.06	1.130	-.283	-.339
LOGDIF2	Finished goods inventory turns	4.72	1.205	.034	-.568
LOGDIF3	Forecasting accuracy	4.23	1.224	.072	.031
LOGDIF4	Line item fill rate	5.03	1.206	-.310	-.257
LOGDIF5	Time between order receipt/delivery	5.00	1.250	-.235	-.603
LOGDIF6	Time on backorder	4.64	1.158	.137	-.160
LGODIF7	Total inventory turns	4.62	1.225	-.028	-.346
LOGDIF8	On-time delivery	5.34	1.154	-.653	.423
LOGEFF1	Shipped from primary location	4.86	1.630	-.924	-.059
LOGEFF2	Line item fill rate	4.79	1.532	-1.035	.208
LOGEFF3	Orders shipped on time	4.67	1.563	-.771	-.443
LOGEFF4	Shipments requiring expediting	5.40	1.602	-.943	.359
LOGEFF5	Inventory turns	3.91	1.699	.375	-.738
LOGEFF6	Average order cycle time	5.20	1.393	-1.525	2.027
LOGEFV1	Sales	4.13	1.376	.162	-.204
LOGEFV2	Transportation costs	4.62	1.223	.101	-.533
LOGEFV3	Warehousing costs	4.49	1.091	.202	.271
LOGEFV4	Inventory costs	4.22	1.083	.263	.171
LOGEFV5	Total logistics costs	4.55	1.016	.273	-.228
COMPADV1	Response to key customers	5.24	1.005	-.358	-.086
COMPADV2	Accommodation of requests	5.35	1.057	-.592	.472
COMPADV3	Meeting anticipated delivery dates	5.25	1.145	-.531	-.120
COMPADV4	Providing desired quantities	5.29	1.137	-.581	.044
COMPADV5	Accommodation of new products	5.05	1.262	-.296	-.597
COMPADV6	Notifying customers of delivery delays	4.53	1.395	.005	-.480
FIRM1	Market share	5.09	1.158	-.090	-.414
FIRM2	Return on assets	4.78	1.183	-.154	-.245
FIRM3	Return on investment	4.83	1.198	-.272	-.220
FIRM4	Net profit margin	4.82	1.248	-.492	.264
FIRM5	General profitability	4.80	1.325	-.595	.323

TESTS OF NORMALITY

	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
PROCAP1	.268	225	.000	.773	225	.000
PROCAP2	.201	225	.000	.893	225	.000
PROCAP3	.222	225	.000	.903	225	.000
PROCAP4	.167	225	.000	.929	225	.000
PROCAP5	.288	225	.000	.822	225	.000
PROCAP6	.255	225	.000	.866	225	.000
PROCAP7	.145	225	.000	.938	225	.000
VALCAP1	.185	225	.000	.897	225	.000
VALCAP2	.186	225	.000	.937	225	.000
VALCAP3	.244	225	.000	.866	225	.000
VALCAP4	.211	225	.000	.890	225	.000
VALCAP5	.278	225	.000	.807	225	.000
RELCAP1	.199	225	.000	.913	225	.000
RELCAP2	.217	225	.000	.888	225	.000
RELCAP3	.182	225	.000	.894	225	.000
RELCAP4	.138	225	.000	.937	225	.000
RELCAP5	.192	225	.000	.911	225	.000
RELCAP6	.162	225	.000	.937	225	.000
RELCAP7	.187	225	.000	.920	225	.000
RELCAP8	.161	225	.000	.939	225	.000
RELCAP9	.204	225	.000	.902	225	.000
RESCOM1	.243	225	.000	.902	225	.000
RESCOM2	.227	225	.000	.910	225	.000
RESCOM3	.154	225	.000	.927	225	.000
RESCOM4	.226	225	.000	.885	225	.000
RESCOM5	.186	225	.000	.922	225	.000
RESCOM6	.185	225	.000	.915	225	.000
RESCOM7	.229	225	.000	.879	225	.000
RESCOM8	.164	225	.000	.940	225	.000
RESCOM9	.131	225	.000	.943	225	.000
RESCOM10	.152	225	.000	.943	225	.000
RESCOM11	.200	225	.000	.912	225	.000
SIGVAL1	.167	225	.000	.926	225	.000
SIGVAL2	.149	225	.000	.929	225	.000
SIGVAL3	.146	225	.000	.933	225	.000
SIGVAL4	.157	225	.000	.938	225	.000
SIGVAL5	.215	225	.000	.889	225	.000
SIGVAL6	.199	225	.000	.908	225	.000
SIGVAL7	.126	225	.000	.945	225	.000
SIGVAL8	.160	225	.000	.930	225	.000

	Kolmogorov-Smirnov(a)			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
SIGVAL9	.166	225	.000	.923	225	.000
SIGVAL10	.170	225	.000	.919	225	.000
SIGVAL11	.154	225	.000	.934	225	.000
LOGDIF1	.207	225	.000	.902	225	.000
LOGDIF2	.191	225	.000	.930	225	.000
LOGDIF3	.198	225	.000	.934	225	.000
LOGDIF4	.177	225	.000	.927	225	.000
LOGDIF5	.166	225	.000	.929	225	.000
LOGDIF6	.220	225	.000	.921	225	.000
LGODIF7	.180	225	.000	.938	225	.000
LOGDIF8	.226	225	.000	.901	225	.000
LOGEFF1	.221	225	.000	.864	225	.000
LOGEFF2	.220	225	.000	.844	225	.000
LOGEFF3	.211	225	.000	.873	225	.000
LOGEFF4	.203	225	.000	.859	225	.000
LOGEFF5	.143	225	.000	.927	225	.000
LOGEFF6	.290	225	.000	.781	225	.000
LOGEFV1	.174	225	.000	.944	225	.000
LOGEFV2	.182	225	.000	.933	225	.000
LOGEFV3	.234	225	.000	.913	225	.000
LOGEFV4	.233	225	.000	.915	225	.000
LOGEFV5	.226	225	.000	.911	225	.000
COMPADV1	.198	225	.000	.907	225	.000
COMPADV2	.199	225	.000	.900	225	.000
COMPADV3	.225	225	.000	.905	225	.000
COMPADV4	.251	225	.000	.893	225	.000
COMPADV5	.174	225	.000	.926	225	.000
COMPADV6	.177	225	.000	.942	225	.000
FIRM1	.166	225	.000	.925	225	.000
FIRM2	.150	225	.000	.937	225	.000
FIRM3	.148	225	.000	.937	225	.000
FIRM4	.185	225	.000	.931	225	.000
FIRM5	.165	225	.000	.927	225	.000

a Lilliefors Significance Correction

APPENDIX G: FINAL STUDY FACTOR ANALYSIS

EXPLORATORY FACTOR ANALYSIS (SPSS)

RESOURCE COMMITMENT

Initial Scale

	Component		
	1	2	3
RESCOM1	.752	.174	.264
RESCOM2	.365	.052	.755
RESCOM3	-.010	.144	.863
RESCOM4	.749	.252	.172
RESCOM5	.748	.223	.284
RESCOM6	.705	.142	-.047
RESCOM7	.840	.229	.070
RESCOM8	.310	.774	.145
RESCOM9	.177	.740	.078
RESCOM10	.244	.821	.058
RESCOM11	.738	.350	.069

Final Scale – Personnel Dimension

	Component
RESCOM1	.804
RESCOM4	.816
RESCOM5	.827
RESCOM6	.685
RESCOM7	.871
RESCOM11	.811

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.882	64.700	64.700	3.882	64.700	64.700

Alpha = .8858 Standardized item alpha = **.8895**

Final Scale – Technology Dimension

	Component
RESCOM8	.863
RESCOM9	.745
RESCOM10	.860

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.041	68.029	68.029	2.041	68.029	68.029

Alpha = .7612 Standardized item alpha = **.7627**

PROCESS CAPABILITIES

Final Scale

	Component
	1
PROCAP1	.739
PROCAP2	.850
PROCAP3	.773
PROCAP4	.674
PROCAP5	.792
PROCAP6	.782
PROCAP7	.520

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.830	54.720	54.720	3.830	54.720	54.720

Alpha = .8540 Standardized item alpha = **.8575**

VALUE-ADDED SERVICE CAPABILITIES

Final Scale

	Component
	1
VALCAP1	.785
VALCAP2	.780
VALCAP3	.733
VALCAP4	.771
VALCAP5	.740

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.903	58.052	58.052	2.903	58.052	58.052

Alpha = .8189 Standardized item alpha = **.8191**

RELATIONAL CAPABILITY

Initial Scale

	Component
	1
RELCAP1	.623
RELCAP2	.598
RELCAP3	.448
RELCAP4	.684
RELCAP5	.632
RELCAP6	.769
RELCAP7	.789
RELCAP8	.698
RELCAP9	.768

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.105	45.608	45.608	4.105	45.608	45.608

Alpha = .8416 Standardized item alpha = **.8460**

Final Scale

	Component
	1
RELCAP1	.625
RELCAP2	.601
RELCAP4	.685
RELCAP5	.612
RELCAP6	.776
RELCAP7	.805
RELCAP8	.702
RELCAP9	.780

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.946	49.325	49.325	3.946	49.325	49.325

Alpha = .8467 Standardized item alpha = **.8503**

LOGISTICS PERFORMANCE

Initial Logistics Differentiation Scale

	Component	
	1	2
LOGDIF1	.668	.175
LOGDIF2	.186	.873
LOGDIF3	.201	.734
LOGDIF4	.647	.345
LOGDIF5	.809	.062
LOGDIF6	.649	.377
LGODIF7	.244	.877
LOGDIF8	.789	.189

Final Logistics Differentiation Scale

	Component
	1
LOGDIF2	.903
LOGDIF3	.766
LGODIF7	.910

Extraction Method: Principal Component Analysis.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.231	74.356	74.356	2.231	74.356	74.356

Alpha = .8243 Standardized item alpha = **.8245**

Initial Logistics Efficiency Scale

	Component	
	1	2
LOGEFF1	.708	-.096
LOGEFF2	.798	.014
LOGEFF3	.659	.284
LOGEFF4	.021	.768
LOGEFF5	.584	.068
LOGEFF6	.073	.790

Final Logistics Efficiency Scale

	Component
	1
LOGEFF1	.682
LOGEFF2	.794
LOGEFF3	.695
LOGEFF5	.591

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.930	48.251	48.251	1.930	48.251	48.251

Alpha = .6332 Standardized item alpha = **.6375**

Initial Logistics Effectiveness Scale

	Component
	1
LOGEFV1	.323
LOGEFV2	.796
LOGEFV3	.819
LOGEFV4	.690
LOGEFV5	.910

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.715	54.300	54.300	2.715	54.300	54.300

Alpha = .7414 Standardized item alpha = **.7645**

Final Logistics Effectiveness Scale

	Component
	1
LOGEFV2	.815
LOGEFV3	.830
LOGEFV4	.682
LOGEFV5	.911

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.647	66.171	66.171	2.647	66.171	66.171

Alpha = .8215 Standardized item alpha = **.8254**

MARKETING SIGNALS OF VALUE

Initial Scale

	Component	
	1	2
SIGVAL1	.849	.225
SIGVAL2	.789	.238
SIGVAL3	.804	.277
SIGVAL4	.363	.674
SIGVAL5	.332	.611
SIGVAL6	.239	.693
SIGVAL7	.563	.448
SIGVAL8	.513	.372
SIGVAL9	.183	.823
SIGVAL10	.782	.241
SIGVAL11	.233	.860

Final Scale

	Component
	1
SIGVAL2	.822
SIGVAL3	.788
SIGVAL7	.761
SIGVAL8	.671
SIGVAL10	.838

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.028	60.567	60.567	3.028	60.567	60.567

Alpha = .8358 Standardized item alpha = **.8353**

COMPETITIVE ADVANTAGE

Final Scale

	Component
	1
COMPADV1	.820
COMPADV2	.736
COMPADV3	.786
COMPADV4	.735
COMPADV5	.643
COMPADV6	.630

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.181	53.012	53.012	3.181	53.012	53.012

Alpha = .8108 Standardized item alpha = .**8200**

FIRM PERFORMANCE

Final Scale

	Component
	1
FIRM1	.497
FIRM2	.905
FIRM3	.921
FIRM4	.913
FIRM5	.907

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.570	71.409	71.409	3.570	71.409	71.409

Alpha = .8912 Standardized item alpha = **.8892**

CONFIRMATORY FACTOR ANALYSIS LOADINGS (SEM)
EXOGENEOUS VARIABLES

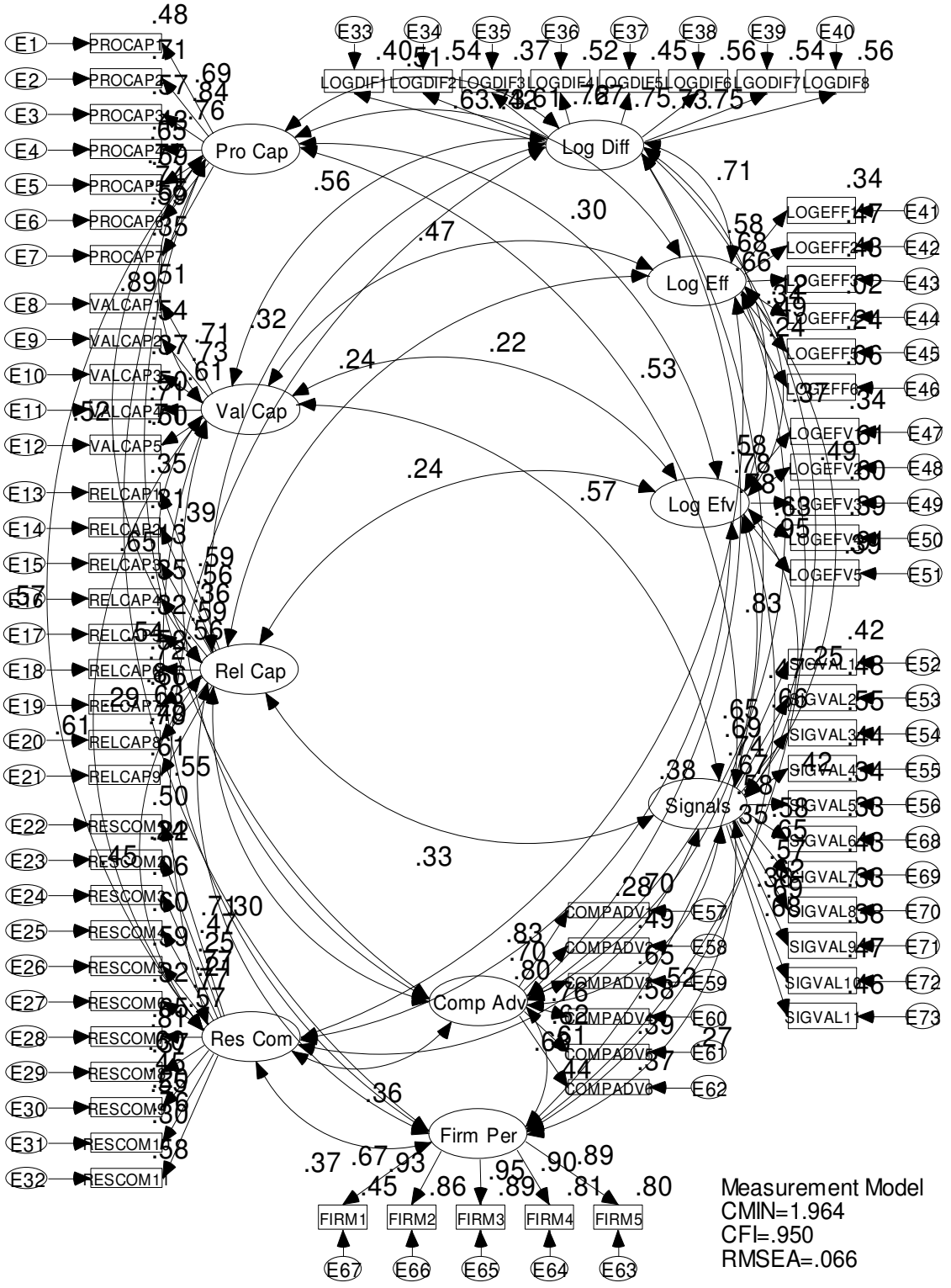
	RESCOM	PROCAP	VALCAP	RELCAP
RESCOM1	0.709			
RESCOM2	0.468			
RESCOM3	0.247			
RESCOM4	0.775			
RESCOM5	0.767			
RESCOM6	0.567			
RESCOM7	0.805			
RESCOM8	0.605			
RESCOM9	0.453			
RESCOM10	0.759			
RESCOM11	0.551			
PROCAP1		0.692		
PROCAP2		0.844		
PROCAP3		0.757		
PROCAP4		0.652		
PROCAP5		0.771		
PROCAP6		0.742		
PROCAP7		0.594		
VALCAP1			0.713	
VALCAP2			0.734	
VALCAP3			0.608	
VALCAP4			0.706	
VALCAP5			0.710	
RELCAP1				0.593
RELCAP2				0.559
RELCAP3				0.358
RELCAP4				0.590
RELCAP5				0.561
RELCAP6				0.724
RELCAP7				0.813
RELCAP8				0.630
RELCAP9				0.780

CONFIRMATORY FACTOR ANALYSIS LOADINGS (SEM)
ENDOGENEOUS VARIABLES

	SIGVAL	LOGDIF	LOGEFF	LOGEFV	COMPADV	FIRM
SIGVAL1	0.646					
SIGVAL2	0.693					
SIGVAL3	0.744					
SIGVAL4	0.665					
SIGVAL5	0.582					
SIGVAL6	0.576					
SIGVAL7	0.654					
SIGVAL8	0.571					
SIGVAL9	0.616					
SIGVAL10	0.687					
SIGVAL11	0.676					
LOGDIF1		0.634				
LOGDIF2		0.732				
LOGDIF3		0.610				
LOGDIF4		0.722				
LOGDIF5		0.670				
LOGDIF6		0.747				
LOGDIF7		0.731				
LOGDIF8		0.746				
LOGEFF1			0.583			
LOGEFF2			0.684			
LOGEFF3			0.659			
LOGEFF4			0.123			
LOGEFF5			0.490			
LOGEFF6			0.245			
LOGEFV1				0.580		
LOGEFV2				0.781		
LOGEFV3				0.777		
LOGEFV4				0.628		
LOGEFV5				0.953		
COMPADV1					0.835	
COMPADV2					0.700	
COMPADV3					0.804	
COMPADV4					0.760	
COMPADV5					0.622	
COMPADV6					0.607	
FIRM1						0.670
FIRM2						0.928
FIRM3						0.945
FIRM4						0.902
FIRM5						0.895

APPENDIX H: FINAL STUDY SEM RESULTS

UNCONSTRAINED MEASUREMENT MODEL



STANDARDIZED REGRESSIONS AND SQUARED MULTIPLE CORRELATIONS

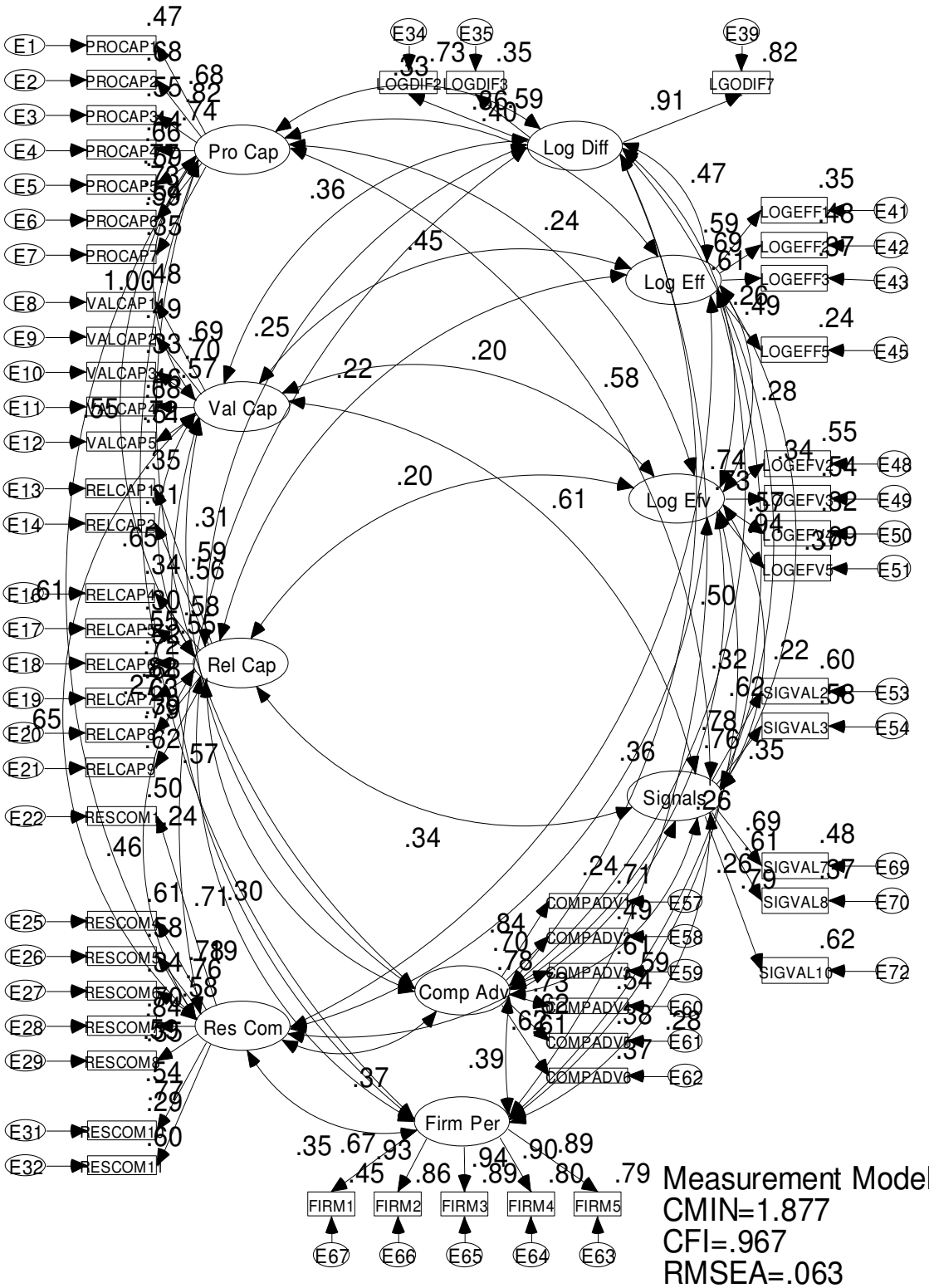
Item		Construct	r	R2
RESCOM1	<--	Resource Commitment	0.709	0.503
RESCOM2	<--	Resource Commitment	0.468	0.219
RESCOM3	<--	Resource Commitment	0.247	0.061
RESCOM4	<--	Resource Commitment	0.775	0.600
RESCOM5	<--	Resource Commitment	0.767	0.589
RESCOM6	<--	Resource Commitment	0.567	0.322
RESCOM7	<--	Resource Commitment	0.805	0.649
RESCOM8	<--	Resource Commitment	0.605	0.366
RESCOM9	<--	Resource Commitment	0.453	0.205
RESCOM10	<--	Resource Commitment	0.551	0.303
RESCOM11	<--	Resource Commitment	0.759	0.577
PROCAP1	<--	Process Capabilities	0.692	0.478
PROCAP2	<--	Process Capabilities	0.844	0.712
PROCAP3	<--	Process Capabilities	0.757	0.574
PROCAP4	<--	Process Capabilities	0.652	0.425
PROCAP5	<--	Process Capabilities	0.771	0.594
PROCAP6	<--	Process Capabilities	0.742	0.550
PROCAP7	<--	Process Capabilities	0.594	0.353
VALCAP1	<--	Value-Added Service Capabilities	0.713	0.508
VALCAP2	<--	Value-Added Service Capabilities	0.734	0.538
VALCAP3	<--	Value-Added Service Capabilities	0.608	0.369
VALCAP4	<--	Value-Added Service Capabilities	0.706	0.498
VALCAP5	<--	Value-Added Service Capabilities	0.71	0.504
RELCAP1	<--	Relational Capabilities	0.593	0.352
RELCAP2	<--	Relational Capabilities	0.559	0.312
RELCAP3	<--	Relational Capabilities	0.358	0.128
RELCAP4	<--	Relational Capabilities	0.59	0.348
RELCAP5	<--	Relational Capabilities	0.561	0.315
RELCAP6	<--	Relational Capabilities	0.724	0.524
RELCAP7	<--	Relational Capabilities	0.813	0.661
RELCAP8	<--	Relational Capabilities	0.63	0.398
RELCAP9	<--	Relational Capabilities	0.78	0.609
SIGVAL1	<--	Signals of Value	0.646	0.417
SIGVAL2	<--	Signals of Value	0.693	0.480
SIGVAL3	<--	Signals of Value	0.744	0.553

Item		Construct	r	R2
SIGVAL4	<--	Signals of Value	0.665	0.442
SIGVAL5	<--	Signals of Value	0.582	0.339
SIGVAL6	<--	Signals of Value	0.576	0.332
SIGVAL7	<--	Signals of Value	0.654	0.428
SIGVAL8	<--	Signals of Value	0.571	0.326
SIGVAL9	<--	Signals of Value	0.616	0.379
SIGVAL10	<--	Signals of Value	0.687	0.472
SIGVAL11	<--	Signals of Value	0.676	0.456
LOGDIF1	<--	Logistics Differentiation	0.634	0.402
LOGDIF2	<--	Logistics Differentiation	0.732	0.536
LOGDIF3	<--	Logistics Differentiation	0.61	0.372
LOGDIF4	<--	Logistics Differentiation	0.722	0.521
LOGDIF5	<--	Logistics Differentiation	0.67	0.449
LOGDIF6	<--	Logistics Differentiation	0.747	0.558
LOGDIF7	<--	Logistics Differentiation	0.731	0.535
LOGDIF8	<--	Logistics Differentiation	0.746	0.557
LOGEFF1	<--	Logistics Efficiency	0.583	0.340
LOGEFF2	<--	Logistics Efficiency	0.684	0.468
LOGEFF3	<--	Logistics Efficiency	0.659	0.434
LOGEFF4	<--	Logistics Efficiency	0.123	0.015
LOGEFF5	<--	Logistics Efficiency	0.49	0.240
LOGEFF6	<--	Logistics Efficiency	0.245	0.060
LOGEFV1	<--	Logistics Effectiveness	0.58	0.337
LOGEFV2	<--	Logistics Effectiveness	0.781	0.610
LOGEFV3	<--	Logistics Effectiveness	0.777	0.604
LOGEFV4	<--	Logistics Effectiveness	0.628	0.394
LOGEFV5	<--	Logistics Effectiveness	0.953	0.909
COMPADV1	<--	Competitive Advantage	0.835	0.697
COMPADV2	<--	Competitive Advantage	0.7	0.490
COMPADV3	<--	Competitive Advantage	0.804	0.647
COMPADV4	<--	Competitive Advantage	0.76	0.578
COMPADV5	<--	Competitive Advantage	0.622	0.387
COMPADV6	<--	Competitive Advantage	0.607	0.368
FIRM1	<--	Firm Performance	0.67	0.449
FIRM2	<--	Firm Performance	0.928	0.861
FIRM3	<--	Firm Performance	0.945	0.893
FIRM4	<--	Firm Performance	0.902	0.813
FIRM5	<--	Firm Performance	0.895	0.801

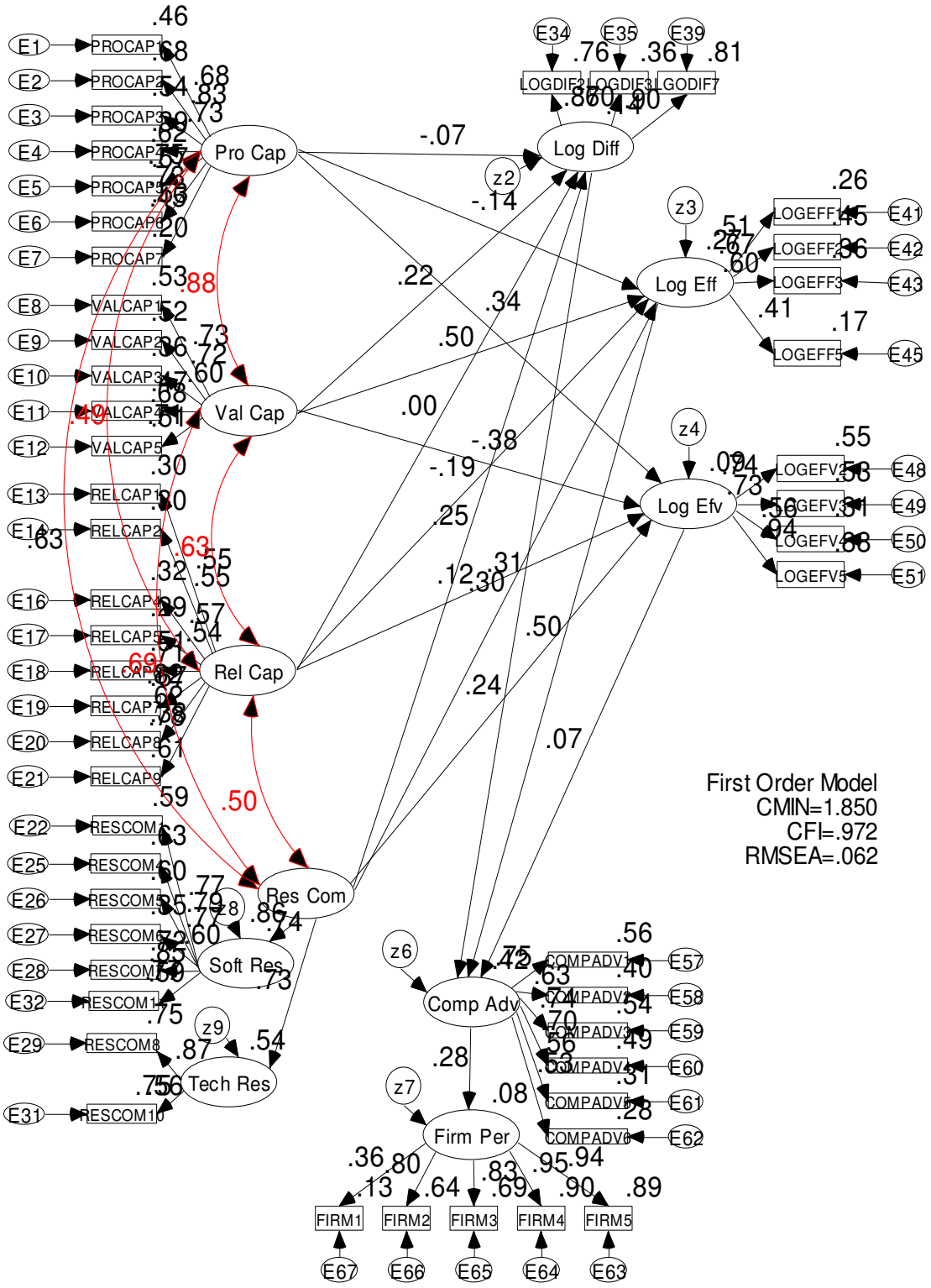
MODIFICATION INDICES

Regression Weights:			**M.I.**	**Par Change**
LOGEFV1	<--	Log Efv	21.222	-0.454
SIGVAL1	<--	Comp Adv	19.708	0.382
SIGVAL1	<--	Val Cap	19.196	0.377
SIGVAL1	<--	Signals	18.14	0.366
FIRM1	<--	Firm Per	16.91	-0.316
PROCAP4	<--	Signals	16.495	0.331
SIGVAL1	<--	Pro Cap	16.041	0.343
SIGVAL1	<--	Log Diff	15.279	0.336
LOGDIF3	<--	Res Com	13.586	0.27
COMPADV6	<--	Signals	13.007	0.304
SIGVAL1	<--	Log Eff	11.937	0.32
SIGVAL1	<--	Res Com	11.692	0.294
SIGVAL11	<--	SIGVAL9	11.435	0.075
RESCOM4	<--	Pro Cap	10.441	0.23

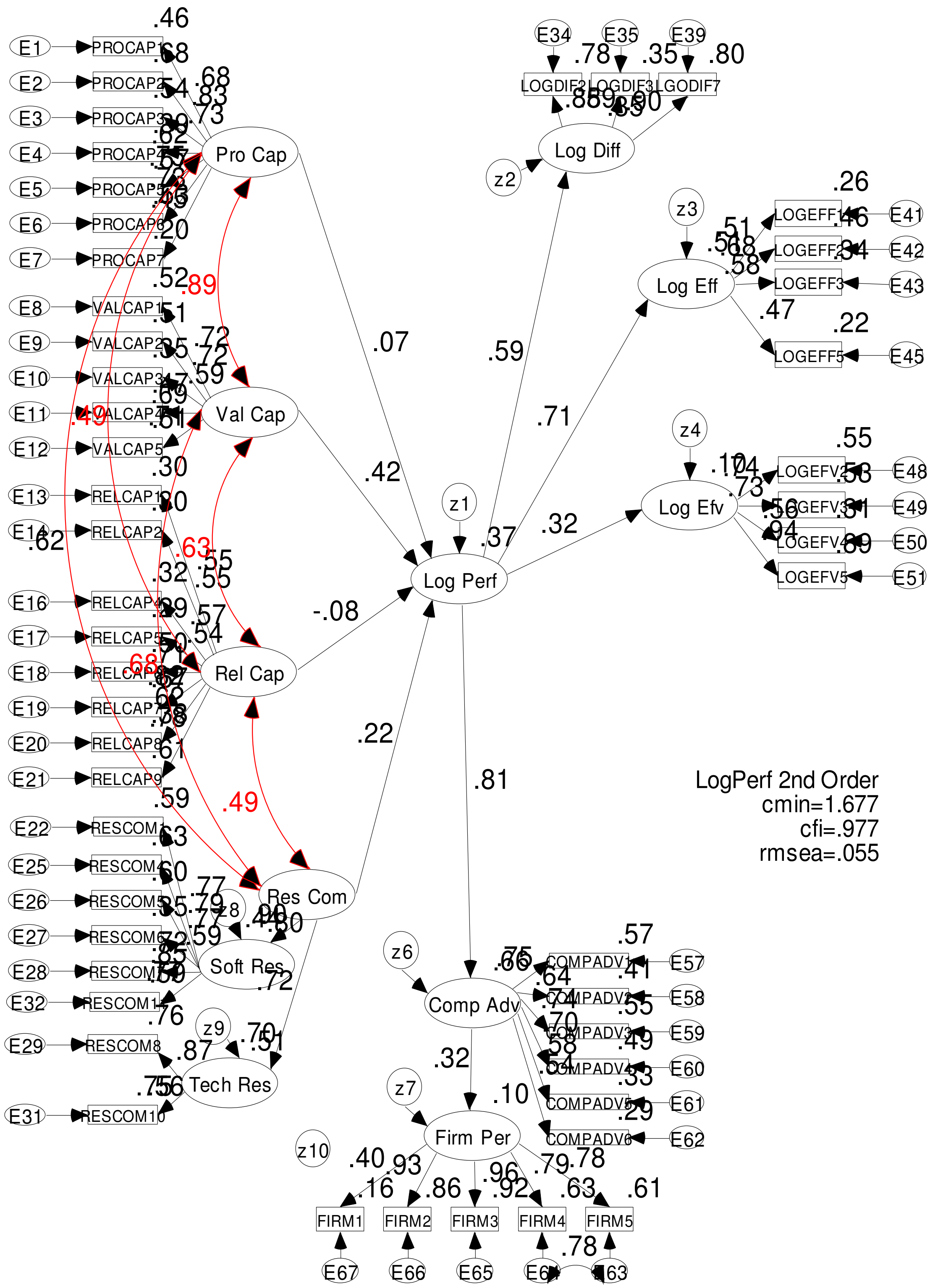
UNCONSTRAINED MEASUREMENT MODEL WITH ITEMS DELETED



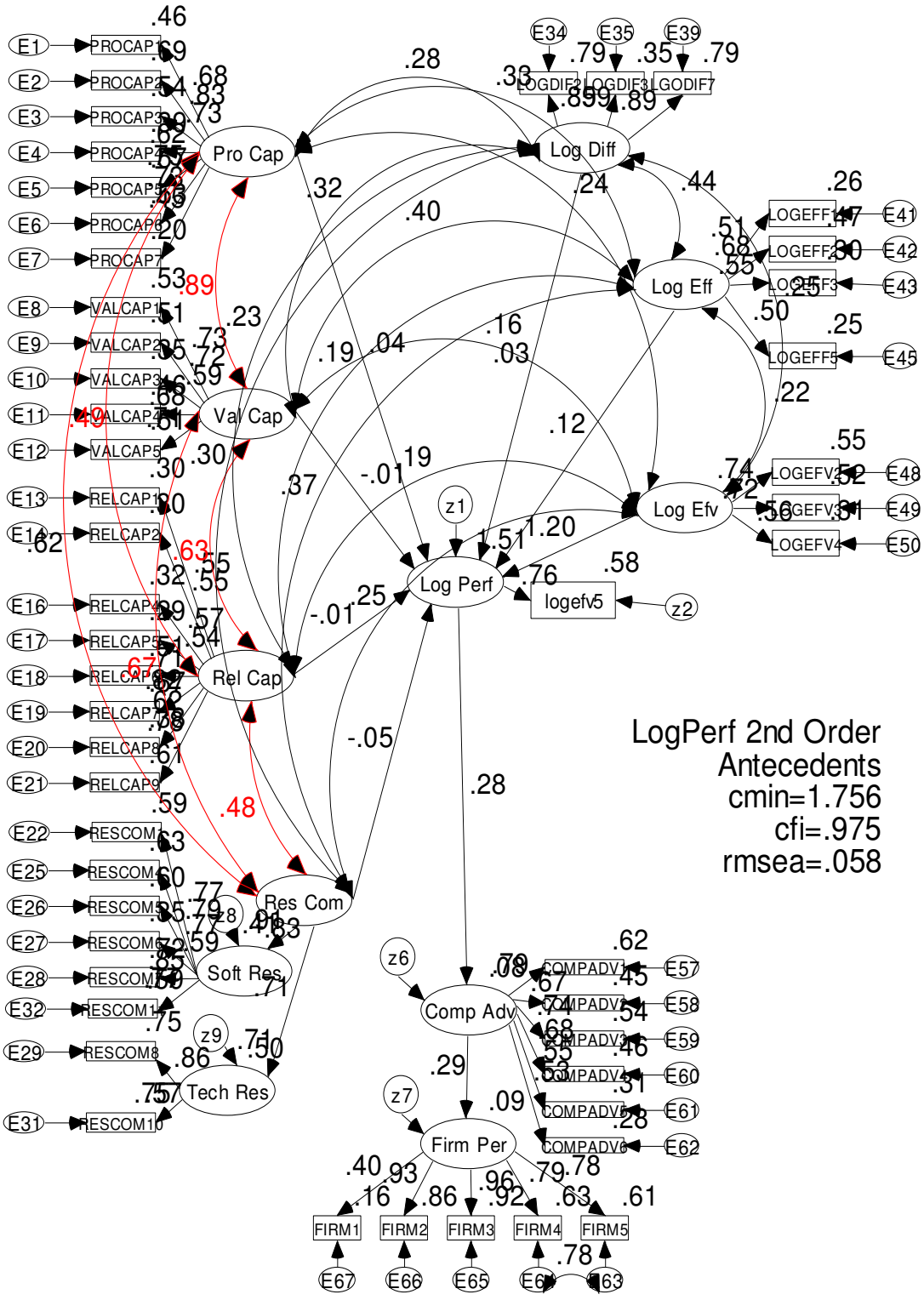
FIRST ORDER LOGISTICS STRUCTURAL MODEL



SECOND ORDER LOGISTICS MODEL



ALTERNATIVE LOGISTICS MODEL



FIRST ORDER LOGISTICS MODEL RESULTS

Path			Estimate	Significance
Pro Cap	--	Log Diff	-0.068	0.766
Pro Cap	--	Log Eff	-0.141	0.595
Pro Cap	--	Log Efv	0.340	0.170
Val Cap	--	Log Diff	0.223	0.430
Val Cap	--	Log Eff	0.498	0.133
Val Cap	--	Log Efv	-0.384	0.207
Rel Cap	--	Log Diff	0.003	0.981
Rel Cap	--	Log Eff	-0.185	0.148
Rel Cap	--	Log Efv	0.125	0.276
Res Com	--	Log Diff	0.247	0.052
Res Com	--	Log Eff	0.299	0.043
Res Com	--	Log Efv	0.237	0.074
Log Diff	--	Comp Adv	0.306	0.000
Log Eff	--	Comp Adv	0.503	0.000
Log Efv	--	Comp Adv	0.074	0.263
Comp Adv	--	Firm Per	0.282	0.002
Res Com	--	Soft Res	0.862	0.000
Res Com	--	Tech Res	0.733	n/a

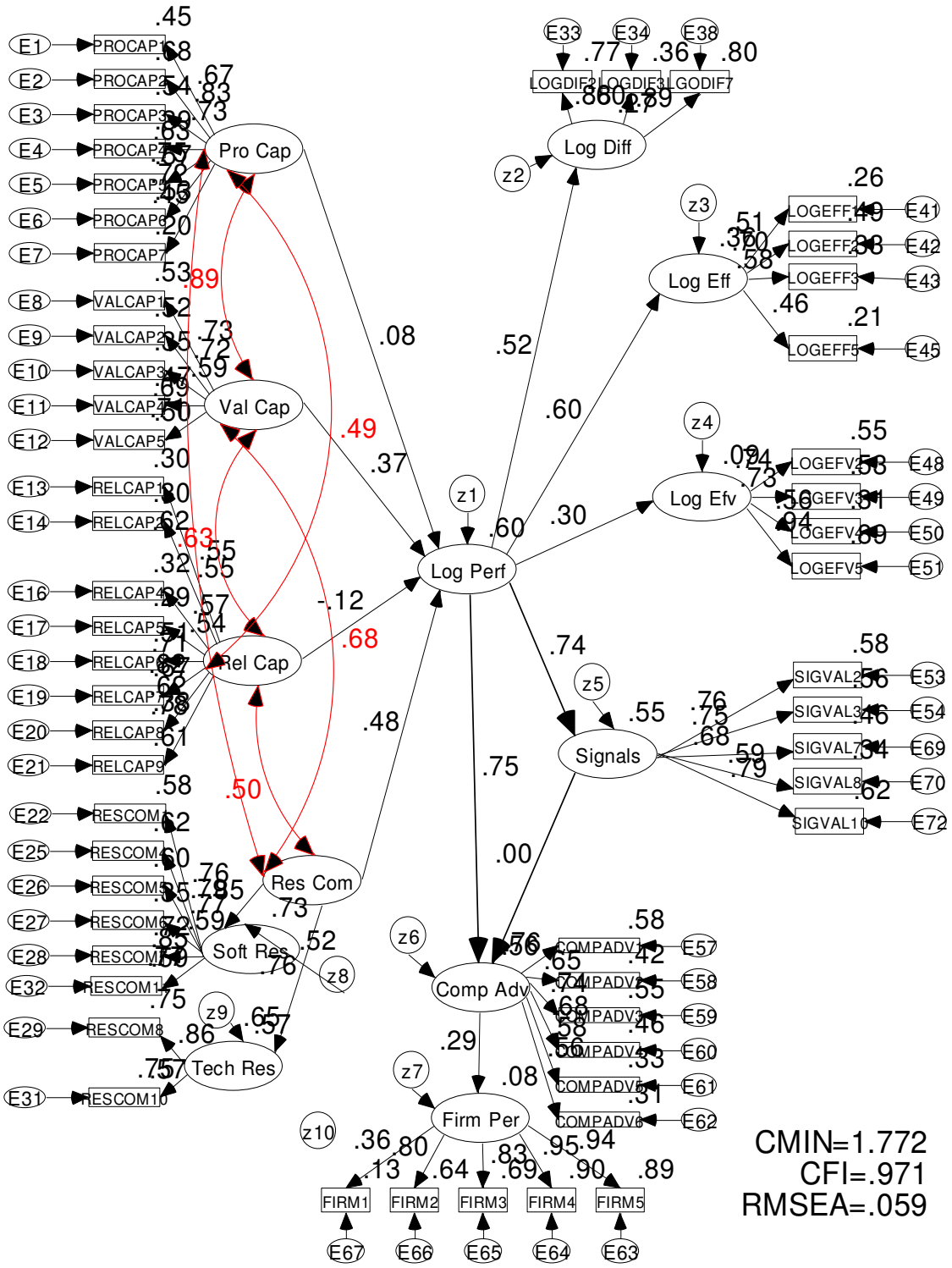
SECOND ORDER LOGISTICS MODEL RESULTS

Path			Estimate	Significance
Pro Cap	--	Log Perf	0.070	0.783
Val Cap	--	Log Perf	0.420	0.188
Rel Cap	--	Log Perf	-0.081	0.494
Res Com	--	Log Perf	0.220	0.096
Log Diff	--	Log Perf	0.810	0.000
Log Eff	--	Log Perf	0.323	0.000
Log Efv	--	Log Perf	0.592	n/a
Log Perf	--	Comp Adv	0.324	0.000
Comp Adv	--	Firm Per	0.712	0.000
Res Com	--	Soft Res	0.897	n/a
Res Com	--	Tech Res	0.718	0.000

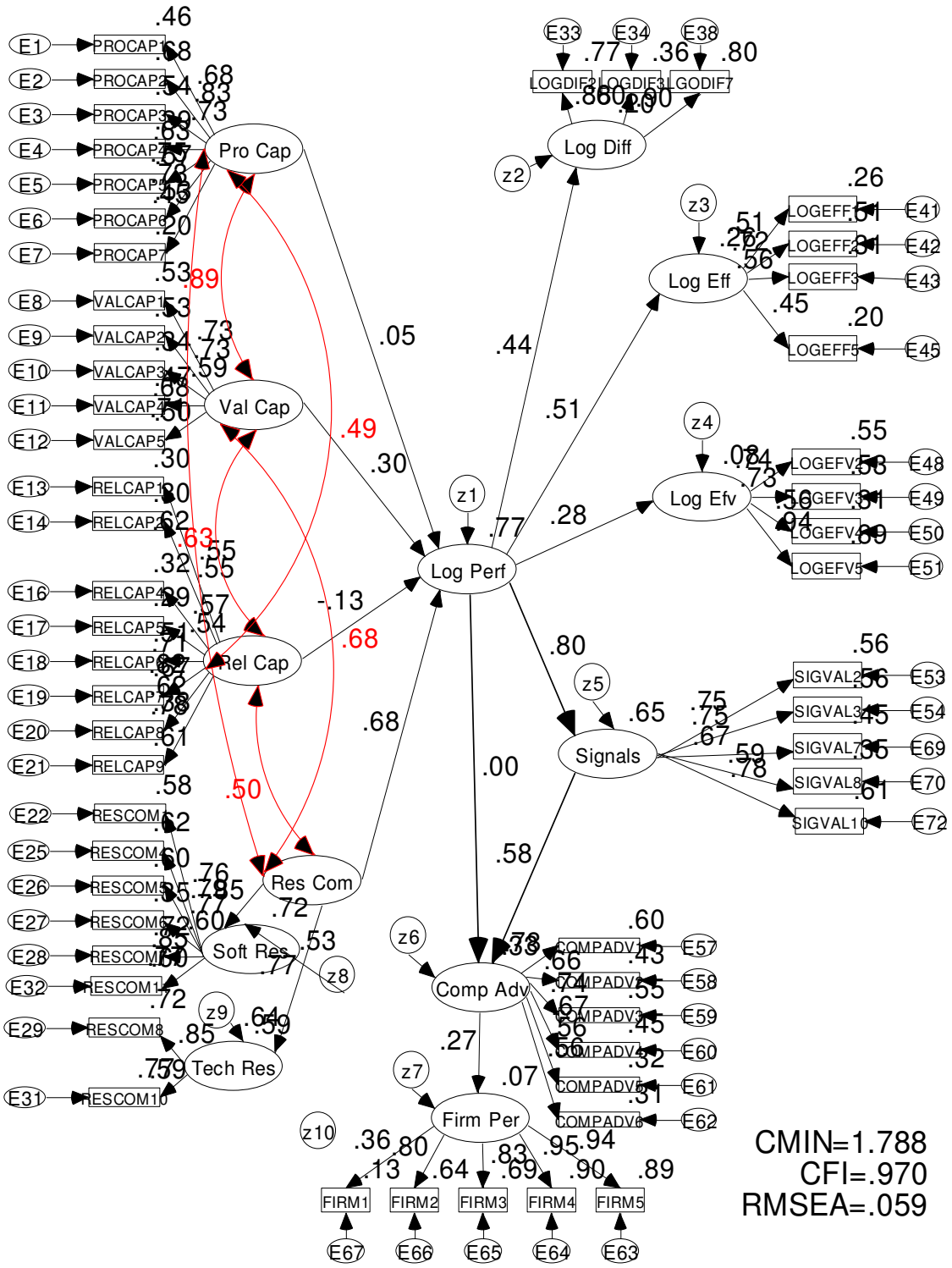
ALTERNATIVE LOGISTICS MODEL RESULTS

Path			Estimate	Significance
Pro Cap	--	Log Perf	0.036	0.868
Val Cap	--	Log Perf	-0.014	0.961
Rel Cap	--	Log Perf	-0.008	0.934
Res Com	--	Log Perf	-0.049	0.622
Log Diff	--	Log Perf	0.029	0.690
Log Eff	--	Log Perf	0.123	0.192
Log Efv	--	Log Perf	1.196	0.000
Log Perf	--	Comp Adv	0.276	0.000
Comp Adv	--	Firm Per	0.292	0.001
Res Com	--	Soft Res	0.913	n/a
Res Com	--	Tech Res	0.707	0.000

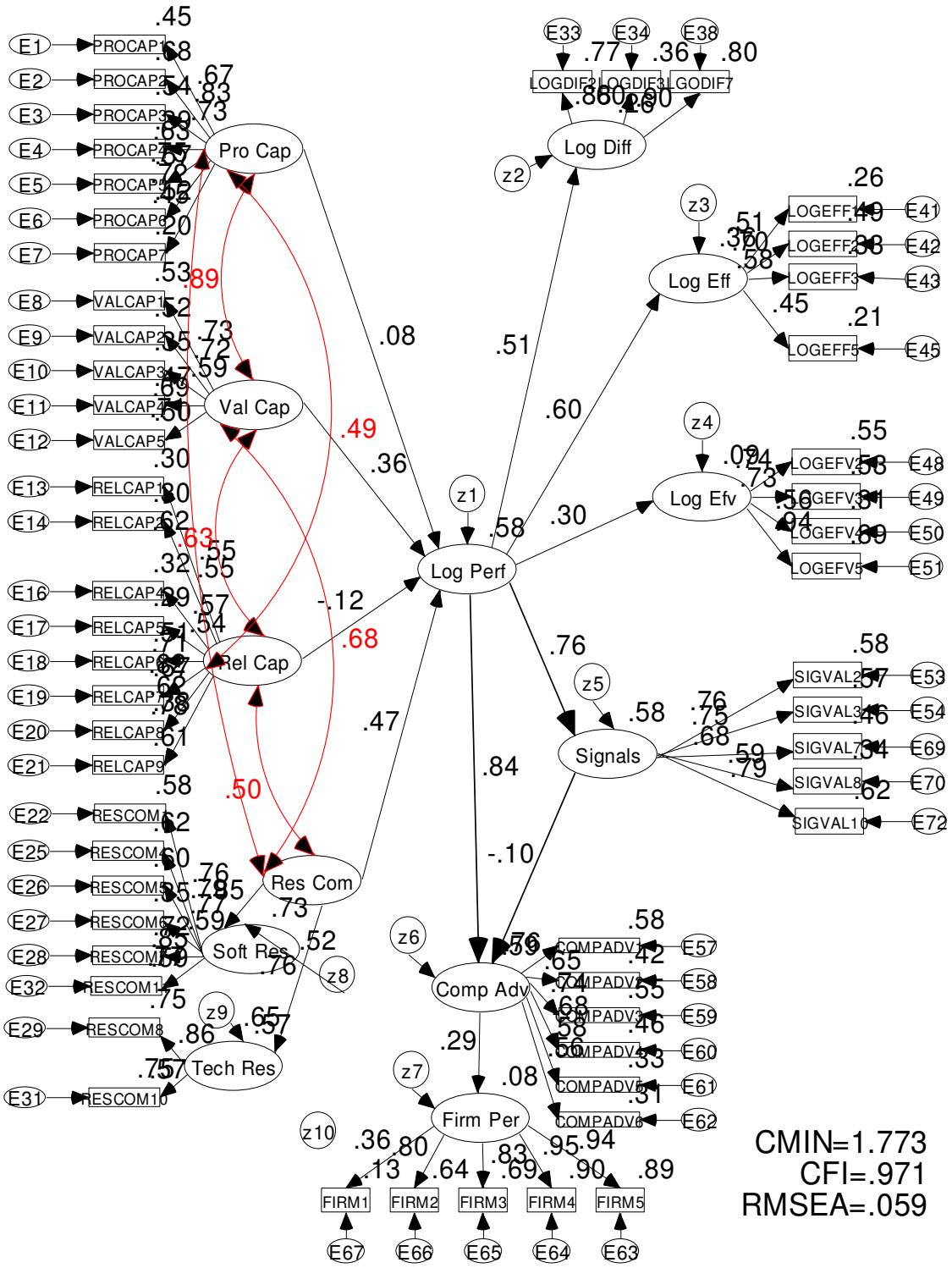
MODEL I – DIRECT MODEL



MODEL II – COMPLETE MEDIATION MODEL



MODEL III – SATURATED MODEL



STRUCTURAL MODEL COMPARISONS

MODEL I - DIRECT MODEL

Path			Estimate	Significance
Pro Cap	--	Log Perf	0.078	0.733
Val Cap	--	Log Perf	0.366	0.206
Rel Cap	--	Log Perf	-0.121	0.266
Res Com	--	Log Perf	0.477	0.001
Log Perf	--	Signals	0.743	0.000
Log Perf	--	Comp Adv	0.746	0.000
Signals	--	Comp Adv	0.000	n/a
Comp Adv	--	Firm Per	0.287	0.001
Log Perf	--	Log Diff	0.519	n/a
Log Perf	--	Log Efv	0.303	0.001
Log Perf	--	Log Eff	0.603	0.000
Res Com	--	Soft Res	0.854	n/a
Res Com	--	Tech Res	0.757	0.000

MODEL II – COMPLETE MEDIATION MODEL

Path			Estimate	Significance
Pro Cap	--	Log Perf	0.054	0.819
Val Cap	--	Log Perf	0.299	0.320
Rel Cap	--	Log Perf	-0.129	0.256
Res Com	--	Log Perf	0.676	0.000
Log Perf	--	Signals	0.804	0.000
Log Perf	--	Comp Adv	n/a	n/a
Signals	--	Comp Adv	0.579	0.000
Comp Adv	--	Firm Per	0.273	0.002
Log Perf	--	Log Diff	0.444	n/a
Log Perf	--	Log Efv	0.280	0.002
Log Perf	--	Log Eff	0.509	0.000
Res Com	--	Soft Res	0.846	n/a
Res Com	--	Tech Res	0.768	0.000

MODEL III – SATURATED MODEL

Path			Estimate	Significance
Pro Cap	--	Log Perf	0.081	0.719
Val Cap	--	Log Perf	0.362	0.204
Rel Cap	--	Log Perf	-0.123	0.249
Res Com	--	Log Perf	0.471	0.002
Log Perf	--	Signals	0.760	0.000
Log Perf	--	Comp Adv	0.843	0.000
Signals	--	Comp Adv	-0.101	0.579
Comp Adv	--	Firm Per	0.288	0.001
Log Perf	--	Log Diff	0.514	n/a
Log Perf	--	Log Efv	0.298	0.001
Log Perf	--	Log Eff	0.596	0.000
Res Com	--	Soft Res	0.853	n/a
Res Com	--	Tech Res	0.757	0.000

MODEL FIT COMPARISONS

Fit Measure	Saturated	Direct	Complete Mediation	Independence
Discrepancy	2502.091	2502.456	2525.325	38985.191
Degrees of freedom	1411	1412	1412	1540
P	0.000	0.000	0.000	0.000
Number of parameters	184	183	183	55
Discrepancy / df	1.773	1.772	1.788	25.315
Normed fit index	0.936	0.936	0.935	0.000
Relative fit index	0.93	0.930	0.929	0.000
Incremental fit index	0.971	0.971	0.97	0.000
Tucker-Lewis index	0.968	0.968	0.968	0.000
Comparative fit index	0.971	0.971	0.97	0.000
Parsimony ratio	0.916	0.917	0.917	1.000
Parsimony-adjusted NFI	0.857	0.858	0.857	0.000
Parsimony-adjusted CFI	0.89	0.890	0.89	0.000
Noncentrality parameter estimate	1091.091	1090.456	1113.325	37445.191
NCP lower bound	955.52	954.892	976.868	36805.282
NCP upper bound	1234.469	1233.829	1257.58	38091.463
FMIN	11.17	11.172	11.274	174.041
F0	4.871	4.868	4.97	167.166
F0 lower bound	4.266	4.263	4.361	164.309
F0 upper bound	5.511	5.508	5.614	170.051
RMSEA	0.059	0.059	0.059	0.329
RMSEA lower bound	0.055	0.055	0.056	0.327
RMSEA upper bound	0.062	0.062	0.063	0.332
P for test of close fit	0.000	0.000	0.000	0.000
Akaike information criterion (AIC)	2870.091	2868.456	2891.325	39095.191
Browne-Cudeck criterion	2992.757	2990.456	3013.325	39131.857
Bayes information criterion				
Consistent AIC				
Expected cross validation index	12.813	12.806	12.908	174.532
ECVI lower bound	12.208	12.200	12.299	171.675
ECVI upper bound	13.453	13.446	13.552	177.417
MECVI	13.361	13.350	13.452	174.696

VITA

L. Michelle Bobbitt earned a Bachelor of Business Administration and a Master of Business Administration with a concentration in Marketing from Middle Tennessee State University. In December 2004, she completed the requirements for the Ph.D. in Business Administration with a dual concentration in Logistics and Marketing from the University of Tennessee. She is currently employed as an Assistant Professor of Marketing at Bradley University in Peoria, Illinois.

Michelle has over eight years of teaching experience and has taught a variety of marketing and logistics courses including logistics, channels of distribution, and marketing strategy. Her research interests include supply chain management, marketing strategy, and interfunctional coordination issues between the areas of marketing and logistics. She has presented at the Council of Logistics Management, American Marketing Association, and Society for Marketing Advances conferences and has published in various journals including the Journal of Marketing Education, the International Journal of Physical Distribution & Logistics Management and the International Journal of Services Industry Management.