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AN INVESTIGATION OF PERFORMANCE MEASUREMENT:
THE IMPACT OF LOGISTICS STRUCTURE AND STRATEGY

presented by

Richard Nicholas Germain

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Marketing

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Date Nov. 10, 1989

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AN INVESTIGATION OF PERFORMANCE MEASUREMENT: THE IMPACT OF LOGISTICS STRUCTURE AND STRATEGY

By

Richard Nicholas Germain

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Marketing and Transportation Administration

1989

ABSTRACT

AN INVESTIGATION OF PERFORMANCE MEASUREMENT:
THE IMPACT OF LOGISTICS STRUCTURE AND STRATEGY

By

Richard Nicholas Germain

Performance measures monitor the conversion of labor and capital inputs, such as warehousing costs, into outputs, such as customer service. The research objective was to examine empirically how logistics strategy and structure relate to performance measurement across three channel positions: manufacturers, wholesalers and retailers.

A 2x2 typology of performance measurement was developed. The first dimension distinguished cost from differentiation performance measurement. The second dimension distinguished internal performance measurement from competitive benchmarking. These four types of performance measurement served to create six dependent variables.

Three groups of independent variables were examined. The first group consisted of: (1) formal integrative devices such as a logistics mission statement; (2) whether logistics controls customer service or logistics systems planning; and (3) the total number of activities controlled by logistics. These variables are positively related to performance measurement within all three types of firms. Thus, organizations having these attributes were found to have more extensive performance measurement systems.

The second group of independent variables consisted of:

(1) the maturity of the logistics; (2) participation in business unit strategic planning by the senior logistics executive; and (3) the title level of the senior logistics executive. These variables are sporadically related to performance measurement. These variables, especially variables describing the "position" of the senior logistics executive, are of lessor importance with respect to performance measurement.

The third group of independent variables consists of: (1) the number of times logistics has been reorganized during the past five years; and (2) the frequency of updating the logistics strategic plan. These variables, possibly because they are indicative of logistical flexibility, are unrelated to performance measurement.

The major finding regarding channel position is that while firms at different levels of the channel are not equally involved in logistics performance measurement, the relationship of logistics strategy and structure to performance measurement are the same. The results of this research provide additional evidence that the "best" practices of logistics management are independent of channel position. Additional insights are provided regarding the impact of structure and strategy upon best practice.

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ACKNOWLEDGEMENTS

Above all, I would like to thank Donald J. Bowersox, Chairman of the dissertation committee, for his guidance during the writing of this dissertation and throughout my tenure in the doctoral program. I am also greatly indebted to him for the numerous research opportunities he provided to me.

I would also like to thank David J. Closs and Cornelia L. Droge who were also members of the dissertation committee. Their insights were invaluable.

Lastly, I would like to thank my parents, Gilles and Zoria Germain. Without their continual support, none of this would have been possible.

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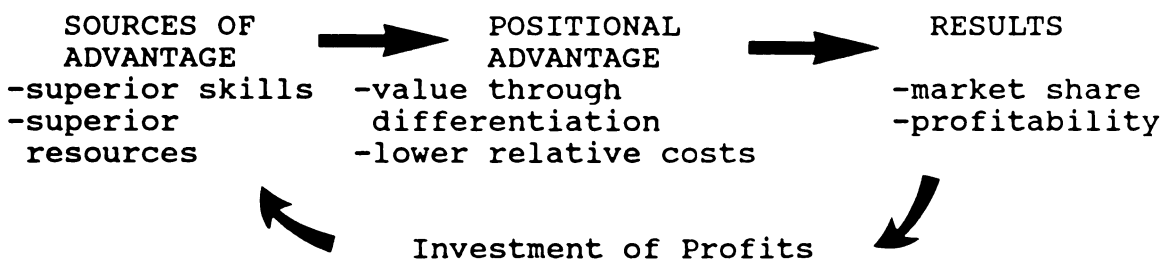
CHAPTER I: INTRODUCTION

A comprehensive examination of logistics texts reveals many sections, if not chapters, devoted to logistics performance measurement (Coyle and Bardi 1984, p. 451-453; Ballou 1985, p. 547-554; Bowersox, Closs and Helferich 1986, p. 321-340; Stock and Lambert 1987, p. 698-711). Performance measurement is important because of its direct relationship to operational results such as profitability or market share. For example, one study found a 14 to 22 percent productivity gain by firms with sophisticated performance measurement systems (A.T. Kearney, Inc. 1984).

Exhibit 1 demonstrates the importance of performance measurement (Day and Wensley 1988). Positional advantage refers to the extent to which a firm **actually** holds a competitive advantage. It is through formal performance measurement that positional advantage is determined. As seen in Exhibit 1, positional advantage leads to results such as market share, profits and customer satisfaction. Knowledge of positional advantage and its causal attributes ideally guide reinvestment into appropriate advantage generating skills and resources.

This competitive advantage framework provides a mechanism to interpret performance-related research. For example, the

Exhibit 1
THE ELEMENTS OF COMPETITIVE ADVANTAGE *



* From Day and Wensley (1988, p. 3)

early PIMS research by Buzzell, Gale and Sultan (1975), which was restricted to an examination of the interrelationships among performance outcomes, found a positive relationship between market share and return on investment. Another example was provided by Phillips, Chang and Buzzell (1983). They examined the effect of direct relative costs, a type of positional advantage, on market share and return on investment. These two examples are representative of the large body of research conducted in marketing on organizational performance.

In logistics, research has been devoted to: (1) defining how performance can be measured (Bowersox et al. 1989); (2) how logistics can conceptually impact profits (Shapiro 1984); and (3) how productivity can be measured and improved (A.T. Kearney, Inc. 1978; Grottke and Norris 1981; Gautschi 1983). The topic of performance measurement remains timely in that it was identified as a major source of concern among senior logistics executives (Bowersox et al. 1989, p. 273-274). This

concern was expressed equally by manufacturers, wholesalers and retailers.

FOCUS OF THE DISSERTATION

For the purpose of this research, marketing can be viewed as two interrelated subsystems. One subsystem is viewed as creating or stimulating demand. The second subsystem primarily services demand (Bowersox 1961; Lewis and Erickson 1969; Reidenbach and Oliva 1981). Some of the activities involved in stimulating demand are advertising, promotion and personal selling. Some of the activities involved in servicing demand are transportation, warehousing, inventory management, order processing and material handling, among others. Marketing management can be viewed as the process of integrating and coordinating demand stimulation and demand servicing.

Demand servicing is discussed under the topics of physical distribution, materials management, or logistics, the marriage of both physical distribution and materials management. A title currently gaining industrial support to describe the demand servicing aspects of marketing is product supply (Dumaine 1989).

For the purpose of this research it is important to define the terms "logistics activities" and "logistics function." The term "logistics activities" is used to describe the flow of goods and related information throughout

an organization. The term "logistics function" is used to describe that organizational hierarchy with responsibility for logistics activities.

The dissertation is concerned with relationships between the structure of the logistics function and the extent or usage of performance measurement of logistics activities. The dissertation focuses on three research questions.

> (1) How are various types of performance measurement of logistics activities interrelated?
>
> (2) What organizational factors describing logistics function structure and strategy are related to performance measurement?
>
> (3) Does a firm's channel position alter how different types of performance measurement are interrelated or how logistics function structure and strategy are related to performance measurement?

THEORETICAL FRAMEWORK

The framework of the dissertation is presented in three sections. First, a typology of performance measurement is introduced. Next, the constructs and major linkages between constructs examined are presented. Lastly, analysis considerations are discussed.

A TYPOLOGY OF PERFORMANCE MEASUREMENT

Performance measurement takes many different forms. To help understand the complexity and goals of performance

Exhibit 2
CLASSIFICATION OF PERFORMANCE MEASUREMENT

	Performance Measurement Focus	
Strategic Focus	Internal Measurement	External Measurement (Benchmarking)
Cost approach	Measurement of firm costs. Examples include cost, productivity and asset management measurement.	Measurement of competitor costs. Benchmarking firm cost with that of key competitors.
Differentiation approach	Measurement of items that can be used as differentiators. Examples include customer service and quality measurement.	Measurement of competitor differentiation. Benchmarking firm differentiation with that of key competitors.

measurement, Exhibit 2 offers a 2x2 typology. The term **performance measurement focus** refers to whether the measurement is **internal** or **external**. Internal performance measurement consists of monitoring: (1) financial data such as return on investment; (2) specific logistics measures such as total logistics cost, inbound freight cost and order processing cost; (3) customers perceptions of customer service; and (4) levels of attained customer service. Internal measurement provides an across time indicator of

relative performance but it does not help assess how well a firm is doing in relation to key competitors.

External performance measurement compares a firm's performance to key competitors. It is often called **benchmarking** (Camp 1989). The term benchmarking is used throughout the dissertation. While internal performance measurement is important, benchmarking provides depth to the positional advantage pictured in Exhibit 1. For example, a firm that only measures its own customer service does not fully understand relative competitive advantage.

The second dimension of the typology is the **strategic focus** of performance measurement. Strategic focus is related to either **cost** or **differentiation**. The strategic focus is derived from the generic overall low cost and differentiation strategies of Porter (1980). With respect to logistics, cost measures are defined to include logistical productivity and asset management. Differentiation refers to a distinctive customer service strategy. Shapiro (1984) provided numerous examples of low cost and differentiation logistics strategies.

The typology relates four types of performance measurement: (1) internal cost measurement; (2) internal measurement of factors that can be used as differentiators; (3) cost benchmarking; and (4) differentiation benchmarking.

CONSTRUCTS AND THEORETICAL FRAMEWORK

The linkages examined empirically in this research are presented in Exhibit 3. First, the dependent or endogenous variables in the box are the four types of performance measurement. Total or combined internal and benchmarking performance measurement offer two additional dependent variables that are also examined. Thus, the research design treats six dependent variables. In addition, relationships existing between benchmarking and internal performance measurements are examined.

Second, four categories that represent independent or exogenous constructs are illustrated across the top of Exhibit 3. They are: (1) logistics strategy; (2) structuring variables describing the latent organizational structure of the logistics function; (3) pictorial configuration variables which also describe the organizational structure of logistics; and (4) channel position. A theoretical framework that incorporates these constructs is discussed next.

Contingency theory, which provides an approach for linking environment, strategy, structure and performance, interconnects the constructs examined in the dissertation. **Environment** is examined through the channel position at which an organization operates. In this research, the positions examined are manufacturers, wholesalers and retailers. **Strategy** is examined through how frequently the logistics strategic plan is updated.

Structure is examined through various structuring and

Exhibit 3
TESTING FRAMEWORK

INDEPENDENT VARIABLES

Strategy	Structuring Variables	Pictorial Configuration	Channel Position

DEPENDENT VARIABLES

Internal Cost Performance Measurement	Cost Benchmarking Performance Measurement
Internal Differentiation Performance Measurement	Differentiation Benchmarking Performance Measurement
Combined Internal Performance Measurement	Combined Benchmarking Performance Measurement

pictorial configuration variables (Dalton et al. 1981). Structuring variables refer to latent constructs such as: (1) formalization which consists of formal rules, policies, procedures, cost and quality control measures; (2) centralization which is the vertical locus of decision-making authority; and (3) specialization. Discussion of structuring variables has long standing in the management literature (Hage 1965; Pugh et al. 1967; Miller and Droge 1986).

Pictorial configuration variables can literally be drawn. Examples are functional versus divisional organizational structures, tall versus flat hierarchies, activity allocation to various functions and spans of control.

ANALYSIS

The analyses is conducted in two stages. First, each of the strategy, structuring and pictorial configuration independent variables is modeled with the channel position variable as a covariate. Second, separate subgroup analysis of manufacturers, wholesalers and retailers is completed. This two stage approach helps isolate whether the relationship between logistics function structure and performance measurement is invariant across channel positions. This will allow generalizations regarding the extent to which manufacturers, wholesalers and retailers are similar or dissimilar with respect to logistics performance measurement.

POTENTIAL CONTRIBUTIONS

Contributions of the dissertation are expected in two areas. First, from a theoretical perspective, elements of structure and strategy of the logistics function have not been examined in relation to performance measurement. The research design includes hypotheses to potentially facilitate new theoretical insights about logistics performance measurement and channel position. A theoretical contribution may result from an examination of the extent to which manufacturers, wholesalers and retailers are comparatively similar or dissimilar.

The second potential contribution of the dissertation is the generation of managerially relevant guidelines for

logistics structure and strategy. For example, the hypotheses could yield insights into what role a formal logistics mission statement plays in encouraging performance measurement. Another example of a potential contribution is the relatedness of the senior logistics executive's title to performance measurement. These results could offer managerial guidelines toward understanding the importance or lack thereof of the vertical organizational positioning of the senior logistics executive.

ORGANIZATION OF THE DISSERTATION

Chapter II initially presents a description of contingency theory which is used to provide a framework for hypothesis development and testing. This is followed by sections on performance measurement, logistics strategy, latent structuring of the logistics function, pictorial configuration of the logistics function, and channel position. In each section, the appropriate variables are defined, relevant empirical and conceptual research is reviewed, and research hypotheses developed. Chapter II concludes with a summary of the research hypotheses. Statistical hypotheses are presented in Appendix D.

Chapter III presents methodology. The samples from which the data was collected are discussed. Questionnaire design and scaling considerations are also detailed. Chapter IV contains results of statistical tests. Chapter V presents

managerial implications of the research and discusses the implications of the research for Leading Edge logistics (Bowersox *et al*. 1989). The chapter concludes with suggestions for future research, limitations and a final summary.

CHAPTER II: THEORETICAL AND EMPIRICAL BACKGROUND

Chapter II is reviews relevant literature and presents the hypotheses that are tested. The first section of this chapter presents the contingency theory framework of organizational design. To illustrate the complex manner in which environment, strategy, structure and performance interact, three types of relationships are discussed: (1) relationships among indicators of a single construct; (2) relationships between pairs of constructs; and (3) the effect of "fit" between pairs of constructs on a third construct.

A section on reviewing internal and benchmarking performance measurement follows and hypotheses are proposed relating performance measurement variables to one another.

The next three sections discuss logistics strategy, structuring of logistics and pictorial configuration, respectively. In each section, empirical research focusing on the structure of the logistics function is reviewed and hypotheses developed.

Channel position is discussed in the sixth section. The last section summarizes the hypotheses that are examined in this research.

THEORETICAL BACKGROUND

Exhibit 4 depicts the contingency theory framework. This theory focuses on four constructs: environment, strategy, structure and performance. The following sections define these constructs and describe contingency relationships.

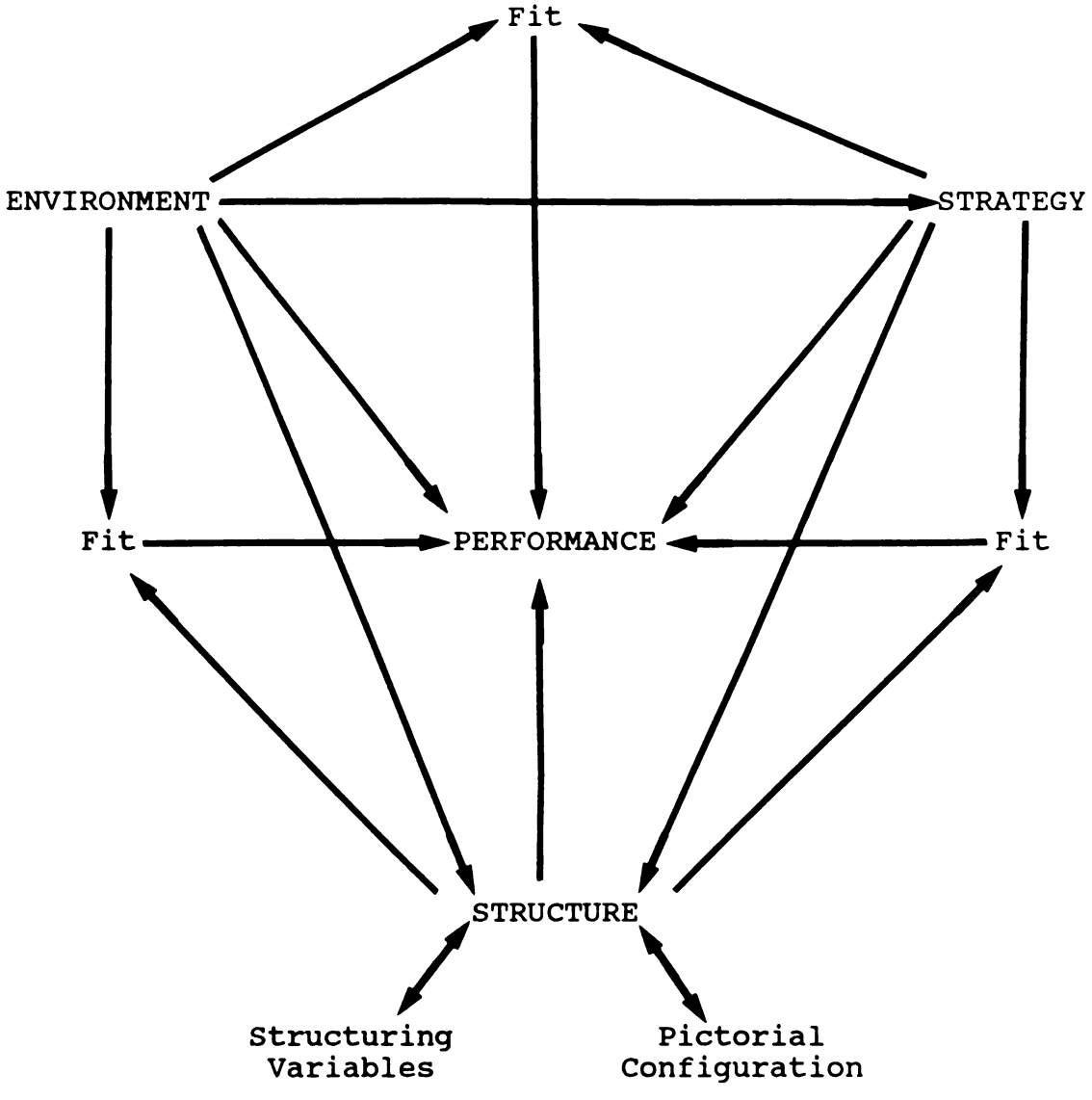
ENVIRONMENT

Environment refers to organizational contexts which cannot easily be altered in the short-run. The most frequently discussed contextual variables are size, technology and uncertainty (Lawrence and Lorsch 1967; Duncan 1972; Ruekert, Walker and Roering 1985). Other contextual variables have been discussed including stage of the product or business life cycle (Anderson and Zeithaml 1984) and percent of manufactured output made to stock (Persson 1982; Christopher 1986; Phofl and Zollner 1987).

Organizational size is multidimensional and operationalizations include measures of physical output such sales, the number of employees, or resources available such as net assets or profits (Jackson, Morgan and Paolillo 1986, p. 216).

Technology is defined as: "The techniques and technical process an organization uses to change inputs such as materials, knowledge, energy, and capital into outputs such as products or services" (Jackson, Morgan and Paolillo 1986, p.242). While the definition of technology applies to all

Exhibit 4
THEORETICAL FRAMEWORK



firms, empirical studies generally focus on the effect of manufacturing technology on structure (Woodward 1965; Khandwella 1974; Marsh and Mannari 1981; Lincoln, Hanada and McBride 1986; Miller and Droge 1986). Measurement frequently distinguishes among custom, small batch, large batch, mass production and continuous process manufacturing technologies.

Uncertainty refers to actual and perceived levels of environmental uncertainty. Perceived uncertainty may actually be more important than actual uncertainty since management reacts to environmental perceptions (Duncan 1972). Elements of uncertainty include predictability of competitors, variability of customer requirements, and heterogeneity of products in the marketplace (Miller and Droge 1986).

Another environmental variable receiving attention is percent of manufactured output made-to-stock. Thompson (1967) discussed this variable claiming that firms producing to stock "buffer" internal operations from environmental variances. The proportion of output made-to-stock has been linked to "task predictability" (Christopher 1986). As firms produce a greater proportion of output to order, the predictability of logistical tasks declines. Furthermore, Blois (1980) and Hayes and Wheelwright (1979) related percent of manufactured output made-to-stock to manufacturing technology. They argued that made-to-order manufacturers are more likely to use custom or batch technologies while made-to-stock firms are more likely to use mass production or continuous process technology.

Channel position has not explicitly been identified in the literature as an environmental variable. However, other descriptors of firm "type" are found in contingency research. Child and Mansfield (1972) explored how "work-flow" integration, a specific operationalization of technology, relates to structure. They examined manufacturers and service firms, at first simultaneously, then separately, and found some differences. For relationships between specific constructs, the manufacturing versus service distinction appears important.

Channel position is not the same as channel structure. Channel structure describes how a channel is organized for a product or an industry. A study of channel structure would compare channels across products or industries. One goal of this research is to compare manufacturers, wholesalers and retailers without regard to product or industry type.

STRATEGY

Strategy refers to the methods by which goals are achieved. Three strategic typologies receiving considerable literature attention are discussed. Porter's (1980) typology consists of the generic low cost, differentiated and focus strategies. Recently, the mutual exclusivity of this typology has been questioned (Miller 1988). A firm need not follow one and only one strategy: a firm can be a differentiator servicing a focused market niche.

The Miles and Snow (1978) typology is based on new

product introduction strategy. For example, prospectors aggressively search for both new products and new markets for existing products, while reactors introduce new products only if they are seriously threatened.

Another important strategic variable is product diversification. Chandler (1962) concluded that the divisionalized structure was primarily instituted in response to product diversification. A typology based on diversification is Rumelt's (1982) related, unrelated, single and dominant strategic typology.

STRUCTURE

Structure refers to the manner in which the firm is organized. As seen in Exhibit 4, structure can been dichotomized in **structuring** variables, or latent constructs, and **pictorial configuration** variables, or variables that can literally be drawn (Dalton et al. 1980). Structuring variables include: (1) formalization, or the existence of formal rules, policies, cost and quality control measures; (2) centralization, or the vertical locus of decision-making authority; and (3) specialization, or the extent to which individuals and/or departments specialize. Integration has been identified as an important structuring variable (Mintzberg 1979; Bowersox, Closs and Helferich 1986).

Pictorial configuration variables include, but are not limited to: (1) vertical differentiation, or the number of layers in an organization: (2) horizontal differentiation, or

the number of units or departments; (3) divisional versus functional forms; (4) activity sharing across business units in a divisionalized firm; (5) spans of control, or the number of subordinates reporting directly to, for example, a CEO or a factory foreman; and (6) activity allocation to various functions.

PERFORMANCE

Performance is a multidimensional construct consisting of: (1) efficiency, or how well inputs are used; (2) effectiveness, or how well the organization is able to achieve goals; and (3) and flexibility. Flexibility refers to either long-term adaptability to changing environmental conditions through strategic new product introductions or to short-term operational adaptability to temporary marketplace alterations (Phofl and Zollner 1987).

CONTINGENCY RELATIONSHIPS

Three types of contingency relationships are typically researched: (1) relationships among elements of a particular construct; (2) relationships between pairs of constructs; and (3) the effect of the relationship between a particular pair on another construct. All three constitute contingency relationships, although the latter type is the most sophisticated since it tests whether the "fit" between pairs of constructs is dependent on or is related to other constructs. In order to fully understand the nature and logic

of contingency theory, each of the three types of relationships are discussed.

First, relationships among the elements of a single construct can be examined. When Buzzell, Gale and Sultan (1975) concluded that market share and return on investment were positively related, they examined a relationship between two dimensions of performance. Hage (1965) argued conceptually that flexibility and efficiency were negatively related.

The second type of relationship is that existing between pairs of constructs. A few examples of how strategy is related to other constructs are presented. Varadarajan (1986) examined how product diversification affects financial performance. Vancil (1979) examined the effect of product diversification on resource sharing across business units, a pictorial configuration structure variable. Gupta and Govindarajan (1986) examined the effect of low cost versus differentiation strategy on resource sharing across business units. Walker and Ruekert (1987) described how firms should be structured, along structuring dimensions, in response to combinations of the Miles and Snow (1978) and Porter's (1980) strategic typologies.

Research has frequently focused on relationships between environment and structure (Ford and Slocum 1977; Fry 1982). Firms operating in stable, certain environments are more formalized, less centralized and rely less on specialists than firms operating in complex, uncertain environments (Lawrence

and Lorsch 1967). Khandwella (1974) examined the effect of manufacturing technology and size on structure. Argarwal (1979) examined how size and structure are related and reported nonlinearities, while Blau et al. (1976) examined the effect of computerization technology on structure. For a review of contingency theory research in marketing, see Zeithaml, Varadarajan and Zeithaml (1988).

The third type of relationship emerging in the literature examines "fit." The essence of "fit" theory is that the level of "fit" between environment and structure, strategy and structure, and environment and strategy affects performance. In other words, performance is dependent on the level of "fit" between pairs of constructs.

Two difficulties are associated with "fit" theory. First, fitness testing requires larger sample sizes than those needed to test the first two types of contingency relationships. Second, the level of "fit" between a pair of constructs may be more important than the level of "fit" between other pairs of constructs. There can exist a large number of divergent environmental and strategic antecedents, and the firm "fitting" structure to all might do very little properly (Galbraith and Nathenson 1978).

Drazin and Van de Ven (1985) discussed empirical congruencies between pairs of constructs. They claimed congruencies exist between environment and structure, for example, because firms are capable of "fitting" structure to environment (John and Martin 1984; Morgan 1986).

Miller (1988) provides an example of testing "fit." He split the firms in his sample into those that had high and low levels of performance and then tested the strength of relationships between strategy and structure variables, between environment and structure variables, and between environment and strategy variables. The strategy -- structure relationships were significantly stronger for high performers. The interpretation is that high performing firms are better "fitting" structure to strategy.

Alternatively, one could test whether certain strategies are more profitable under specific environmental contexts, or whether specific structures are more profitable under specific strategies. Hamermesh and White (1984) found that business units following a low cost strategy were more profitable when they shared resources with other business units than when they did not share resources with other business units. Conversely, they found the opposite when business units followed a differentiation strategy. The interpretation is that the level of "fit" between strategy and structure affects performance.

McKee, Varadarajan and Pride (1989) tested whether strategy types, as defined by the Miles and Snow (1978) typology, were more profitable under specific environmental contexts. Again, this is another example of "fit" testing.

In summary, the environment, strategy, structure and performance constructs underlying the contingency theory approach to organizational design and three types of

relationships among these constructs were defined.

PERFORMANCE MEASUREMENT

Performance measurement has long been researched in management. Taylor (1911) introduced "scientific management" and modernized business by applying scientific methods to the study of management. Taylor, a proponent of time and motion study, monitored a method of working, measured performance, altered the method of working, and remeasured performance. He was able to determine if the alteration improved perforance. This sequence of events still applies in many cases today as a firm may alter inventory levels in expectation of lower costs. In logistics, monitoring performance is critical because the potential of trade-off analysis cannot be realized until performance is measured (Tyndall and Busher 1985).

The discussion of performance measurement is presented in three parts. The first two sections discuss internal and benchmarking measurement, respectively. The third section develops hypotheses concerning how performance measurement variables are expected to be interrelated.

INTERNAL PERFORMANCE MEASUREMENT

Bowersox et al. (1989) discussed five areas in which internal logistics performance measurement can focus: asset management, cost, productivity, customer service and quality. Each is discussed separately.

Asset management refers to how efficiently assets are utilized over a specified time period. Examples of asset management performance measures include: (1) return on net assets, or profit after taxes divided by total assets; (2) return on investment, or profit after taxes divided by net investment; and (3) inventory turnover, or cost of goods sold divided by the value of inventory (Soloman and Pringle 1980; Schall and Haley 1983; Halloran and Lanser 1985). Asset management performance measures are important because they focus on the end result of logistical practices. For example, the level of inventory investment to support a particular level of sales volume directly impacts return on investment and profitability. The importance of asset management to logisticians is not unique. Return on investment has come under close scrutiny by marketers (Jackson, Ostrum and Evans 1982; Jacobson and Aaker 1985; Jacobson 1988). Asset management is also of equal importance to manufacturers, wholesalers and retailers.

The measurement of internal logistical **costs** is important. An understanding of costs allows the firm to implement trade-off analysis. The components that comprise total cost analysis are transportation costs, warehousing costs, order processing costs, lot quantity costs and the cost of lost sales due to lack of stock (Lekashman and Stolle 1965; Lambert and Mentzer 1980; Stock and Lambert 1987). The cost of lost sales is generally not used in total cost analyisi because of estimation difficulties. Unlike the other

components of total cost analysis, the cost of lost sales is dependent on how product availability and customers' reaction to stockouts are related.

The third performance measurement area identified by Bowersox et al. (1989) is **productivity**. Productivity ratios are units of output divided by units of input (Chew 1988). Important logistics-related productivity measures include units shipped per employee and units per labor dollar. The use of too few productivity indices can decrease productivity rather than promote it (Skinner 1986). Management can be sensitized to a small number of productivity indices and ignore other equally important but unused indices. This could results in productivity gains on the indices being used, but productivity declines on other indices. It is the productivity of the entire system that is critical, and not the productivity of a given index.

The fourth area of performance measurement is **customer service**. Important components of customer service include fill rate, stockouts, on-time delivery and backorders (LaLonde and Zinszer 1976). The overall objective of the logistics approach to customer service is to minimize total logistics costs subject to meeting prespecified service levels. Measuring customer service performance is thus of critical importance to the organization.

The last area of performance measurement is **quality**. Quality refers to: "how effectively the logistics task is performed" (Bowersox, Closs and Helferich 1986, p. 274).

Examples of quality-related performance measures include frequency of damage, dollar amount of damage and number of customer returns. Quality is related to differentiation since it is associated with the quality of the service provided to customers. In other words, a firm can differentiate itself from competitors on the basis of logistical quality.

Three of the five performance measurement areas are related to organizational efficiency, or **costs:** asset management, cost and productivity. The remaining two performance measurement areas, customer service and quality of service, are related to **differentiation.** Shapiro (1984) examined generic logistics strategies, two of which were the low cost and differentiated strategies. The strategic thrust of performance measurement may be related to the strategic thrust of the organization and of logistics.

Only a few studies have examined how logistical organizational factors affect internal performance measurement. Bowersox et al. (1989) reported that manufacturers, wholesalers and retailers engage in more performance measurement as logistical sophistication increases. Leading Edge organizations, use larger numbers of asset management, cost, productivity, customer service and quality performance measures.

Lambert and Sterling (1987) examined performance reports received by marketing managers. They found 28% of managers receive profitability reports containing direct variable transportation costs. They, however, made no effort to

examine organizational factors affecting type of report received.

A study by Jackson, Ostrum and Evans (1982) examined measures used to evaluate marketing performance. The measures examined were related to sales statistics, cost, margins and return on investment. They explored how these measures were related to "control segments" such as order size, market segment, and geographical area. Similar to Lambert and Sterling (1987), they did not examine how organizational factors relate to type of measures or control segments used.

Khandwella (1974) examined the use of formal "internal" controls as a function of several organizational design variables. While size and type of manufacturing technology were found to be related to the use of internal controls, Khandwella (1974), using path analysis, concluded that variables describing other elements of organizational structure such as centralization and formalization intervened the relationship between size and use of controls and between technology and the use of controls.

In summary, the logistics literature has yet to fully examine how logistics strategy and structure are related to performance measurement. The following section reviews the literature on benchmarking performance measurement.

STRATEGIC INTELLIGENCE AND BENCHMARKING

Benchmarking has been discussed in conjunction with strategic intelligence and environmental scanning. Strategic

intelligence is: "...information about competitor capabilities and intentions that provides a basis for planning long term strategy and goals" (Hershey 1980, p. 22). Strategic intelligence is distinct from strategic espionage, although the exact boundary between the two is at times blurred. Strategic espionage often involves activities of a clandestine nature which, if not illegal, are unethical (Wall 1974). These activities include theft, bribery, extortion and/or wiretapping (Sammon, Kurland and Spitalnic 1984). The difference between strategic intelligence and espionage thus lies in data collection methods and not in goals.

Strategic intelligence represents the gathering of environmental information to guide long term strategy formulation. Porter (1980) suggested the following sources of strategic intelligence: publicly filed reports, speeches given by executives, business press, the salesforce, customers and/or suppliers, inspection of competitor's products, engineering estimates and managerial insight.

Montgomery and Weinberg (1979) discussed three purposes of strategic intelligence. First, strategic intelligence can be defensive. The goal is to determine whether basic assumptions about the environment hold. The essence of defensive intelligence is to minimize "sudden surprises." An example of a defensive intelligence act is when a firm monitors the prices competitors are charging.

The second type of intelligence is passive and refers to comparing competitor performance to that of the firm. This

type of intelligence enables the firm to determine positional advantage. Montgomery and Weinberg (1979) state that: "Passive intelligence is designed to provide benchmark data for objective evaluation" (p. 42).

The third of strategic intelligence is offensive in nature. It is undertaken to identify opportunities and spot problems. The firm can then act to improve its competitive position or to protect its present market position.

Montgomery and Weinberg (1979) also discussed six areas in which strategic intelligence can focus: competitive, technological, customer, economic, political/regulatory and social. The benchmarking variable examined in this research include competitive, technological and customer facets.

The bounds delineating the three purposes of strategic intelligence are themselves not all that distinct. McLagen and Zeismer (1982) suggested that cost benchmarking, which would appear to be defensive, can lead to an understanding of opportunities or problems. Thus, if cost benchmarking is undertaken by a firm, it is difficult, if not impossible, to determine whether the purpose of the intelligence operation is offensive or passive. Knowledge of the act of benchmarking gives little insight into the purpose or motive behind the act.

Sharman (1984) discussed how profiles of competitors along logistical customer service levels can be used by firms to spot problems and opportunities. The profiles are similar to those used in product positioning research to plot customer

perceptions of competing products. The development of competitor profiles requires some form of information about competitor performance. This method of spotting opportunities is thus one type competitor intelligence.

Porter (1980) suggested that the extent to which firms engage in strategic intelligence is related to organizational factors, including organizational needs, industry characteristics, staff capability, management interest and management talent. As already mentioned, this list is extended to include logistics strategy and structure.

Empirical support of industry differences in the importance of type of strategic intelligence is provided by Wall (1974). Across industries he found that managers most frequently felt the need to know information concerning competitor pricing. In terms of rank order, this was followed by expansion plans, competitive plans, promotional strategy, cost data, sales statistics, research and development, product styling, financing and executive compensation. Customer service was not examined in this study. Industry differences in the importance of type of intelligence gathered were found. For example, for the retail and wholesale industries, the most important aspect of competitor intelligence was pricing, while for the advertising, media and publishing industries, the most important aspect was competitive plans.

Zinkham and Gelb (1985) demonstrated that organizational and industry characteristics affect the extent of engagement in competitor intelligence. They found the amount of

competitor intelligence gathered by industrial marketing firms was positively related to the number of competitors in the industry, a "build share" versus "harvest" marketing strategy, and whether or not the purpose of the intelligence operation was offensive. Conversely, the amount of intelligence gathered was less for firms with a passive intelligence purpose. Organizational size, as measured by dollar sales, was found not to be related to the amount of intelligence gathered.

In summary, this section described two types of performance measurement. While limited research exists on organizational factors impacting performance measurement, little research was identified that examined how internal and benchmarking performance measurement are related, especially in the context of logistics across channel positions.

HYPOTHESES

Both internal performance measurement and benchmarking essentially represent different facets of a formal performance measurement or formal control construct. For this reason, internal performance measurement and benchmarking measurement should be positively correlated.

This generalized relationship can be made specific for particular dimensions of performance measurement. Firms following a low cost logistics strategy may be more committed to measuring logistics costs, productivity and/or asset management. On the other hand, some firms may be more

committed to providing a differentiating level of customer service, and thus may place a larger degree of importance on measuring customer service and quality. The result of varying degrees of commitment to various strategic foci means that firms benchmarking in one area, say differentiation, may measure a larger number of items of internal performance within the same area. These expectations are stated in the following hypothesis.

> H1: The use of internal performance measures is positively related with the use of benchmarking performance measures; (H1a) cost benchmarking is related to the use of internal cost performance measures; and (H1b) differentiation benchmarking is related to the use of internal differentiation performance measures.

The hypothesis does not imply that internal performance measurement "causes" benchmarking performance measurement or vice versa, or that cost benchmarking "causes" internal cost performance measurement. Rather, a relationship between two types of performance measurement is indicative of a firm's commitment to monitoring performance.

LOGISTICS STRATEGY

Logistics strategy has increasingly received attention in the literature. Shapiro (1984) discussed generic logistics strategies including low cost, differentiation and new product introduction strategies. Bowersox and Daugherty (1987) discussed process versus market versus channel strategies.

The strategy variable examined in the dissertation, however, is not related to generic logistics strategies. Rather, it is the frequency with which the logistics strategic plan is updated. Daugherty (1988) reported that this variable was unrelated to anticipated use of outside service vendors. Make-to-stock manufacturers update their logistics strategic plan less frequently than make-to-order manufacturers (Germain 1989). The latter finding suggests that environmental factors influence the frequency of strategic plan updating. Make-to-order manufacturers face more complex, unstable and unpredictable markets and customer requirements than make-to-stock manufacturers.

The same may also apply for wholesalers and retailers. Those that frequently update their strategic plan could face unstable and unpredictable markets and customer requirements. What should be considered is how firms facing unstable markets compare to firms facing stable markets in terms of the extent of performance measurement. There is no obvious reason why market stability should be related to cost versus differentiation performance measurement. Nor is there any reason to suspect that market complexity should be related to internal performance measurement, for example, but not benchmarking performance measurement. However, the possibility exists that total performance measurement, both internal and benchmarking, could be related to the frequency of updating the logistics strategic plan. A firm in a stable market could plan longer into the future than a firm in an

unstable market. Stability could imply that organizations are more willing to invest in performance measurement since market changes over time are less likely to invalidate the performance measures being used. Conversely, market instability could retard performance measures since the firm's investment in performance measurement could be invalidated by, for example, changing customer requirements.

This expectation is formally expressed in the following hypothesis.

> H2: The frequency with which the logistics strategic plan is updated is inversely related to the use of performance measures.

STRUCTURING VARIABLES

The study of specific structuring variables such as formalization, has long been explored in management and can be traced back at least to Weber during the late 19th century (Hage 1965). In logistics, and in marketing, certain structuring variables have recently received attention. LaLonde and Zinszer (1976) stated that a written customer service mission statement was a pretransaction component of customer service. More recently, Bowersox et al. (1989) discussed: (1) the importance of a written logistics mission statement as an integrative device; and (2) the importance of a formal logistics strategic plan as a strategic planning tool. A written customer service mission statement, a written

logistics mission statement and a formal logistics strategic plan are indicative of the level of formalization, a structuring variable.

Research has been conducted on customer service and channel conflict (Levy 1981a), segmenting the market on the basis of customer service (Gilmour 1982), cross industry customer service differences (LaLonde, Cooper and Noordewier 1988), customer service management (Levy 1981b; Uhr, Houck and Rogers 1981; Christopher 1983; Tucker 1983; Jackson, Keith and Burdick 1986), and on logistics strategy (Shapiro 1984; Shapiro and Heskett 1985; Stock and Lambert 1987; Gattorna 1988). However, very little research has been conducted on how structuring variables are related to performance measurement.

The structuring constructs that are examined in the dissertation are: (1) **formalization**, as indicated by the existence of a formal logistics mission statement, the existence of a formal logistics strategic plan, and maturity, or the length of time that logistics has been a formal function within the firm; (2) **reorganization**, as indicated by the number of times that the logistics function has been reorganized during the previous five years; and (3) **participation** in business unit strategic planning by the senior logistics executive. The number of reorganizations is an important variable describing the static nature of the organization. It is considered a structuring variable since it cannot be pictorially represented.

The following two sections review the limited empirical research examining logistical structuring variables in relation to other organizational variables. A brief summary and hypotheses development follow.

STRUCTURING VARIABLES AS DEPENDENT VARIABLES

Exhibit 5 lists empirical studies which have examined the structuring of logistics as a dependent variable. Each study is discussed separately.

A study that examined logistical formalization was conducted by Bowersox et al. (1989). They found that leading edge firms, as indicated by a common attributes index, were more likely than other firms to have a formal logistics mission statement, a formal logistics strategic plan, to have had logistics organized as a formal function for a longer period of time, and to have reorganized the logistics function a larger number of times over the past five years.

A relationship was found between the proportion of manufactured output made-to-stock versus made-to-order and logistical formalization (Germain 1989). Make-to-stock firms are more formalized than make-to-order with respect to a formal logistics mission statement and a formal logistics strategic plan. This finding supports contingency theorists who suggest that logistical task predictability, an environmental variable, of make-to-stock firms is higher than the task predictability of make-to-order firms, and that higher levels of task predictability are more conducive to a

Exhibit 5
EMPIRICAL RESEARCH WITH STRUCTURING VARIABLES
AS DEPENDENT VARIABLES

Study	Major Constructs
Bowersox *et al*. (1989)	Formalization, maturity and reorganization as a function of leading edge logistics.
Germain (1989)	Formalization as a function of percent of manufactured output to customer order.
Droge and Germain (1989)	Formalization and participation in business unit strategic planning by the senior logistics executive as a function of functional versus divisional structure and centralized versus decentralized structures.

formalized logistics function (Persson 1982; Christopher 1986; Phofl and Zollner 1987). In general, the more predictable the task, the more the cost savings that can result from a formalized bureaucracy.

Droge and Germain (1989) found that functionally structured manufacturers with a decentralized logistics function were less likely to have a formal logistics mission statement and a formal logistics strategic plan than divisionalized manufacturers with logistics centralized in a cross-divisional function. In the case of the latter, the logistics function had both line and staff responsibility cutting across divisions. Participation by the senior logistics executive in business unit strategic planning was found to be independent of the pictorial configuration of logistics.

STRUCTURING VARIABLES AS INDEPENDENT VARIABLES

Exhibit 6 lists empirical studies which have examined logistics structuring variables as independent variable.

Kyj (1987) examined relationships between the existence of a formal customer service mission statement and attitudes of senior executives. This is related to logistics since the logistics function in many firms has line authority over customer service (Bowersox et al. 1989). Kyj (1987) found that executives in firms with a written customer service mission statement were more likely to believe that customer service is used as a competitive weapon. In addition, a

Exhibit 6
EMPIRICAL RESEARCH WITH STRUCTURING VARIABLES
AS INDEPENDENT VARIABLES

Study	Major Constructs
Kyj (1987)	Use of logistical customer service as a competitive weapon and the importance of elements of customer service as a function of whether or not a formal customer service mission statement exists.
Daugherty (1988)	Use of outside service vendors as a function of formalization, maturity of the logistics function, reorganizations and participation in business unit strategic planning by the senior logistics executive.
Germain and Cooper (1989)	Use of customer surveys, quantitative measures of customer service and total number of customer service performance measures kept as a function of whether or not a formal customer service mission statement exists.

number of customer service elements were found to be more important for firms with a written customer service mission statement. For example, the provision of backorder information was considered to be more important in firms with a written customer service mission statement.

Daugherty (1988) examined how formalization, maturity of the logistics function, reorganizations and participation by the senior logistics executive in business unit strategic planning are related to the use of outside service vendors. Daugherty (1988) reported that maturity was positively related to anticipated outsourcing of inventory management, and reorganization and participation in business unit strategic planning by the senior logistics executive was positively related to anticipated outsourcing of order entry/processing services.

A third study that examined formalization as an independent variable was conducted by Germain and Cooper (1989). They found that firms with a written customer service mission or policy statement were far more likely to survey customers and to keep quantitative measures of customer service performance. In addition, these same firms actually measured customer service performance in a larger number of ways. This result was found to hold across three types of firms: manufacturers, industrial service firms and consumer service firms.

In summary, structuring variables describing the logistics function have been examined empirically both as

independent and dependent variables. Much of this research is grounded, if not explicitly, in the contingency theory framework. Little research has explored potential relationships between structuring variables and formal performance measurement.

HYPOTHESES

Based on the previous discussion, three hypotheses are proposed. They are concerned with the relationship between the structuring of the logistics function and performance measurement.

The mission statement, strategic plan and maturity variables, all dimensions of formalization, should be positively related to the usage of performance measures. This is expected because performance measurement is also a dimension of formalization. In addition, a logistics mission statement and a logistics strategic plan often state performance criteria. Measurement of performance becomes necessary to determine if these criteria are being met.

The length of time that logistics has been a formal function should be related to the use of performance measures. Increasing maturity of the logistics function implies that logistics has had a longer time to implement an increasingly sophisticated performance measurement system.

These expectations are expressed in the following hypothesis.

H3: Formalization is positively related to the use of performance measures.

This hypothesis implies that all four types of performance measurement plus total internal and total benchmarking performance measurement, vary positively with the level of formalization of the logistics function.

The number of reorganizations that the logistics function has undertaken during the past five years is expected to be related to performance measurement. More frequent reorganizations of logistics could signify, as described by Bowersox et al. (1989), leading edge logistics. In other words, frequent reorganizations could be an indicator of the organization's overall commitment to logistics. This increased commitment to logistics could be reflected in an increased belief in the importance of measuring the performance of logistics.

This expectation is expressed in the following hypothesis.

H4: The frequency with which the logistics function is reorganized is positively related to the use of performance measures.

The last structuring variable examined in this research is participation by the senior logistics executive in business unit strategic planning. Increasing levels of participation by the senior logistics executive should be related to all four types of performance measurement. Participating in overall strategic planning implies increasing importance of

and reliance on logistics. This could result in a greater reliance on performance measurement. Internal performance results could be filtered up chains of command to senior executives. The senior logistics executive participating in strategic planning may integrate logistics into overall corporate planning. Just as manufacturing and marketing positional advantages are used to plot a future organizational course, so could positional advantages derived from logistics. Hence, participation in business unit strategic planning by the senior logistics executive is expected to be related to internal and benchmarking performance measurement, and it is not expected to be related to the strategic focus of the performance measurement.

These expectations are expressed in the following hypothesis.

> H5: Participation by the senior logistics executive in business units strategic planning is positively related to the use of performance measures.

PICTORIAL CONFIGURATION

Certain dimensions of the pictorial configuration of the logistics function have been discussed in the literature. Stolle (1967) discussed whether activities should be allocated to logistics on a staff basis, a line basis, or a combination of both. Schiff (1972) provided further delineation of organizational structure types using the case study method to

discuss staff, line and staff-line organization of logistics. The allocation of activities in a staff versus line manner is one of many dimensions of pictorial configuration.

Another issue is: which activities should the logistics function control? The stages paradigm (A.T. Kearney 1981; Bowersox and Daugherty 1987) and the closely related "organizational types" (Bowersox, Closs and Helferich 1986, p. 304) partly address this question.

These two perspectives on the organizational design of logistics each present three "stages" or "types" of structures. Exhibit 7 presents the basic outline of the stages paradigm. The underlying logic of the stages paradigm is that the eventual integration of logistical activities proceeds through a series of recognizable stages. The process is evolutionary, rather than revolutionary. As shown in Exhibit 7, organizations first integrate outbound transportation and finished goods field warehousing. While the focus is operational, cost savings can arise from balancing the number and location of warehouses against total transportation costs.

Once these two logistical activities have been integrated, further cost reductions can arise if physical supply and physical distribution are integrated. Inbound and outbound transportation systems are coordinated under a single organizational function. In this manner, new trade-offs are made across functions.

In the last stage, materials management activities are

Exhibit 7
STAGES PARADIGM *

Stage I Logistics activities dispersed across various functions. "Core" activities of outbound transportation and finished goods warehousing integrated under a function typically called physical distribution. Operations orientation.
Stage II Integration of physical distribution and physical supply. Inbound and outbound transportation coordinated under a single function. Trade-offs made across functions.
Stage III Physical supply, physical distribution and materials management integrated under a single function which can be called logistics. Trade-offs being made across functions. Strategic nature of logistics recognized and utilized by the organization.

* from A.T Kearney (1981) and Bowersox, Closs and Helferich (1986, p. 312-313.)

integrated with Stage II activities. The focus of logistics at this point becomes strategic as well as operational. The organization is now positioned to identify and create positional advantages that can be integrated into long-term strategic planning.

Each organizational "type" described by Bowersox, Closs and Helferich (1986) is related to a particular stage in the stages paradigm. With each type, a typical organizational chart is presented. These charts illustrate an archetypical pictorial configuration closely associated with a particular stage.

"Beyond functions" was recently discussed by Bowersox et al. (1989, p. 79). Beyond functions are activities that are not traditionally considered to be logistics-related. These include, but are not limited to, real estate activities, data processing for distribution applications and facilities management. As stated by Bowersox et al. (1989, p. 80): "The assignment of beyond functions means that the logistics organization and its senior officer have gained sufficient organizational longevity to be viewed as part of the permanent management structure."

Another related issue is: How many activities should the logistics function control? This has also been called the span of logistics control (Bowersox et al. 1989; Droge and Germain 1989). The concept is independent of the stages paradigm since it is concerned with how many activities report to the logistics function, not how many and which activities

report to the logistics function. However, even this view may be somewhat limited since: "...how you manage logistics is more important than how many functions are managed" (Bowersox et al. 1989, p. 286).

Still another important variable is the title level of the senior logistics executive which represents the vertical position or visibility of the executive. This variable was recently discussed by Bowersox et al. (1989).

The pictorial configuration variables describing the logistics function examined in this research are: (1) whether the logistics function has formal line authority over customer service; (2) whether the logistics function has formal line authority over logistics systems planning; (3) the logistics span of control; and (4) the title level of the senior logistics executive.

PICTORIAL CONFIGURATION AS DEPENDENT VARIABLES

Exhibit 8 lists empirical studies which have examined pictorial configuration as a dependent variable. In some studies, the structure of the logistics function was of primary interest, while in others it was embedded in a larger context. The articles in Exhibit 8 have been grouped into three categories: (1) resource sharing across divisions; (2) span of logistical control; and (3) activity allocation to various hierarchies.

Vancil (1979) researched the business units of divisionalized manufacturers. Relying on Rumelt's (1982)

Exhibit 8
EMPIRICAL RESEARCH WITH PICTORIAL CONFIGURATION AS DEPENDENT VARIABLES

Author and Year	Major Constructs
Resource Sharing	
Vancil (1979)	Resource sharing of resource and development, manufacturing, distribution and marketing assets across strategic business units as a function product diversification.
Gupta and Govindarajan (1986)	Resource sharing across business units as a function of low cost and differentiation strategies.
Germain and Daugherty (1989)	Line and staff versus staff only consolidation of logistics activities across divisions of divisionalized firms as a function of product diversification.
Span of Logistics Control	
Bowersox, *et al*. (1989)	Span of logistics control and line control over individual activities as a function of leading edge logistics.
Germain (1989)	Span of logistics control as a function of percent of manufactured output to customer order.
Droge and Germain (1989)	Span of logistics control as a function of centralized versus decentralized and functional versus divisionalized structures.

Exhibit 8 (Cont'd)
EMPIRICAL RESEARCH WITH PICTORIAL CONFIGURATION AS DEPENDENT VARIABLES

Author and Year	Major Constructs
Daugherty and Droge (1989)	Span of logistics control as a function of line and staff versus staff only logistics resource sharing across divisions in divisionalized firms.
Activity Allocation	
Lynagh and Poist (1984)	Perceptual differences between marketing and logistics executives over whether activities should report to logistics versus marketing.
Voorhees, Teas, Allen and Dinkler (1988)	Perceptual differences between marketing and logistics executives over whether activities should report to logistics versus marketing.
Droge, Germain and Daugherty (1989)	Logistics line control over various activities as a function of centralized versus decentralized and functional versus divisionalized structures.

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diversification typology, he classified each business unit as being either a single business, a dominant diversifier, a related diversifier, or an unrelated diversifier. Vancil (1979) found that related diversifiers were more likely than unrelated diversifiers to share manufacturing, selling, research and development and distribution resources across business units.

Another study that examined resource sharing as a function of strategy was conducted by Gupta and Govindarajan (1986). In this study resource sharing was examined across six functions, one of which was purchasing. Resource sharing was greater for organizations pursuing a low cost versus a differentiation strategy, although the relationship was weak.

Germain and Daugherty (1989) also examined the effect of product diversification on resource sharing across business units in divisionalized manufacturers. In particular, they examined two archetypical resource sharing structures: (1) a structure where major logistics activities are consolidated across divisions in a cross divisional function; and (2) a structure where major logistics activities reside in the divisions, but a cross divisional structure sharing mostly staff type responsibilities exists. While Vancil (1979) used a categorical measure of product diversification, Germain and Daugherty (1989) used continuous measures of product diversification based on SIC codes (Varadarajan 1986). They found that the number of four-digit manufacturing SIC codes was predictive of logistics structure. As product

diversification increased, firms were more likely to use the structure in which the resource sharing was mostly staff. These firms are constrained by differences in logistical requirements across divisions. A diversified organization is more likely to have heterogeneous product handling equipment, warehousing requirements, channels and customers across divisions. In contrast, a less diversified company can share line resources across divisions and gain economies of scale because warehouses, customers, channels and product handling equipment are more likely to be similar across divisions.

The similar findings of Vancil (1979) and Germain and Daugherty (1989) based on different operationalizations of product diversity and resource sharing are not without theoretical support. Similar results have also been found in relation to other functional areas of the firm. Porter (1985) claimed that resource sharing across business units is easier when products are related because of inherently similar manufacturing, distribution and selling assets and because of similar channels of distribution and customers (Phofl and Zollner 1987).

Another aspect of logistics structure which has recently been examined is the span of logistics control. Bowersox et al. (1989) reported that the span of logistics control was related to leading edge logistics. Firms on the leading edge were found to have a larger span of logistics control than less sophisticated organizations. Interestingly, this finding held for manufacturers, wholesalers and retailers suggesting

a level of similarity in logistics across channel position.

One study found percent of manufactured output made-to-order was related to the span of logistics control (Germain 1989). The span of logistics control for make-to-stock manufacturers exceeded that of make-to-order manufacturers, possibly in response to market complexity and to the need to control finished goods inventory. The aggregation of logistics activities in a single function in response to production to stock may be indicative of the existence of a formal logistics function. The need to organize logistics on a formal basis because of production to stock was noted by Heskett, Ivie and Glaskowsky (1964, p. 484).

A third study that examined span of logistics control was conducted by Droge and Germain (1989). Survey respondents were asked to select that pictorial diagram that best represented the structure of logistics within the firm. Among functional firms, those that selected an organizational chart depicting logistics activities as centralized in a single function had a larger span of logistics control than those that selected a diagram depicting logistics activities as being dispersed across other functions.

A forth study that examined span of logistics control was conducted by Daugherty and Droge (1989). The cross-divisional logistics function in manufacturers that have both line and staff responsibility was found to have a larger span of logistics control than the function that has mostly staff responsibility.

Droge, Germain and Daugherty (1989) relied on the same organizational charts as those used by Droge and Germain (1989) and found that functionally structured firms that selected the centralized diagram were more likely than those that selected the dispersed diagram to have formal line authority over sales forecasting, customer service and order processing. The previous three studies demonstrated that various pictorial configuration variables are interrelated. These studies also demonstrate the difficulties involved in organizational design research as the same variable can be exogenous or endogenous depending on the research objective.

Two studies, one by Lynagh and Poist (1984) and the other by Voorhees et al. (1988) examined perceptual differences between logistics and marketing managers as to which of logistics versus marketing should control various activities.

PICTORIAL CONFIGURATION AS INDEPENDENT VARIABLES

Exhibit 9 lists empirical studies which have examined pictorial configuration as an independent variable.

Anderson, Jermin and Constantin (1978) found the importance of physical distribution goals were not affected by the degree to which logistics activities were centralized. However, the importance of some goals were higher when logistics controlled a limited number of activities, one of which was warehousing.

Droge, Germain and Daugherty (1989) studied the impact of structural variables on the total number of logistics

Exhibit 9
EMPIRICAL RESEARCH WITH PICTORIAL CONFIGURATION AS INDEPENDENT VARIABLES

Author and Year	Major Constructs
Anderson, Jermin and Constantin (1978)	Importance of physical distribution goals as a function of degree of centralization of logistics.
Droge, Germain and Daugherty (1989)	Computerization and characteristics of information as a function of centralized versus decentralized and functional versus divisionalized structures.
Daugherty and Droge (1989)	Use of outside logistics service vendors as a function of line and staff versus staff only logistics resource sharing across divisions in divisionalized firms.
Germain and Daugherty (1989)	Formalization of logistics as a function of line and staff versus staff only resource sharing of logistics activities across divisions in divisionalized firms.

computer applications and on information related variables. They found that functionally structured decentralized firms were less computerized than functionally structured centralized firms and divisionalized firms. In addition, they found a relationship between pictorial configuration and the impact of logistics communication with other functions.

Daugherty and Droge (1989) found a relationship between the pictorial configuration of logistics and perceptions concerning anticipated use of outside service vendors such as public warehousing, transportation services. Two types of divisional firms were compared: those that have a corporate level logistics function with mostly staff responsibility versus those with staff and line responsibility. The former anticipated higher future use of outside service vendors. Firms that consolidate mostly staff activities across business units use outside service vendors to achieve economies of scale that would be otherwise impossible to obtain. Given that use of outside vendors is implicitly related to the structural "picture" of the firm, this research examined interrelationships among pictorial configuration variables.

Comparing the same two types of structures, Germain and Daugherty (1989) found that divisionalized firms with a line and staff cross-divisional function were more formalized with respect to a formal logistics mission statement and a formal logistics strategic plan than firms with a mostly staff cross-divisional logistics function.

In summary, studies have examined the pictorial config-

uration of the logistics function, both as an independent variable and as a dependent variable. However, no studies focusing on logistics were identified examining relationships between pictorial configuration and performance measurement.

HYPOTHESES

An question that can be asked is: What are the implications of the logistics function having formal line authority over customer service? One answer to this question is that the logistics function may be more committed to customer service. The logistics function that controls customer service may be more committed to measuring customer service performance, both internally and through benchmarking. These firms may be more committed to customer service and the quality thereof, and may be attempting to differentiate themselves from competitors along various customer service dimensions. If so, then these firms may measure a larger number of customer service and quality related performance items. However, an emphasis on differentiation has few if any implications for cost performance measurement. Hypothesis six formally expresses these expectations.

> H6: Logistics' formal line authority over customer service is: (H6a): positively related to the use of differentiation performance measures; and (H6b) not related to the use of cost performance measures.

A related question is: What is the effect of whether or not the logistics function has line control over logistics

systems planning? Much like the answer to the previous question, the answer can be formulated by considering revealed versus actual strategy. The assignment of activities to various functions could be an indicator of "revealed" strategy, or what strategy turned out to be. The logistics function that controls logistics systems planning may be revealing a commitment to a low cost strategy. This may be reflected in an increased level of cost-based performance measurement. However, as mentioned by Miller (1988), the low cost and differentiation strategies need not be mutually exclusive. Thus, a potential focus on costs, as indicated by the logistics function having line responsibility for logistics systems planning, is not hypothesized to have implications for the level of differentiation-based performance measurement.

Hypothesis seven formally expresses these expectations.

> H7: Logistics' formal line authority over logistics systems planning is: (H7a): not related to the use of differentiation performance measures; and (H7b) positively related with the use of cost performance measures.

The next pictorial configuration variable considered is the total number of line activities that the logistics function controls, or the span of logistics control. It is expected that the larger the number of activities that the logistics function has formal authority over, the greater the reliance on internal and benchmarking performance measurement. This is expected since the aggregation of activities in a

single function may be an indicator of: (1) increased integration of all logistics related activities; and (2) increased commitment to the logistics total cost concept which includes both a customer service strategic focus and cost strategic focus. This is expressed hypothesis eight.

> H8: The number of activities that the logistics function has line control over is positively related to the use of performance measures.

The last variable examined is the title level of the senior logistics executive which represents the vertical visibility of the executive. Potentially, a higher title level implies greater power for logistics relative to other functions and an increased likelihood that the senior executive participates in overall business unit strategic planning. For these reasons, the higher the title level of the senior logistics executive, the greater the use of logistics performance measures.

> H9: An increasing title level of the senior logistics executive is positively related to the use of performance measures.

CHANNEL POSITION

Channel position has been used to denote where in the channel of distribution a firm operates: that is, manufacturer, wholesaler or retailer. According to Bowersox, Closs and Helferich (1986, p. 497-506), there are four

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approaches to understanding channels of distribution. The descriptive institutional approach seeks to classify "middlemen" institutions into "types" based on ownership of goods and on the range of services offered. The graphic approach illustrates channel flows of goods and information. The commodity grouping approach identifies distribution channels used for specific commodities. The functional approach seeks to identify generic functions which are performed in the majority of channels and to identify which channel members are performing which functions.

The different descriptions of and approaches to understanding channel members suggests that firms occupying different channel positions are "totally different." In one sense this is correct: "The appropriate activities to be integrated through the logistical value-added process differ depending on whether an organization is a manufacturer, retailer or wholesaler" (Bowersox et al. 1989, p. 10).

However, from a management perspective, channel position to some extent may not be that important. A major empirical study which recently examined logistical practices for different channel members concluded: "...the best practice as typified by leading edge firms is remarkably similar regardless of a firm's channel position" (Bowersox et al. 1989, p. 31). These best practices include the existence of a formal logistics mission statement, an increased reliance on information technology including internal computerization, the use of electronic data interchange linkages, heightened

levels of operational flexibility, and a higher title level of the senior logistics executive.

While the logistical activities managed by manufacturers, wholesalers and retailers may be different, Bowersox et al. (1989) concluded that the methods or processes by which top performing firms manage logistical activities are similar, regardless of channel position. This suggests that logistics management concepts that have traditionally been developed in manufacturing contexts may also be applicable to wholesaling and retailing contexts.

Consider the case of inventory management. Many retailing texts cover this topic and/or economic order quantity (Markin 1971, p. 388-401; Berman and Evans 1979, p. 358-360; Larson, Weigand and Wright 1982, p. 251-253). Inventory policy is frequently discussed under "overall retail marketing strategy" (Bates 1979, p. 59; Gattorna 1985, p. 148-163; Knee and Walters 1985, p. 138) because of its relationship to how consumers react to stockouts (Schary and Christopher 1979) and to associated out of stock costs (Walter and Grabner 1975). Inventory control has also been identified as a primary operational concern in wholesaling management (Revzan 1961; Lopata 1969; Stern and El-Ansary 1987). Inventory is thus a critical activity to be managed regardless of whether the firm is a manufacturer, wholesaler or retailer.

A second concept that demonstrates similarities across channel positions is related to activity allocation to various functions. Manufacturing firms frequently utilize three major

line functions: manufacturing, marketing and logistics (Bowersox et al. 1989). Retailing organizational charts often depict a merchandising/buying function and an operations function (Gattorna 1985). This is similar to typical wholesaling organizational charts depicting a sales and an operations function (Heskett, Ivie and Glaskowsky 1964, p. 496).

These two functions in retailing and wholesaling firms have respective counterparts in manufacturing firms: marketing and logistics. They are typically responsible for stimulating demand and servicing demand, respectively. The interdependence of these two marketing subsystems may increasingly become important as firms seek strategic alliances with suppliers. This applies to both retailers (Droge, Germain and Stock 1989) and manufacturers pursuing just-in-time strategies (Frazier, Spekman and O'Neil 1988).

The purpose of the previous two examples is to demonstrate that while logistics has often been applied to manufacturers, many of the concepts have parallel applications for other members in the distribution channel. The study by Bowersox et al. (1989) provides an excellent example. In spite of these similarities, a recent review of retailing research failed to identify retailing operations as either an area needy of further research, let alone as an area of inquiry in and of itself (Lindquist and Samli 1985).

In fact, contingency theory applies to all organizations, not just manufacturers. Formalization, centralization, role specialization, and tall versus flat hierarchies apply to all

organizations. Some of the empirical studies reviewed contained different channel members in the same sample. For example, Kyj's (1986) sample contained manufacturers and wholesalers and Miller's (1988) sample contained manufacturers and retailers. In neither case was channel position modeled as an independent variable, suggesting that channel position is not an independent variable worthy of study. However, this may be explained in part by insufficient sample sizes.

The research hypotheses of the dissertation are not concerned with whether manufacturers, wholesalers and retailers use different performance measures. Rather, the research hypotheses are concerned with whether logistics structure and strategy are related to performance measurement. A critical point is whether the research hypotheses one through nine hold across channel positions. No difference in these underlying relationships are expected to be found. The research hypotheses explicated thus far are expected to hold for all three types of organizations.

Hypothesis ten formally expresses this expectation.

H10: Hypotheses one through nine hold equally for manufacturers, wholesalers and retailers.

SUMMARY OF HYPOTHESES

This last section of Chapter II summarizes the research hypotheses that are tested in the dissertation and recasts them in the framework presented in Exhibit 4. Exhibit 10

depicts the variables that are included in the dissertation. There are a total of eleven independent variables and six dependent variables.

Hypothesis one is concerned with relationships between internal performance measurement and benchmarking. This hypothesis examines interrelationships among the dependent variables.

> H1: The use of internal performance measures is positively related with the use of benchmarking; (H1a) cost benchmarking is related to the use of internal cost performance measures; and (H1b) differentiation benchmarking is related to the use of internal differentiation performance measures.

Hypothesis two deals with the relationship between logistics strategy and performance measurement.

> H2: The frequency with which the logistics strategic plan is updated is inversely related to the use of performance measures.

Hypotheses three, four and five deal with how the structuring of logistics is related to performance measurement.

> H3: Formalization is positively related to the use of performance measures.

> H4: The frequency with which the logistics function is reorganized is positively related to the use of performance measures.

> H5: Participation by the senior logistics executive in business unit strategic planning is positively related to the use of performance measures.

Exhibit 10
THEORETICAL FRAMEWORK OF THE DISSERTATION

Independent Variables

ENVIRONMENT

Channel position
1. manufacturer versus wholesaler versus retailer

STRATEGY

Frequency of strategic plan update
2. How often logistics strategic plan updated

STRUCTURE

Structuring Variables

Formalization
3. logistics mission statement
4. logistics strategic plan
5. maturity of the logistics function

Frequency of reorganization
6. no. of times logistics has been reorganized during the past five years.

Participation in planning
7. senior logistics executive participates in strategic planning

Pictorial Configuration

Span of control
8. Logistics controls customer service
9. Logistics controls logistics systems planning
10. Span of logistics control

Title level
11. Title level of senior logistics executive

Dependent Variables

Internal cost measurement	Cost benchmarking
Internal differentiation measurement	Differentiation benchmarking
Total internal measurement	Total Benchmarking

Hypotheses six, seven eight and nine deal with how the pictorial configuration of logistics is related to performance measurement.

> H6: Logistics' formal line authority over customer service is: (H6a): positively related to the use of differentiation performance measures; and (H6b) not related to the use of cost performance measures.

> H7: Logistics' formal line authority over logistics systems planning is: (H7a): not related to the use of differentiation performance measures; and (H7b) positively related with the use of cost performance measures.

> H8: The number of activities that the logistics function has line control over is positively related to the use of performance measures.

> H9: An increasing title level of the senior logistics executive is positively related to the use of performance measures.

The last research hypothesis examines the role of channel position. It is expected that the relationships set forth in hypotheses one through nine are invariant across channel position. For example, the relationship between formalization and performance measurement should hold for manufacturers, wholesalers and retailers. This implies that no significant interaction should be found between the channel position variable and each of the independent variables. Hypothesis ten formally expresses this expectation.

> H10: Hypotheses one through nine hold equally for manufacturers, wholesalers and retailers.

It should be noted that the hypotheses expressed above are research hypotheses and not statistical hypotheses. For example, H10 expresses the expectations for manufacturers versus wholesalers versus retailers in one short sentence. However, this hypothesis actually summarizes 3x9=27 statistical hypotheses: one for each of H1 through H9 for manufacturers, wholesalers and retailers separately. The complete test of H10 requires an examination of 6x9=54 two factor GLM models.

CHAPTER III: METHODOLOGY

Chapter III presents the method used in the dissertation. The sampling design is described first. This is followed by a section covering the design of the questionnaires. Lastly, the statistical methodology is described.

SAMPLING DESIGN

The data used in the dissertation was collected in three separate surveys. The sampling frame for the first survey was provided by the Council of Logistics Management and A.T. Kearney Management Consultants. A total of 3,002 letters were mailed to the senior logistics executive of U.S. manufacturer firms requesting participation in the study. Six hundred and sixty-eight executives indicated a willingness to participate. Questionnaires were then mailed, and a total of 380 usable questionnaires were returned. This survey is referred to as the "manufacturer" survey.

An "update" survey was mailed to the 380 manufacturers that participated in the first study. Of these, 187 usable questionnaires were returned. Since the second survey contains the performance measurement scales, 187 manufacturers are examined in the dissertation.

A third survey, the "wholesaler/retailer" survey, was mailed to a sample of wholesalers and retailers. A sampling frame was purchased from Dunn and Bradstreet consisting of American and Canadian wholesalers and retailers with sales in excess of $50 million. A total of 6678 questionnaires were mailed to the Chief Executive Officer in each organization, and 90 retailers and 148 wholesalers returned usable questionnaires.

Seventy-seven vertically integrated firms responded to the wholesaler/retailer survey. These firms are not included in the analysis. The wholesalers and retailers included in the analyses can be called "pure" in terms of the channel position occupied. The questionnaires were designed by a panel of academicians and executives and pretested prior to the final mailing.

QUESTIONNAIRE DESIGN

For the variables relevant to the dissertation, identical scaling methods were used in all questionnaires. The manufacturer questionnaire appears in Appendix A, the manufacturer update questionnaire appears in Appendix B, and the wholesaler/retailer questionnaire appears in Appendix C.

Exhibit 11 presents the variables examined in the dissertation and for each variable lists the questionnaire from which the variable is taken and its respective question number. The measurement of the independent and dependent

Exhibit 11
VARIABLES FROM THE QUESTIONNAIRES

Variable	Questionnaire		
	Manu facturer	Update Manu- facturer	Wholesaler - Retailer
Independent Variables			
Frequency of strategic plan update.....	Q8c		Q5b
Mission statement.....	Q7a		Q4
Strategic plan.....	Q8a		Q4
Length of time logistics a formal function.....	Q11		Q16
Number of reorganizations during past five years.....	Q10a		Q17
Participation in strategic planning.....		Q5	Q18
Logistics controls customer service.....	Q13		Q20
Logistics controls logistics systems planning.	Q13		Q20
Number of activities controlled by logistics....	Q13		Q20
Title level of the senior logistics executive.....	Q5a1		Q8
Dependent Variables			
Internal performance measurement.....		Q7	Q22
Benchmarking performance measurement.....		Q6	Q23

variables follows.

The first independent variable examined is channel position. In the wholesaler/retailer questionnaire, respondents were asked whether the organization they represented was a wholesaler, retailer or manufacturer and they were allowed to select more than one category.

The strategy variable examined is the frequency with which the logistics strategic plan is updated. On a free response scale, respondents were asked: "How often is your plan reviewed or updated?" The values on this scale were reversed since a longer time between plan updates is synonymous with decreasing frequency of strategic plan updating.

A total of nine variables describing the structure of the logistics function are examined: five structuring variables and four pictorial configuration variables.

Three measures of formalization were collected: whether a formal logistics mission statement exists, whether a formal logistics strategic plan exists, and the maturity of or the length of time that logistics has been a formal function.

Participation in business unit strategic planning by the senior logistics executive was measured by asking respondents: "Does your senior logistics executive formally participate in overall strategic planning for your business unit?" Response categories of "yes" "no, but provides input through other executives" and "no, provides no input" were used. These were coded 2, 1 and 0. Increasing values on this scale indicate increasing participation in business unit strategic planning.

The number of times that the logistics function has been reorganized over the past five years was collected on a free response scale in response to the question: "Within the last five years, how many times have all or parts of logistics been reorganized?"

Four pictorial configuration variables are examined. Respondents were asked whether the logistics function has line responsibility for a number of activities. Exhibit 12 presents the thirteen activities which are common to both the manufacturer and wholesaler/retailer questionnaires. If the logistics function had formal line authority over an activity, respondents were instructed to "tick" the appropriate box. The first two pictorial configuration variables are whether the logistics function controls customer service and whether the logistics function controls logistics systems planning. The sum out of thirteen is assumed to represent the span of logistics control or the number of line activities that the logistics functions controls.

The last pictorial configuration variable examined which is also the last independent variable is the title level of the senior logistics executive. The following response categories were provided: "president," "executive vice president," "senior vice president," "vice president," "director," "manager," "supervisor" and "other." The president response was coded as a seven, the executive vice president response was coded as a six, and so on. Respondents selecting the "other" response category were treated as

Exhibit 12
ACTIVITIES USED TO MEASURES SPAN OF LOGISTICS CONTROL

Sales forecasting	Purchasing
Inbound transportation	Inventory management
Intra-company transportation	Warehousing
Order processing	Customer service
Outbound transportation	Logistics system planning
Logistics administration	International
Facilities design/logistical engineering	

missing since the actual title level is not known.

The dependent performance measurement variables were all measured by the sum of a series of yes/no items. A total of thirty-eight items were used to indicate usage of internal performance measures (Appendix B, question 7 and Exhibit 13). As shown in Exhibit 13, twenty-four of the items are cost related. The sum out of twenty-four represents the extent to which internal cost performance is measured.

Also shown in Exhibit 13 is that fourteen of the thirty-eight items are classified as being differentiation related. The sum of these out of fourteen represents the extent to which internal differentiation performance is measured. Lastly, the sum of all thirty-eight items is used to indicate the extent to which a firm uses internal performance measures.

Ten benchmarking items were examined using yes/no scales (Appendix B, question 6 and Exhibit 14). As shown in Exhibit 14, the indicator of cost benchmarking performance measurement is the sum of three items. The indicator of differentiation

Exhibit 13
ITEMS USED TO INDICATE INTERNAL PERFORMANCE MEASUREMENT

Cost Measures

Inventory turns
Inventory levels (no. of days)
Return on assets
Inventory carrying costs
Obsolete inventory
Return on investment
Total cost analysis
Cost as a percentage of sales
Outbound freight costs
Logistics administrative costs
Comparison of actual to budget
Cost per unit
Direct product profitability
Inbound freight costs
Warehouse costs
Order processing costs
Cost trend analysis
Direct labor costs
Units shipped per employee
Orders per sales rep.
Units per labor dollar
Goal programs
Productivity index
Comparison to historical standards

Differentiation Measures

Fill rate
Shipping errors
Backorders
Customer feedback
Customer surveys
Stockouts
On time delivery
Cycle time
Salesforce feedback
Frequency of damage
Number of credit claims
Cost of returned goods
Dollar amount of damage
Number of customer returns

Exhibit 14
ITEMS USED TO INDICATE BENCHMARKING
PERFORMANCE MEASUREMENT

Cost Measures	
Cost	Asset management
Productivity	
Differentiation Measures	
Customer service	Quality
Additional Measures	
Logistics strategy	Warehouse operations
Technology deployment	Order processing operations
Transportation operations	

benchmarking performance measurement is the sum of two items.

The five remaining "additional" items on which benchmarking data was collected cannot be classified easily as cost or differentiation related. The benchmarking of "logistics strategy," "warehousing operations" and "technology deployment" could well be conducted for either cost of differentiation purposes. These items are therefore not included in the measures of cost or differentiation performance measurement. However, all ten items are used to indicate the total level of benchmarking.

The 187 manufacturers, 147 wholesalers and 90 retailers form the respondent base. Missing values are present for a number of variables. Exhibit 15 presents the sample sizes

Exhibit 15
SAMPLE SIZES

Variable	All Firms	Manu-facturer	Whole-sale	Retail
Independent Variables				
Frequency of strategic plan update.....	185	93	45	47
Mission statement.....	291/126*	119/66*	119/26*	53/34*
Strategic plan.....	230/189*	92/93*	101/46*	37/50*
Length of time logistics a formal function.....	382	187	116	79
Number of reorganizations during past five years.....	319	172	128	79
Participation in strategic planning.....	392	185	145	88
Logistics controls customer service.....	258/167*	85/102*	105/43*	68/22*
Logistics controls log. systems planning.....	244/181*	68/119*	109/39*	67/23*
Number of activities controlled by logistics....	425	187	148	90
Title level of the senior logistics executive.....	407	184	137	86
Dependent Variables				
All elements of internal and benchmarking performance measurement....	425	187	148	90

* Number in the sample who replied no/yes.

available for each of the variables overall, and within each subgroup.

OVERVIEW OF METHODOLOGY

Within the context of General Linear Models (GLM), the statistical test employed is dependent on the level of the scales used as dependent and independent variables. All six dependent variables examined in the dissertation are assumed to be continuous. As already mentioned, they are the number of: (1) internal cost measures used; (2) internal differentiation measures used; (3) total internal measures used; (4) benchmarking cost measures used; (5) benchmarking differentiation measures used; and (6) total benchmarking measures used.

As shown in Exhibit 16, the independent variables examined are either binary or continuous. The binary variables are: (1) the existence of logistics mission statement; (2) the existence of a logistics strategic plan; (3) whether the logistics function has line authority over customer service; and (4) whether the logistics function has line authority over logistics systems planning.

The continuous independent variables are: (1) the frequency of the strategic logistics plan update; (2) the length of time that the logistics function has formally existed; (3) the number of times that the logistics function has been reorganized over the past years; (4) the number of

Exhibit 16
STATISTICAL METHODOLOGY

Independent Variable	Continuous vs. Binary	Analysis: Overall Type of Two-Factor Model	Analysis: Subgroup Univariate Test
Frequency of strategic plan update.....	C	GLM	corr.
Mission statement.....	B	ANOVA	t-test
Strategic plan.....	C	ANOVA	t-test
Length of time logistics a formal function.....	C	GLM	corr.
Number of reorganizations during past five years...	C	GLM	corr.
Participation in strategic planning.....	C	GLM	corr.
Logistics controls customer service.....	B	ANOVA	t-test
Logistics controls log. systems planning.....	B	ANOVA	t-test
Number of activities controlled by logistics..	C	GLM	corr.
Title level of the senior logistics executive.....	C	GLM	corr.

C=continuous independent variable
B=binary independent variable

line activities that the logistics function has formal line authority over; and (5) the title level of the senior logistics executive.

Exhibit 16 also summarizes the statistical methods that are employed. The analysis is performed in two stages. In the first stage, the overall analysis, two-factor models are examined with the following independent variables: (1) the channel position variable; (2) one of the independent variables listed in Exhibit 16; and (3) an interaction term between channel position and the respective independent variable. Six of these models are examined for each independent variable since there are six indicators of performance measurement. Thus a total of 10x6=60 two-factor models are examined. The two-factor plus interaction term models employed are either GLM or ANOVA depending on whether the independent variable is continuous or binary. Exhibit 16 presents the type of model required for each independent variable. The significance of interaction terms in these models are used to support or refute hypothesis ten. But these models do not indicate the directionality of a relationship. The directionality of a particular relationship is examined using a correlation or a t-test, whichever is applicable.

The second stage of the analysis is the subgroup analysis. Exhibit 16 presents the type of statistical method employed for the manufacturing, wholesaling and retailing subgroups. If the independent variable listed in Exhibit 16

is continuous, then a correlation is used. If the independent variable is binary, then a t-test is used. The statistical tests for examining the directionality during the overall analysis is the same as those employed during the subgroup analysis.

Appendix D presents the exact statistical hypotheses that are tested. The null hypotheses are presented in the same order as tested in the results chapter. Appendix D lists the corresponding Table in which the null hypothesis is tested.

CHAPTER IV: RESULTS

This chapter is divided into five sections. First, means and initial ANOVA models are presented. Then, hypothesis one, which examines interrelationships among the types of performance measurement, is discussed. This is followed by the overall analysis. In this section, hypotheses two through ten are examined for all firms. This is followed by subgroup analysis examining hypotheses two through nine for each of manufacturers, wholesalers and retailers separately. Lastly, the results are summarized. Implications appear in the following chapter.

INITIAL RESULTS

Table 1 presents the means and standard deviations for each of the performance measurement variables for each type of firm and for all firms together. Table 2 presents the results of a series of one-way ANOVA models. In each model, the independent variable is the channel position variable. The dependent variable in each model is a different indicator of performance measurement. As can be seen in Table 2, all six models are significant at the .05 level. The results of Tukey tests are also shown in Table 2 where means underlined

Table 1
MEANS AND STANDARD DEVIATIONS OF PERFORMANCE MEASURES
USED BY CHANNEL MEMBERS

Type of Performance Measure	Manu-facturer Mean	Whole-saler Mean	Retailer Mean	Mean of all Firms
Internal				
Cost	16.48 (5.45) *	14.89 (5.78)	15.50 (4.38)	15.72 (5.40)
Differentiation	9.86 (3.89)	8.07 (3.84)	7.88 (3.88)	8.82 (3.97)
Total	26.34 (8.57)	22.96 (8.65)	23.38 (7.53)	24.54 (8.52)
Benchmarking				
Cost	1.66 (1.05)	1.19 (1.11)	1.09 (1.09)	1.37 (1.11)
Differentiation	1.61 (0.68)	0.91 (0.90)	0.67 (0.83)	1.16 (0.89)
Total	5.77 (2.86)	3.91 (3.16)	3.58 (3.16)	4.66 (3.18)

* Standard deviations in parentheses.

Table 2
ONE-WAY ANOVA MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF CHANNEL POSITION AND TUKEY TEST RESULTS

Type of Performance Measure	Overall F *	Model R-Square	Tukey Test Results
Internal			
Cost	3.72 (.0250) ***	0.017	W R M **
Differentiation	12.23 (.0001)	0.055	R W M
Total	7.81 (.0005)	0.036	W R M
Benchmarking			
Cost	11.71 (.0001)	0.053	R W M
Differentiation	54.72 (.0001)	0.206	R W M
Total	22.85 (.0001)	0.098	R W M

* d.f.=2 and 422 for model and error, respectively.
** R=retailers; W=wholesalers; M=manufacturers; means underlined by the same line are not significantly different.
*** p-values in parentheses.

by the same line are not significantly different. For all six indicators of performance measurement, the mean for manufacturers is the greatest. For both total internal performance measurement and total benchmarking performance measurement, the Tukey test reveals that the means of manufacturing firms are significantly greater than the means of wholesalers and of retailers, but no significant difference exists between the means of the latter two types of firms. At a minimum, all subsequent ANOVA and GLM models examining channel position and other independent variables should contain a significant channel position main effect.

HYPOTHESIS ONE

Hypothesis one related various types of performance measurement to one another. Table 3 presents the correlation matrix of the performance measurement indicators, while Tables 4, 5 and 6 present the correlation matrices for the manufacturing, wholesaling and retailing subgroups, respectively.

As can be seen from Table 3, when all firms are considered, the performance measurement intercorrelations are significant at the .01 level. Several of the correlations should be significant since they represent a type of item to total correlation. An example is the relationship between internal cost and total internal performance measurement.

Total internal and total benchmarking performance

Table 3
CORRELATION MATRIX OF PERFORMANCE MEASURES USED
(ALL FIRMS)

Variable	(1)	(2)	(3)	(4)	(5)
(1) Internal cost	-				
(2) Internal diff	0.646 (.0001) *	-			
(3) Total internal	0.935 (.0001)	0.875 (.0001)	-		
(4) Cost benchmarking	0.419 (.0001)	0.284 (.0001)	0.398 (.0001)	-	
(5) Diff benchmarking	0.262 (.0001)	0.357 (.0001)	0.332 (.0001)	0.506 (.0001)	-
(6) Total benchmarking	0.420 (.0001)	0.421 (.0001)	0.463 (.0001)	0.798 (.0001)	0.757 (.0001)

* p-values in parentheses.

Table 4
CORRELATION MATRIX OF PERFORMANCE MEASURES USED
(MANUFACTURERS)

Variable	(1)	(2)	(3)	(4)	(5)
(1) Internal cost	-				
(2) Internal diff	0.672 (.0001) *	-			
(3) Total internal	0.942 (.0001)	0.882 (.0001)	-		
(4) Cost benchmarking	0.393 (.0001)	0.290 (.0001)	0.382 (.0001)	-	
(5) Diff benchmarking	0.318 (.0074)	0.340 (.0001)	0.357 (.0001)	0.427 (.0001)	-
(6) Total benchmarking	0.445 (.0001)	0.417 (.0001)	0.472 (.0001)	0.768 (.0001)	0.684 (.0001)

* p-values in parentheses.

Table 5
CORRELATION MATRIX OF PERFORMANCE MEASURES USED
(WHOLESALERS)

Variable	(1)	(2)	(3)	(4)	(5)
(1) Internal cost	-				
(2) Internal diff	0.603 (.0001) *	-			
(3) Total internal	0.935 (.0001)	0.846 (.0001)	-		
(4) Cost benchmarking	0.470 (.0001)	0.207 (.0116)	0.406 (.0001)	-	
(5) Diff benchmarking	0.219 (.0074)	0.314 (.0001)	0.286 (.0004)	0.480 (.0001)	-
(6) Total benchmarking	0.419 (.0001)	0.398 (.0001)	0.456 (.0001)	0.768 (.0001)	0.804 (.0001)

* p-values in parentheses.

Table 6
CORRELATION MATRIX OF PERFORMANCE MEASURES
(RETAILERS)

Variable	(1)	(2)	(3)	(4)	(5)
(1) Internal cost	-				
(2) Internal diff	0.659 (.0001) *	-			
(3) Total internal	0.922 (.0001)	0.899 (.0001)	-		
(4) Cost benchmarking	0.309 (.0030)	0.213 (.0440)	0.289 (.0056)	-	
(5) Diff benchmarking	0.126 (.2365)	0.175 (.0999)	0.163 (.1240)	0.503 (.0001)	-
(6) Total benchmarking	0.305 (.0035)	0.270 (.0100)	0.317 (.0023)	0.847 (.0001)	0.700 (.0001)

* p-values in parentheses.

measurement are highly correlated (r=.463; p<.01), supporting H1. Internal cost and cost benchmarking are correlated (r=.419; p<.01), and internal differentiation and differentiation benchmarking are correlated (r=.357; p<.01), supporting H1a and H1b, respectively.

However, an interesting pattern emerges from a closer examination of these correlations. Not including the item to total correlations, the largest correlations for all firms is that existing between internal cost and differentiation (r=.646) and between cost and differentiation benchmarking (r=.506). The next strongest correlation is that existing between total internal and total benchmarking performance measurement (r=.463). Next are the correlations between internal cost and cost benchmarking (r=.419) and between internal differentiation and differentiation benchmarking (r=.357). The weakest correlations are those across both focus and strategic thrust: r=.262 between internal cost and differentiation benchmarking and r=.284 between internal differentiation and cost benchmarking. Thus cost-based measurements (H1a) and differentiation-based measurements are more strongly correlated (H1b) than the correlations between cost and differentiation-based measurements across strategic thrust, but are weaker than the correlations between cost and differentiation-based measurements within a particular strategic thrust.

This pattern repeats itself across Tables 4, 5 and 6.

For manufacturers, the weakest correlations are those between internal cost and differentiation benchmarking (r=.318) and between internal differentiation and cost benchmarking (r=.290). The correlations between internal and benchmarking cost (r=.393) and between internal and benchmarking differentiation (r=.340) are the next greatest. The largest correlations within the manufacturing subgroup are those between the two internal performance measurement (r=.672), the two benchmarking performance measurement (r=.427), and the two total performance measurement variables (r=.472).

This pattern more or less holds for wholesalers and for retailers. The only exception is that for retailers, the correlation between internal and benchmarking differentiation (r=.175) is less than all remaining correlations.

In summary, H1, H1a and H1b are all fully supported, but must be qualified by fact that an ordering of sorts exists among the relatedness of performance measurement variables. Furthermore, H1, H1a and H1b also hold for the individual subgroups.

OVERALL ANALYSIS

Tables 7 through 16 each contain the results of the six two-factor GLM models. The models in each table examine the main effect of a particular independent variable, the channel position variable, and an interaction term between channel

position and the respective independent variable. The significance of the channel position variable is estimated after the main effect of interest, and the significance of the interaction term is estimated after the main effect of interest and the channel position main effect.

The directionality of the relationships are presented in Tables 17 and 18. The upper half of Table 17 presents correlations between each of the six continuous independent variables and the three indicators of internal performance measurement. The lower half of Table 17 presents the correlations between the six continuous independent variables and the three indicators of benchmarking measurement.

Table 18 presents t-tests of difference between means of the four independent binary variables for all firms. These tests are either one-tailed or two-tailed tests, depending on the specific wording of the respective hypothesis.

STRATEGY AND PERFORMANCE MEASUREMENT

The results of the two-factor GLM models examining the effect of frequency of the logistics strategic plan update, channel position and an interaction term on the six indicators of performance measurement are presented in Table 7. As with all models examined in this subsection, the channel position main effect is not of primary interest. As seen in Table 7, the only significant "update" main effect is in the differentiation benchmarking model. None of the interaction

Table 7
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF FREQUENCY OF STRATEGIC PLAN UPDATE (PU) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values PU	CP	PU*CP
Internal					
Cost	1.57 (.1722) **	0.042	0.01 (.9421)	2.00 (.1377)	1.91 (.1517)
Differentiation	3.09 (.0106)	0.079	0.01 (.9279)	6.98 (.0012)	0.74 (.4799)
Total	2.38 (.0407)	0.062	0.01 (.9303)	4.43 (.0132)	1.50 (.2252)
Benchmarking					
Cost	3.22 (.0083)	0.083	0.39 (.5309)	6.70 (.0016)	1.15 (.3177)
Differentiation	10.96 (.0001)	0.234	7.31 (.0075)	22.65 (.0001)	1.10 (.3339)
Total	4.29 (.0010)	0.107	0.82 (.3768)	8.90 (.0002)	1.42 (.2453)

* d.f.=5 and 179 for model and error, respectively.
** p-values in parentheses.

terms are significant.

The only significant correlation between the frequency of updating the logistics strategic plan and the six indicators of performance measurement is the one for differentiation benchmarking ($r=.177$; $p<.05$), and the direction is opposite from that hypothesized (Table 17). The remaining five indicators of performance measurement are unrelated to the frequency of the logistics strategic plan update.

The evidence does not support H2. The only significant correlation is positive and hence contradicts expectations. The remaining five correlations are nonsignificant, weak, and none are in the hypothesized direction. In general, the frequency of strategic plan updating is unrelated to performance measurement. This applies to internal and benchmarking and to cost and differentiation based performance measurement.

STRUCTURING VARIABLES AND PERFORMANCE MEASUREMENT

The first structuring variables examined are the indicators of formalization of the logistics function: a logistics mission statement, a logistics strategic plan and the length of time that logistics has been a formal function.

Table 8 presents the results of the two-factor ANOVA models examining the effects of a logistics mission statement, channel position and an interaction term on the six indicators of performance measurement. As expected, the presence of a

Table 8
ANOVA MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF LOGISTICS MISSION STATEMENT (MS) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values MS	CP	MS*CP
Internal					
Cost	6.91 (.0001) **	0.078	26.66 (.0001)	1.86 (.1573)	2.10 (.1244)
Differentiation	11.07 (.0001)	0.119	34.40 (.0001)	7.98 (.0001)	0.68 (.5052)
Total	10.13 (.0001)	0.110	36.63 (.0001)	5.34 (.0051)	1.66 (.1911)
Benchmarking					
Cost	7.44 (.0001)	0.083	13.88 (.0002)	9.67 (.0001)	2.00 (.1369)
Differentiation	24.35 (.0001)	0.229	13.55 (.0003)	52.28 (.0001)	1.81 (.1642)
Total	15.52 (.0001)	0.159	30.85 (.0001)	20.76 (.0001)	2.63 (.0736)

* d.f.=5 and 411 for model and error, respectively.
** p-values in parentheses.

logistics mission is significantly related to internal cost, internal differentiation, total internal, cost benchmarking, differentiation benchmarking and total benchmarking performance measurement. The interaction term is not significant in any of the models.

The one-tailed t-tests of difference in means between firms with versus without a logistics mission statement (Table 18) demonstrate that the presence of a logistics mission statement is associated with increasing usage of performance measures. Hypothesis three, formalization and performance measurement are positively related, is thus supported, at least when a logistics mission statement is used to indicate formalization of the logistics function. The nonsignificant interaction term in the models (Table 8) supports H10: manufacturers, wholesalers and retailers do not differ with respect to the effect of a logistics mission statement on performance measurement.

The results of the two-factor ANOVA models examining the effects of a logistics strategic plan, channel position and a strategic plan -- channel position interaction term are presented in Table 9. The results are similar to those found with respect to the effect of a logistics mission statement. The strategic plan main effect is significant in all six ANOVA models, none of the interaction terms are significant, and directionality of the significant one-tailed t-tests (Table 18) support H3 and H10. Formalization of the logistics

Table 9
ANOVA MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF LOGISTICS STRATEGIC PLAN (SP) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values SP	CP	SP*CP
Internal					
Cost	7.47 (.0001) **	0.083	23.39 (.0001)	1.96 (.1417)	0.51 (.6023)
Differentiation	13.00 (.0001)	0.136	40.73 (.0001)	11.01 (.0001)	1.12 (.3267)
Total	11.49 (.0001)	0.122	44.04 (.0001)	5.88 (.0030)	0.83 (.4362)
Benchmarking					
Cost	7.91 (.0001)	0.087	16.44 (.0001)	10.79 (.0001)	0.71 (.4943)
Differentiation	23.34 (.0001)	0.220	10.31 (.0014)	52.52 (.0001)	0.68 (.5073)
Total	14.09 (.0001)	0.146	26.00 (.0001)	21.58 (.0001)	0.66 (.5195)

* d.f.=5 and 413 for model and error, respectively.
** p-values in parentheses.

function is positively related to performance measurement and this holds for manufacturers, wholesalers and retailers, at least when a logistics strategic plan is used to indicate formalization.

Table 10 presents the results of the GLM models examining the effect of the third and last formalization variable explored, the length of time that logistics has been a formal function. The "length of time" main effect is significant in all six models. The correlations between the length of time that logistics has been a formal function and the six indicators of performance measurement are positive and significant (Table 17). The longer the length of time that logistics has been a formal function, the greater the use of internal and benchmarking performance measures. This also applies to cost and differentiation performance measurement.

Thus, at the overall level, H3 is supported when the length of time that logistics has been a formal function is used to indicate formalization of the logistics function.

But support for H3 is not complete since the interaction term in the three internal performance measurement GLM models are significant (Table 10). This suggests that H10 is not supported. The relationship between the length of time that the logistics function has been a formal function and internal performance measurement is not consistent across manufacturers, wholesalers and retailers. The exact nature of these differences is explicated in the subgroup analysis.

Table 10
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF NUMBER OF YEARS LOGISTICS HAS BEEN A FORMAL FUNCTION (NY) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values NY	CP	NY*CP
Internal					
Cost	3.54 (.0038) **	0.045	3.65 (.0569)	2.34 (.0979)	4.69 (.0097)
Differentiation	6.04 (.0001)	0.074	4.46 (.0355)	8.03 (.0004)	4.85 (.0083)
Total	5.10 (.0002)	0.063	4.86 (.0281)	4.84 (.0084)	5.48 (.0045)
Benchmarking					
Cost	5.13 (.0001)	0.064	6.02 (.0146)	9.09 (.0001)	0.73 (.4819)
Differentiation	20.95 (.0001)	0.218	5.28 (.0221)	48.65 (.0001)	1.07 (.3499)
Total	9.97 (.0001)	0.117	10.00 (.0017)	17.92 (.0001)	2.01 (.1351)

* d.f.=5 and 376 for model and error, respectively.
** p-values in parentheses.

The results of the ANOVA models examining the effects of the number of times the logistics function has been reorganized during the past five years (H4), channel position and an interaction term are presented in Table 11. All the "number of times" main effects and interaction terms are nonsignificant. The correlations shown in Table 17 are also nonsignificant. Hypothesis four is thus not supported: the number of times that the logistics function has been reorganized during the past five years is unrelated to performance measurement.

The last structuring variable examined in the dissertation is participation in business units strategic planning by the senior logistics executive. The GLM models are presented in Table 12 and the overall correlations are presented in Table 17. The "participation in strategic planning" main effect is significant for all three internal performance measurement models, and the correlations between participation in strategic planning and internal performance measurement are positive and significant (Table 17). The interaction term in these three models are nonsignificant. Thus, as the senior logistics executive increasingly participates in strategic planning for the business unit, internal performance measurement also increases. Hypothesis five and ten are thus supported for internal performance measurement.

The evidence for benchmarking is not quite as strong.

Table 11
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF NUMBER OF TIMES LOGISTICS HAS BEEN REORGANIZED (NR) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values NR	CP	NR*CP
Internal					
Cost	1.25 (.2840) **	0.017	0.12 (.7274)	2.24 (.1079)	0.83 (.4366)
Differentiation	3.56 (.0037)	0.046	0.01 (.9575)	8.52 (.0002)	0.37 (.6884)
Total	2.31 (.0437)	0.030	0.06 (.8054)	5.03 (.0070)	0.71 (.4925)
Benchmarking					
Cost	4.23 (.0009)	0.054	0.02 (.8993)	10.06 (.0001)	0.52 (.5976)
Differentiation	19.49 (.0001)	0.207	0.01 (.9382)	48.26 (.0001)	0.47 (.6226)
Total	7.24 (.0001)	0.094	0.01 (.9123)	18.26 (.0001)	1.08 (.3409)

* d.f.=5 and 373 for model and error, respectively.
** p-values in parentheses.

Table 12
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF THE SENIOR LOGISTICS EXECUTIVE PARTICIPATION IN STRATEGIC PLANNING (PP) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values PP	CP	PI*CP
Internal					
Cost	5.71 (.0001) **	0.065	16.13 (.0001)	5.54 (.0042)	0.68 (.5092)
Differentiation	7.40 (.0001)	0.082	7.53 (.0063)	14.67 (.0001)	0.06 (.9396)
Total	7.27 (.0001)	0.081	14.80 (.0001)	10.59 (.0001)	0.19 (.8311)
Benchmarking					
Cost	5.27 (.0001)	0.060	0.57 (.4522)	12.86 (.0001)	0.04 (.9622)
Differentiation	23.45 (.0001)	0.222	0.16 (.6884)	55.21 (.0001)	0.33 (.7179)
Total	11.18 (.0001)	0.120	3.59 (.0588)	25.85 (.0001)	0.31 (.7329)

* d.f.=5 and 412 for model and error, respectively.
** p-values in parentheses.

The interaction term in the three benchmarking models are all nonsignificant (Table 12). The participation in strategic planning main effect is significant for total benchmarking, but the correlation (Table 17) is weak ($r=.088$; $p<.10$). Thus H5 is weakly supported when total benchmarking performance measurement is considered, but not supported for either cost or differentiation benchmarking.

PICTORIAL CONFIGURATION AND PERFORMANCE MEASUREMENT

The results of the ANOVA and GLM models of the four pictorial configuration variables appear in Tables 13 through 16.

The results of the ANOVA models for whether the logistics function has line responsibility for customer service are shown in Table 13. Hypothesis six stated that when the logistics function has line control over customer service, differentiation performance measurement would be enhanced (H6a), but cost performance measurement would not be affected (H6b). The t-tests shown in Table 18 are two-tailed for the tests of cost based performance measures and one-tailed for the tests of differentiation based and total performance measures.

The "customer service" main effect is significant in all six ANOVA models. None of the interaction terms are significant. The t-tests (Table 18) show that when the logistics function has line control over customer service, a

Table 13
ANOVA MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF WHETHER LOGISTICS CONTROLS CUSTOMER SERVICE (CS) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values CS	CP	CS*CP
Internal					
Cost	2.88 (.0145) **	0.033	6.85 (.0092)	2.34 (.0975)	1.42 (.2428)
Differentiation	6.89 (.0001)	0.076	17.91 (.0001)	7.85 (.0005)	0.42 (.6550)
Total	5.00 (.0002)	0.056	13.18 (.0003)	4.85 (.0083)	1.05 (.3493)
Benchmarking					
Cost	5.04 (.0002)	0.057	5.91 (.0155)	9.36 (.0001)	0.29 (.7468)
Differentiation	22.08 (.0001)	0.209	13.05 (.0001)	48.09 (.0001)	0.36 (.6983)
Total	9.62 (.0001)	0.103	9.54 (.0021)	18.83 (.0001)	0.44 (.6416)

* All models are based on d.f.=5 and 419.
** p-values in parentheses.

larger number of internal differentiation measures are used (supporting H6a), but also that a larger number of internal cost measures are used (contradicting H6b). Thus when the logistics function controls customer service internal performance is more intensely monitored.

With respect to benchmarking, the t-tests (Table 18) show that when the logistics function controls customer service, both cost and differentiation-based benchmarking and total benchmarking are enhanced. Again, this supports H6a, but not H6b.

The second pictorial configuration variable examined is whether the logistics function has line responsibility for logistics system planning. The results of the two-factor ANOVA models are shown in Table 14 and the t-tests are shown in Table 18. These t-tests are either one or two-tailed depending on the wording of the hypothesis.

The interaction term is nonsignificant and the "logistics systems planning" main effect is significant in all six ANOVA models. The t-tests reveal that when the logistics function has line authority over logistics systems planning that the following types of performance measurement are enhanced: internal cost and cost benchmarking (supporting H7b) and internal differentiation and differentiation benchmarking (contradicting H7a). Both total internal and total benchmarking performance measurement are enhanced when the logistics function has line responsibility for logistics

Table 14
ANOVA MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF WHETHER LOGISTICS CONTROLS LOGISTICS SYSTEMS PLANNING (LSP) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values LSP	CP	LSP*CP
Internal					
Cost	2.02 (.0748) **	0.024	4.95 (.0267)	2.16 (.1168)	0.42 (.6591)
Differentiation	6.44 (.0001)	0.071	19.03 (.0001)	6.46 (.0017)	0.12 (.8857)
Total	4.05 (.0013)	0.046	11.78 (.0007)	4.16 (.0163)	0.07 (.9337)
Benchmarking					
Cost	5.14 (.0001)	0.058	9.09 (.0027)	7.99 (.0004)	0.30 (.7418)
Differentiation	23.71 (.0001)	0.221	35.70 (.0001)	40.03 (.0001)	1.38 (.2520)
Total	10.38 (.0001)	0.110	22.21 (.0001)	14.64 (.0001)	0.20 (.8164)

* d.f.=5 and 419 for model and error, respectively.
** p-values in parentheses.

systems planning. Thus, at the general level, the evidence does not support H7.

The third pictorial configuration variable examined is the number of activities that the logistics function has line responsibility over, or the span logistics of control. Table 15 present the results of the GLM models and Table 17 presents the correlations. The interaction term is nonsignificant in all six models. The "number of activities" main effect is significant in all six models. The correlations (Table 17) between the span of logistics control and each six indicators of performance measurement are positive and significant. Hypothesis eight is thus strongly supported. The larger the span of logistics control, the greater the performance measurement.

The last pictorial configuration variable examined is the title level of the senior logistics executive. The results of the GLM models are shown in Table 16 and the correlations are presented in Table 17. The "title level of the senior logistics executive" main effect is predictive of internal differentiation and differentiation benchmarking performance measurement. However, the respective significant correlations (Table 17) are in a direction opposite to that hypothesized. The correlation between internal differentiation performance measurement and "title level" ($r=-.091$; $p<.10$) and between differentiation benchmarking and "title level" ($r=-.192$; $p<.01$) are negative. The inverse relationship indicates that

Table 15
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF NUMBER OF ACTIVITIES CONTROLLED BY LOGISTICS (NA) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values NA	CP	NA*CP
Internal					
Cost	4.81 (.0003) **	0.054	21.73 (.0001)	0.73 (.4848)	0.44 (.6429)
Differentiation	11.58 (.0001)	0.121	48.24 (.0001)	4.08 (.0176)	0.75 (.4718)
Total	8.73 (.0001)	0.094	38.52 (.0001)	1.87 (.1550)	0.69 (.5040)
Benchmarking					
Cost	5.55 (.0001)	0.062	11.06 (.0010)	7.74 (.0005)	0.60 (.5469)
Differentiation	24.13 (.0001)	0.224	34.66 (.0001)	41.24 (.0001)	1.75 (.1747)
Total	11.41 (.0001)	0.120	24.74 (.0061)	14.69 (.0001)	1.47 (.2310)

* d.f.=5 and 419 for model and error, respectively.
** p-values in parentheses.

Table 16
GLM MODELS OF PERFORMANCE MEASURES USED AS A FUNCTION OF LEVEL OF SENIOR LOGISTICS EXECUTIVE (LE) AND CHANNEL POSITION (CP)

Dependent Variable	Overall * F-Value	R-Square	Partial F-values LE	CP	LE*CP
Internal					
Cost	2.32 (.0425) **	.043	0.93 (.3343)	4.17 (.0161)	1.17 (.3113)
Differentiation	4.95 (.0002)	.058	3.49 (.0625)	9.75 (.0001)	0.89 (.4106)
Total	3.48 (.0043)	.042	0.07 (.7952)	7.45 (.0007)	1.21 (.2985)
Benchmarking					
Cost	5.24 (.0001)	.061	0.73 (.3942)	11.50 (.0001)	1.24 (.2915)
Differentiation	21.80 (.0001)	.214	18.74 (.0001)	43.65 (.0001)	1.46 (.2324)
Total	8.96 (.0001)	.100	2.67 (.1031)	20.26 (.0001)	0.80 (.4491)

* d.f.=5 and 401 for model and error, respectively.
** p-values in parentheses.

Table 17
CORRELATIONS FOR ALL FIRMS

Independent Variable	Type of Performance Measure Cost	Diff	Total
Internal			
Strategy			
Frequency of logistics strategic plan update	0.005 (.9427)	0.007 (.9300)	0.006 (.9317)
Structuring Variables			
No. of years logistics a formal function	0.096 (.0602)	0.105 (.0408)	0.110 (.0316)
No. of times logistics has been reorganized	-0.018 (.7281)	-0.003 (.9582)	-0.013 (.8072)
Participation in strategic planning	0.194 (.0001)	0.129 (.0080)	0.182 (.0002)
Pictorial Configuration			
No. of activities logistics controls	0.221 (.0001)	0.318 (.0001)	0.289 (.0001)
Title level of senior logistics executive	0.048 (.3383)	-0.091 (.0681)	-0.012 (.7984)
Benchmarking			
Strategy			
Frequency of logistics strategic plan update	0.045 (.5435)	0.177 (.0161)	0.064 (.3885)
Structuring Variables			
No. of years logistics a formal function	0.122 (.0167)	0.105 (.0406)	0.153 (.0027)
No. of times logistics has been reorganized	0.006 (.9015)	0.004 (.9477)	0.005 (.9161)
Participation in strategic planning	0.036 (.4637)	0.017 (.7221)	0.088 (.0736)
Pictorial Configuration			
No. of activities logistics controls	0.157 (.0011)	0.253 (.0001)	0.228 (.0001)
Title level of senior logistics executive	-0.041 (.4063)	-0.192 (.0001)	-0.077 (.1191)

Table 18
T-TESTS OF DIFFERENCE IN MEANS OF
PERFORMANCE MEASURES USED: ALL FIRMS

Type of Performance Measure	Yes Mean	Yes s.d.	No Mean	No s.d.	t-value	p-value
Mission Statement						
Internal Cost	17.75	(4.36)	14.87	(5.60)	5.663	.0001
Internal Diff.	10.47	(3.16)	8.13	(4.07)	6.340	.0001
Total Internal	28.21	(6.85)	22.99	(8.07)	5.567	.0001
Cost Benchmarking	1.67	(1.07)	1.24	(1.10)	3.641	.0002
Diff. Benchmarking	1.38	(0.82)	1.07	(0.90)	3.291	.0006
Total Benchmarking	5.85	(2.99)	4.11	(3.11)	5.288	.0001
Strategic Plan						
Internal Cost	17.31	(4.80)	14.40	(5.53)	5.763	.0001
Internal Diff.	10.08	(3.55)	7.76	(3.97)	6.232	.0001
Total Internal	27.39	(7.69)	22.16	(8.45)	6.562	.0001
Cost Benchmarking	1.61	(1.06)	1.19	(1.12)	3.979	.0001
Diff. Benchmarking	1.30	(0.85)	1.05	(0.91)	2.877	.0021
Total Benchmarking	5.47	(3.14)	3.98	(3.09)	4.869	.0001
Logistics Controls Customer Service						
Internal Cost *	16.56	(5.35)	15.17	(5.37)	2.607	.0095
Internal Diff.	9.80	(3.69)	8.18	(4.02)	4.171	.0001
Total Internal *	26.36	(8.43)	23.37	(8.39)	3.598	.0004
Cost Benchmarking *	1.53	(1.09)	1.27	(1.11)	2.388	.0174
Diff. Benchmarking	1.34	(0.86)	1.05	(0.89)	3.327	.0005
Total Benchmarking *	5.22	(3.06)	4.29	(3.22)	2.970	.0031
Logistics Controls Logistics Systems Planning						
Internal Cost	16.39	(5.10)	15.22	(5.57)	2.221	.0135
Internal Diff. *	9.76	(3.62)	8.11	(4.08)	4.395	.0001
Total Internal *	26.15	(8.01)	23.34	(8.71)	3.414	.0007
Cost Benchmarking	1.56	(1.08)	1.24	(1.12)	2.971	.0015
Diff. Benchmarking *	1.43	(0.82)	0.97	(0.89)	5.486	.0001
Total Benchmarking *	5.46	(3.04)	4.06	(3.17)	4.576	.0001

* Implies that the t-test is two-tailed rather than one-tailed.

as the title level increases, a less intense effort is made at differentiation performance measurement.

SUMMARY OF THE OVERALL ANALYSIS

The results of the GLM models, the correlations and the t-tests are summarized in Table 19. The independent variables are listed by row and the dependent variables are listed by column. The significance of the main effect for the each independent variable, the channel position main effect and the interaction term between the respective independent variable and the channel position variable are shown.

An "i" in Table 19 indicates the significance of an interaction term; an "x" indicates that the main effect listed in the column is significant and that the correlation or t-test is also significant in the hypothesized direction; an "a" indicates that the main effect is significant and that the correlation or t-test is also significant but opposite to the hypothesis; a "p" indicates that the channel position main effect is significant; and a blank space indicates that the main effect or the interaction term in the GLM model is not significant.

If Table 19 met all expectations, then the following would be found: (1) all entries under the interaction heading, "I," would be blank, indicating that the H2 through H9 are invariant across channel position; (2) except for the "logistics controls customer service" and "logistics controls

Table 19
SUMMARY OF ANOVA AND GLM MODELS

Independent Variable	Internal									Benchmarking								
	Cost			Diff			Total			Cost			Diff			Total		
	M	P	I	M	P	I	M	P	I	M	P	I	M	P	I	M	P	I
Strategy																		
Strategic plan updates					p			p			p		a	p			p	
Structuring Variables																		
Mission statement	x			x	p		x	p		x	p		x	p		x	p	
Strategic plan	x			x	p		x	p		x	p		x	p		x	p	
Time a formal function	x	p	i	x	p	i	x	p	i	x	p		x	p		x	p	
Reorganizations					p			p			p			p			p	
Participation in planning	x	p		x	p		x	p			p			p		x	p	
Pictorial Configuration																		
Logistics controls CS	a			x	p		x	p		a	p		x	p		x	p	
Logistics controls LSP	x	p		a	p		x	p		x	p		a	p		x	p	
Number of activities	x			x	p		x			x	p		x	p		x	p	
Title level of executive		p		a	p			p			p		a	p			p	

M=main effect of variable listed in column.
P=main effect for the channel position variable.
I=Interaction effect between main effect and channel position variable.
i=significant interaction effect.
x=implies both significant main effect and significant correlation (or t-test) in hypothesized direction.
p=significant channel position main effect.
a=implies both significant main effect and significant correlation (or t-test) opposite to hypothesized direction.
blank space=no significant relationship.

logistics system planning" rows, all columns under the main effect headings, "M," would contain an "x"; (3) the "customer service" row would contain an "x" under the internal differentiation and differentiation benchmarking main effect columns; and (4) the "logistics systems planning" row would contain an "x" under the internal cost and cost benchmarking main effect columns. The symbol "a" would not appear anywhere. No expectations were made for columns under the channel position, "P," main effect.

The pattern that exists in Table 19 strongly supports H10. Only three of sixty interaction terms are significant, and all three are located in GLM models examining the effect of the length of time logistics has been a formal function on internal performance measurement. The conclusion that can be drawn is that, except for the previous qualification, the manner in which logistics strategy and structure are related to performance measurement does not differ significantly across manufacturers, wholesalers and retailers.

Table 19 shows which variables met expectations. The models for mission statement (H3), logistics strategic plan (H3) and the number of activities controlled by the logistics function (H8) have significant main effects in the expected direction and nonsignificant interaction terms. The relevant hypotheses are thus supported. Participation in business units strategic planning by the senior logistics executive (H5) is related to four dependent variables. The frequency

of the strategic plan update (H2) and title level of the senior logistics executive (H9) are each related to one performance measurement variable apiece: differentiation benchmarking and internal cost performance measurement, respectively. The number of reorganizations (H4) is totally unrelated to performance measurement.

The "logistics function controls customer service" variable is positively related to all types of performance measurement, supporting (H6a), but not (H6b). The "logistics function controls logistics systems planning" variable is also positively related to all types of performance measurement. This supports (H7b), but not (H7a).

The channel position main effect is significant in the majority of models. Two notable exceptions are that it is significant in four of ten internal cost GLM models and that it is nonsignificant in one of ten total internal GLM models. This leads to the general conclusion that the level of performance measurement differs across channel position, but that the relatedness of logistics strategy and structure to performance measurement does not differ across channel positions.

SUBGROUP ANALYSIS

Tables 20 through 26 present the results of the subgroup analysis. The first four tables contain t-tests for mission statement, logistics strategic plan, logistics controls

customer service and logistics controls logistics systems planning, respectively. Each of these tables contains separate sections on manufacturers, wholesalers and retailers. Tables 24, 25 and 26 contain correlations for the manufacturers, wholesalers and retailers, respectively.

SUBGROUP ANALYSIS: STRATEGY

The correlations between the strategy variable (H2) and the performance measurement variables can be seen in Table 24 for manufacturers, in Table 25 for wholesalers and in Table 26 for retailers. The frequency of the logistics strategic plan update is unrelated to all six indicators of performance measurement for all three types of firms. However, 12 of 18 correlations are positive, suggesting an extremely weak positive relationship could actually be present. This contradicts H2. In several cases, the correlations approach significance. The correlation for internal cost measures ($r=.226$; $p=.13$) and for differentiation benchmarking ($r=.243$; $p=.10$) among retailers provide examples. At the subgroup level, it is apparent that performance measurement and the frequency of strategic plan update are unrelated, however, there is a tendency toward a weak positive relationship.

SUBGROUP ANALYSIS: STRUCTURING VARIABLES

The results of the subgroup analysis for the mission statement (H3) variable appear in Table 20. Except for the

Table 20
SUBGROUP ONE-TAILED T-TESTS OF DIFFERENCE IN MEANS OF PERFORMANCE MEASURES USED BETWEEN FIRMS WITH VERSUS WITHOUT A LOGISTICS MISSION STATEMENT

Type of Performance Measure	Mission Statement: Yes Mean	Yes s.d.	No Mean	No s.d.	t-value	p-value
Manufacturers						
Internal Cost	17.53	(4.36)	15.84	(5.79)	2.159	.0162
Internal Diff.	10.97	(3.08)	9.20	(4.17)	3.283	.0007
Total Internal	28.50	(7.11)	25.04	(9.10)	2.861	.0024
Cost Benchmarking	1.77	(1.00)	1.57	(1.07)	1.252	.1061
Diff. Benchmarking	1.71	(0.60)	1.55	(0.72)	1.586	.0573
Total Benchmarking	6.33	(2.69)	5.39	(2.89)	2.168	.0157
Wholesalers						
Internal Cost	18.62	(4.45)	14.16	(5.75)	3.711	.0002
Internal Diff.	10.27	(3.03)	7.61	(3.84)	3.304	.0006
Total Internal	28.88	(7.11)	21.77	(8.45)	3.991	.0001
Cost Benchmarking	1.81	(1.17)	1.04	(1.05)	3.294	.0006
Diff. Benchmarking	1.35	(0.80)	0.81	(0.90)	2.835	.0026
Total Benchmarking	6.07	(3.38)	3.40	(2.88)	4.156	.0001
Retailers						
Internal Cost	17.50	(3.65)	14.26	(4.45)	3.543	.0003
Internal Diff.	9.65	(3.32)	6.87	(3.81)	3.488	.0004
Total Internal	27.15	(6.18)	21.13	(7.45)	3.919	.0001
Cost Benchmarking	1.35	(1.07)	0.96	(1.09)	1.642	.0522
Differentiation	0.76	(0.85)	0.60	(0.82)	0.881	.1905
Total Benchmarking	4.74	(3.04)	2.83	(3.12)	2.805	.0031

Table 21
SUBGROUP ONE-TAILED T-TESTS OF DIFFERENCE IN MEANS OF PERFORMANCE MEASURES USED BETWEEN FIRMS WITH VERSUS WITHOUT A LOGISTICS STRATEGIC PLAN

Type of Performance Measure	Strategic Plan Yes Mean	Yes s.d.	No Mean	No s.d.	t-value	p-value
Manufacturers						
Internal Cost	18.10	(4.54)	14.73	(5.78)	4.405	.0001
Internal Diff.	11.14	(3.03)	8.50	(4.23)	4.876	.0001
Total Internal	29.24	(6.91)	23.23	(9.03)	5.079	.0001
Cost Benchmarking	1.83	(1.02)	1.49	(1.07)	2.203	.0145
Diff. Benchmarking	1.67	(0.61)	1.54	(0.75)	1.224	.1112
Total Benchmarking	6.30	(2.73)	5.20	(2.91)	2.667	.0041
Wholesalers						
Internal Cost	16.41	(6.06)	14.24	(5.56)	2.139	.0171
Internal Diff.	9.07	(4.05)	7.60	(3.69)	2.161	.0162
Total Internal	25.48	(9.64)	21.84	(7.99)	2.395	.0089
Cost Benchmarking	1.61	(1.08)	1.01	(1.08)	3.110	.0012
Diff. Benchmarking	1.13	(0.91)	0.80	(0.88)	2.071	.0201
Total Benchmarking	5.22	(3.42)	3.33	(2.87)	3.481	.0003
Retailers						
Internal Cost	16.66	(3.71)	14.00	(4.89)	2.770	.0037
Internal Diff.	9.04	(3.46)	6.35	(3.74)	3.465	.0004
Total Internal	25.70	(6.25)	20.35	(8.02)	3.497	.0004
Cost Benchmarking	1.22	(1.04)	0.92	(1.16)	1.272	.1035
Diff. Benchmarking	0.78	(0.86)	0.51	(0.77)	1.490	.0699
Total Benchmarking	4.14	(3.16)	2.73	(3.12)	2.070	.0207

Table 22
SUBGROUP T-TESTS OF DIFFERENCE IN MEANS OF PERFORMANCE MEASURES USED BETWEEN FIRMS WITH LOGISTICS CONTROLLING VERSUS NOT CONTROLLING CUSTOMER SERVICE

Type of Performance Measure	Logistics Function Controls Customer Service: Yes Mean	Yes s.d.	No Mean	No s.d.	t-value	p-value
Manufacturers						
Internal Cost *	16.72	(5.56)	16.20	(5.35)	0.643	.5211
Internal Diff.	10.24	(3.71)	9.41	(4.07)	1.445	.0751
Total Internal *	26.95	(8.65)	25.61	(8.46)	1.065	.2883
Cost Benchmarking *	1.74	(1.04)	1.56	(1.06)	1.104	.2710
Diff. Benchmarking	1.61	(0.68)	1.61	(0.69)	0.039	.4845
Total Benchmarking *	5.98	(2.80)	5.52	(2.93)	1.102	.2717
Wholesalers						
Internal Cost *	15.56	(5.31)	14.62	(5.96)	0.897	.3711
Internal Diff.	9.07	(3.73)	7.66	(3.82)	2.056	.0208
Total Internal *	24.63	(8.51)	22.28	(8.65)	1.508	.1337
Cost Benchmarking *	1.30	(1.10)	1.14	(1.12)	0.789	.4314
Diff. Benchmarking	1.00	(0.95)	0.87	(0.88)	0.819	.2072
Total Benchmarking *	4.35	(3.14)	3.72	(3.17)	1.093	.2762
Retailers						
Internal Cost *	17.82	(4.19)	14.75	(4.20)	2.981	.0037
Internal Diff.	9.18	(3.39)	7.46	(3.96)	1.836	.0349
Total Internal *	27.00	(6.98)	22.21	(7.37)	2.686	.0087
Cost Benchmarking *	1.05	(1.09)	1.10	(1.09)	0.214	.8308
Diff. Benchmarking	0.77	(0.97)	0.63	(0.79)	0.684	.2480
Total Benchmarking *	3.41	(2.97)	3.63	(3.24)	0.286	.7753

* Implies that the t-test is two-tailed rather than one-tailed.

Table 23
SUBGROUP T-TESTS OF DIFFERENCE IN MEANS OF PERFORMANCE MEASURES USED BETWEEN FIRMS WITH LOGISTICS CONTROLLING VERSUS NOT CONTROLLING LOGISTICS SYSTEMS PLANNING

Type of Performance Measure	Logistics Function Controls Logistics Systems Planning: Yes Mean	Yes s.d.	No Mean	No s.d.	t-value	p-value
Manufacturers						
Internal Cost	16.95	(5.01)	15.66	(6.10)	1.479	.0709
Internal Diff. *	10.19	(3.58)	9.28	(4.35)	1.470	.1441
Total Internal *	27.14	(7.89)	24.94	(9.54)	1.614	.1091
Cost Benchmarking	1.73	(1.01)	1.53	(1.11)	1.262	.1042
Diff. Benchmarking *	1.63	(0.67)	1.57	(0.70)	0.546	.5856
Total Benchmarking *	5.97	(2.86)	5.43	(2.84)	1.244	.2152
Wholesalers						
Internal Cost	15.00	(5.55)	14.85	(5.88)	0.136	.4461
Internal Diff. *	9.08	(3.55)	7.71	(3.89)	1.932	.0552
Total Internal *	24.08	(8.45)	22.56	(8.72)	0.940	.3489
Cost Benchmarking	1.21	(1.17)	1.18	(1.10)	0.104	.4588
Diff. Benchmarking *	1.18	(0.91)	0.81	(0.88)	2.250	.0259
Total Benchmarking *	4.62	(3.10)	3.65	(3.16)	1.644	.1023
Retailers						
Internal Cost	15.87	(4.38)	15.37	(4.40)	0.467	.3208
Internal Diff. *	8.70	(3.67)	7.60	(3.94)	1.173	.2438
Total Internal *	24.57	(7.19)	22.97	(7.65)	0.876	.3836
Cost Benchmarking	1.26	(1.05)	1.03	(1.10)	0.878	.1913
Diff. Benchmarking *	0.83	(0.94)	0.61	(0.80)	1.062	.2909
Total Benchmarking *	4.26	(3.28)	3.34	(3.11)	1.204	.2319

* Implies that the t-test is two-tailed rather than one-tailed.

Table 24
SUBGROUP CORRELATIONS: MANUFACTURERS

Independent Variable	Type of Performance Measure		
	Cost	Diff	Total
Internal			
Strategy			
Frequency of logistics strategic plan update	0.006	-0.180	0.026
	(.9546)	(.6545)	(.8086)
Structuring Variables			
No. of years logistics a formal function	-0.018	-0.065	-0.041
	(.8080)	(.3796)	(.5789)
No. of times logistics has been reorganized	-0.058	-0.006	-0.040
	(.4485)	(.9422)	(.6063)
Participation in strategic planning	0.236	0.175	0.229
	(.0012)	(.0172)	(.0017)
Pictorial Configuration			
No. of activities logistics controls	0.150	0.214	0.193
	(.0403)	(.0033)	(.0082)
Title level of senior logistics executive	0.101	-0.023	0.054
	(.1721)	(.7552)	(.4678)
Benchmarking			
Strategy			
Frequency of logistics strategic plan update	-0.098	0.003	-0.116
	(.3489)	(.9798)	(.2673)
Structuring Variables			
No. of years logistics a formal function	0.154	0.169	0.096
	(.0352)	(.0208)	(.1906)
No. of times logistics has been reorganized	-0.043	-0.038	-0.062
	(.5758)	(.6210)	(.4185)
Participation in strategic planning	0.084	0.089	0.186
	(.2532)	(.2264)	(.0115)
Pictorial Configuration			
No. of activities logistics controls	0.147	0.075	0.123
	(.0449)	(.3050)	(.0938)
Title level of senior logistics executive	-0.092	0.169	-0.022
	(.2122)	(.0220)	(.7647)

Table 25
SUBGROUP CORRELATIONS: WHOLESALERS

Independent Variable	Type of Performance Measure Cost	Diff	Total
Internal			
Strategy			
Frequency of logistics strategic plan update	-0.180 (.2345)	-0.147 (.3352)	-0.176 (.2488)
Structuring Variables			
No. of years a logistics a formal function	0.312 (.0006)	0.326 (.0004)	0.354 (.0001)
No. of times logistics has been reorganized	0.085 (.3405)	0.061 (.4957)	0.084 (.3438)
Participation in strategic planning	0.234 (.0047)	0.166 (.0455)	0.231 (.0053)
Pictorial Configuration			
No. of activities logistics controls	0.174 (.0345)	0.257 (.0016)	0.232 (.0049)
Title level of senior logistics executive	0.040 (.6428)	-0.059 (.4947)	0.001 (.9985)
Benchmarking			
Strategy			
Frequency of logistics strategic plan update	0.171 (.2616)	0.210 (.1665)	0.164 (.2808)
Structuring Variables			
No. of years a logistics a formal function	0.159 (.0881)	0.153 (.1016)	0.300 (.0011)
No. of times logistics has been reorganized	0.065 (.4760)	0.067 (.4491)	0.104 (.2430)
Participation in strategic planning	0.060 (.4720)	0.112 (.1809)	0.089 (.2896)
Pictorial Configuration			
No. of activities logistics controls	0.052 (.5319)	0.214 (.0090)	0.222 (.0067)
Title level of senior logistics executive	0.052 (.5319)	0.214 (.0090)	0.009 (.9127)

Table 26
SUBGROUP CORRELATIONS: RETAILERS

Independent Variable	Type of Performance Measure Cost	Diff	Total
Internal			
Strategy			
Frequency of logistics strategic plan update	0.226	0.031	0.154
	(.1269)	(.8367)	(.3003)
Structuring Variables			
No. of years logistics a formal function	-0.012	0.145	0.070
	(.9180)	(.2013)	(.5419)
No. of times logistics has been reorganized	-0.074	-0.061	-0.076
	(.5155)	(.5899)	(.5133)
Participation in strategic planning	0.115	0.193	0.167
	(.2870)	(.0174)	(.1200)
Pictorial Configuration			
No. of activities logistics controls	0.328	0.360	0.377
	(.0016)	(.0005)	(.0003)
Title level of senior logistics executive	0.255	0.122	0.211
	(.0177)	(.2625)	(.0517)
Benchmarking			
Strategy			
Frequency of logistics strategic plan update	0.052	0.243	0.100
	(.7273)	(.1003)	(.5029)
Structuring Variables			
No. of years logistics a formal function	0.037	0.006	0.082
	(.7469)	(.9604)	(.4749)
No. of times logistics has been reorganized	0.047	-0.024	0.027
	(.6793)	(.8362)	(.8146)
Participation in strategic planning	0.097	0.147	0.181
	(.3665)	(.7221)	(.0909)
Pictorial Configuration			
No. of activities logistics controls	0.021	0.008	-0.008
	(.8463)	(.9385)	(.9422)
Title level of senior logistics executive	0.125	0.048	0.142
	(.2514)	(.6599)	(.1912)

inability of a mission statement to predict the level of differentiation benchmarking for retailers, the presence of a logistics mission statement is predictive of all four types of performance measurement, plus total internal and total benchmarking performance measurement for all three types of firms. Firms with logistics mission statement use more performance measures.

Table 21 presents the subgroup analysis for the existence of a logistics strategic plan (H3). Aside from the nonsignificant difference in means for differentiation benchmarking among manufacturers and for cost benchmarking among retailers, a logistics strategic plan is associated with a more intense effort to monitor performance for all types of firms.

The subgroup correlations between the length of time that logistics has been a formal function (H3) and performance measurement are presented in Tables 24, 25 and 26 for manufacturers, wholesalers and retailers, respectively. The interaction term in the GLM models were significant (Table 10) for internal performance measurement. For manufacturers and retailers the length of time that logistics has been a formal function and internal cost, internal differentiation and total internal performance measurement are unrelated. The "length of time" variable and internal performance measurement are significantly related among wholesalers ($r=312$; $p<.01$ for internal cost: $r=.326$; $p<.01$ for internal differentiation: $r=.354$; $p<.01$ for total internal). The GLM model interactions

can be explained as follows: the length of time that logistics has been a formal function is positively related to internal performance measurement among wholesalers, but not among manufacturers or retailers.

With respect to benchmarking, the length of time that logistics has been a formal function is: (1) related to cost and differentiation benchmarking among manufacturers; (2) related to cost and total benchmarking among wholesalers; and (3) not related to any of the benchmarking variables among retailers. While the interaction term in the relevant GLM models were not significant, the length of time that logistics has been a formal function is related to total benchmarking in manufacturers and wholesalers, but not retailers.

The subgroup correlations for the number of times the logistics function has been reorganized during the past five years (H4) appear in Tables 24, 25 and 26. All six correlations for manufacturers, wholesalers or retailers are nonsignificant.

Several subgroup correlations between participation in business unit strategic planning by the senior logistics executive (H5) and performance measurement are significant. Participation is related to the total number of internal performance measures used among manufacturers ($r=.229$; $p<.01$) and in wholesalers ($r=.231$; $p<.01$); among retailers, the correlation is almost significant ($r=.167$; $p=.12$). As far as the total number of benchmarking measures used is concerned,

participation in strategic planning is significantly correlated among manufacturers ($r=.186$; $p<.10$) and retailers ($r=.181$; $p<.10$), but not among wholesalers ($r=.089$; $p=.28$).

SUBGROUP ANALYSIS: PICTORIAL CONFIGURATION

The first pictorial configuration variable examined is whether the logistics function has line responsibility over customer service (H6). The results of the t-tests are shown in Table 22. These tests are one or two-tailed depending on the specific wording of the hypothesis. As can be seen in Table 22, whether the logistics function controls customer service is unrelated to the usage of cost based performance measures (supporting H6b). Except for retailers and internal cost performance measurement, this holds for manufacturers, wholesalers and retailers. It was expected that when the logistics function has line responsibility for customer service, differentiation performance measurement would be enhanced (H6a). This holds only for internal performance measurement, and not for benchmarking measurement for all three subgroups.

The results of the t-tests for whether the logistics function controls logistics systems planning (H7) are shown in Table 23. Cost measurement (H7b), but not differentiation measurement (H7a), is expected to be enhanced when the logistics function controls logistics systems planning. From Table 23, it can be seen within manufacturers and retailers

that whether the logistics function controls logistics systems planning is unrelated to internal and benchmarking differentiation performance measurement (supporting H7a in these subgroups), but that this configuration variable is related to internal and benchmarking differentiation performance measurement among wholesalers (contradicting H7a for this subgroup). Only among manufacturers is internal cost performance measurement positively related to the logistics function controlling logistics systems planning (H7b).

The subgroup correlations between the number of activities that the logistics function has line responsibility over (H8) and performance measurement are shown in Tables 24, 25 and 26. Among manufacturers, wholesalers and retailers, the span of logistics control is significantly correlated with cost, differentiation and total internal performance measurement. The total number of benchmarking measures used is significantly correlated with the number of activities controlled by the logistics function among manufacturers ($r=.123$; $p<.10$) and wholesalers ($r=.222$; $p<.10$), but not among retailers ($r=-.008$; $p=.94$). In fact, among retailers, neither cost ($r=.021$; $p=.85$) nor differentiation benchmarking ($p=.008$; $p=.94$) are related to the span of logistics control.

The last pictorial configuration variable examined is title level of the senior logistics executive (H9): the results are shown in Tables 24, 25 and 26. The total number of internal performance measures used is unrelated to title

level among manufacturers ($r=.054$; $p=.47$) and wholesalers ($p=.001$; $p=.99$), but these two variables are related in the retailer subgroup ($r=.211$; $p<.10$). The only significant relationship between title level and the remaining internal performance measurement indicators is that existing between internal cost and title level among retailers ($r=.255$; $p<.05$); all remaining relationships are nonsignificant. With respect to benchmarking, the only significant correlation is that between differentiation benchmarking and title level among wholesalers ($r=.214$; $p<.01$).

SUMMARY OF SUBGROUP ANALYSIS

Table 27 summarizes the subgroup analysis. In this table: (1) an "x" represents a significant correlation or difference in means that supports the respective hypothesis; (2) a "z" represents no significant difference between means that supports the respective hypothesis; (3) an "a" represents a significant correlation or difference in means that is opposite to the respective hypothesis; and (4) a blank space represents a nonsignificant correlation or difference in means not supporting the respective hypothesis.

The frequency of strategic plan updating (H2) and the number of times that logistics has been reorganized (H4) are totally unrelated to performance measurement within the subgroups.

Table 27
SUMMARY OF SUBGROUP ANALYSES

Independent Variable	Manufacturers Int C	Manufacturers Int D	Manufacturers Int T	Manufacturers Ben C	Manufacturers Ben D	Manufacturers Ben T	Wholesalers Int C	Wholesalers Int D	Wholesalers Int T	Wholesalers Ben C	Wholesalers Ben D	Wholesalers Ben T	Retailers Int C	Retailers Int D	Retailers Int T	Retailers Ben C	Retailers Ben D	Retailers Ben T
Strategy																		
Strategic plan update																		
Structuring Variables																		
Mission statement	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x		x
Strategic plan	x	x	x	x		x	x	x	x	x	x	x	x	x	x		x	x
Maturity				x	x		x	x	x	x		x						
Reorganization																		
Participation in planning	x	x	x			x	x	x	x					x				x
Pictorial Configuration																		
Log. controls CS	z	x		z			z	x		z			a	x	x	z		
Log. controls LSP	x	z			z			a			a			z			z	
No. of activities	x	x	x	x		x	x	x	x		x	x	x	x	x			
Level of executive					a						x		x		x			

Int=Internal performance measurement.
Ben=Benchmarking performance measurement.
C=Cost based performance measurement.
D=Differentiation based performance measurement.
T=Total internal or benchmarking performance measurement.

x=positive correlation or significant increase in mean, whichever is appropriate (supports hypothesis).
z=no significant relationship (supports hypothesis).
a=significant relationship (opposite to hypothesis).
blank space=no significant relationship (not supporting hypothesis).

The logistics mission statement and logistics strategic plan elements of formalization (H3) show a high degree of consistency across subgroups with respect to the positive relationship to all types of performance measurement. The third dimension of formalization, the length of time that logistics has been a formal function (H3), is far more related to performance measurement in wholesalers than in manufacturers or retailers.

Another variable that shows a high degree of consistency across subgroups in terms of its relatedness to performance measurement is the number of activities that the logistics function has line responsibility over (H8).

Participation in business strategic planning by the senior logistics executive (H5) and title level of the senior logistics executive (H9) show sporadic relatedness to selected indicators of performance measurement across subgroups.

Lastly, the pictorial configuration variables of whether or not logistics controls customer service (H6) or logistics systems planning (H7) are related to some indicators of performance measurement, but the pattern shown in Table 27 is insufficient to fully support either H6 or H7.

SUMMARY OF RESULTS

Chapter IV presented the results of the statistical tests that were undertaken. The substantive implications and

interpretations of the results are explicated in Chapter V. In summarizing the results, the following appear to be in order. The channel position variable, for the most part, impacts the level of performance measurement, but not the manner in which the independent variables are related to performance measurement. While the subgroup analysis pointed out some interesting differences, the majority of these were not detected by the interaction terms in the two-factor ANOVA and GLM models.

The variables that are the most related to performance measurement are: (1) a logistics mission statement, a dimension of formalization; (2) a logistics strategic plan, another dimension of formalization; (3) whether logistics has line control over customer service; (4) whether logistics has line control over logistics systems planning; and (5) the total number of activities that logistics controls in a line fashion.

The variables that are least related to performance measurement are: (1) the frequency of the logistics strategic plan update; and (2) the number of times that the logistics function has been reorganized during the past five years.

A third set of variables can be identified. These variables are sporadically related to different dimensions of performance measurement for different types of organizations. Not all these differences were detected by the ANOVA and GLM model interaction terms. These variables are: (1) the length

of time that logistics has been a formal function; (2) participation in business unit strategic planning by the senior logistics executive; and (3) the title level of the senior logistics executive.

CHAPTER V: DISCUSSION AND CONCLUSIONS

Chapter V contains five sections. The first section discusses each independent variable, its relationship to performance measurement and managerial implications. Then, implications of the research for leading edge logistics is discussed. Next, suggestions for future research are presented. A limitations section follows. Lastly, the dissertation is summarized.

DISCUSSION

The discussion section is organized as follows. First, channel position is discussed. Then relationships among performance measurement variables are discussed. This is followed by separate sections on logistics strategy and structure.

CHANNEL POSITION

Three channel positions were examined: manufacturers, wholesalers and retailers. It was hypothesized that channel position would have no impact on the how the independent variables related to the dependent variables (H10). This means that channel position does not moderate the relatedness

of logistics strategy and structure to performance measurement. With the exception of the relationship between the length of time that logistics has been a formal function and internal performance measurement, this hypothesis was supported.

Hypothesis ten does not, however, mean that channel position has no impact on the **level** of performance measurement. For example, manufacturers generally use more performance measures than wholesalers or retailers. This finding suggests that channel position impacts the level of performance measurement, but not the relatedness of the independent variables to the dependent variables.

This finding presents detailed supporting evidence that "best" logistical practices are nearly identical across channel positions (Bowersox et al. 1989). The practice of logistics management is very similar across manufacturers, wholesalers or retailers. Managerial practices and experience in one type of firm, say a manufacturer, can with minimal alteration, be applied to other types of firms independent of channel position.

This conclusion if of importance to logistical performance. If logistics managers transfer from a manufacturer to a retailer they can be expected to transfer relevant logistical management skills. A manager can anticipate that a formal logistics mission statement developed for a retailer will have much the same impact upon organization practice as it did within a manufacturing

organization.

INTERRELATIONSHIPS AMONG PERFORMANCE MEASURES

Interrelations among the performance measurement variables were examined. Relations were expected between the following pairs of variables: (1) total internal and benchmarking measurement (H1); (2) internal cost and cost benchmarking measurement (H1a); and (3) internal differentiation and differentiation benchmarking measurement (H1b).

The data supported these expectations, at an overall level, and for manufacturers, wholesalers and retailers separately. While all types of performance measurement are highly related, the strength of the relationships between internal cost and cost benchmarking and between internal differentiation and differentiation benchmarking generally exceeded the relatedness across cost and differentiation measures.

While organizations do measure both cost and differentiation dimensions of performance, they lean toward one or the other. Overall organizational strategy might explain such an orientation. The firm leaning toward a low cost strategy may be more likely to focus on cost performance measures, be they internal or benchmarking. The firm relying on a differentiation corporate level strategy may be more likely to focus on differentiation-related performance measures. That cost and differentiation performance

measurement are related demonstrates that cost and differentiation strategies are not mutually exclusive. Firms pursue both strategies simultaneously, but appear to focus more on one than another. These findings apply to all three organizational types.

In summary, performance measurement can be internal or benchmarking and can focus on costs or on factors that are or can be differentiators. The pattern of relationships provides evidence of how organizations focus performance measurement efforts. While concentrating on both cost and differentiation measurement, firms appear likely to rely on measures of one more than the other.

LOGISTICS STRATEGY

The dimension of logistics strategy examined was the frequency of updating the logistics strategic plan. Because environmental uncertainty may lead to more frequent updating of the strategic plan, the frequency of plan updating was hypothesized to be inversely related to performance measurement (H2). In the case of differentiation benchmarking, the hypothesis was contradicted, while for the remaining indicators of performance measurement, no meaningful relationship was isolated.

Those organizations engaging in differentiation benchmarking appear to be more sensitive to their competitive environment. Environmental sensitivity can result in more frequent plan updating since the organization is constantly

customizing the plan to the "latest differentiation information."

Only those firms with a logistics strategic plan were examined. Since these firms tend to use more performance measures (see H3), the testing of this hypothesis was performed on a subset of highly formalized organizations. Thus, among formalized organizations, the frequency of strategic plan updating is not related to performance measurement. This does not mean that environmental uncertainty is unrelated to performance measurement. A battery of scales measuring uncertainty, that is applicable to all firms, would better serve the purpose of examining relationships between uncertainty and performance measurement.

STRUCTURING VARIABLES

A total of five structuring variables were examined in this research. Three are dimensions of **formalization** and one representing **reorganization** and **participation in business unit strategic planning**.

FORMALIZATION

Formalized organizations were hypothesized to use a greater number of performance measures (H3). Three indicators of formalization were examined: (1) a written logistics mission statement; (2) a written logistics strategic plan; and (3) the length of time that logistics has been a formal function.

The effects of a written logistics mission statement and a written logistics strategic plan on performance measurement are similar and pervasive. The existence of these two integrative devices are associated with a more intense effort to monitor performance. This holds for all four types of performance measurement and for total internal and total benchmarking performance measurement. This finding holds when all firms were considered simultaneously and for each of manufacturers, wholesalers and retailers individually. A formalized logistics function in terms of formal mission and strategy is more deeply involved in performance measurement than less formalized logistics functions.

Managers in all three types of firms use formal integrative devices to promote various types of performance measurement. Potentially, a mission statement might be a better predictor of performance measurement than a logistics strategic plan since a mission statement is more likely to define important performance criteria and to set performance standards. There appears to be little difference between a mission statement and a strategic plan in terms of their relationship to performance measurement. A firm wishing to promote performance measurement could generate a formal logistics mission statement or a formal logistics strategic plan.

The third formalization variable examined is the length of time that logistics has been a formal function. Mature functions were hypothesized to have had more time to implement

sophisticated performance measurement systems, and hence to use a larger number of performance measures. For this variable alone, and only in conjunction with internal performance measurement, significant differences in the nature of relationships across channel positions were isolated.

Within wholesalers, but not manufacturers or retailers, the length of time that logistics has been a formal function is positively related to internal cost and differentiation-based and total internal performance measurement. Unlike the remaining structure variables examined in this research, which are under a high level of management control, the length of time that logistics has been a formal function is beyond functional management control. It is controllable only if a formal function does not exist, in which case one can be initiated. Mature functions, in wholesalers alone, have an internal performance measurement advantage that cannot be readily duplicated by competitors. Competitors can design a formal mission statement to enhance performance measurement, but they cannot make their logistics function equally mature. A logistics mission statement, a logistics strategic plan, the number of reorganizations, and participation by the senior logistics executive in business unit strategic planning can be altered by the firm in isolation or in conjunction with other organizational adjustments. Nothing can be done by functional management about longevity.

Within the manufacturing and retailing subgroups no relationship was found between the maturity of the logistics

function and internal performance measurement. This implies that manufacturing and retailing executives need not be concerned about internal performance measurement advantages arising from the maturity of a competitor's logistics function.

Precisely why these differences in relationships between the maturity of the logistics function and internal performance measurement exists across channel positions is difficult to explain. If, within wholesalers, the relationship held just for internal cost and not internal differentiation performance measurement, or vice versa, then it might be explained as a statistical artifact. But the relationship holds for both types of internal performance measurement suggesting that some underlying differences exist. Nevertheless, it can be stated that mature wholesaling logistics functions hold a performance measurement advantage, and that this advantage is virtually impossible for competitors to duplicate.

The maturity of the logistics function also impacts cost, differentiation and total benchmarking performance measurement. While the relationships between the maturity of the logistics function and benchmarking performance measurement did not differ across the channel positions, at the subgroup level these relationships exist sporadically. For example, within retailers, maturity of logistics and performance measurement are not related, but within manufacturers, maturity of the logistics function and cost and

differentiation benchmarking are positively related.

REORGANIZATIONS

The next structuring variable examined is the number of times that the logistics function was reorganized during the past five years. It was hypothesized to be positively related to performance measurement (H4). The number of reorganizations is unrelated to performance measurement. Fluid structures neither enhance nor detract performance measurement.

PARTICIPATION IN STRATEGIC PLANNING

The last structuring variable examined is participation in business unit strategic planning by the senior logistics executive. Increased participation in business unit strategic planning by the senior logistics executive was hypothesized to be positively related to performance measurement (H5). This was in part expected because an executive participating in overall strategic planning indicates enhanced importance of that executive's function. In addition, it could also be indicative of the logistics function being used strategically. Since benchmarking has strategic implications, the relationship between participation by the senior logistics executive in business unit strategic planning and performance measurement was expected to be positive. At the overall level, the data supported this hypothesis for total internal and total benchmarking performance measurement. Logistical

performance measurement is enhanced when the senior executive participates in overall strategic planning.

At the subgroup level, however, the relationships dissipated. Within manufacturers and wholesalers, but not retailers, participation is related to internal cost performance measurement. Cost and differentiation benchmarking are unrelated to title level within the manufacturing, wholesaling retailing subgroups. The conclusion is drawn that participation is sporadically related to performance measurement.

In summary, a total of five structuring variables were examined. Integrative devices such as a logistics mission statement or a logistics strategic plan strongly influence performance measurement. The maturity of the logistics function and participation of the senior logistics executive in business unit strategic planning fail to strongly influence performance measurement. Reorganizations plays little or no role in performance measurement.

PICTORIAL CONFIGURATION VARIABLES

A total of four pictorial configuration variables were examined. Three are related to **activity allocation** and one represents the **title level** of the senior logistics executive. These two descriptors of organization are discussed.

ACTIVITY ALLOCATION

The three activity allocation variables are whether logistics has line control over customer service, whether

logistics has line control over logistics systems planning and the span of logistics control.

Whether logistics controls customer service was hypothesized to be positively related to differentiation performance measurement (H6a), but unrelated to cost performance measurement (H6b). Whether the logistics function has line authority over logistics systems planning was hypothesized to be unrelated to differentiation performance measurement (H7a), but positively related to cost performance measurement (H7b).

All types of performance measurement were enhanced when the logistics function has line authority over customer service or logistics systems planning. Revealed strategy through activity allocation does not differentially impact the type performance measurement. It does, however, impact all types equally. Given the close relationship between the logistics function controlling a specific activity and the span of logistics control, additional implications are discussed in the following paragraphs.

Logistics span of control was hypothesized to be related to all types of performance measurement (H8). When all firms were considered simultaneously, this hypothesis was strongly supported. At the subgroup level, this hypothesis was also strongly supported. One exception is that the number of line activities controlled by the logistics function and total benchmarking performance measurement are related in manufacturers and wholesalers, but unrelated in retailers. The hypothesis was supported for total internal performance

measurement for all three types of firms.

The relationship is that as the logistics function accumulates line responsibility, in general, and of customer service and logistics systems planning in particular, performance measurement of logistical activities are enhanced and expanded. The actual explanation for why this occurs rests in part on the notion of horizontal differentiation: that is, the formation of distinct differentiated departments. Not all of the activities comprising the "total number of activities" scale are performed by all organizations. Consider the case of the "logistics systems planning" activity. Some firms may simply not perform the logistics systems planning activity. This activity, if performed, would be conducted by role specialists examining the logistics "system." The actual designing of systems requires, among others, highly trained engineers, management scientists and efficiency experts. Once a system is designed, then logistics systems planning specialists might "demand" a performance measurement system to monitor inherent input-output conversion processes. Not only would this serve the purpose of controlling and monitoring operations, but the information would be used to guide the development and design of new systems.

The relationship between span of logistics control and performance measurement does not rest on the simple argument of "more is better." Much the same can be said for specific activities such as customer service and logistics systems planning. Some activities not controlled by logistics might

not performed in the organization. This could be the case for a number of the activities examined in the dissertation including facilities design, logistics system planning and logistical administration. Increasing span of logistics control could be indicative of both increasing horizontal differentiation and increasing consolidation of logistics activities in the logistics function.

TITLE LEVEL OF THE SENIOR LOGISTICS EXECUTIVE

The last pictorial configuration variable examined is the title level of the senior logistics executive. It was hypothesized that an increasing title level would be positively related to performance measurement (H9). At the overall level, the data contradicts this hypothesis. As the senior logistics executive title level increases, internal and benchmarking differentiation performance measurement actually decline, but the remaining types of performance measurement are unaffected.

However, at the subgroup level, fourteen of eighteen correlations between title level and performance measurement are positive and four of these are significant. This suggests that a weak positive relationship exists between title level and performance measurement in the subgroups.

The senior executive need not be visible to enhance performance measurement. Conversely, a senior logistics executive not having high visibility is not a deterrent to organizational benchmarking of logistics. The notion of high

"visibility" as a requirement of strategic use of a function is not supported. In conclusion, benchmarking, being an indicator of environmental scanning and hence a strategic logistics approach, is not enhanced as the title level of the senior logistics executive increases.

In summary, a total of four pictorial configuration variables were examined. The three variables reflecting activity allocation strongly influence performance measurement. The activities that are allotted to logistics affects the extent to which logistical performance is measured. The title level of the senior logistics executive is related to performance measurement. But the pattern of relationships that do exist fail to provide strong evidence of the senior executive influencing performance measurement by the position they occupy.

IMPLICATIONS FOR LEADING EDGE LOGISTICS

In the Bowersox et al. (1989) study, the leading edge logistics concept was introduced. Organizations on the "leading edge" were positioned to use logistical competency strategically. They achieve competitive superiority through logistical competency, by adding value cost effectively and by forging strategic alliances with third party service providers. A critical component of leading edge logistics is that organizations use logistics to stimulate demand. In other words, leading edge organizations use logistics to

become preferred suppliers.

A common attributes index (CAI) was developed distinguishing leading edge from other less advanced organizations. A delphi panel consisting of industry executives was convened, and fifteen attributes indicative of a leading edge philosophy were selected. The panel then assigned a weight to each attribute. In the subsequent empirical study, responding firms were given a CAI score out of one hundred indicating the level of logistical excellence.

Three major attributes characterize leading edge organizations. The first is **formalization**. Leading edge firms have a logistics mission statement, a logistics strategic plan, frequently update their logistics strategic plan, have more mature logistics functions, a larger span of logistics control, frequent reorganizations of logistics, a higher title level for the senior logistics executive, and participation in strategic planning by the senior logistics executive.

The second attribute is **flexibility** at accommodating various non-routine events. This flexibility is achieved through the strategic use of technology and through strategic alliances with service suppliers.

The last attribute is **measurement** in the form of monitoring internal performance and competitive benchmarking.

The dissertation examined how two of the three attributes of leading edge logistics are interrelated: formalization and measurement. The results detail how formalization and

measurement are related and how these relationships differ across channel positions.

A major finding in the dissertation is that the relatedness of logistics strategy and structure to performance measurement do not differ across manufacturers, wholesalers and retailers. This provides additional evidence in support of the notion that leading edge attributes and best logistical practices are nearly identical regardless of where in the channel an organization operates (Bowersox and Droge 1989).

The significant relationships between formalization and performance measurement that were isolated provide insight into which specific elements of formalization are more important than others in terms of measurement practices.

For example, the frequency of updating the logistics strategic plan and the number of reorganizations during the past five years are unrelated to performance measurement. These variables are of lessor importance in relation to measurement practices, but this does not mean that they are unimportant. These two variables are perhaps more indicative of organizational flexibility. A large number of reorganizations, for example, demonstrates that the firm is willing and capable of altering the structure of logistics in response to changing markets requirements. The structure of logistics is flexible and management is constantly willing to adjust to accommodate changing customer requirements. Thus the number of reorganizations, while unrelated to the measurement attribute of leading edge logistics, might play

an important role in the flexibility attribute. Much the same can be said for the frequency of updating the logistics strategic plan. The organization that frequently updates its logistics strategic plan could be flexible and less rigid. Thus frequent updating may be more related to the flexibility attribute than to the measurement attribute.

The dissertation identified a set of variables that were highly related to the measurement attribute: a formal logistics mission statement, a formal logistics strategic plan, whether logistics controls customer service, whether logistics controls logistics systems planning, and the span of logistics control. These variables are highly related to the measurement attribute, not only for all organizations together, but also for the manufacturing, wholesaling and retailing subgroups.

The activities comprising the span of logistics control such as logistics systems planning, facilities design, and logistical administration play a critical role in the development of measurement systems. These differentiated activities are more likely to employ role specialists who monitor performance and costs, design various systems, signal upper management when problems arise and identify specific positional advantages through benchmarking.

A logistics mission statement and a logistics strategic plan are also important since they are under a high degree of management control. A mission statement is used to identify key performance criteria and performance standards, and to

signal employees and customers as to what to expect from logistics. A logistics strategic plan can be used in conjunction with competitive benchmarking. If benchmarking does identify a positional advantage in a particular area, then the information can be incorporated into the logistics strategic plan.

The variables just identified that are highly related to the measurement attribute might be unrelated to the flexibility attribute. This is contrasted with the variables that are unrelated to the measurement attribute, such as reorganizations, which might be highly related to the flexibility attribute.

A third set of variables were identified in this research. They are sporadically related to performance measurement and include the length of time that logistics has been a formal function, participation in business unit strategic planning by the senior logistics executive and the title level of the senior logistics executive. These variables were found to be sporadically related to performance measurement depending on the particular type of measurement being examined and the particular channel position at which the organization operated.

This leads to an interesting conjecture about the variables that are sporadically related to performance measurement, especially the two variables describing the "position" of the senior logistics executive. A creative tension may exist in organizations between the measurement and

flexibility attributes and between the formalization and measurement attributes. On the one hand, organizations need to implement bureaucratic rules, plans, policies and control measures. The measurement attribute and certain elements of the formalization attribute of leading edge organizations are integrative, create predictable internal reporting relationships, create expected rules of behavior and lower costs.

On the other hand, organizations require flexibility. Technology, regulation and customer requirements are constantly changing. But flexibility requires fluid internal rules, fluid internal reporting relationships, fluid behavioral expectations and a fluid logistics structure. Thus the need for predictability can conflict with the need for flexibility. It is at this confluence that creative tension results in leading edge logistics. Leading edge logistics does not require a trade-off between flexibility and predictability. Rather it requires the simultaneous enhancement of both.

Leading edge logistics requires senior executives to formalize an organization capability that both is flexible and predictable. Management is positioned at the confluence of flexibility and predictability where contradictory demands between these two "forces" are the greatest. Elements of the formalization attribute that are highly related to the measurement attribute could be unrelated to the flexibility attribute. Other elements of formalization that are unrelated

to the measurement attribute could be highly related to the flexibility attribute. The variables describing the position of the senior logistics executive are sporadically related to the measurement attribute and could also be sporadically related to the flexibility attribute. The senior logistics executive can be viewed as existing in the interior portion of a triangle bounded by the measurement, flexibility and formalization attributes.

In summary, leading edge logistics involves three attributes: formalization, flexibility and measurement. This research has examined how the formalization and measurement attributes of leading edge logistics are related. The relatedness of variables when viewed from the perspective of these three attributes demonstrates that not all elements of formalization impact measurement. Rather, those elements of formalization unrelated to measurement may actually be important toward enhancing logistical flexibility. Management is charged with enhancing flexibility, measurement and formalization. Given that flexibility and formalization are traded-off in most organizations, rather than simultaneously enhanced, it is not surprising that leading edge logistics requires a long-term management commitment.

SUGGESTIONS FOR FUTURE RESEARCH

The dissertation suggests two distinct streams of future research. They are: (1) future research from further

examination of the dissertation data; and (2) future research from a new study. Each is discussed separately.

RESEARCH FROM DISSERTATION DATA SET

The questionnaires shown in Appendices A, B and C contain variables over and above those examined in the dissertation.

The first variable that might be related to performance measurement is size. Size can be operationalized as the natural logarithm of annual sales. Larger organizations have been found to use more formal controls (Khandwella 1974). Future research could concentrate on whether size is a significant covariate. For example, both size and a mission statement could be positively related to internal performance measurement. The exact nature of this relationship could be determined by an analysis of covariance. It may be that the strength of the relationship between size and internal performance measurement is the same for organizations with versus without a mission statement. Organizations with a formal mission might consistently measure more elements of internal performance, regardless of size.

Another construct that should be examined is technology including the total number of internal computer applications (Appendix B, question 13), the total number of electronic data interchange linkages (Appendix B, question 14) and use of automated product handling equipment (Appendix B, question 14, items 5 and 6). Data on similar scales were also collected in the wholesalers/retailer study.

The performance measurement variables plus other structure variables should be examined simultaneously with size and technology. Size and technology, according to contingency theory, are elements of an organizations environment. The structure variables that are available in the data set can be split into: (1) those that describe the structure of logistics such as span of logistics control, the use of performance measures and formalization in the form of a mission statement and strategic plan; and (2) those that describe the "position" of the senior logistics executive such as the title level of the senior logistics executive, participation by the senior logistics executive in business units strategic planning, and the tenure of the senior executive in the current position.

A simultaneous examination of these variables could provide insight into how logistics is organized. This approach might identify whether size has a direct impact on structure or whether technology intervenes the relationship between size and structure. Consider the following situation. Sales and internal performance measurement are highly correlated and internal computerization and internal performance measurement are highly correlated, but sales and the technology variables are not. This pattern would support the notion that size has a direct impact on structure. If technology intervened the relationship between size and structure, then the following pattern might exist. Size and internal computerization would be highly correlated, internal

computerization and internal performance measurement would be highly correlated, but size and internal performance measurement would be uncorrelated.

The same issues should be examined for the "position" of the senior logistics executive. Is the position of the senior logistics executive affected by size and/or technology? If so, does size have a direct effect, or does technology intervene the relationship between size and "position"? It could be that the "position" of the senior logistics executive is independent of size and technology and that these variables are related only to other variables describing the structure of logistics such as internal performance measurement and formalization in the form of a logistics mission statement and a logistics strategic plan.

A simultaneous approach might also provide insights into how the "position" variables are interrelated. Is title level correlated with participation in business unit strategic planning? Is the tenure of the senior logistics executive related to participation, formalization, or both?

The opportunity exists to explore these relationships for all organizations together or to explore these relationships for manufacturers, wholesalers and retailers separately.

Some of the literature suggests that various relationships are nonlinear. For example, Argarwal (1979) found a nonlinear relationship between size and structure. One way to explore nonlinearities is to split the sample into large and small firms and to examine correlations across

groups. For example, the retailers could be split into large and small firms, and the correlation between size and, for example, the span of logistics control could be compared across groups. If a difference exists in this correlation across small versus large retailers, then a nonlinearity has been identified. This might lead to insights concerning how the organizational design of logistics differs across small versus large organizations.

In summary, future research from existing data set should focus on examining size, technology and structure simultaneously. The structure variables should include internal performance measurement, benchmarking, formalization in the form of a logistics mission statement and a logistics strategic plan, and variables describing the "position" of the senior logistics executive. The relationships among these variables could be examined separately for manufacturers, wholesalers and retailers. Additionally, nonlinearities could be examined by comparing large versus small organizations.

RESEARCH FROM A NEW STUDY

A second stream of research questions can be considered if a new study is undertaken. The major constructs that should be examined are environment, strategy, structure and possibly performance. First, specific operationalizations of these variables are discussed. Then potential relationships are presented.

Environment can explored through size and technology.

Size variables that should be collected include annual sales and the number of employees. Other indicators of size that are important to the organizational design of logistics include the number of stock keeping units, the number of warehouses, and the number of retail outlets, if the organization is a retailer. The contextual complexity of the logistics system could also be explored by the number of suppliers and the number of customers.

An important element of technology that should be explored is the use of electronic data interchange (EDI) linkages. This can be operationalized as the proportion of outbound shipments from EDI linkages and the percent of inbound purchases conducted using EDI.

Several elements of structure should be explored. First, the number of layers in, or the vertical differentiation of, organizations should be collected.

Second, the number of departments that exist should be examined. The span of logistics control, while measuring the consolidation of activities within the logistics function, failed to fully indicate the level of horizontal differentiation. Consider the case of the facilities design activity. It might be more important that such an activity is performed rather than whether logistics controls the activity. Some organizations may simply not perform such an activity while others do. The critical factor may be whether the activity is conducted somewhere in the organization, not whether it is conducted under the guidance of the logistics

function in particular.

A third structure variable that should be explored are various spans of control. The number of subordinates reporting directly to the senior logistics executive or the CEO has important implications for how logistics is organized.

A fourth structure variable that should be explored is the vertical locus of decision-making authority. This construct is not the same as the extent to which existing logistical activities are consolidated in a single department, which may or may not be related to the vertical locus of decision-making authority. Centralization of decision-making can be measured by the vertical level in the firm at which, for example, employment, transportation carrier, vehicle routing and scheduling, and technology deployment decisions are made.

The next major construct that should be examined in future research is strategy. In this case, a strategic typology that is relevant to the unit of analysis should be selected. For example, a strategic typology describing the logistical posture of wholesalers can be examined. The typology selected for wholesalers may not be the same as the typology selected for manufacturers.

The last major construct that should be examined, and certainly the most difficult to collect, is performance. Market share and market share growth rate, return on investment and inventory turnover are important descriptors of organizational performance.

Future research based on a new study might explore how these variables are related to one another. For example, does increasing logistical technology lead to flattening of the organization in conjunction with increasing spans of control? This might especially be the case for wholesalers and retailers where logistical technology forms the "core" technology of the organization.

Another question is: does increasing technology promote horizontal differentiation of logistical activities? Are specialists hired and grouped together to create new departments as logistical technology increases? Horizontal differentiation has been found to be related to size (Argarwal 1979), but in the case of logistics, it could be that technology is a primary factor driving the process.

The relationship between centralization of decision-making authority and technology can also be explored. Larger organizations are generally more formalized and decentralized (Khandwella 1974; Ford and Slocum 1977). It may be that decentralization plays an important role in determining the extent of the internal performance measurement system. The more decentralized the organization, the greater the extent of performance measurement. In addition, technology might facilitate the centralization of certain policy decisions such as fill rate and order cycle variance targets, and facilitate the decentralization of other decisions such as vehicle routing and scheduling.

Another entire set of research questions can be generated

by considering performance. The inclusion of this construct offers the potential to generate significant managerial guidelines. It also presents the greatest difficulty from a data collection perspective. Correlational evidence between constructs could be explored. Internal performance measurement could be positively related to actual return on investment. But an analysis of "fit" might prove even more enlightening. It could be that only under specific contexts are performance measurement and profitability related. Under the context of "large and highly computerized," internal performance measurement and profitability could be positively related, but under the context of "large and less computerized," internal performance measurement and profitability could be inversely related. Why should such a contingency relationship exist? A large less computerized firm could potentially implement a internal logistical performance measurement system only at great cost. The cost of the system, without computers, would exceed the savings, and profits would be pushed downward. In contrast, a large highly computerized firm may be able to implement an internal performance measurement system at low cost, and the increased operational savings could exceed the associated costs and hence lead to improved profitability.

In summary, a new study should examine a wide range of organizational design variables associated with logistics. The dissertation and other research out of the Bowersox et al. (1989) data set has provided important insights about which

variables are worthy of further exploration. A new study would build upon this research base and further describe how organizations design logistical systems.

LIMITATIONS

The primary limitation of this research is related to the sampling procedure. The majority of respondents included in the first manufacturer's survey were members of a logistics professional organization. As stated by Daugherty (1988, p. 166): "The firms selected were believed to be logistically sensitive."

For the wholesaler-retailer study, the response rate was low, which could be a function of the questionnaire length. The questionnaire was twelve pages long and pretesting demonstrated that it required about forty minutes to complete. The sample may be biased toward organizations or managers that are favorable to or sensitive of logistics. Another interpretation is that logistics has a large impact on profitability in those organizations that participated. In general, the external validity of the sample can be questioned and the following question can be asked. To what extent can the findings be extended to the general population of manufacturers, wholesalers and retailers?

A second limitation of this research is that only one element of logistics strategy was examined. Perhaps an examination of generic strategies such as Porter's (1980) low

cost versus differentiation strategies would better serve the purpose of examining how strategy and performance measurement are related.

An important strength of many of the scales used in the dissertation is that they rely minimally on perceptions. For example, performance measurement was operationalized as the sum of a series of yes/no items. Certainly the problem of bias toward organizations sensitive to logistics would be greater if Likert or semantic differential scales were employed.

SUMMARY OF DISSERTATION

This dissertation demonstrated that performance measurement of logistical activities varies with a wide variety of organizational design variables. In addition, the manner in which these organizational design variables are related to performance measurement are similar for manufacturers, wholesalers and retailers.

The organizational design variables can be grouped in terms of their relationships with performance measurement. The first group of variables consists of those having a more or less consistent and positive effect on performance measurement. They are: (1) the existence of a formal logistics mission statement; (2) the existence of a formal logistics strategic plan; (3) whether logistics controls customer service; (4) whether logistics controls logistics

systems planning; and (5) the number of line activities reporting to the logistics function.

The second group of independent variables are those that are sporadically related to different dimensions of performance measurement for firms operating at different channel positions. These variables are: (1) the length of time that logistics has been a formal function; (2) participation by the senior logistics executive in overall business unit strategic planning; and (3) and the title level of the senior logistics executive.

The third and last group of variables are those that are basically unrelated to performance measurement. They are: (1) the frequency of updating the logistics strategic plan; and (2) the number of times that the logistics function has been reorganized during the past five years.

The dissertation examined empirically a number of organizational design variables in a contingency theory framework. Future research endeavors should incorporate elements of environment such as size, technology and uncertainty, strategy, other elements of structure such as horizontal and vertical differentiation and, most importantly, performance.

APPENDIX A

MANUFACTURER QUESTIONNAIRE

Thank You

We sincerely appreciate your advance agreement to complete this questionnaire. Your rapid response is critical to completing this research and will help develop a better understanding of rapidly changing logistics organization.

Logistics Organization and Strategy Research

A third survey of factors and trends influencing logistics organizations

Conducted by Michigan State University

in cooperation with:

A. T. Kearney Management Consultants
Traffic Management Magazine
Gateway Systems Corporation
Council of Logistics Management
Canadian Association of Physical Distribution Management

sponsored by:

Digital Equipment Corporation

MICHIGAN STATE UNIVERSITY
LOGISTICS ORGANIZATION AND STRATEGY RESEARCH PROJECT

This questionnaire is the third in a continuing effort to understand how logistics (also called physical distribution or materials management) activities are organized. Your responses will help develop a better understanding of the rapidly changing logistics organization.

DIRECTIONS

1. The overall questionnaire contains 25 questions. Pre-testing indicates it can be completed in approximately 90 minutes.

2. Please answer only for your division or business unit. A business unit is typically a division or subsidiary of a larger corporation. Copies of this questionnaire may be provided to other business units in your corporation. If you are at corporate headquarters, please answer the questions from a corporate perspective.

3. If a particular question does not apply, skip it and go on. Please return the questionnaire even if you cannot complete it.

4. If you wish to expand on a question, use either blank space on the questionnaire or attach comments on a separate sheet of paper.

5. Throughout this questionnaire the terms logistics, physical distribution and materials management are used interchangeably. The Council of Logistics Management has defined logistics as a term describing the integration of two or more activities for the purpose of planning, implementing and controlling the efficient flow of raw materials, in-process inventory and finished goods from point of origin to point of consumption.

6. Please return questionnaire as soon as possible to:

Dr. Donald J. Bowersox
Professor of Marketing and Logistics
309 Eppley Center
Michigan State University
East Lansing, MI 48824
(517) 353-6381

1. What were the annual dollar sales of your business unit (division or subsidiary) and the total corporation (if different) during the most recent fiscal year?

   (A) Business Unit $ _____

   (B) Total Corporation $ _____

2. What are the primary products manufactured by your business unit?

   _____

   _____

3. In finished product logistics, do you use:

	Yes	No
(A) Dealers	_____	_____
(B) Distributors	_____	_____

4. What percentage of your manufacturing is:

   (A) To Customer Order _____%

   (B) Sold from Inventory _____%

5. (A) What is the title of your senior logistics executive? _____

   _____

   (B) How many years has this executive been in this position? _____

   _____

   (C) What was the senior logistics executive's previous assignment? _____

   _____

6. (A) What is the title of the person that senior logistics executive reports to? _____

   _____

   (B) What was this executive's previous assignment? _____

   _____

7. Do you have a formal logistics mission statement?

   Yes _____ No _____

   If yes, please provide below or attach a separate sheet. _____

   _____

   _____

   _____

8. Do you have a formal logistics strategic plan?

(A) Yes _____ No _____

(B) If yes, what is the time horizon of the plan? _____

_____

(C) If yes, how often is your plan reviewed or updated? _____

_____

9. Do logistics executives formally participate in overall strategic planning for your business unit?

Yes _____ No _____

10. (A) Within the last five years, how many times have all or parts of logistics been reorganized?

_____

(B) What parts of logistics have been reorganized? _____

_____

_____

11. How many years has logistics been a formal organization? _____

_____

12. In some companies the senior logistics executive manages activities that are not typically part of a logistics organization. For example, some logistic organizations have responsibility for data processing, real estate, dealer services, and/or facilities.

(A) Does your logistical organization have responsibility for any such non-typical activities?

Yes _____ No _____

(B) If yes, please list the responsibilities.

_____

_____

_____

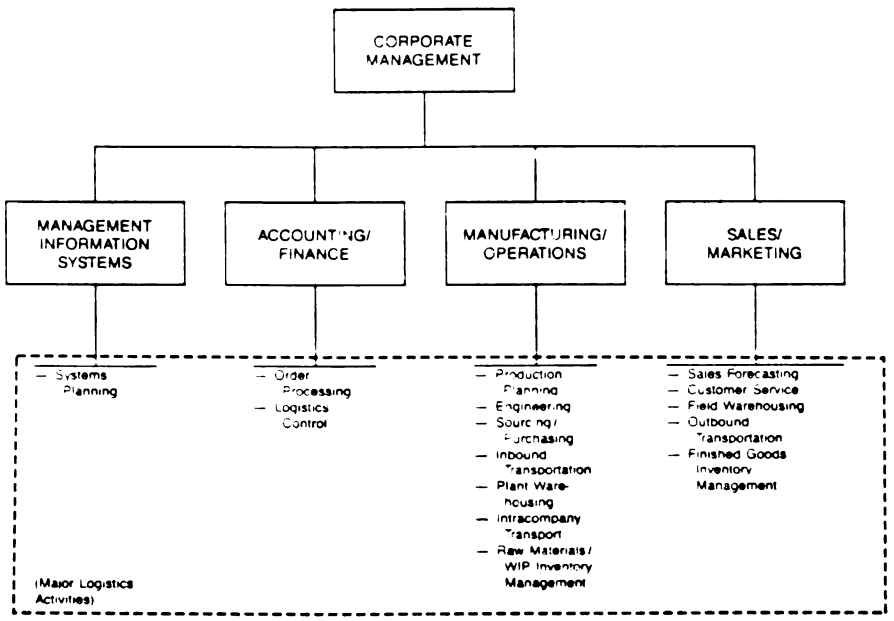
_____

13. Please indicate which activities have been, are currently, or are expected to be part of the formal responsibility of logistics. In addition, identify whether the logistics organization has line responsibility or functions in an advisory role. Space is available to include additional activities not listed.

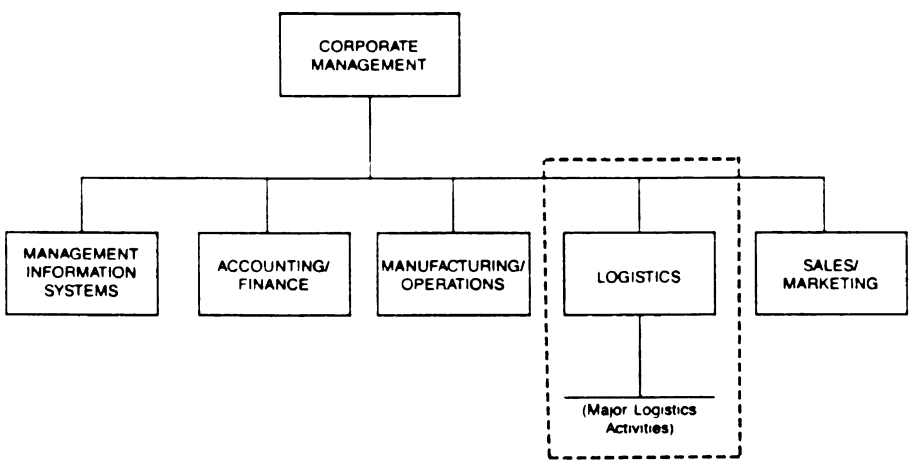
Activity	How Long Part of Logistics (years)	Likely to be Added in Future		Nature of Responsibility	
		Yes	No	Line	Advisory
Sales Forecasting					
Production Planning					
Sourcing/Purchasing					
Inbound Transportation					
Raw Materials/Work in Process Inventory Management					
Finished Goods Inventory Management					
Intra-Company Transportation					
Finished Goods Field Warehousing					
Order Processing					
Customer Service					
Outbound Transportation					
Logistics Systems Planning					
Logistics Engineering					
Logistics Administration					
International Logistics					

14. Five types of organizations are illustrated below. These organizations vary in the degree to which logistics activities are dispersed or consolidated. Consider which chart is most similar to your organization and respond to the question at the end of the charts.

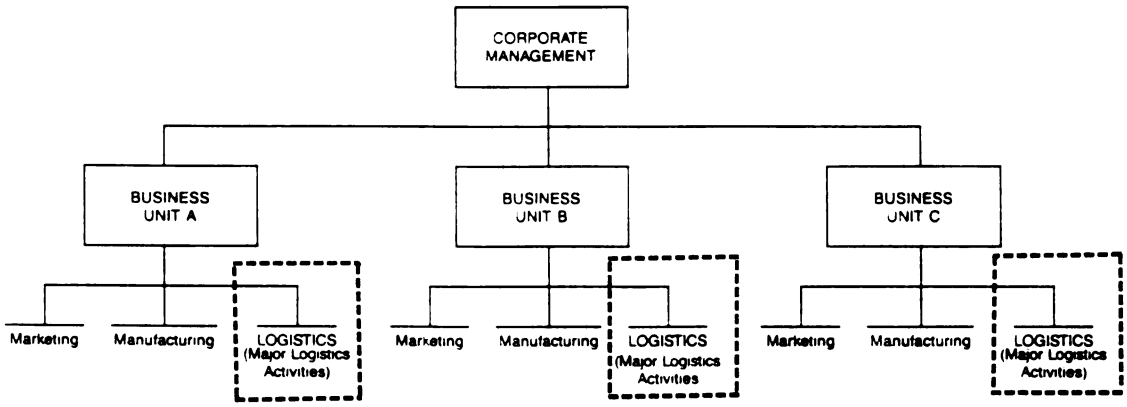
Type A - Functional Organization:
Dispersed Responsibilities for Logistics Activities



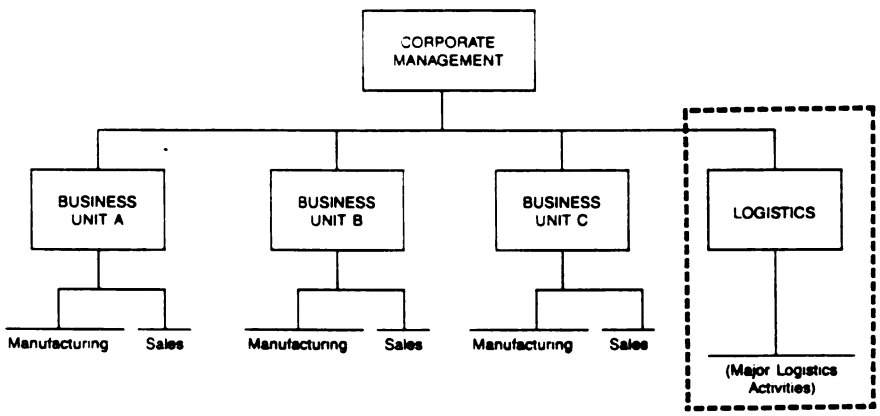
Type B - Functional Organization:
Consolidated Logistics Responsibilities



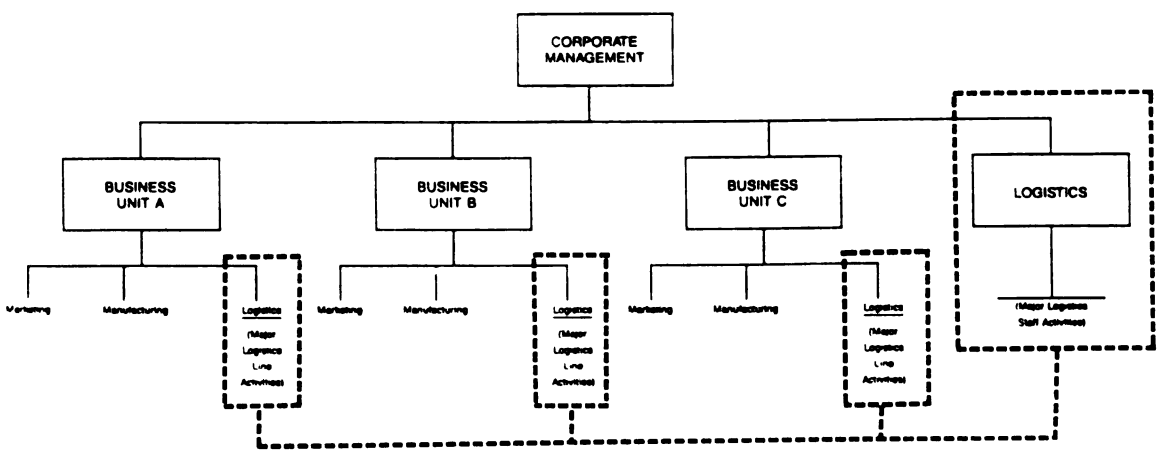
Type C - Divisional Organization:
Logistics Functions Consolidated within Business Units



Type D - Divisionalized Organization:
Centrally Consolidated Logistics Responsibilities



Type E - Divisionalized Organization:
Corporate Staff Logistics Function with Line Logistics Functions in the Business Units (essentially a combination of Type C and D)



Although your situation may not exactly fit one of the five models, indicate which most closely resembles your organization.

Model A _____ Model B _____ Model C _____

Model D _____ Model E _____ Other _____

If "other" please explain or attach a separate organization chart.

_____

_____

_____

_____

15. Which of the following statements provides the most accurate description of the primary strategy of your logistics operation? Please check most applicable.

_____ Type A – Process
A process-based strategy is concerned with managing a broad group of logistics activities as a value added chain. Emphasis is on achieving efficiency from managing purchasing, manufacturing, scheduling, and physical distribution as an integrated system.

_____ Type B – Market
A market-based strategy is concerned with managing a limited group of logistics activities for a multidivision single business unit or across multiple business units. The logistics organization seeks to make joint product shipments to common customers for different product groups and seeks to facilitate sales and logistical coordination by a single order-invoice. Often the senior sales and logistics executives report to the same manager.

_____ Type C – Channel
A channel-based strategy is concerned with managing logistics activities performed jointly with dealers and distributors. The strategic orientation places a great deal of attention on external control. Significant amounts of finished inventories are typically maintained forward or downstream in the distribution channel.

_____ Type D – Other
If your strategy does not fit into one of the above, please describe it below.

_____

_____

_____

16. Rank the following events in terms of your ability to accommodate. Use a five point scale where:

1 = not applicable
2 = current logistics system cannot handle
3 = current logistics system has difficulty handling
4 = current logistics system handles with few problems
5 = current logistics system handles easily.

Special customer service requests	1	2	3	4	5
Sales and Marketing incentive programs	1	2	3	4	5
Product Introduction	1	2	3	4	5
Product Phase Out	1	2	3	4	5
Disruption in supply	1	2	3	4	5
Computer breakdown	1	2	3	4	5
Unexpected production schedule changes	1	2	3	4	5
Product recall	1	2	3	4	5
Customization of service levels to specific markets or customers	1	2	3	4	5
Product modification or customization while in the logistics system	1	2	3	4	5

17. Please rate each of the following in terms of their impact on your logistical operations. Use a five point scale where:

1 = not applicable
2 = no impact
3 = slight impact
4 = high impact
5 = very high impact

Forecast accuracy	1	2	3	4	5
Computer support	1	2	3	4	5
Excessive end-of-month or end-of-quarter surges	1	2	3	4	5
Communications with customers	1	2	3	4	5
Production planning and scheduling	1	2	3	4	5
Interface with manufacturing	1	2	3	4	5
Availability of trained logistics personnel	1	2	3	4	5
Vehicle routing and scheduling	1	2	3	4	5
Computer applications backlog	1	2	3	4	5
Transportation cost	1	2	3	4	5
Communication with material vendors	1	2	3	4	5
Communication with dealers, distributors, or brokers	1	2	3	4	5
Warehouse productivity	1	2	3	4	5
Measurement tools and methods	1	2	3	4	5
Communication with internal non-logistics organizational units	1	2	3	4	5
Timely information	1	2	3	4	5
Supplier performance	1	2	3	4	5
Communications with external logistical service suppliers	1	2	3	4	5
Incompatibility of computer equipment and/or software	1	2	3	4	5

18. Please list primary performance measurements that the senior logistics management uses to monitor and identify problems.

A) Cost

_____

_____

_____

_____

_____

B) Customer Service

_____

_____

_____

_____

_____

C) Productivity

_____

_____

_____

_____

_____

D) Quality

_____

_____

_____

_____

_____

19. Below is a list of logistic computer applications. Please check the appropriate box for each application.

	Currently Installed	Will be revised in next 3-5 yrs	Will be installed in next 3-5 yrs
Freight Audit and Payment	_____	_____	_____
Purchasing	_____	_____	_____
Sales Forecasting	_____	_____	_____
MRP	_____	_____	_____
DRP	_____	_____	_____
Raw Material Inventory Control	_____	_____	_____
Finished Goods Inventory Control	_____	_____	_____
Warehousing	_____	_____	_____
Order Processing	_____	_____	_____
Order Entry	_____	_____	_____
Vehicle Routing and Scheduling	_____	_____	_____
Inbound Freight Consolidation	_____	_____	_____
Outbound Freight Consolidation	_____	_____	_____
Supporting Financials	_____	_____	_____
Performance Measurements	_____	_____	_____
Distribution Modeling	_____	_____	_____

20. Are you currently using, or planning in the next three to five years to use EDI (Electronic Data Interchange) in the following applications?

Application	Current	Planned
Raw Materials Vendors	_____	_____
Copackers/Contractors	_____	_____
Public Warehouses	_____	_____
Carriers	_____	_____
Customers/Brokers	_____	_____
Other (please specify)		
_____	_____	_____
_____	_____	_____

21. Are you currently using knowledge-based expert systems (Artificial Intelligence) in logistics operations?

    (A) Yes _____ No _____

    (B) If yes, please elaborate how you are using such systems? _____

    _____

    (C) If no, do you have specific plans to install such a system within the next three years?

    Yes _____ No_____

22. Do you have the following information available, either from your own computer system or from carriers or other logistical service providers?

	Yes	No
Freight tracking	_____	_____
Real-time freight rating systems	_____	_____
Accurate freight delivery time	_____	_____

23. Please indicate the characteristics of information used to manage logistics. Use a five point scale where:

    1 = Never
    2 = Not usually
    3 = Sometimes
    4 = In most instances
    5 = Always

Timely	1	2	3	4	5
Accurate	1	2	3	4	5
Readily Available	1	2	3	4	5
Formatted on an Exception Basis	1	2	3	4	5
Appropriately Formatted to Facilitate Use	1	2	3	4	5

24. What do you anticipate will happen in regard to your company's usage of outside service vendors in the next three to five years? Rank the following on a scale of 1 to 5, where:

    1 = Will not use outside logistical services
    2 = Will use less than current levels
    3 = Usage will remain constant
    4 = Will use more outside logistical services
    5 = Will use many more outside logistical services

Transportation	1	2	3	4	5
Warehousing	1	2	3	4	5
Order Entry and Processing	1	2	3	4	5
Inventory Management	1	2	3	4	5
Freight Audit and Payment	1	2	3	4	5

25. In addition to cost, which of the following factors influence the decision to use outside service vendors? Please rank them on a scale of 1 to 5, where:

    1 = not applicable
    2 = not important
    3 = neutral
    4 = somewhat important
    5 = very important

Deregulation	1	2	3	4	5
Services available	1	2	3	4	5
Quality of services	1	2	3	4	5
Data processing/Communications services	1	2	3	4	5
Management quality	1	2	3	4	5
Customer attitudes	1	2	3	4	5
Other (please specify)					
_____	1	2	3	4	5
_____	1	2	3	4	5

Please indicate below:

This information will be handled in a confidential manner.

Name: _____

Title: _____

Parent Company: _____

Division or Business Unit: _____

Street Address: _____

City: _____ State/Province: _____ Zip/Postal Code: _____

Telephone: ( ) _____

Are you a member of the Council of Logistics Management?

☐ Yes ☐ No

Are you a member of the Canadian Association of Physical Distribution Management?

☐ Yes ☐ No

Would you be willing to participate in a short telephone follow-up interview to this questionnaire?

☐ Yes ☐ No

Thank You

APPENDIX B

UPDATE MANUFACTURER QUESTIONNAIRE

THANK YOU

We sincerely appreciate your help in filling out this questionnaire. Your rapid response is critical to completing this research and will help develop a better understanding of dynamic logistics organizations.

1988 Special Edition Manufacturer Logistics Organization and Strategy Research

A fourth survey
of factors and trends
influencing logistics organizations

Conducted by Michigan State University

in cooperation with:

A.T. Kearney, Inc.
Traffic Management Magazine
Council of Logistics Management
Canadian Association of Physical Distribution Management

sponsored by:

Digital Equipment Corporation

MICHIGAN STATE UNIVERSITY

LOGISTICS ORGANIZATION AND RESEARCH PROJECT

This questionnaire is part of a continuing effort to understand how logistics activities are organized. Your participation will help develop a better understanding of rapidly changing logistic organizations. All responses will be handled with strict confidence.

OBJECTIVE

This questionnaire is intended to extend the scope of the logistics organization research project you helped us with last year. In order to examine major changes in your logistics operation since you completed the 1987 questionnaire, we are asking you to complete a short follow-up survey. We appreciate your assistance.

DIRECTIONS

1. The overall questionnaire contains 16 questions. It should take approximately 20 minutes to complete.

2. Please answer for your division or business unit. A business unit is defined as a division or subsidiary of a larger corporation that is operated independently.

3. If a particular question does not apply to your situation, skip it and go on. Please return the questionnaire even if you have not completed all of the questions.

4. The answer "not applicable" (N.A.) should be used when specific activities, tasks or terms are not relevant to you. Not applicable should not be confused with "never" or "do not use" which refer to activities, tasks or terms that may be relevant to your business but are not used.

5. Please return the questionnaire as soon as possible to:

Dr. Donald J. Bowersox
Professor of Marketing and Logistics
311 Eppley Center
Michigan State University
East Lansing, MI 48824
(517) 353-6381

WE APPRECIATE YOUR COOPERATION

1. What were the annual gross dollar sales of your business unit and total corporation (if different) during the most recent fiscal year?

   Business Unit $_____ Total Corporation $_____

2. Are the logistics activities within your business unit:

[] completely centralized	[] somewhat centralized	[] combination	[] somewhat decentralized	[] completely decentralized

   Has the trend over the last three years been toward:

   [] centralization of logistics activities, [] decentralization of logistics activities, or [] no change

3. The set of relationships defined by manufacturers, wholesalers, and retailers is referred to as a marketing channel. Who is the most influential member of your channel in terms of coordinating logistical relationships:

   [] your business unit, or [] wholesaler [] retailer
   [] broker [] other, please describe_____
   [] manufacturer

4. Within the last year, how many times have all or parts of logistics been reorganized? _____

5. Does your senior logistics executive formally participate in overall strategic planning for your business unit?

   [] Yes [] No, but provides input through other executives.

   [] No, provides no input.

6. Benchmarking is a management process used to monitor and measure performance against competitors. Please indicate whether you use competitive benchmarking in each of the following areas:

Area	Yes	No	Area	Yes	No
Cost	[]	[]	Logistics strategy	[]	[]
Asset management	[]	[]	Technology deployment	[]	[]
Customer service	[]	[]	Transportation operations	[]	[]
Productivity	[]	[]	Warehouse operations	[]	[]
Quality	[]	[]	Order processing operations	[]	[]

7. Below is a list of logistics related performance measurements. Please indicate if you use these measures and if specific measurement information is available. Also, on a scale of 1 to 5, please indicate the importance of these measurements in monitoring operations or identifying problems. (Circle the number or N.A. if not applicable.)

Measurement	Do you Use? Yes	Do you Use? No	Information Available? Yes	Information Available? No	Unimportant				Important	Not Applicable
COST (logistics cost only)										
Total cost analysis	[]	[]	[]	[]	1	2	3	4	5	N.A.
Cost per unit	[]	[]	[]	[]	1	2	3	4	5	N.A.
Cost as a percentage of sales	[]	[]	[]	[]	1	2	3	4	5	N.A.
Inbound freight costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Outbound freight costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Warehouse costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Administrative costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Order processing costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Direct labor costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Comparison of actual versus budget	[]	[]	[]	[]	1	2	3	4	5	N.A.
Cost trend analysis	[]	[]	[]	[]	1	2	3	4	5	N.A.
Direct product profitability	[]	[]	[]	[]	1	2	3	4	5	N.A.
ASSET MANAGEMENT										
Inventory turns	[]	[]	[]	[]	1	2	3	4	5	N.A.
Inventory carrying costs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Inventory levels, number of days supply	[]	[]	[]	[]	1	2	3	4	5	N.A.
Obsolete inventory	[]	[]	[]	[]	1	2	3	4	5	N.A.
Return on net assets	[]	[]	[]	[]	1	2	3	4	5	N.A.
Return on investment	[]	[]	[]	[]	1	2	3	4	5	N.A.
CUSTOMER SERVICE (to your customer)										
Fill rate	[]	[]	[]	[]	1	2	3	4	5	N.A.
Stockouts	[]	[]	[]	[]	1	2	3	4	5	N.A.
Shipping errors	[]	[]	[]	[]	1	2	3	4	5	N.A.
On time delivery	[]	[]	[]	[]	1	2	3	4	5	N.A.
Backorders	[]	[]	[]	[]	1	2	3	4	5	N.A.
Cycle time	[]	[]	[]	[]	1	2	3	4	5	N.A.
Customer feedback	[]	[]	[]	[]	1	2	3	4	5	N.A.
Sales force feedback	[]	[]	[]	[]	1	2	3	4	5	N.A.
Customer surveys	[]	[]	[]	[]	1	2	3	4	5	N.A.
PRODUCTIVITY										
Units shipped per employee	[]	[]	[]	[]	1	2	3	4	5	N.A.
Units per labor dollar	[]	[]	[]	[]	1	2	3	4	5	N.A.
Orders per sales representative	[]	[]	[]	[]	1	2	3	4	5	N.A.
Comparison to historical standards	[]	[]	[]	[]	1	2	3	4	5	N.A.
Goal programs	[]	[]	[]	[]	1	2	3	4	5	N.A.
Productivity index	[]	[]	[]	[]	1	2	3	4	5	N.A.
QUALITY										
Frequency of damage	[]	[]	[]	[]	1	2	3	4	5	N.A.
Dollar amount of damage	[]	[]	[]	[]	1	2	3	4	5	N.A.
Number of credit claims	[]	[]	[]	[]	1	2	3	4	5	N.A.
Number of customer returns	[]	[]	[]	[]	1	2	3	4	5	N.A.
Cost of returned goods	[]	[]	[]	[]	1	2	3	4	5	N.A.
Other, please specify_____	[]	[]	[]	[]	1	2	3	4	5	N.A.
_____	[]	[]	[]	[]	1	2	3	4	5	N.A.
_____	[]	[]	[]	[]	1	2	3	4	5	N.A.

8. Point of sale (UPC) scanning has given retailers a unique advantage over other members of the distribution channel.

[]	[]	[]	[]	[]
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. Information derived from point of sale scanning has made your business unit competitively stronger in comparison to other members of your distribution channel.

[]	[]	[]	[]	[]
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. Point of sale scanning information is more important to retailers than wholesalers.

[]	[]	[]	[]	[]
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. How do your company's logistics management information systems compare overall to the management information systems designed to support other areas of the business? (i.e. Accounting, Finance, Sales, etc.)

[]	[]	[]	[]	[]
much worse	worse	same	better	much better

12. What do you anticipate will happen to your company's usage of outside service vendors in the next three years? Please rate the following on a scale of 1 to 5. (Circle the number or N.A. if not applicable.)

Outside Service Vendor	Will not use outside services	Will use less outside services	Usage will remain constant	Will use more outside services	Will use many more outside services	Not Applicable
Transportation	1	2	3	4	5	N.A.
Warehousing	1	2	3	4	5	N.A.
Order Entry and Processing	1	2	3	4	5	N.A.
Inventory Management	1	2	3	4	5	N.A.
Freight Audit and Payment	1	2	3	4	5	N.A.
Consolidators	1	2	3	4	5	N.A.
International Freight Forwarders	1	2	3	4	5	N.A.
Domestic Freight Forwarders	1	2	3	4	5	N.A.
Order Fulfillment and Support	1	2	3	4	5	N.A.
Other, please describe_____	1	2	3	4	5	N.A.

13. Below is a list of logistics computer applications. Please check the appropriate box for each application.

Logistics Computer Application	Currently installed and no plans for revision	Currently installed but will be revised in next 3 yrs	Not currently installed but will be in next 3 yrs	Not currently installed and no plans to install
Freight Audit and Payment	[]	[]	[]	[]
Purchasing	[]	[]	[]	[]
Sales Forecasting	[]	[]	[]	[]
Raw Material Inventory Control	[]	[]	[]	[]
In Process Inventory Control	[]	[]	[]	[]
Finished Goods Inventory Control	[]	[]	[]	[]
Warehouse Order Selection	[]	[]	[]	[]
Warehouse On-Line Receiving	[]	[]	[]	[]
Warehouse Merchandise Locator	[]	[]	[]	[]
Warehouse Workload Balancing	[]	[]	[]	[]
Warehouse Short Interval Scheduling	[]	[]	[]	[]
Order Processing	[]	[]	[]	[]
Order Entry	[]	[]	[]	[]
Vehicle Routing and Scheduling	[]	[]	[]	[]
Inbound Freight Consolidation	[]	[]	[]	[]
Outbound Freight Consolidation	[]	[]	[]	[]
Supporting Financials	[]	[]	[]	[]
Performance Measurements	[]	[]	[]	[]
Distribution Modeling	[]	[]	[]	[]
Direct Product Profitability	[]	[]	[]	[]
Direct Store Delivery	[]	[]	[]	[]
Shelf Management	[]	[]	[]	[]
MRP	[]	[]	[]	[]
DRP	[]	[]	[]	[]
Other_____	[]	[]	[]	[]

14. Please indicate whether you are currently using, or planning to use Electronic Data Interchange (EDI) to facilitate order, financial or other communications with the following?

Entity	Currently installed	Plan to install in next 3 years	No plans to install	Not applicable
Manufacturers	[]	[]	[]	[]
Wholesalers	[]	[]	[]	[]
Public Warehouses	[]	[]	[]	[]
Carriers	[]	[]	[]	[]
Financial Institutions	[]	[]	[]	[]
Retailers	[]	[]	[]	[]
Customers	[]	[]	[]	[]
Copackers/Contractors	[]	[]	[]	[]

15. Are financial and personnel resources available to install and implement suitable logistics computer applications?
[] Yes [] No

16. Listed below are several technologies. With respect to your business unit, please check each one that is:

Technology	Currently used in logistics	Currently used in firm but not in logistics	Planned to be installed in logistics next 3 yrs	Not planned to be installed in logistics	Have not evaluated
Bar codes	[]	[]	[]	[]	[]
Optical Scanning	[]	[]	[]	[]	[]
Robotics	[]	[]	[]	[]	[]
Artificial Intelligence/Knowledge Based Systems	[]	[]	[]	[]	[]
Automated Storage and Retrieval Systems	[]	[]	[]	[]	[]
Automated Material Handling Equipment	[]	[]	[]	[]	[]
Local Area Networks	[]	[]	[]	[]	[]
Computer-aided warehouse design	[]	[]	[]	[]	[]
Handheld Data Entry Devices	[]	[]	[]	[]	[]
Electronic Order Transmission	[]	[]	[]	[]	[]
On Board Computers-Delivery Vehicles	[]	[]	[]	[]	[]
On Board Computers-Lift Trucks	[]	[]	[]	[]	[]
Voice Data Capture	[]	[]	[]	[]	[]
IBM PC or PC XT Compatible	[]	[]	[]	[]	[]
80286 Microcomputers (IBM AT or Compatible)	[]	[]	[]	[]	[]
80386 Microcomputers	[]	[]	[]	[]	[]
CD-ROM	[]	[]	[]	[]	[]
WORM (write once, read many) discs	[]	[]	[]	[]	[]
68020-Based Microcomputers (Macintosh 2 or Sun)	[]	[]	[]	[]	[]
Fiber Optics	[]	[]	[]	[]	[]
Other, please describe_____	[]	[]	[]	[]	[]
_____	[]	[]	[]	[]	[]
_____	[]	[]	[]	[]	[]

Please indicate below:

This information will be handled in a confidential manner.

Name:_____

Title:_____

Parent Company:_____

Division or Business Unit:_____

Street Address:_____

City:_____ State:_____ Zip:_____

Telephone:( )_____

Are you a member of the Council of Logistics Management?

[] Yes [] No

Are you a member of the Canadian Association of Physical Distribution Management?

[] Yes [] No

Would you be willing to participate in a short telephone follow-up interview to this questionnaire?

[] Yes [] No

THANK YOU

APPENDIX C

WHOLESALER- RETAILER QUESTIONNAIRE

Thank You

We sincerely appreciate your help in filling out this questionnaire. Your rapid response is critical to completing this research and will help develop a better understanding of dynamic logistics organizations.

1988 Retail/Wholesale Logistics Organization and Strategy Research

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LOGISTICS ORGANIZATION AND RESEARCH PROJECT

This questionnaire is part of a continuing effort to understand how logistics activities are organized. Your participation will help develop a better understanding of rapidly changing logistic organizations. All responses will be handled with strict confidence.

SENIOR LOGISTICS EXECUTIVE RESPONSIBILITIES

This questionnaire concerns the scope of authority and responsibility of the Senior Logistics Executive in your organization. Throughout this questionnaire the terms logistics, physical distribution and materials management are used interchangeably. Because organizations and titles vary extensively among manufacturers, wholesalers and retailers, further clarification is appropriate. Logistics can be divided into two broad areas - Operations and Support. Typical Logistics Operations responsibilities include but are not limited to warehousing, transportation, inventory and order processing. Logistics Support responsibilities include such activities as facility planning and design, industrial engineering, computer support and administration. While the above list of logistical responsibilities is not exhaustive, the items reflect the type of duties that typically report to the senior logistics executive. In selected wholesale and retail firms one could conclude that the total business is logistics. Please distinguish between logistics as a total business and the scope of authority and responsibility of the senior executive responsible for logistics operations and support.

DIRECTIONS

1. The overall questionnaire contains 36 questions. It should take approximately 40 minutes to complete.

2. Please answer for your division or business unit. A business unit is defined as a division or subsidiary of a larger corporation that is operated independently.

3. If a particular question does not apply to your situation, skip it and go on. Please return the questionnaire even if you have not completed all of the questions.

4. The answer "not applicable" (N.A.) should be used when specific activities, tasks or terms are not relevant to you. Not applicable should not be confused with "never" or "do not use" which refer to activities, tasks or terms that may be relevant to your business but are not used.

5. Please return the questionnaire as soon as possible to:

Dr. Donald J. Bowersox
Professor of Marketing and Logistics
311 Eppley Center
Michigan State University
East Lansing, MI 48824
(517) 353-6381

We appreciate your cooperation

1. Is your company and/or business unit a:

   ☐ manufacturer ☐ wholesaler ☐ retailer ☐ other, please describe _____

2. What were the annual gross dollar sales of your business unit and total corporation (if different) during the most recent fiscal year?

   Business Unit $_____ Total Corporation $_____

3. Check the **one** industry classification listed below that **best** describes products sold by your business unit.

   ☐ Building Materials, Hardware, and Garden Supply
   ☐ General Merchandise
   ☐ Food
   ☐ Automotive
   ☐ Apparel and Accessory
   ☐ Furniture, Home Furnishings, and Equipment
   ☐ Eating and Drinking Establishments
   ☐ Drugs, Health and Beauty Aids
   ☐ Other, please describe _____

   Please list your primary product. _____

4. Do you have a written logistics mission statement? ☐ Yes ☐ No

   If yes, please provide below or attach a separate sheet.

5. Do you have a written logistics strategic plan? ☐ Yes ☐ No

   If yes, what is the time horizon of your plan? _____

   If yes, how often is your plan reviewed or updated? _____

6. Are the logistics activities within your business unit:

☐ completely centralized	☐ somewhat centralized	☐ combination	☐ somewhat decentralized	☐ completely decentralized

   Has the trend over the last three years been toward:

   ☐ centralization of logistics activities, ☐ decentralization of logistics activities, or ☐ no change

7. The set of relationships defined by manufacturers, wholesalers, and retailers is referred to as a marketing channel. Who is the most influential member of your channel in terms of coordinating logistical relationships:

   ☐ your business unit, or ☐ wholesaler ☐ broker ☐ manufacturer ☐ retailer ☐ other, please describe _____

8. What is the title **level** of your most senior logistics executive? (See page 1 for clarification.)

☐ President ☐ Vice President ☐ Supervisor
☐ Executive Vice President ☐ Director ☐ Manager
☐ Senior Vice President ☐ Other, please describe _____

9. What is the **functional** title of your most senior logistics executive?

☐ Administration ☐ Logistics ☐ Sales/Marketing
☐ CEO/COO ☐ Merchandising ☐ Traffic/Transportation
☐ Data Processing ☐ Operations ☐ Warehousing
☐ Distribution ☐ Purchasing/Materials Management

If not listed above, please provide specific title _____

10. How many years has the most senior logistics executive been in this position? _____

11. What was the previous title **level** of the person who is now your most senior logistics executive?

☐ President ☐ Vice President ☐ Supervisor
☐ Executive Vice President ☐ Director ☐ Manager
☐ Senior Vice President ☐ Other, please describe _____

12. What was the previous **functional** title of the person who is now your most senior logistics executive?

☐ Administration ☐ Logistics ☐ Sales/Marketing
☐ CEO/COO ☐ Merchandising ☐ Traffic/Transportation
☐ Data Processing ☐ Operations ☐ Warehousing
☐ Distribution ☐ Purchasing/Materials Management

If not listed above, please provide specific title _____

13. What is the title **level** of the person the most senior logistics executive reports to?

☐ Chairman ☐ Senior Vice President ☐ Manager
☐ President ☐ Vice President ☐ Supervisor
☐ Executive Vice President ☐ Director ☐ Other, please describe _____

14. What is the **functional** title of the person your most senior logistics executive reports to?

☐ Administration ☐ Logistics ☐ Sales/Marketing
☐ CEO/COO ☐ Merchandising ☐ Traffic/Transportation
☐ Data Processing ☐ Operations ☐ Warehousing
☐ Distribution ☐ Purchasing/Materials Management

If not listed above, please provide specific title _____

15. How many years has this executive been in this position? _____

16. How many years has logistics been a formal organization? _____

17. Within the last five years, how many times have all or parts of logistics been reorganized? _____

18. Does your senior logistics executive formally participate in overall strategic planning for your business unit?

☐ Yes ☐ No, but provides input through other executives.
☐ No, provides no input.

19. In order to develop a picture of your logistics organizational structure, indicate the title level **and** function for **each** person who reports directly to the senior logistics executive. Please check all appropriate functions for each direct report. If the senior logistics executive has more direct reports than the organization chart, please list the full titles of the additional people on the blanks provided.

Senior Logistics Executive

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other _____

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other _____

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other _____

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other _____

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other _____

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other _____

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other _____

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other _____

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other _____

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other _____

Level
- ☐ Executive Vice President
- ☐ Senior Vice President
- ☐ Vice President
- ☐ Director
- ☐ Manager
- ☐ Supervisor
- ☐ Other

Function
- ☐ Traffic
- ☐ Order Processing
- ☐ Purchasing
- ☐ Inventory
- ☐ Data Processing
- ☐ Facilities Management
- ☐ Materials Handling
- ☐ Material Management
- ☐ Administration
- ☐ Customer Service
- ☐ Transportation
- ☐ Warehousing
- ☐ International
- ☐ Capital Asset Management
- ☐ Other

Titles of additional personnel that report directly to the senior logistics executive.

_____ _____ _____

_____ _____ _____

_____ _____ _____

_____ _____ _____

20. If the following activities are currently part of the formal responsibility of logistics, please indicate how long they have been part of logistics, and the nature of responsibility (line or staff). If the activities are not part of logistics, please indicate whether they are likely to be added in the future.

Activity	How long part of Logistics (in years)	Nature of Responsibility Line	Nature of Responsibility Staff	Likely to be Added in Future Yes	Likely to be Added in Future No
Sales Forecasting	_____	☐	☐	☐	☐
Purchasing	_____	☐	☐	☐	☐
Inbound Transportation	_____	☐	☐	☐	☐
Inventory Management	_____	☐	☐	☐	☐
Intra-Company Transportation	_____	☐	☐	☐	☐
Warehousing	_____	☐	☐	☐	☐
Order Processing	_____	☐	☐	☐	☐
Customer Service	_____	☐	☐	☐	☐
Outbound Transportation	_____	☐	☐	☐	☐
Logistics Systems Planning	_____	☐	☐	☐	☐
Facilities Design	_____	☐	☐	☐	☐
Materials Handling	_____	☐	☐	☐	☐
Logistics Administration	_____	☐	☐	☐	☐
International	_____	☐	☐	☐	☐
Capital Equipment Procurement	_____	☐	☐	☐	☐
Data Processing for Distribution Applications	_____	☐	☐	☐	☐

21. In some companies the senior logistics executive manages activities that are not typically part of a logistics organization. For example, some logistics organizations have responsibility for real estate and facilities. (These are activities not listed in question 20.)

Does your logistical organization have responsibility for any such non-typical activities? ☐ Yes ☐ No

If yes, please list the responsibilities. _____

_____

22. Below is a list of logistics related performance measurements. Please indicate if you use these measures and if specific measurement information is available. Also, on a scale of 1 to 5, please indicate the importance of these measurements in monitoring operations or identifying problems. (Circle the number or N.A. if not applicable.)

Measurement	Do you Use? Yes	Do you Use? No	Information Available? Yes	Information Available? No	Unimportant				Important	Not Applicable
ASSET MANAGEMENT										
Inventory turns	☐	☐	☐	☐	1	2	3	4	5	N.A.
Inventory carrying costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Inventory levels, number of days supply	☐	☐	☐	☐	1	2	3	4	5	N.A.
Obsolete inventory	☐	☐	☐	☐	1	2	3	4	5	N.A.
Return on net assets	☐	☐	☐	☐	1	2	3	4	5	N.A.
Return on investment	☐	☐	☐	☐	1	2	3	4	5	N.A.

Please continue question 22 on next page.

Measurement	Do you Use? Yes	Do you Use? No	Information Available? Yes	Information Available? No	Unimportant				Important	Not Applicable
COST (logistics cost only)										
Total cost analysis	☐	☐	☐	☐	1	2	3	4	5	N.A.
Cost per unit	☐	☐	☐	☐	1	2	3	4	5	N.A.
Cost as a percentage of sales	☐	☐	☐	☐	1	2	3	4	5	N.A.
Inbound freight costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Outbound freight costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Warehouse costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Administrative costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Order processing costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Direct labor costs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Comparison of actual versus budget	☐	☐	☐	☐	1	2	3	4	5	N.A.
Cost trend analysis	☐	☐	☐	☐	1	2	3	4	5	N.A.
Direct product profitability	☐	☐	☐	☐	1	2	3	4	5	N.A.
CUSTOMER SERVICE (to your customer)										
Fill rate	☐	☐	☐	☐	1	2	3	4	5	N.A.
Stockouts	☐	☐	☐	☐	1	2	3	4	5	N.A.
Shipping errors	☐	☐	☐	☐	1	2	3	4	5	N.A.
On time delivery	☐	☐	☐	☐	1	2	3	4	5	N.A.
Backorders	☐	☐	☐	☐	1	2	3	4	5	N.A.
Cycle time	☐	☐	☐	☐	1	2	3	4	5	N.A.
Customer feedback	☐	☐	☐	☐	1	2	3	4	5	N.A.
Sales force feedback	☐	☐	☐	☐	1	2	3	4	5	N.A.
Customer surveys	☐	☐	☐	☐	1	2	3	4	5	N.A.
PRODUCTIVITY										
Units shipped per employee	☐	☐	☐	☐	1	2	3	4	5	N.A.
Units per labor dollar	☐	☐	☐	☐	1	2	3	4	5	N.A.
Orders per sales representative	☐	☐	☐	☐	1	2	3	4	5	N.A.
Comparison to historical standards	☐	☐	☐	☐	1	2	3	4	5	N.A.
Goal programs	☐	☐	☐	☐	1	2	3	4	5	N.A.
Productivity index	☐	☐	☐	☐	1	2	3	4	5	N.A.
QUALITY										
Frequency of damage	☐	☐	☐	☐	1	2	3	4	5	N.A.
Dollar amount of damage	☐	☐	☐	☐	1	2	3	4	5	N.A.
Number of credit claims	☐	☐	☐	☐	1	2	3	4	5	N.A.
Number of customer returns	☐	☐	☐	☐	1	2	3	4	5	N.A.
Cost of returned goods	☐	☐	☐	☐	1	2	3	4	5	N.A.
Other, please specify _____	☐	☐	☐	☐	1	2	3	4	5	N.A.
_____	☐	☐	☐	☐	1	2	3	4	5	N.A.
_____	☐	☐	☐	☐	1	2	3	4	5	N.A.

23. Benchmarking is a management process used to monitor and measure performance against competitors. Please indicate whether you use competitive benchmarking in each of the following areas:

Area	Yes	No	Area	Yes	No
Cost	☐	☐	Logistics strategy	☐	☐
Asset management	☐	☐	Technology deployment	☐	☐
Customer service	☐	☐	Transportation operations	☐	☐
Productivity	☐	☐	Warehouse operations	☐	☐
Quality	☐	☐	Order processing operations	☐	☐

24. On a scale of 1 to 5, rate the factors you use to evaluate suppliers. (Circle the number or N.A. if not applicable.)

Factor Used To Evaluate Supplier:	Never Used	Rarely Used	Sometimes Used	Often Used	Always Used	Not Applicable
On time delivery	1	2	3	4	5	N.A.
Percentage of complete orders	1	2	3	4	5	N.A.
Automatic substitution rates	1	2	3	4	5	N.A.
Customer support	1	2	3	4	5	N.A.
Easy to work with	1	2	3	4	5	N.A.
Maintains short order cycle	1	2	3	4	5	N.A.
Good communication	1	2	3	4	5	N.A.
Early notification of disruptions	1	2	3	4	5	N.A.
Flexibility	1	2	3	4	5	N.A.
Willing to customize service	1	2	3	4	5	N.A.
Management quality	1	2	3	4	5	N.A.
Service quality	1	2	3	4	5	N.A.
Positive attitude	1	2	3	4	5	N.A.
Master carton packaging quality	1	2	3	4	5	N.A.
Shelf unit packaging quality	1	2	3	4	5	N.A.
Price	1	2	3	4	5	N.A.
Consistency of Order Cycle	1	2	3	4	5	N.A.
Other, please describe_____	1	2	3	4	5	N.A.

25. Please indicate whether you are currently using, or planning to use Electronic Data Interchange (EDI) to facilitate order, financial or other communications with the following.

Entity	Currently installed	Plan to install in next 3 years	No plans to install	Not applicable
Manufacturers	☐	☐	☐	☐
Wholesalers	☐	☐	☐	☐
Public Warehouses	☐	☐	☐	☐
Carriers	☐	☐	☐	☐
Financial Institutions	☐	☐	☐	☐
Retailers	☐	☐	☐	☐
Customers	☐	☐	☐	☐
Copackers/Contractors	☐	☐	☐	☐

26. Below is a list of logistics computer applications. Please check the appropriate box for each application.

Logistics Computer Application	Currently installed and no plans for revision	Currently installed but will be revised in next 3 yrs	Not currently installed but will be in next 3 yrs	Not currently installed and no plans to install
Freight Audit and Payment	☐	☐	☐	☐
Purchasing	☐	☐	☐	☐
Sales Forecasting	☐	☐	☐	☐
Inventory Control	☐	☐	☐	☐
Warehouse Order Selection	☐	☐	☐	☐
Warehouse On-Line Receiving	☐	☐	☐	☐
Warehouse Merchandise Locator	☐	☐	☐	☐
Warehouse Workload Balancing	☐	☐	☐	☐
Warehouse Short Interval Scheduling	☐	☐	☐	☐
Order Processing	☐	☐	☐	☐
Order Entry	☐	☐	☐	☐
Vehicle Routing and Scheduling	☐	☐	☐	☐
Inbound Freight Consolidation	☐	☐	☐	☐
Outbound Freight Consolidation	☐	☐	☐	☐
Supporting Financials	☐	☐	☐	☐
Performance Measurement	☐	☐	☐	☐
Distribution Modeling	☐	☐	☐	☐
Direct Product Profitability	☐	☐	☐	☐
Direct Store Delivery	☐	☐	☐	☐
Shelf Management	☐	☐	☐	☐
Other _____	☐	☐	☐	☐

27. Point of sale (UPC) scanning has given retailers a unique advantage over other members of the distribution channel.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

28. Information derived from point of sale scanning has made your business unit competitively stronger in comparison to other members of your distribution channel.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

29. Point of sale scanning information is more important to retailers than wholesalers.

☐ Strongly Disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree

30. How do your company's logistics management information systems compare **overall** to the management information systems designed to support other areas of the business? (i.e. Accounting, Finance, Sales, etc.)

☐ much worse ☐ worse ☐ same ☐ better ☐ much better

31. On a scale of 1 to 5, please indicate the characteristics of information used to manage logistics.

Characteristic	Never	Rarely	Sometimes	Often	Always	Not Applicable
Timely	1	2	3	4	5	N.A.
Accurate	1	2	3	4	5	N.A.
Readily available	1	2	3	4	5	N.A.
Formatted on an exception basis	1	2	3	4	5	N.A.
Appropriately formatted to facilitate use	1	2	3	4	5	N.A.

32. On a scale of 1 to 5, rate the following events in terms of your logistical organization's ability to accommodate. (Circle the number or N.A. if not applicable.)

Event	Cannot Accommodate	Accommodates With Difficulty	Accommodates With Few Problems	Accommodates Easily	Accommodates Very Easily	Not Applicable
Special customer service requests	1	2	3	4	5	N.A.
Sales and Marketing incentive programs	1	2	3	4	5	N.A.
Product introduction	1	2	3	4	5	N.A.
Product phase out	1	2	3	4	5	N.A.
Disruption in supply	1	2	3	4	5	N.A.
Computer breakdown	1	2	3	4	5	N.A.
Product recall	1	2	3	4	5	N.A.
Customization of service levels to specific markets or customers	1	2	3	4	5	N.A.
Product modification or customization while in the logistics system (e.g. pricing, packaging, mixing)	1	2	3	4	5	N.A.
Returned goods	1	2	3	4	5	N.A.

33. On a scale of 1 to 5, rate the level of impact each of the following have on your logistical operations. (Circle the number or N.A. if not applicable.)

Item	No Impact	Slight Impact	Medium Impact	High Impact	Very High Impact	Not Applicable
Sales forecast accuracy	1	2	3	4	5	N.A.
Computer support	1	2	3	4	5	N.A.
Excessive end-of-month or end-of-quarter surges	1	2	3	4	5	N.A.
Communications with customer	1	2	3	4	5	N.A.
Availability of trained logistics personnel	1	2	3	4	5	N.A.
Vehicle routing and scheduling	1	2	3	4	5	N.A.
Computer applications backlog	1	2	3	4	5	N.A.
Transportation cost	1	2	3	4	5	N.A.
Communication with suppliers	1	2	3	4	5	N.A.
Warehouse productivity	1	2	3	4	5	N.A.
Measurement tools and methods	1	2	3	4	5	N.A.
Communication with internal non-logistics organizational units	1	2	3	4	5	N.A.
Timely information	1	2	3	4	5	N.A.
Supplier logistical performance	1	2	3	4	5	N.A.
Communication with external logistical service suppliers	1	2	3	4	5	N.A.
Incompatibility of computer equipment and/or software	1	2	3	4	5	N.A.
Inventory reduction programs	1	2	3	4	5	N.A.
Cost reduction programs	1	2	3	4	5	N.A.
Load leveling	1	2	3	4	5	N.A.
Workforce leveling	1	2	3	4	5	N.A.

34. What do you anticipate will happen to your company's usage of outside service vendors in the next three years? Please rate the following on a scale of 1 to 5. (Circle the number or N.A. if not applicable.)

Outside Service Vendor	Will not use outside services	Will use less outside services	Usage will remain constant	Will use more outside services	Will use many more outside services	Not Applicable
Transportation	1	2	3	4	5	N.A.
Warehousing	1	2	3	4	5	N.A.
Order Entry and Processing	1	2	3	4	5	N.A.
Inventory Management	1	2	3	4	5	N.A.
Freight Audit and Payment	1	2	3	4	5	N.A.
Consolidators	1	2	3	4	5	N.A.
International Freight Forwarders	1	2	3	4	5	N.A.
Domestic Freight Forwarders	1	2	3	4	5	N.A.
Order Fulfillment and Support	1	2	3	4	5	N.A.
Other, please describe _____	1	2	3	4	5	N.A.

35. Price and cost considerations being equal, which of the following factors influence the decision to use outside service vendors? Please rate them on a scale of 1 to 5. (Circle the number or N.A. if not applicable.)

Factor	Never	Rarely	Sometimes	Often	Always	Not Applicable
Services available	1	2	3	4	5	N.A.
Quality of services	1	2	3	4	5	N.A.
Data processing/ communications services	1	2	3	4	5	N.A.
Management quality	1	2	3	4	5	N.A.
Customer orientation	1	2	3	4	5	N.A.
Vendor reputation	1	2	3	4	5	N.A.
Other _____	1	2	3	4	5	N.A.

36. Listed below are several technologies. With respect to your business unit, please check each one that is:

Technology	Currently used in logistics	Currently used in firm but not in logistics	Planned to be installed in logistics next 3 yrs	Not planned to be installed in logistics	Have not evaluated
Bar codes	☐	☐	☐	☐	☐
Optical Scanning	☐	☐	☐	☐	☐
Robotics	☐	☐	☐	☐	☐
Artificial Intelligence/Knowledge Based Systems	☐	☐	☐	☐	☐
Automated Storage and Retrieval Systems	☐	☐	☐	☐	☐
Automated Material Handling Equipment	☐	☐	☐	☐	☐
Local Area Networks	☐	☐	☐	☐	☐
Computer-aided warehouse design	☐	☐	☐	☐	☐
Handheld Data Entry Devices	☐	☐	☐	☐	☐
Electronic Order Transmission	☐	☐	☐	☐	☐
On Board Computers-Delivery Vehicles	☐	☐	☐	☐	☐
On Board Computers-Lift Trucks	☐	☐	☐	☐	☐
Voice Data Capture	☐	☐	☐	☐	☐
IBM PC or PC XT Compatible	☐	☐	☐	☐	☐
80286 Microcomputers (IBM AT or Compatible)	☐	☐	☐	☐	☐
80386 Microcomputers	☐	☐	☐	☐	☐
CD-ROM	☐	☐	☐	☐	☐
WORM (write once, read many) discs	☐	☐	☐	☐	☐
68020-Based Microcomputers (Macintosh 2 or Sun)	☐	☐	☐	☐	☐
Fiber Optics	☐	☐	☐	☐	☐
Other, please describe _____	☐	☐	☐	☐	☐
_____	☐	☐	☐	☐	☐
_____	☐	☐	☐	☐	☐

Please indicate below:

This information will be handled in a confidential manner.

Name: _____

Title: _____

Parent Company: _____

Division or Business Unit: _____

Street Address: _____

City: _____ State/Province: _____ Zip/Postal Code: _____

Telephone: ( ) _____

Are you a member of the Council of Logistics Management?

☐ Yes ☐ No

Are you a member of the Canadian Association of Physical Distribution Management?

☐ Yes ☐ No

Would you be willing to participate in a short telephone follow-up interview to this questionnaire?

☐ Yes ☐ No

Thank You

APPENDIX D

STATISTICAL HYPOTHESES

APPENDIX D
STATISTICAL HYPOTHESES

Table 2

Ho: No difference exists among the manufacturer, wholesaler and retailer means of internal cost performance measurement.

H1: No difference exists among the manufacturer, wholesaler and retailer means of internal differentiation performance measurement.

H2: No difference exists among the manufacturer, wholesaler and retailer means of total internal performance measurement.

H3: No difference exists among the manufacturer, wholesaler and retailer means of cost benchmarking performance measurement.

H4: No difference exists among the manufacturer, wholesaler and retailer means of differentiation benchmarking performance measurement.

H5: No difference exists among the manufacturer, wholesaler and retailer means of total benchmarking performance measurement.

Table 3

H6: Total internal and total benchmarking performance measurement are not related.

H7: Internal cost and internal differentiation performance measurement are not related.

H8: Cost benchmarking and differentiation benchmarking performance measurement are not related.

H9: Internal cost and cost benchmarking performance measurement are not related.

H10: Internal cost and differentiation benchmarking performance measurement are not related.

Table 4

H11: Total internal and total benchmarking performance measurement are not related among manufacturers.

H12: Internal cost and internal differentiation performance measurement are not related among manufacturers.

H13: Cost benchmarking and differentiation benchmarking performance measurement are not related among manufacturers.

H14: Internal cost and cost benchmarking performance measurement are not related among manufacturers.

H15: Internal cost and differentiation benchmarking performance measurement are not related among manufacturers.

Table 5

H16: Total internal and total benchmarking performance measurement are not related among wholesalers.

H17: Internal cost and internal differentiation performance measurement are not related among wholesalers.

H18: Cost benchmarking and differentiation benchmarking performance measurement are not related among wholesalers.

H19: Internal cost and cost benchmarking performance measurement are not related among wholesalers.

H20: Internal cost and differentiation benchmarking performance measurement are not related among wholesalers.

Table 6

H21: Total internal and total benchmarking performance measurement are not related among retailers.

H22: Internal cost and internal differentiation performance measurement are not related among retailers.

H23: Cost benchmarking and differentiation benchmarking performance measurement are not related among retailers.

H24: Internal cost and cost benchmarking performance measurement are not related among retailers.

H25: Internal cost and differentiation benchmarking performance measurement are not related among retailers.

Table 7

H26: The frequency of strategic plan update main effect is not a significant predictor of internal cost performance measurement.

H27: The channel position main effect is not a significant predictor of internal cost performance measurement.

H28: The interaction of frequency of strategic plan update and channel position is not a significant predictor of internal cost performance measurement.

H29: The frequency of strategic plan update main effect is not a significant predictor of internal differentiation performance measurement.

H30: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H31: The interaction of frequency of strategic plan update and channel position is not a significant predictor of internal differentiation performance measurement.

H32: The frequency of strategic plan update main effect is not a significant predictor of total internal performance measurement.

H33: The channel position main effect is not a significant predictor of total internal performance measurement.

H34: The interaction of frequency of strategic plan update and channel position is not a significant predictor of total internal performance measurement.

H35: The frequency of strategic plan update main effect is not a significant predictor of cost benchmarking performance measurement.

H36: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H37: The interaction of frequency of strategic plan update and channel position is not a significant predictor of cost benchmarking performance measurement.

H38: The frequency of strategic plan update main effect is not a significant predictor of differentiation benchmarking performance measurement.

H39: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H40: The interaction of frequency of strategic plan update and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H41: The frequency of strategic plan update main effect is not a significant predictor of total benchmarking performance measurement.

H42: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H43: The interaction of frequency of strategic plan update and channel position is not a significant predictor of total benchmarking performance measurement.

Table 8

H44: The mission statement main effect is not a significant predictor of internal cost performance measurement.

H45: The channel position main effect is not a significant predictor of internal cost performance measurement.

H46: The interaction of mission statement and channel position is not a significant predictor of internal cost performance measurement.

H47: The mission statement main effect is not a significant predictor of internal differentiation performance measurement.

H48: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H49: The interaction of mission statement and channel position is not a significant predictor of internal differentiation performance measurement.

H50: The mission statement main effect is not a significant predictor of total internal performance measurement.

H51: The channel position main effect is not a significant predictor of total internal performance measurement.

H52: The interaction of mission statement and channel position is not a significant predictor of total internal performance measurement.

H53: The mission statement main effect is not a significant predictor of cost benchmarking performance measurement.

H54: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H55: The interaction of mission statement and channel position is not a significant predictor of cost benchmarking performance measurement.

H56: The mission statement main effect is not a significant predictor of differentiation benchmarking performance measurement.

H57: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H58: The interaction of mission statement and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H59: The mission statement main effect is not a significant predictor of total benchmarking performance measurement.

H60: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H61: The interaction of mission statement and channel position is not a significant predictor of total benchmarking performance measurement.

Table 9

H62: The strategic plan main effect is not a significant predictor of internal cost performance measurement.

H63: The channel position main effect is not a significant predictor of internal cost performance measurement.

H64: The interaction of strategic plan and channel position is not a significant predictor of internal cost performance measurement.

H65: The strategic plan main effect is not a significant predictor of internal differentiation performance measurement.

H66: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H67: The interaction of strategic plan and channel position is not a significant predictor of internal differentiation performance measurement.

H68: The strategic plan main effect is not a significant predictor of total internal performance measurement.

H69: The channel position main effect is not a significant predictor of total internal performance measurement.

H70: The interaction of strategic plan and channel position is not a significant predictor of total internal performance measurement.

H71: The strategic plan main effect is not a significant predictor of cost benchmarking performance measurement.

H72: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H73: The interaction of strategic plan and channel position is not a significant predictor of cost benchmarking performance measurement.

H74: The strategic plan main effect is not a significant predictor of differentiation benchmarking performance measurement.

H75: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H76: The interaction of strategic plan and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H77: The strategic plan main effect is not a significant predictor of total benchmarking performance measurement.

H78: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H79: The interaction of strategic plan and channel position is not a significant predictor of total benchmarking performance measurement.

Table 10

H80: The number of years logistics has been a formal function main effect is not a significant predictor of internal cost performance measurement.

H81: The channel position main effect is not a significant predictor of internal cost performance measurement.

H82: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of internal cost performance measurement.

H83: The number of years logistics has been a formal function main effect is not a significant predictor of internal differentiation performance measurement.

H84: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H85: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of internal differentiation performance measurement.

H86: The number of years logistics has been a formal function main effect is not a significant predictor of total internal performance measurement.

H87: The channel position main effect is not a significant predictor of total internal performance measurement.

H88: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of total internal performance measurement.

H89: The number of years logistics has been a formal function main effect is not a significant predictor of cost benchmarking performance measurement.

H90: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H91: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of cost benchmarking performance measurement.

H92: The number of years logistics has been a formal function main effect is not a significant predictor of differentiation benchmarking performance measurement.

H93: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H94: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H95: The number of years logistics has been a formal function main effect is not a significant predictor of total benchmarking performance measurement.

H96: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H97: The interaction of number of years logistics has been a formal function and channel position is not a significant predictor of total benchmarking performance measurement.

Table 11

H98: The number of times logistics has been reorganized main effect is not a significant predictor of internal cost performance measurement.

H99: The channel position main effect is not a significant predictor of internal cost performance measurement.

H100: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of internal cost performance measurement.

H101: The number of times logistics has been reorganized main effect is not a significant predictor of internal differentiation performance measurement.

H102: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H103: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of internal differentiation performance measurement.

H104: The number of times logistics has been reorganized main effect is not a significant predictor of total internal performance measurement.

H105: The channel position main effect is not a significant predictor of total internal performance measurement.

H106: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of total internal performance measurement.

H107: The number of times logistics has been reorganized main effect is not a significant predictor of cost benchmarking performance measurement.

H108: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H109: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of cost benchmarking performance measurement.

H110: The number of times logistics has been reorganized main effect is not a significant predictor of differentiation benchmarking performance measurement.

H111: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H112: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H113: The number of times logistics has been reorganized main effect is not a significant predictor of total benchmarking performance measurement.

H114: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H115: The interaction of number of times logistics has been reorganized and channel position is not a significant predictor of total benchmarking performance measurement.

Table 12

H116: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of internal cost performance measurement.

H117: The channel position main effect is not a significant predictor of internal cost performance measurement.

H118: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of internal cost performance measurement.

H119: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of internal differentiation performance measurement.

H120: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H121: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of internal differentiation performance measurement.

H122: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of total internal performance measurement.

H123: The channel position main effect is not a significant predictor of total internal performance measurement.

H124: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of total internal performance measurement.

H125: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of cost benchmarking performance measurement.

H126: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H127: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of cost benchmarking performance measurement.

H128: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of differentiation benchmarking performance measurement.

H129: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H130: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H131: The participation in strategic planning by the senior logistics executive main effect is not a significant predictor of total benchmarking performance measurement.

H132: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H133: The interaction of participation in strategic planning by the senior logistics executive and channel position is not a significant predictor of total benchmarking performance measurement.

Table 13

H134: The logistics control customer service main effect is not a significant predictor of internal cost performance measurement.

H135: The channel position main effect is not a significant predictor of internal cost performance measurement.

H136: The interaction of logistics control customer service and channel position is not a significant predictor of internal cost performance measurement.

H137: The logistics control customer service main effect is not a significant predictor of internal differentiation performance measurement.

H138: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H139: The interaction of logistics control customer service and channel position is not a significant predictor of internal differentiation performance measurement.

H140: The logistics control customer service main effect is not a significant predictor of total internal performance measurement.

H141: The channel position main effect is not a significant predictor of total internal performance measurement.

H142: The interaction of logistics control customer service and channel position is not a significant predictor of total internal performance measurement.

H143: The logistics control customer service main effect is not a significant predictor of cost benchmarking performance measurement.

H144: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H145: The interaction of logistics control customer service and channel position is not a significant predictor of cost benchmarking performance measurement.

H146: The logistics control customer service main effect is not a significant predictor of differentiation benchmarking performance measurement.

H147: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H148: The interaction of logistics control customer service and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H149: The logistics control customer service main effect is not a significant predictor of total benchmarking performance measurement.

H150: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H151: The interaction of logistics control customer service and channel position is not a significant predictor of total benchmarking performance measurement.

Table 14

H152: The logistics controls logistics systems planning main effect is not a significant predictor of internal cost performance measurement.

H153: The channel position main effect is not a significant predictor of internal cost performance measurement.

H154: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of internal cost performance measurement.

H155: The logistics controls logistics systems planning main effect is not a significant predictor of internal differentiation performance measurement.

H156: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H157: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of internal differentiation performance measurement.

H158: The logistics controls logistics systems planning main effect is not a significant predictor of total internal performance measurement.

H159: The channel position main effect is not a significant predictor of total internal performance measurement.

H160: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of total internal performance measurement.

H161: The logistics controls logistics systems planning main effect is not a significant predictor of cost benchmarking performance measurement.

H162: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H163: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of cost benchmarking performance measurement.

H164: The logistics controls logistics systems planning main effect is not a significant predictor of differentiation benchmarking performance measurement.

H165: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H166: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H167: The logistics controls logistics systems planning main effect is not a significant predictor of total benchmarking performance measurement.

H168: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H169: The interaction of logistics controls logistics systems planning and channel position is not a significant predictor of total benchmarking performance measurement.

Table 15

H170: The number of activities controlled by the logistics function main effect is not a significant predictor of internal cost performance measurement.

H171: The channel position main effect is not a significant predictor of internal cost performance measurement.

H172: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of internal cost performance measurement.

H173: The number of activities controlled by the logistics function main effect is not a significant predictor of internal differentiation performance measurement.

H174: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H175: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of internal differentiation performance measurement.

H176: The number of activities controlled by the logistics function main effect is not a significant predictor of total internal performance measurement.

H177: The channel position main effect is not a significant predictor of total internal performance measurement.

H178: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of total internal performance measurement.

H179: The number of activities controlled by the logistics function main effect is not a significant predictor of cost benchmarking performance measurement.

H180: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H181: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of cost benchmarking performance measurement.

H182: The number of activities controlled by the logistics function main effect is not a significant predictor of differentiation benchmarking performance measurement.

H183: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H184: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H185: The number of activities controlled by the logistics function main effect is not a significant predictor of total benchmarking performance measurement.

H186: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H187: The interaction of number of activities controlled by the logistics function and channel position is not a significant predictor of total benchmarking performance measurement.

Table 16

H188: The title level of the senior logistics executive main effect is not a significant predictor of internal cost performance measurement.

H189: The channel position main effect is not a significant predictor of internal cost performance measurement.

H190: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of internal cost performance measurement.

H191: The title level of the senior logistics executive main effect is not a significant predictor of internal differentiation performance measurement.

H192: The channel position main effect is not a significant predictor of internal differentiation performance measurement.

H193: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of internal differentiation performance measurement.

H194: The title level of the senior logistics executive main effect is not a significant predictor of total internal performance measurement.

H195: The channel position main effect is not a significant predictor of total internal performance measurement.

H196: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of total internal performance measurement.

H197: The title level of the senior logistics executive main effect is not a significant predictor of cost benchmarking performance measurement.

H198: The channel position main effect is not a significant predictor of cost benchmarking performance measurement.

H199: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of cost benchmarking performance measurement.

H200: The title level of the senior logistics executive main effect is not a significant predictor of differentiation benchmarking performance measurement.

H201: The channel position main effect is not a significant predictor of differentiation benchmarking performance measurement.

H202: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of differentiation benchmarking performance measurement.

H203: The title level of the senior logistics executive main effect is not a significant predictor of total benchmarking performance measurement.

H204: The channel position main effect is not a significant predictor of total benchmarking performance measurement.

H205: The interaction of title level of the senior logistics executive and channel position is not a significant predictor of total benchmarking performance measurement.

Table 17

H206: The frequency of logistics strategic plan update and internal cost performance measurement are not related.

H207: The frequency of logistics strategic plan update and internal differentiation performance measurement are not related.

H208: The frequency of logistics strategic plan update and total internal performance measurement are not related.

H209: The number of years logistics has been a formal function and internal cost performance measurement are not related.

H210: The number of years logistics has been a formal function and internal differentiation performance measurement are not related.

H211: The number of years logistics has been a formal function and total internal performance measurement are not related.

H212: The number of times logistics has been reorganized and internal cost performance measurement are not related.

H213: The number of times logistics has been reorganized and internal differentiation performance measurement are not related.

H214: The number of times logistics has been reorganized and total internal performance measurement are not related.

H215: Participation in strategic planning by the senior logistics executive and internal cost performance measurement are not related.

H216: Participation in strategic planning by the senior logistics executive and internal differentiation performance measurement are not related.

H217: Participation in strategic planning by the senior logistics executive and total internal performance measurement are not related.

H218: The number of activities controlled by the logistics function and internal cost performance measurement are not related.

H219: The number of activities controlled by the logistics function and internal differentiation performance measurement are not related.

H220: The number of activities controlled by the logistics function and total internal performance measurement are not related.

H221: The title level of the senior logistics executive and internal cost performance measurement are not related.

H222: The title level of the senior logistics executive and internal differentiation performance measurement are not related.

H223: The title level of the senior logistics executive and total internal performance measurement are not related.

H224: The frequency of logistics strategic plan update and cost benchmarking performance measurement are not related.

H225: The frequency of logistics strategic plan update and differentiation benchmarking performance measurement are not related.

H226: The frequency of logistics strategic plan update and total benchmarking performance measurement are not related.

H227: The number of years logistics has been a formal function and cost benchmarking performance measurement are not related.

H228: The number of years logistics has been a formal function and differentiation benchmarking performance measurement are not related.

H229: The number of years logistics has been a formal function and total benchmarking performance measurement are not related.

H230: The number of times logistics has been reorganized and cost benchmarking performance measurement are not related.

H231: The number of times logistics has been reorganized and differentiation benchmarking performance measurement are not related.

H232: The number of times logistics has been reorganized and total benchmarking performance measurement are not related.

H233: Participation in strategic planning by the senior logistics executive and cost benchmarking performance measurement are not related.

H234: Participation in strategic planning by the senior logistics executive and differentiation benchmarking performance measurement are not related.

H235: Participation in strategic planning by the senior logistics executive and total benchmarking performance measurement are not related.

H236: The number of activities controlled by the logistics function and cost benchmarking performance measurement are not related.

H237: The number of activities controlled by the logistics function and differentiation benchmarking performance measurement are not related.

H238: The number of activities controlled by the logistics function and total benchmarking performance measurement are not related.

H239: The title level of the senior logistics executive and cost benchmarking performance measurement are not related.

H240: The title level of the senior logistics executive and differentiation benchmarking performance measurement are not related.

H241: The title level of the senior logistics executive and total benchmarking performance measurement are not related.

Table 18

H242: No difference exists in mean internal cost performance measurement between organizations with versus without a logistics mission statement.

H243: No difference exists in mean internal differentiation performance measurement between organizations with versus without a logistics mission statement.

H244: No difference exists in mean total internal performance measurement between organizations with versus without a logistics mission statement.

H245: No difference exists in mean cost benchmarking performance measurement between organizations with versus without a logistics mission statement.

H246: No difference exists in mean differentiation benchmarking performance measurement between organizations with versus without a logistics mission statement.

H247: No difference exists in mean total benchmarking performance measurement between organizations with versus without a logistics mission statement.

H248: No difference exists in mean internal cost performance measurement between organizations with versus without a logistics strategic plan.

H249: No difference exists in mean internal differentiation performance measurement between organizations with versus without a logistics strategic plan.

H250: No difference exists in mean total internal performance measurement between organizations with versus without a logistics strategic plan.

H251: No difference exists in mean cost benchmarking performance measurement between organizations with versus without a logistics strategic plan.

H252: No difference exists in mean differentiation benchmarking performance measurement between organizations with versus without a logistics strategic plan.

H253: No difference exists in mean total benchmarking performance measurement between organizations with versus without a logistics strategic plan.

H254: No difference exists in mean internal cost performance measurement between organizations with logistics controlling versus not controlling customer service.

H255: No difference exists in mean internal differentiation performance measurement between organizations with logistics controlling versus not controlling customer service.

H256: No difference exists in mean total internal performance measurement between organizations with logistics controlling versus not controlling customer service.

H257: No difference exists in mean cost benchmarking performance measurement between organizations with logistics controlling versus not controlling customer service.

H258: No difference exists in mean differentiation benchmarking performance measurement between organizations with logistics controlling versus not controlling customer service.

H259: No difference exists in mean total benchmarking performance measurement between organizations with logistics controlling versus not controlling customer service.

H260: No difference exists in mean internal cost performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

H261: No difference exists in mean internal differentiation performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

H262: No difference exists in mean total internal performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

H263: No difference exists in mean cost benchmarking performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

H264: No difference exists in mean differentiation benchmarking performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

H265: No difference exists in mean total benchmarking performance measurement between organizations with logistics controlling versus not controlling logistics systems planning.

Table 20

H266: No difference exists in mean internal cost performance measurement between manufacturers with versus without a logistics mission statement.

H267: No difference exists in mean internal differentiation performance measurement between manufacturers with versus without a logistics mission statement.

H268: No difference exists in mean total internal performance measurement between manufacturers with versus without a logistics mission statement.

H269: No difference exists in mean cost benchmarking performance measurement between manufacturers with versus without a logistics mission statement.

H270: No difference exists in mean differentiation benchmarking performance measurement between manufacturers with versus without a logistics mission statement.

H271: No difference exists in mean total benchmarking performance measurement between manufacturers with versus without a logistics mission statement.

H272: No difference exists in mean internal cost performance measurement between wholesalers with versus without a logistics mission statement.

H273: No difference exists in mean internal differentiation performance measurement between wholesalers with versus without a logistics mission statement.

H274: No difference exists in mean total internal performance measurement between wholesalers with versus without a logistics mission statement.

H275: No difference exists in mean cost benchmarking performance measurement between wholesalers with versus without a logistics mission statement.

H276: No difference exists in mean differentiation benchmarking performance measurement between wholesalers with versus without a logistics mission statement.

H277: No difference exists in mean total benchmarking performance measurement between wholesalers with versus without a logistics mission statement.

H278: No difference exists in mean internal cost performance measurement between retailers with versus without a logistics mission statement.

H279: No difference exists in mean internal differentiation performance measurement between retailers with versus without a logistics mission statement.

H280: No difference exists in mean total internal performance measurement between retailers with versus without a logistics mission statement.

H281: No difference exists in mean cost benchmarking performance measurement between retailers with versus without a logistics mission statement.

H282: No difference exists in mean differentiation benchmarking performance measurement between retailers with versus without a logistics mission statement.

H283: No difference exists in mean total benchmarking performance measurement between retailers with versus without a logistics mission statement.

Table 21

H284: No difference exists in mean internal cost performance measurement between manufacturers with versus without a logistics strategic plan.

H285: No difference exists in mean internal differentiation performance measurement between manufacturers with versus without a logistics strategic plan.

H286: No difference exists in mean total internal performance measurement between manufacturers with versus without a logistics strategic plan.

H287: No difference exists in mean cost benchmarking performance measurement between manufacturers with versus without a logistics strategic plan.

H288: No difference exists in mean differentiation benchmarking performance measurement between manufacturers with versus without a logistics strategic plan.

H289: No difference exists in mean total benchmarking performance measurement between manufacturers with versus without a logistics strategic plan.

H290: No difference exists in mean internal cost performance measurement between wholesalers with versus without a logistics strategic plan.

H291: No difference exists in mean internal differentiation performance measurement between wholesalers with versus without a logistics strategic plan.

H292: No difference exists in mean total internal performance measurement between wholesalers with versus without a logistics strategic plan.

H293: No difference exists in mean cost benchmarking performance measurement between wholesalers with versus without a logistics strategic plan.

H294: No difference exists in mean differentiation benchmarking performance measurement between wholesalers with versus without a logistics strategic plan.

H295: No difference exists in mean total benchmarking performance measurement between wholesalers with versus without a logistics strategic plan.

H296: No difference exists in mean internal cost performance measurement between retailers with versus without a logistics strategic plan.

H297: No difference exists in mean internal differentiation performance measurement between retailers with versus without a logistics strategic plan.

H298: No difference exists in mean total internal performance measurement between retailers with versus without a logistics strategic plan.

H299: No difference exists in mean cost benchmarking performance measurement between retailers with versus without a logistics strategic plan.

H300: No difference exists in mean differentiation benchmarking performance measurement between retailers with versus without a logistics strategic plan.

H301: No difference exists in mean total benchmarking performance measurement between retailers with versus without a logistics strategic plan.

Table 22

H302: No difference exists in mean internal cost performance measurement between manufacturers with versus without logistics controlling customer service.

H303: No difference exists in mean internal differentiation performance measurement between manufacturers with versus without logistics controlling customer service.

H304: No difference exists in mean total internal performance measurement between manufacturers with versus without logistics controlling customer service.

H305: No difference exists in mean cost benchmarking performance measurement between manufacturers with versus without logistics controlling customer service.

H306: No difference exists in mean differentiation benchmarking performance measurement between manufacturers with versus without logistics controlling customer service.

H307: No difference exists in mean total benchmarking performance measurement between manufacturers with versus without logistics controlling customer service.

H308: No difference exists in mean internal cost performance measurement between wholesalers with versus without logistics controlling customer service.

H309: No difference exists in mean internal differentiation performance measurement between wholesalers with versus without logistics controlling customer service.

H310: No difference exists in mean total internal performance measurement between wholesalers with versus without logistics controlling customer service.

H311: No difference exists in mean cost benchmarking performance measurement between wholesalers with versus without logistics controlling customer service.

H312: No difference exists in mean differentiation benchmarking performance measurement between wholesalers with versus without logistics controlling customer service.

H313: No difference exists in mean total benchmarking performance measurement between wholesalers with versus without logistics controlling customer service.

H314: No difference exists in mean internal cost performance measurement between retailers with versus without logistics controlling customer service.

H315: No difference exists in mean internal differentiation performance measurement between retailers with versus without logistics controlling customer service.

H316: No difference exists in mean total internal performance measurement between retailers with versus without logistics controlling customer service.

H317: No difference exists in mean cost benchmarking performance measurement between retailers with versus without logistics controlling customer service.

H318: No difference exists in mean differentiation benchmarking performance measurement between retailers with versus without logistics controlling customer service.

H319: No difference exists in mean total benchmarking performance measurement between retailers with versus without logistics controlling customer service.

Table 23

H320: No difference exists in mean internal cost performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H321: No difference exists in mean internal differentiation performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H322: No difference exists in mean total internal performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H323: No difference exists in mean cost benchmarking performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H324: No difference exists in mean differentiation benchmarking performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H325: No difference exists in mean total benchmarking performance measurement between manufacturers with versus without logistics controlling logistics systems planning.

H326: No difference exists in mean internal cost performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H327: No difference exists in mean internal differentiation performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H328: No difference exists in mean total internal performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H329: No difference exists in mean cost benchmarking performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H330: No difference exists in mean differentiation benchmarking performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H331: No difference exists in mean total benchmarking performance measurement between wholesalers with versus without logistics controlling logistics systems planning.

H332: No difference exists in mean internal cost performance measurement between retailers with versus without logistics controlling logistics systems planning.

H333: No difference exists in mean internal differentiation performance measurement between retailers with versus without logistics controlling logistics systems planning.

H334: No difference exists in mean total internal performance measurement between retailers with versus without logistics controlling logistics systems planning.

H335: No difference exists in mean cost benchmarking performance measurement between retailers with versus without logistics controlling logistics systems planning.

H336: No difference exists in mean differentiation benchmarking performance measurement between retailers with versus without logistics controlling logistics systems planning.

H337: No difference exists in mean total benchmarking performance measurement between retailers with versus without logistics controlling logistics systems planning.

Table 24

H338: The frequency of logistics strategic plan update and internal cost performance measurement are not related among manufacturers.

H339: The frequency of logistics strategic plan update and internal differentiation performance measurement are not related among manufacturers.

H340: The frequency of logistics strategic plan update and total internal performance measurement are not related among manufacturers.

H341: The number of years logistics has been a formal function and internal cost performance measurement are not related among manufacturers.

H342: The number of years logistics has been a formal function and internal differentiation performance measurement are not related among manufacturers.

H343: The number of years logistics has been a formal function and total internal performance measurement are not related among manufacturers.

H344: The number of times logistics has been reorganized and internal cost performance measurement are not related among manufacturers.

H345: The number of times logistics has been reorganized and internal differentiation performance measurement are not related among manufacturers.

H346: The number of times logistics has been reorganized and total internal performance measurement are not related among manufacturers.

H347: Participation in strategic planning by the senior logistics executive and internal cost performance measurement are not related among manufacturers.

H348: Participation in strategic planning by the senior logistics executive and internal differentiation performance measurement are not related among manufacturers.

H349: Participation in strategic planning by the senior logistics executive and total internal performance measurement are not related among manufacturers.

H350: The number of activities controlled by the logistics function and internal cost performance measurement are not related among manufacturers.

H351: The number of activities controlled by the logistics function and internal differentiation performance measurement are not related among manufacturers.

H352: The number of activities controlled by the logistics function and total internal performance measurement are not related among manufacturers.

H353: The title level of the senior logistics executive and internal cost performance measurement are not related among manufacturers.

H354: The title level of the senior logistics executive and internal differentiation performance measurement are not related among manufacturers.

H355: The title level of the senior logistics executive and total internal performance measurement are not related among manufacturers.

H356: The frequency of logistics strategic plan update and cost benchmarking performance measurement are not related among manufacturers.

H357: The frequency of logistics strategic plan update and differentiation benchmarking performance measurement are not related among manufacturers.

H358: The frequency of logistics strategic plan update and total benchmarking performance measurement are not related among manufacturers.

H359: The number of years logistics has been a formal function and cost benchmarking performance measurement are not related among manufacturers.

H360: The number of years logistics has been a formal function and differentiation benchmarking performance measurement are not related among manufacturers.

H361: The number of years logistics has been a formal function and total benchmarking performance measurement are not related among manufacturers.

H362: The number of times logistics has been reorganized and cost benchmarking performance measurement are not related among manufacturers.

H363: The number of times logistics has been reorganized and differentiation benchmarking performance measurement are not related among manufacturers.

H364: The number of times logistics has been reorganized and total benchmarking performance measurement are not related among manufacturers.

H365: Participation in strategic planning by the senior logistics executive and cost benchmarking performance measurement are not related among manufacturers.

H366: Participation in strategic planning by the senior logistics executive and differentiation benchmarking performance measurement are not related among manufacturers.

H367: Participation in strategic planning by the senior logistics executive and total benchmarking performance measurement are not related among manufacturers.

H368: The number of activities controlled by the logistics function and cost benchmarking performance measurement are not related among manufacturers.

H369: The number of activities controlled by the logistics function and differentiation benchmarking performance measurement are not related among manufacturers.

H370: The number of activities controlled by the logistics function and total benchmarking performance measurement are not related among manufacturers.

H371: The title level of the senior logistics executive and cost benchmarking performance measurement are not related among manufacturers.

H372: The title level of the senior logistics executive and differentiation benchmarking performance measurement are not related among manufacturers.

H373: The title level of the senior logistics executive and total benchmarking performance measurement are not related among manufacturers.

Table 25

H374: The frequency of logistics strategic plan update and internal cost performance measurement are not related among wholesalers.

H375: The frequency of logistics strategic plan update and internal differentiation performance measurement are not related among wholesalers.

H376: The frequency of logistics strategic plan update and total internal performance measurement are not related among wholesalers.

H377: The number of years logistics has been a formal function and internal cost performance measurement are not related among wholesalers.

H378: The number of years logistics has been a formal function and internal differentiation performance measurement are not related among wholesalers.

H379: The number of years logistics has been a formal function and total internal performance measurement are not related among wholesalers.

H380: The number of times logistics has been reorganized and internal cost performance measurement are not related among wholesalers.

H381: The number of times logistics has been reorganized and internal differentiation performance measurement are not related among wholesalers.

H382: The number of times logistics has been reorganized and total internal performance measurement are not related among wholesalers.

H383: Participation in strategic planning by the senior logistics executive and internal cost performance measurement are not related among wholesalers.

H384: Participation in strategic planning by the senior logistics executive and internal differentiation performance measurement are not related among wholesalers.

H385: Participation in strategic planning by the senior logistics executive and total internal performance measurement are not related among wholesalers.

H386: The number of activities controlled by the logistics function and internal cost performance measurement are not related among wholesalers.

H387: The number of activities controlled by the logistics function and internal differentiation performance measurement are not related among wholesalers.

H388: The number of activities controlled by the logistics function and total internal performance measurement are not related among wholesalers.

H389: The title level of the senior logistics executive and internal cost performance measurement are not related among wholesalers.

H390: The title level of the senior logistics executive and internal differentiation performance measurement are not related among wholesalers.

H391: The title level of the senior logistics executive and total internal performance measurement are not related among wholesalers.

H392: The frequency of logistics strategic plan update and cost benchmarking performance measurement are not related among wholesalers.

H393: The frequency of logistics strategic plan update and differentiation benchmarking performance measurement are not related among wholesalers.

H394: The frequency of logistics strategic plan update and total benchmarking performance measurement are not related among wholesalers.

H395: The number of years logistics has been a formal function and cost benchmarking performance measurement are not related among wholesalers.

H396: The number of years logistics has been a formal function and differentiation benchmarking performance measurement are not related among wholesalers.

H397: The number of years logistics has been a formal function and total benchmarking performance measurement are not related among wholesalers.

H398: The number of times logistics has been reorganized and cost benchmarking performance measurement are not related among wholesalers.

H399: The number of times logistics has been reorganized and differentiation benchmarking performance measurement are not related among wholesalers.

H400: The number of times logistics has been reorganized and total benchmarking performance measurement are not related among wholesalers.

H401: Participation in strategic planning by the senior logistics executive and cost benchmarking performance measurement are not related among wholesalers.

H402: Participation in strategic planning by the senior logistics executive and differentiation benchmarking performance measurement are not related among wholesalers.

H403: Participation in strategic planning by the senior logistics executive and total benchmarking performance measurement are not related among wholesalers.

H404: The number of activities controlled by the logistics function and cost benchmarking performance measurement are not related among wholesalers.

H405: The number of activities controlled by the logistics function and differentiation benchmarking performance measurement are not related among wholesalers.

H406: The number of activities controlled by the logistics function and total benchmarking performance measurement are not related among wholesalers.

H407: The title level of the senior logistics executive and cost benchmarking performance measurement are not related among wholesalers.

H408: The title level of the senior logistics executive and differentiation benchmarking performance measurement are not related among wholesalers.

H409: The title level of the senior logistics executive and total benchmarking performance measurement are not related among wholesalers.

Table 26

H410: The frequency of logistics strategic plan update and internal cost performance measurement are not related among retailers.

H411: The frequency of logistics strategic plan update and internal differentiation performance measurement are not related among retailers.

H412: The frequency of logistics strategic plan update and total internal performance measurement are not related among retailers.

H413: The number of years logistics has been a formal function and internal cost performance measurement are not related among retailers.

H414: The number of years logistics has been a formal function and internal differentiation performance measurement are not related among retailers.

H415: The number of years logistics has been a formal function and total internal performance measurement are not related among retailers.

H416: The number of times logistics has been reorganized and internal cost performance measurement are not related among retailers.

H417: The number of times logistics has been reorganized and internal differentiation performance measurement are not related among retailers.

H418: The number of times logistics has been reorganized and total internal performance measurement are not related among retailers.

H419: Participation in strategic planning by the senior logistics executive and internal cost performance measurement are not related among retailers.

H420: Participation in strategic planning by the senior logistics executive and internal differentiation performance measurement are not related among retailers.

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H422: The number of activities controlled by the logistics function and internal cost performance measurement are not related among retailers.

H423: The number of activities controlled by the logistics function and internal differentiation performance measurement are not related among retailers.

H424: The number of activities controlled by the logistics function and total internal performance measurement are not related among retailers.

H425: The title level of the senior logistics executive and internal cost performance measurement are not related among retailers.

H426: The title level of the senior logistics executive and internal differentiation performance measurement are not related among retailers.

H427: The title level of the senior logistics executive and total internal performance measurement are not related among retailers.

H428: The frequency of logistics strategic plan update and cost benchmarking performance measurement are not related among retailers.

H429: The frequency of logistics strategic plan update and differentiation benchmarking performance measurement are not related among retailers.

H430: The frequency of logistics strategic plan update and total benchmarking performance measurement are not related among retailers.

H431: The number of years logistics has been a formal function and cost benchmarking performance measurement are not related among retailers.

H432: The number of years logistics has been a formal function and differentiation benchmarking performance measurement are not related among retailers.

H433: The number of years logistics has been a formal function and total benchmarking performance measurement are not related among retailers.

H434: The number of times logistics has been reorganized and cost benchmarking performance measurement are not related among retailers.

H435: The number of times logistics has been reorganized and differentiation benchmarking performance measurement are not related among retailers.

H436: The number of times logistics has been reorganized and total benchmarking performance measurement are not related among retailers.

H437: Participation in strategic planning by the senior logistics executive and cost benchmarking performance measurement are not related among retailers.

H438: Participation in strategic planning by the senior logistics executive and differentiation benchmarking performance measurement are not related among retailers.

H439: Participation in strategic planning by the senior logistics executive and total benchmarking performance measurement are not related among retailers.

H440: The number of activities controlled by the logistics function and cost benchmarking performance measurement are not related among retailers.

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H443: The title level of the senior logistics executive and cost benchmarking performance measurement are not related among retailers.

H444: The title level of the senior logistics executive and differentiation benchmarking performance measurement are not related among retailers.

H445: The title level of the senior logistics executive and total benchmarking performance measurement are not related among retailers.

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