To the Graduate Council:

I am submitting herewith a dissertation written by Harry Lee Sink entitled "An Empirical Analysis of Industrial Buyer Behavior and Benefit Based Segmentation in the Third Party Logistics Market." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Business Administration.

C. John Langley, Jr., Major Professor

We have read this dissertation
and recommend its acceptance:

Accepted for the Council:

Associate Vice Chancellor
and Dean of The Graduate School

An Empirical Analysis of Industrial Buyer Behavior and Benefit Based Segmentation in the Third Party Logistics Market

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

Harry Lee Sink
August 1995

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DEDICATION

This dissertation is dedicated to my wife

Sarah Ussery Sink

whose love, devotion and encouragement sustain my life.

ACKNOWLEDGMENTS

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ABSTRACT

A new market for distribution related service has recently been created in the United States. Industrial buyers are increasingly replacing proprietary logistical support with the external acquisition of integrated services. These services are often provided and managed by a single supplier under a long-term contract. The rapid growth of this new market has spurred considerable interest in the buying and selling of third party logistics services. This research represents an effort to empirically examine the process used by organizational buyers to select third party logistics providers and the feasibility of benefit based customer segmentation in this market.

A triangulated research methodology was employed to investigate the purchasing process used by private sector manufacturers, distributors and retailers to select third party logistics suppliers. The study was also designed to determine the third party logistics benefits desired by organizational buyers. Data was gathered via a focus group, field case studies and a nationwide mail study. It was statistically analyzed using factor analysis and Ward's minimum-variance method of cluster analysis. The data was examined to:

- Develop a descriptive framework of the third party logistics purchasing process.
- Provide a methodology for customer segmentation from the buyer's perspective, i.e., based on service attributes rather than demographic indices.

The findings reveal that supplier selection is the result of a multiple-step process beginning with need recognition and culminating in ongoing supplier assessment.

Evaluation of the process indicates that solution development represents the most complex phase of the decision and secondary information sources are highly valued by potential purchasers.

Factor analysis of supplier selection data revealed third party logistics buyers desire benefits resulting from economy, reliability, and service synergy. Cluster analysis of industrial buyers identified two major and two minor market segments. Both of the major segments were noted to highly value economy and reliability; however, buyers were differentiated by the degree to which they required synergistic benefits from logistics outsourcing. The two minor customer segments were found to be sub-segments of the major group requiring synergistic benefits. They were noted to base supplier choice on a limited number of highly specific criteria.

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CHAPTER I

INTRODUCTION

Background

Current competitive conditions are forcing many firms to revise their priorities and focus resources on a few key activities. Products or services that provide unique marketplace differentiation and represent the basis of competitive advantage continue to be owned by the firm. Rightly so, these are critical to success or failure. However, by subcontracting the provision of non-core items or functions to external suppliers, management can leverage its resources, spread its risk, and concentrate on issues critical to survival and potential growth. Non-core activities have been described as critical dependencies, i.e., ". . . functions that are important to the smooth running of the business, but not a unique ingredient of the overall product."[1]

Companies have long used outside providers to help them with accounting, tax, management information systems, and auxiliary services such as cafeteria management and security. However, many non-core services traditionally provided in-house are increasingly being outsourced to third party suppliers. This shift in management strategy bodes well for firms that are aligning themselves with appropriate external suppliers. Providers of these outside services can help improve margins, reduce investment in fixed assets, improve quality, and provide quick access to functional expertise and current technology. However, disadvantages, such as increased administrative costs, insecurities in the work place and conflicting objectives between purchaser and provider, await those who unwisely select an external supplier.[2]

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1 Gillett, J., "The Cost-Benefit of Outsourcing: Assessing the True Cost of Your Outsourcing Strategy," *European Journal of Purchasing and Supply Management*, Vol. 1, No. 1, 1994, p. 45.

2 Dole, D. and L. Pinkard, "The Outsourcing Source Book," *Journal Of Business Strategy*, Vol. 18, No. 2, 1992, pp. 52-53.

Logistics is not deemed to be a core competency in many firms. Most in-house logistics activities do not directly produce revenue and capital or other critical corporate resources are often difficult to obtain for these functions. Further, the provision of proprietary logistical support is increasingly found too inflexible and antiquated in today's re-engineered and rationalized marketing channels.

The external provision of logistics services, also known as contract or third party logistics, is part of a trend to outsource non-core activities. While there is no universally accepted definition of contract logistics, several experts in the field consider it ". . . a process whereby the shipper and the third party(ies) enter into an agreement for specific services at specific costs over some identifiable time horizon."[3] Many of these agreements involve a sharing of risks and rewards and constitute strategic partnerships or alliances. These business agreements are considered ". . . a type of logistics channel relationship where the intent of the relationship is to yield differentiated and intermediate or long- term benefits to the parties involved in the relationship."[4]

A limited amount of logistics outsourcing has always occurred via the use of public warehousing and contract trucking. However, the scope of services offered and purchased today is unparalleled. While the idea is considered new in the United States, it is viewed by some as a mature management practice in Europe.[5]

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3 LaLonde, B. and M. Cooper, *Partnerships in Providing Customer Service: A Third-Party Perspective*, Council of Logistics Management, Oak Brook, IL, 1989, p. 5.

4 Ibid., p. 5.

5 Gooley, T.B., "To Outsource or Not to Outsource," *Traffic Management*, Vol. 31, No. 12, 1992, pp. 83A-88A.

The impetus for subcontracting logistics is multi-faceted. Changes in the transportation regulatory environment have prompted sustained rigorous competition and breakthrough service innovations. The recent economic recession has flattened management organizations and forced a reevaluation of business processes. Relaxed trade barriers, global sourcing and distribution have become more prevalent and fostered a need for advanced logistical expertise. Also, rapid technological advancement has rendered many existing logistics systems inadequate. However, the primary reason for logistics outsourcing can be summed up as a need for reduced operating cost coupled with a simultaneous need for improved customer service.[6]

Two types of logistics outsourcing appear to be occurring in the U.S. today. The first involves the limited acquisition of tactical services with strategic functions remaining inside the purchasing firm. Services usually outsourced under this scenario are those requiring large capital investments or representing labor intensive activities. Examples include contract transportation service, fleet management and warehouse pick and pack labor. The second type of logistics outsourcing is the procurement of an integrated or bundled logistics service package under the management of a single provider. These arrangements often include responsibility for all logistics services, e.g., transportation, warehousing, inventory management, order processing, logistics information management, customer service, etc.[7]

As a result of the environmental, organizational and marketplace changes indicated above, the evaluation and purchase of third party logistics services have become more prevalent and further demand is anticipated for these services. Recent estimates of the third party logistics

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6 Aertsen, F., "Contracting out the Physical Distribution Function: A Trade-off between Asset Specificity and Performance Measurement," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 1, 1992, pp. 23-29.

7 Vail, B., "Are You Really Outsourcing," *American Shipper*, November, 1993, pp. 52-56.

market in the United States place the current value of these services at ten billion dollars.[8] This represents approximately three percent of the total U.S. market for transportation, warehousing and related support services. One noted industry observer expects the current penetration rate to grow to ten percent and result in a forty-seven to fifty billion dollar market within the next five years.[9]

The growth of logistics outsourcing is creating much interest among traditional and novice suppliers of distribution related services. Currently, several trade groups are establishing third party logistics professional associations.[10] The purposes of these organizations are the development of standards and ethics for providers and nationwide promotion of the third party logistics concept.

Contract logistics providers are attempting to offer customized services driven by customer needs and based on value. For example, Roadway Logistics Services has signed more than fifty contracts, including a broad range of services such as inventory management, warehousing, cross-docking, product assembly and logistics information systems, since the firm was formed in 1989.[11] The level of interest in contract logistics can be further gauged by corporate logistics managers' responses to a recent international survey concerning the use of these services. Forty-six percent of U.S. managers and seventy-eight percent of Western

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8 Delaney, R., *Contract Logistics Services: The Promises and the Pitfalls*, Cass Logistics, Inc., St. Louis, Missouri, 1993, p. 7.

9 Ibid., p.7.

10 For example see Knee, R., "3rd-party association still just an embryo," *American Shipper*, April 1993, pp. 44-48, _____, "Standards Set for Third-Party Vendors," *Distribution*, December 1993, p. 14, and "Partnership Logistics Promoted," *Distribution*, October 1993, p.14, and _____, "Brokers Aim to Join The (Third) Party," *Distribution*, October 1993, p. 12.

11 Perser, J., "Contract Logistics Providers Optimistic on Growth, but See Shakeout to Come," *Traffic World*, August 16, 1993, pp. 32.

European managers reported an extensive or moderate commitment to the use of third party logistics services.[12]

The Need for Third Party Logistics Market Research

The provision of logistical support is critical to most firms even though it may not be considered a core proprietary activity. However, a review of existing literature has not revealed a specific framework to assist industrial buyers in the evaluation or acquisition of these services. As obtaining services is one of purchasing's most challenging tasks,[13] there is a managerial need for a template to describe the third party logistics procurement process. Further, no attempt to segment this market for the benefit of suppliers is apparent in currently published literature. This highlights another managerial need as segmentation can aid the development and implementation of a successful marketing strategy.

The paucity of research concerning the buying and selling of industrial services is understandable. While the ultimate goal of any industrial purchasing effort is the acquisition of optimum value for the organization, the procurement of services is more complex and uncertain than the acquisition of products.[14] Much of the difficulty associated with acquiring services is attributable to the differences between products and services.

A primary difference between products and services is the inability to store services. This condition leads to quality assurance difficulties since it is often not possible to measure the delivery of a service until it is actually provided to the purchaser. Further, by the time the

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12 Lieb, R., R. Millen and L. Van Wassenhove, "Third Party Logistics Services: A Comparison of Experienced American and European Manufacturers," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 6, 1993, pp. 35-44.

13 Dobler, D., D. Burt and L. Lee, Jr., *Purchasing and Materials Management: Fifth Edition*, McGraw-Hill, Inc. New York, NY, 1990, p. 344.

14 Schonberger, Richard J., "Purchasing Intangibles," *International Journal of Purchasing and Materials Management*, Fall, 1980, p. 27.

service is delivered, it may be too late to do anything about the results. Other differences between products and services relate to tangibility and the nature of delivery.[15]

"Selecting the 'right' source is much more of an art when purchasing services than when purchasing materials."[16] Many problems regarding proper supplier selection in the procurement of services result from an inability of the competitive process to ensure an efficient market. As described by one noted procurement authority, the market for most services is constrained by the following three forces:

- The lack of a continuing or cumulative supply,
- The lack of interchangeable services due to the personal effort and involvement of suppliers, and
- The supply of services can be restricted or restrained more easily than the market for products.[17]

Despite procurement constraints, management will continue to demand third party logistics services to reduce capital outlays and operating expenses, improve customer service and gain access to world class technology. Providers will encourage the expansion of this market to broaden the potential for their own growth and improved profitability. These changes in business strategy provide a stimulus to study the buying process used by industrial organizations to acquire contract logistics services. The current environment also prompts an examination of the segmentation potential of the market from the buyer's perspective.

This dissertation represents a stand alone research effort investigating the purchase and sale of third party logistics services. It was conducted as part of a larger study on the third party

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15 Leenders, M., H. Fearon and W. England, *Purchasing and Materials Management: Tenth Edition*, Richard D. Irwin, Inc. Homewood, IL, 1993, pp. 597-602.

16 Dobler, et. al., Op. Cit., p. 346.

17 DeRose, L., "Not by Bids Alone," *Purchasing World*, November, 1985, p. 46.

logistics market completed by the Center for Logistics Research, Department of Marketing, Logistics and Transportation, The University of Tennessee, Knoxville. The general study and a portion of this dissertation were sponsored by Caterpillar Logistics Services, Inc. (CLS), a major supplier of contract logistics services.

Definition of Terms

In this study, third party logistics means the provision of multiple distribution related services, e.g., transportation, warehousing, logistics information systems, packaging, etc., for a specified period at an agreed upon price by an intermediary in a distribution channel. It is the use of a third party's assets and/or labor rather than resources currently residing in-house or those that could be utilized within the buying or selling organization. The decision to outsource logistics usually involves subcontracting the current provision of internally sourced services to an external supplier. However, it could also involve a decision to employ outside resources rather than initiate the provision of new services within the firm.

Benefit-based market segmentation refers to a behavioral method that results in an aggregation of buyers according to the particular advantage(s) derived from the purchase and use of a product or service. It is based on a comprehensive knowledge of why and how a consumer buys. Further, it can provide an analytical framework for making decisions on target market selection, product or service offerings, pricing strategies, and promotional policy.[18]

Problem Statement

While there is general agreement the United States economy is becoming more service oriented, much of the existing research in purchasing and marketing is directed toward buyer

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[18] Haley, R., "Benefit Segmentation: A Decision Oriented Tool," *Journal of Marketing*, Vol. 32, July 1968, pp. 30-35.

behavior concerning products. Also, there is an imbalance of effort focusing on consumer behavior at the expense of industrial or organizational applications.

Previous studies[19] in the logistics discipline have routinely limited themselves to a demographic overview of the existing contract logistics market and anecdotal reasons for logistics outsourcing. While recent research[20] has provided insight into the make versus buy decision concerning some logistics services, no effort has been made to study the process used by organizations to select third party logistics suppliers. Furthermore, no research has been conducted to empirically determine the benefits sought by third party logistics buyers or whether homogeneous buyer segments exist in this market.

Buyers and sellers of logistics services recently began to enter long-term (three to five years) contractual agreements. These agreements often involve the management of critical assets and products or services previously handled in an exclusively proprietary manner. Many of these contracts involve the sharing of business risks and rewards by all party to the contract. Thus, current practices in the marketing and acquisition of third party logistics services raise three primary dissertation research questions:

1. ***How do industrial buyers select third party logistics suppliers?***
2. ***What are the benefits sought by purchasers of third party logistics services?***
3. ***Can the third party logistics market be segmented into homogeneous groups of industrial buyers based on the benefits sought in the acquisition of sub-contracted services?***

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19 For example, see Sheffi, Y., "Third Party Logistics: Present and Future Prospects," *Journal of Business Logistics*, Vol. 11, No. 2 , 1990, pp. 27-39, Lieb, R., "The Use of Third-Party Logistics Services by Large American Manufacturers," *Journal of Business Logistics*, Vol. 13, No. 2, 1992, pp. 29-42, and LaLonde, B. and A. Maltz, "Some Propositions about Outsourcing the Logistics Function," *International Journal of Logistics Management*, Vol. 3, No. 1, 1992, pp. 1-11.

20 Maltz, A., *Outsourcing the Corporate Logistics Function: Economic and Strategic Considerations*, unpublished doctoral dissertation, The Ohio State University, 1992.

The primary research questions lead to the following secondary research questions:

1a. Who is included in the decision making unit?
1b. What sequence of events constitutes the decision making process?
1c. What type of information is most valuable in supplier selection?
1d. What are the most important supplier selection criteria?

2. Do acquisition benefits relate to price/value, information systems, supplier capability, provider capacity, flexibility, quality of service or other attributes?

3. Do third party logistics buyers differ in their valuation of desired benefits?

Responses to the primary and secondary research questions will address two salient areas of interest in this research. The first area concerns how firms go about identifying and screening potential suppliers, evaluating service offerings, and choosing a provider. This insight will enable identification of the variables, and their relationships, used in the procurement process. The knowledge gained in this endeavor will permit the construction of a descriptive process model for the purchase of contract logistics. This framework will aid buyers in their efforts to evaluate and select an external logistics supplier.

The second area of research interest relates to the likelihood of identifying buyer-oriented market segmentation variables. The identification of such variables can provide a non-traditional approach to segmentation based on the benefits derived from the procurement and use of third party logistics services. This will enable providers to develop market segment profiles based on causal factors rather than traditional descriptive factors. Further, third party logistics suppliers will be better able to formulate specific market segment service offerings, pricing methods, and promotional campaigns.

Objectives of the Research

The overall objectives of this dissertation are twofold, namely:

- To model industrial buying behavior in the purchase of third party logistics services, and
- To determine whether benefit based buyer segments exist in the third party logistics market

Since there has been limited evaluation of the process used to purchase strategic services, such as contract logistics, and no published research concerning benefit based segmentation of this market, the nature of this study is primarily descriptive and exploratory. An understanding of the purchasing methods used by industrial organizations is necessary to define the procurement process and reveal influential variables. Also, the identification of market segmentation variables based on utility is required to develop valid customer profiles and provide a basis for marketing strategy development.

Several considerations are necessary to realize the research objectives. First, an examination of the existing bodies of knowledge relating to strategic purchasing by organizations is necessary. Next, the use of an existing theoretical model or the development of a new framework is required. Further, the formation of a proper research design to adequately investigate the process must be devised. Finally, a technique to identify the benefit(s) desired by third party logistics buyers is essential.

The overall research objectives provide the structure required for an exploratory study of third party logistics supplier selection. Attainment of these objectives will add value to the current body of knowledge in industrial marketing, purchasing and logistics. An explanation of the research methodology, scope of the study, specific contributions and limitations are included in the next three sections of this chapter.

Research Methodology

The research design for this dissertation consists of several segments or phases; a triangulated method of discovery was utilized. Initially, a review of previous literature relating to strategic decision making, industrial marketing, transportation purchasing and supplier selection was necessary. This review assisted in identifying the constructs relevant to the third party logistics buying process and aided in the development of a process model for the

procurement of these services. The literature search also assisted in formulating a research design for the market segmentation portion of the dissertation.

A multi-step approach was used in the qualitative phase of the research, i.e., the abstract modeling of the third party logistics procurement process. Initially, a focus group was convened to provide an overview of current perceptions concerning contract logistics. The focus group consisted of an experienced moderator and eleven senior managers from a variety of functional areas representing diverse industrial firms. Each manager participating in the focus group had recently (within the last two years) served as a member of a decision making unit that evaluated or purchased third party logistics services for their firm. Candidates for the focus group were chosen primarily from the recommendations of the research sponsor (CLS) and the principal advisor to this dissertation, Dr. C. John Langley, Jr.

The question format used in the focus group was semi-structured. The moderator posed initial questions in the following areas:

- The definition of third party logistics
- The specific elements of contract logistics
- Useful sources of information
- Communication flow
- Provider marketing strategies
- The buying process, and
- Contractual relationships

The moderator also probed the group with follow-up questions to clarify and expand items of interest to this research. Finally, the moderator acted to maintain a balance of participation within the focus group.

Results of the focus group were used to devise a methodology and derive topics for a series of in-depth field case studies. Focus group conclusions also augmented the development of a theoretical model of the contract logistics buying process. Further, the focus group provided the perceptual overview necessary to design a detailed study of the purchasing and marketing of third party logistics services.

Case study candidate firms were also identified by the research sponsor and primary advisor. Five companies participated in the in-depth case studies. Each of the participating organizations had recently purchased contract logistics services or was in the process of evaluating potential suppliers at the time the case studies were conducted. All the organizations participating in the case studies used cross-functional buying teams to evaluate and select third party logistics providers.

The case study phase of the research provided insight into:

- The structure and composition of the decision making unit,
- The complexity of the procurement process,
- Vendor sourcing, screening and evaluation methods, and
- Key supplier selection criteria

The case studies also provided detailed information concerning external environmental factors and the degree of intra-firm interaction involved in the purchase of strategic operating services.

The results of the focus group interview and field case studies provided data for the formulation of a theoretical process model for the procurement of contract logistics. The case studies also served to assist in the development of a mail questionnaire used in a comprehensive, cross-industry survey of third party logistics users conducted during the third phase of the research.

As the provision of third party logistics represents a new industry in the U.S., a source of users had to be developed for the mail survey. A likely population of existing and potential third party logistics users was developed from three sources. Initially, a literature review of widely read logistics trade journals, e.g., *Distribution*, *Traffic Management*, *Transportation and Distribution*, etc., was completed to identify companies reportedly using third party logistics services. This review encompassed a two year period beginning July 1992. Further, promotional brochures from contract logistics providers were investigated to identify firms listed

as current customers. Finally, members of the Council of Logistics Management (CLM) representing manufacturing firms, distributors and retailers constituted the third source of potential survey respondents.

Responses to the mail questionnaire assisted in characterizing the third party logistics market and provided data for a factor analytic determination of benefits resulting from the purchase of third party logistics services. The determinants of these benefits were used as input to a cluster analysis algorithm to derive third party logistics market segments. A demographic comparison of the buyers forming each market segment provided a traditional method of identifying segment members. A graphical representation of the entire research process is presented in **Figure 1.1**.

Contributions of the Research

The intent of this study was to contribute to three areas of interest: 1) the buying and selling of strategic services, 2) the provision of a methodology for third party logistics supplier selection, and 3) the identification of behavioral based market segments for sellers of contract logistics services. The value of the contribution is outlined below.

Third party logistics suppliers need to know how to make optimum use of the elements of the marketing mix, i.e., promotional activities, market offerings, pricing, and the delivery of services. "It is commonly agreed that [an] understanding of buyer behavior and market characteristics are prerequisites to the development of a comprehensive marketing strategy. . . [Further] . . . market segmentation plays a pivotal role in strategy formulation."[21] To effectively structure marketing strategy, providers need a framework that will adequately describe the factors influencing third party logistics buyers and the variables that are critical to selection.

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[21] Cox, William E. Jr., *Industrial Marketing Research*, John Wiley and Sons, Inc., New York, NY, 1979, pp. 436-437.

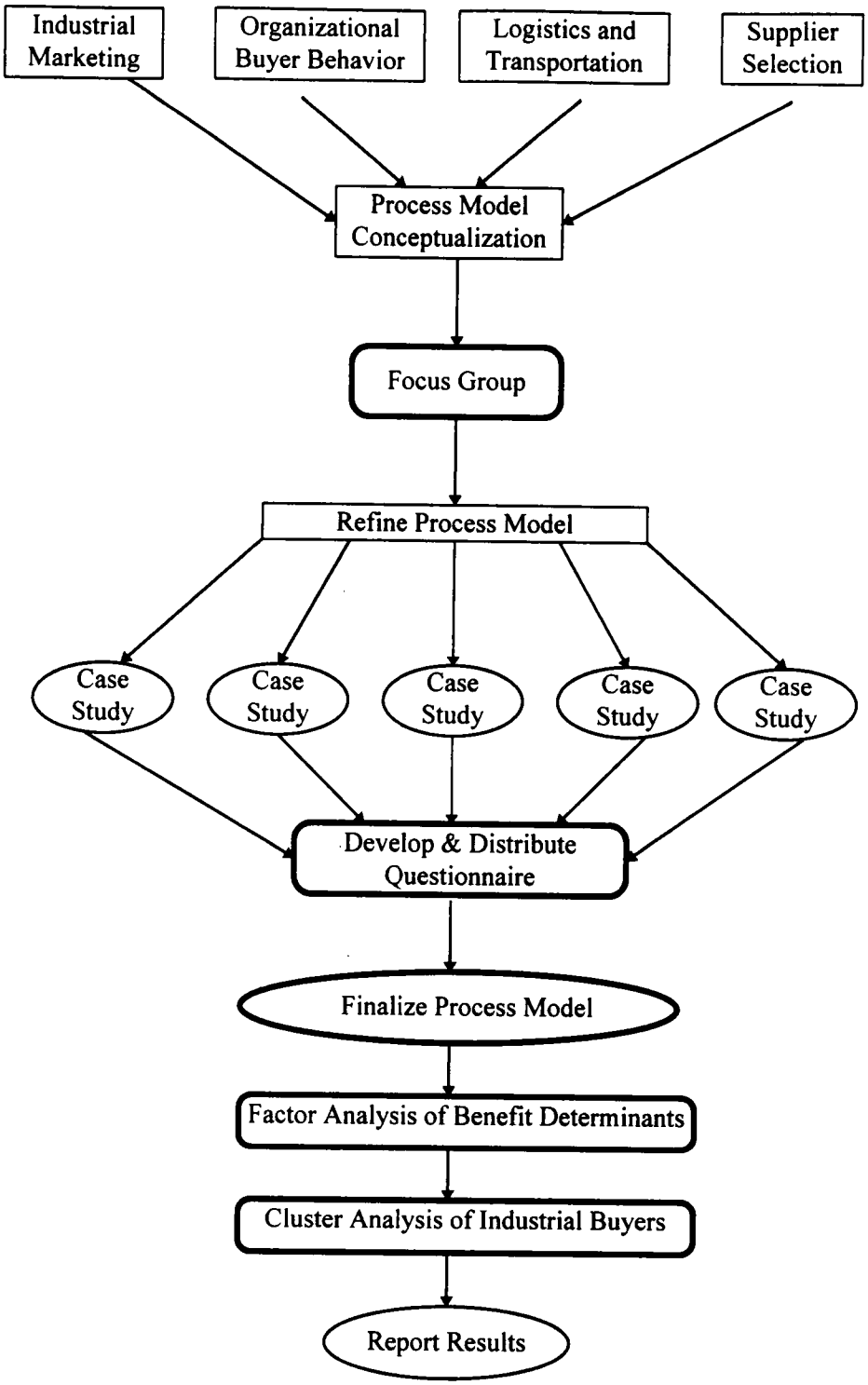


Figure 1.1. Research Design Flowchart

Potential purchasers of third party logistics services need to be aware of the process used by others who have previously completed an evaluation and/or purchase of contract logistics services. The insight provided from the experiences of others in a similar decision can reduce risk and provide structure to a potentially chaotic undertaking.

Organizations currently acquiring third party logistics services are routinely entering long-term (three to five years and more) contractual agreements. Assuming logistics can provide differentiation in the marketplace and contribute to customer value, these relationships become vital to both buyer and seller. Firms purchasing contract logistics services must recognize the goals and priorities of the provider(s) they select. In effect, these outside suppliers become part of the buyer's management and labor team, once the agreement is enacted and service begins.

The purchasing organization must seek to align its vested interests with those of the selected third party logistics provider. This is a new concept for many buyers. It requires an understanding of mutual dependence and brings on a host of unique problems. For example, the decision making protocols used in the procurement process must anticipate and provide for the new communication, administration, and performance monitoring requirements inherent in these types of relationships.

The proper selection of a third party logistics supplier can provide a level of flexibility, efficiency, and effectiveness previously unobtainable in-house. The core business of a third party logistics supplier is logistics. Its revenue and profit come from the successful provision of these services. Therefore, the outside firm is more likely to commit to world class performance than an internal cost center delivering the same services. It is critical for organizational buyers to determine if a potential third party logistics supplier can perform the job better that the status quo. A cross-industry study of the procurement process, as conducted herein, provides a practical method for making this decision.

Logistics outsourcing is not without its problems and the organizational decision making unit must plan for these problems during the procurement process. Some areas for potential conflict are communication and relationship management, unrest resulting from a change in the corporate culture and the introduction of insecurity into the work place. Further, the personal political ramifications of an unwise choice in a purchase of this type can be severe, given the widespread repercussions of a failure to provide timely logistical services. Potential purchasers need to be advised of the pitfalls and perils of improper or inadequate acquisition methods.

Educators in the field of buyer behavior and logistics management can benefit from a better understanding of how contract logistics services are obtained and the marketing strategies used by current providers. It is apparent from the structural business changes driving this new industry that the purchase of third party logistics services does not represent a passing fad. Many future logisticians will likely be employed by true logistics firms. This is a significant change in the field and educators must prepare students for these new challenges.

An empirical determination of behavioral based segmentation variables for the third party logistics market adds value to the marketing discipline by providing an in-depth perspective of the benefits derived from the use of strategic services. To-date, little work has been offered in this type industrial research and more study has been called for in the literature.[22] Currently, contract logistics providers appear to be treating buyers in this new market as homogeneous. Is this a valid assumption? What are the appropriate segmentation bases? Which type of supplier is most likely to be adept at servicing the meaningful sub-markets revealed? Empirical research into the procurement of third party logistics can answer these and the other previously raised study questions.

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[22] Bonoma, T. and B. Shapiro, *Segmenting the Industrial Market*, D. C. Heath and Company, Lexington, MA, 1983, p. 66.

Limitations of the Research

Several constraints are apparent in research involving a purchasing decision made by a multi-person decision making unit in an industrial setting. First, the difficulty of obtaining insight from all participants to fully characterize the procurement process is a challenge. Next, the lack of an efficient methodology to obtain behavioral based data on the purchasing process, amenable to market segmentation analysis, is a problem. Finally, the cost of this type of research can be restrictive.

The ability to generalize findings from this research is constrained by the mail study method selected. Since respondents were not restricted to specific industries, firm size or the type(s) of third party logistics services purchased, conclusions from the research are limited in their ability to specifically characterize the process employed by a particular type of decision making unit. Further, judgment was used to develop the population of third party logistics users polled in the mail survey. This was done to enhance the probability of obtaining the requisite information from respondents with knowledge concerning the purchasing process and benefits resulting from the acquisition of third party logistics services. However, it is highly likely that additional third party logistics users were not included in the mail study since they did not appear in one of the three sources used to develop the survey population.

The omission of third party suppliers' perceptions of the procurement process also constrains the explanatory ability of the research. It is clear the buying process involves vendors in a dyadic or network relationship. The inclusion of vendor data would add another valuable dimension to the process. However, the ability to match buyers with suppliers is precluded as respondents were not asked to provide their name or identify the supplier(s) they selected. This policy was maintained to ensure confidentiality and encourage participation in the research.

While the above conditions limited the study, the dearth of research in this area prompted an initial attempt to understand how contract logistics providers are chosen and whether industrial buyers can be segmented by acquisition benefits. Buyers and sellers need to minimize the potential for erroneous perceptions concerning the provision or use of contract logistics services. This research was undertaken to aid this endeavor and add value to the field of industrial buyer behavior and the logistics discipline.

CHAPTER II

STRUCTURAL UNDERPINNING FROM THE RELATED LITERATURE

Literature Review Design

The procurement of third party logistics services is often a complex strategic undertaking involving a decision making unit composed of participants with diverse backgrounds, motives, and goals. Four streams of literature relate to the primary research problems raised in chapter one. They are as follows: 1) strategic decision making in organizations, 2) industrial buyer behavior, 3) transportation purchasing and 4) supplier selection. These sources provide the foundation for an examination of the third party logistics procurement process resulting in supplier selection. An assessment of the four disciplines will assist in attacking the research problem and in positioning this study within the framework of previous research.

A review of the body of knowledge constituting strategic decision making in organizations will help identify the nature of group choice as it relates to patterns of decision making, purchasing unit structure and influence variables. This literature can provide direction concerning the appropriate unit of analysis for study and reveal the key roles of individuals involved in the process. Previous work in this area will also contribute the factors likely to influence the design of organizational choice and help develop an appropriate orientation to the research problem.

A synthesis of the industrial buyer behavior literature can provide insight into the rationales and methodologies used by corporate bodies in their purchase of goods and services. Key variables influencing these decisions can be identified and accurately positioned. Investigation of these variables will assist an attempt to segment the third party logistics market

by the benefits derived from the acquisition and use of these services. Reflection on environmental constraints, seller strategies, and the decision making unit dynamics likely to influence industrial purchasing is required for a proper analysis of the decision process resulting in the acquisition of strategic services such as contract logistics.

Examination of the literature base surrounding the purchase of transportation will provide a solid foundation for the study of contract logistics procurement. Mode and carrier selection research constitute this area of evaluation. The tradeoffs and variables that are key to many logistics procurement decisions are likely to be found in this rich field. Further, this body of knowledge can buttress an attempt to correctly frame the third party logistics decision process.

A review of the supplier selection literature will assist in identifying key information issues, methods of qualification and constructs relating to provider choice. Special emphasis should be directed at strategic supplier selection, especially the existing work concerning third party logistics. This body of literature will provide insight into the current frameworks used by decision makers in their selection of goods and service providers. The role of tangible and judgmental criteria will be examined to reveal the importance of each in the purchase decision. The supplier selection section of the literature review provides a final narrowing in the evaluation of related research.

The four stage process described above serves to guide the review of related literature from a broad perspective to a localized focus on research relating to the study problem It will also assist in positioning the current study as an addition to the existing body of knowledge in industrial buyer behavior and supplier selection. A synthesis of the literature from strategic decision making, industrial buyer behavior, transportation purchasing and supplier selection will be used to develop a theoretical model for the purchasing of third party logistics services. Knowledge from the literature review will also be used to identify the benefits likely to be

sought in the procurement and use of contract logistics services. Benefits identified as critical to supplier selection will be employed in the instruments designed for data gathering.

Strategic Decision Making in Organizations

Recent changes in the competitive environment caused a revolution in business management. As Porter [23] suggested a decade ago, an undue focus on growth and diversification caused many firms to lose sight of the strategies leading to competitive advantage. History has validated the worth of customer value provided by a firm's cost leadership and/or differentiation. These are the two key performance factors the marketplace rewards in the long run.

To attain or retain competitive advantage, an organization must develop strategic processes that lead to cost leadership and/or differentiation from their competitors. Strategic decision making is critical to the derivation of these crucial processes. Research on strategic decision making in organizations has progressed from the early works of Simon[24] to an abundance of ideas from other authors. It is the intent of this section to synthesize the theoretical and empirical research on strategic decision making and evaluate its applicability to the procurement of third party logistics services.

A strategic decision is defined by Mintzberg, Raisinghani, and Theoret[25] as one that is ". . . important in terms of the actions taken, the resources committed, or the precedents set." These are decisions made by key leaders in an organization which impact the survival and

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23 Porter, M. E., *Competitive Advantage: Creating and Sustaining Superior Performance*, The Free Press, New York, NY, 1985.

24 Simon, H. A., *Administrative Behavior*, Macmillan, New York, NY, 1947.

25 Mintzberg, H., D. Raisinghani and A. Theoret, "The Structure of Unstructured Decision Processes," *Administrative Science Quarterly*, Vol. 21, 1976, p. 246.

prosperity of the corporation. The major decision choice paradigms of rationality and bounded rationality, politics and power and garbage can comprise the literature base for this research area.

Rationality and bounded rationality

The Rational model of organizational decision making has its origin in economic theory. In this model, the objective of all decision making in the firm is the maximization of net profit given an existing market price level and a production function constrained by the existing level of technology. Net profit is the difference between revenue and the sum of fixed and variable costs. To maximize profits, management must determine the optimal mix of production output to the input factors necessary for production, i.e., the point of equilibrium.

For a single product firm to attain the equilibrium point, classical economic theory requires a decision that results in the minimum cost for any given level of output. For a multiple product firm, the logic is not this straight forward. However, by using differential calculus and the theory of quadratic forms, the correct tradeoff between product output and factor inputs can be ascertained.[26]

Behavior under the Rational model is held to revolve around the areas of net revenue maximization and an evaluation of shifts in the product input-output equilibrium level. Rational or economic man's decisions always stem from consistent, benefit maximizing calculations. The decision process begins with defined objectives and these determine the benefits of outcomes from all possible courses of action. The decision making unit gathers complete information, develops a set of alternative actions, and selects the optimal alternative.

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[26] Cyert, R. and J. March, *A Behavioral Theory of the Firm*, Prentice Hall, Englewood Cliffs, NJ, 1963, pp. 5-6.

This concept of the firm and decision making has been questioned by a number of researchers. Simon[27] was one of the first to challenge the validity of rationality in organizational decision making. He limited or bounded rationality in organizational decision making by revising the theory of economic man.

While economic man always selects the best alternative from those available (with complete information concerning all alternatives), Simon offered an organizational or administrative man that "satisfices," i.e., chooses a course of action that is good enough. Further, organizational man is limited, when compared to economic man, in his dealings with the real world in all its complexity. Organizational man is held to view a simplification of the world in reaching his decision. In effect, organizational man leaves out many facts that he perceives as not relevant to the situation he is facing. His decisions include only a few of the factors that he believes are crucial.[28]

Simon redefined rationality as being ". . . concerned with the selection of preferred behavior in terms of some system of values whereby the consequences of behavior can be evaluated."[29] Under this refinement of the Rational model, knowledge is held to be the conduit of discovery for the consequences of all behavior and thus is the primary influence on all choices or decisions. A secondary influence regards the preference of an individual for the consequences resulting from one choice versus another. Therefore, ". . . choice is one of describing sequences, evaluating them, and connecting them with behavior."[30]

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27 Simon, H. A., *The New Science of Management Decision*, Harper and Row, New York, 1960.

28 Simon, H. A., *Administrative Behavior: A Study of Decision Making Processes in Administrative Organizations*, The Macmillan Company, New York, 1960, pp. 25-26.

29 Ibid., p. 75.

30 Ibid., p. 77.

Cyert and March presented[31] an alternative to the Rational model that reveals inconsistent goals among people in the organization, localized search behavior, and the influence of standard operating procedures to guide most of a firm's decisions. The findings from their research reveal that organizational choice 1) takes place as a response to a problem, 2) uses standard operating procedures, and 3) concludes by identifying a solution that is acceptable when compared to a set of evoked goals. These three sub-theories are posited to be all encompassing in regard to the identification of proposed variables within any theory of business decision making.[32]

Four constructs were derived by Cyert and March's attempt to model the organizational decision process. The framework (**Figure 2.1.**) includes the quasi resolution of conflicting goals among organizational members, an aversion to uncertainty, problemistics search and organizational learning.[33]

The decision process was held by Cyert and March to be continuous, always beginning with responses from previous decisions. The sequence of steps is set forth in the abstract flow chart model depicted in **Figure 2.1.** The four concepts underlying the basic theory are related to the phases of the decision process and are indicated by the vertical dashed lines. An empirical test of this model revealed behavioral constructs of the decision process that vary significantly from models based solely on classical economics. In essence, Cyert and March[34] argue that profit is not the only motive behind business decisions. Further, they suggest an organization's goals

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31 Cyert and March, Op. Cit., p. 116.

32 Ibid., p. 117.

33 Ibid., p. 119.

34 Ibid., pp. 116-117.

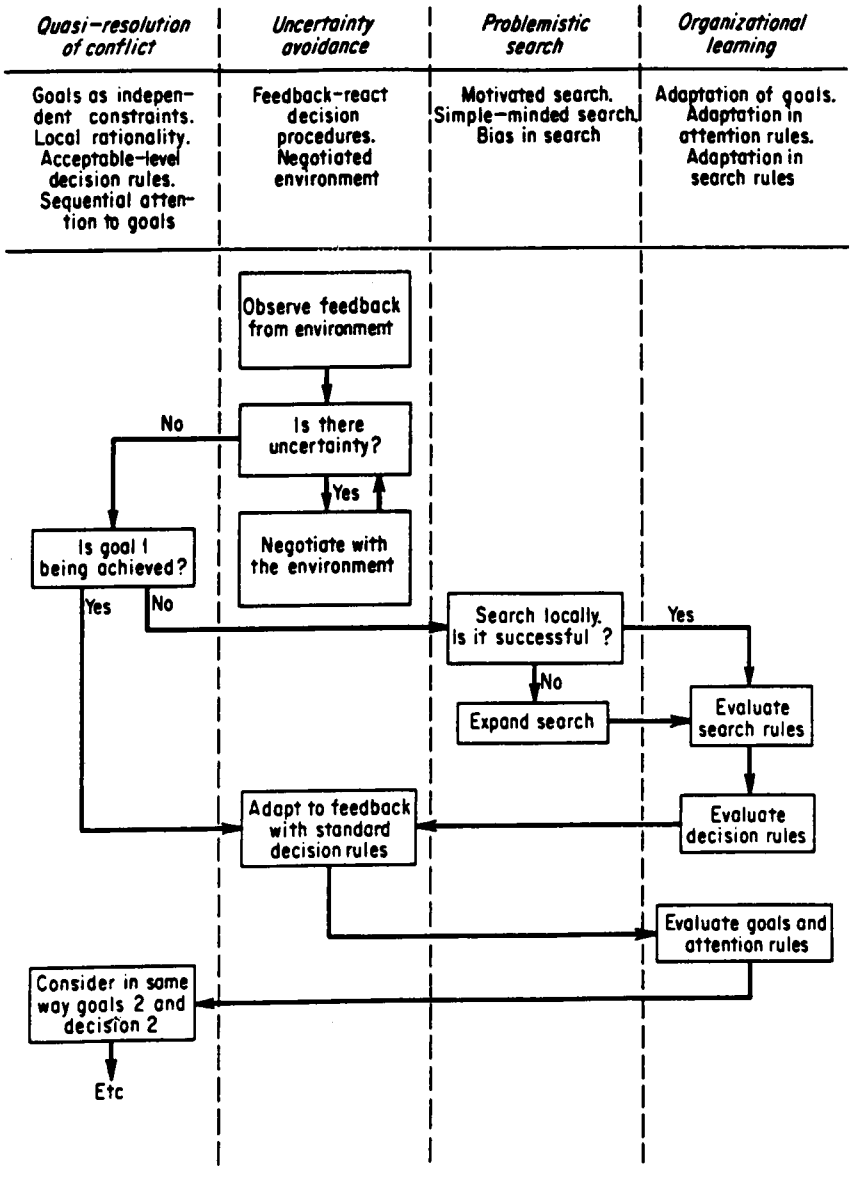


Figure 2.1. Organizational Decision Process Model
Source: R. M. Cyert and J. G. March, *A Behavioral Theory of the Firm*, Prentice-Hall, 1963.

are reached through compromise involving the subunits concerned with any decision.

Allison[35] questioned the Rational model of decision making by showing how standard operating procedures were used in strategic decision making by the federal government during the Cuban missile crisis of 1962. He evaluated the application of three models (the Rational Actor model, the Organizational Process model, and the Bureaucratic Politics model) to explain why and how the Kennedy administration took the action it did during this period of high drama in the history of the United States.[36]

Application of the Rational Actor model and its value maximizing assumptions resulted in a general principle of likely governmental action. The choice was predicated on a combination of 1) the nation's [organization's] values and objectives, 2) the perceived alternative courses of action, 3) estimates of the consequences from any particular choice of action, and 4) the net valuation of each set of consequences.[37]

Any actions taken in accordance with the Rational Actor model are viewed as maximizing means to achieve desired ends. This paradigm is rooted in the following pattern of inference: if an organization takes a particular action, that organization must have ends to which the action is the optimal choice for goal attainment.[38]

In considering an appropriate course of action against Russia using the Organizational Process model, i.e., the government is seen as a conglomerate of loosely allied organizations

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35 Allison, G., *Essence of Decision: Explaining the Cuban Missile Crisis*, Little Brown, Boston, MA, 1972.

36 Ibid., p. 42.

37 Ibid., p. 56.

38 Allison, G., "Conceptual Models and the Cuban Missile Crisis," in *Decision Making: An Organizational Behavior Approach* (J. Pennings, Ed.) Markus Wiener Publishing, USA, 1986, pp. 313-320.

with a life of their own, current choices are always predicated on past decisions. Previous decisions are built up over time to form standard operating procedures (SOP's). These guidelines allow nations to complete "higher" functions such as problem solving. Decisions resulting from the application of SOP's satisfy rather than maximize. The strength of this model to predict a likely decision lies in its ability to uncover the organizational routines that produce the outputs leading a decision.[39]

While considering the navel blockade of Cuba via the Bureaucratic Politics model, Allison posited choice as an action resulting from bargaining or compromise. Parochial priorities and individual goals are present in this model. A decision maker's stand on an issue is tied to where he sits in regards to the possible consequences from decision application. Any action resulting from a decision is based on bargaining between individuals and groups. The explanatory capability of this model is achieved by revealing the interaction of various decision makers, with different perceptions and priorities, resulting in a definitive course of action.[40]

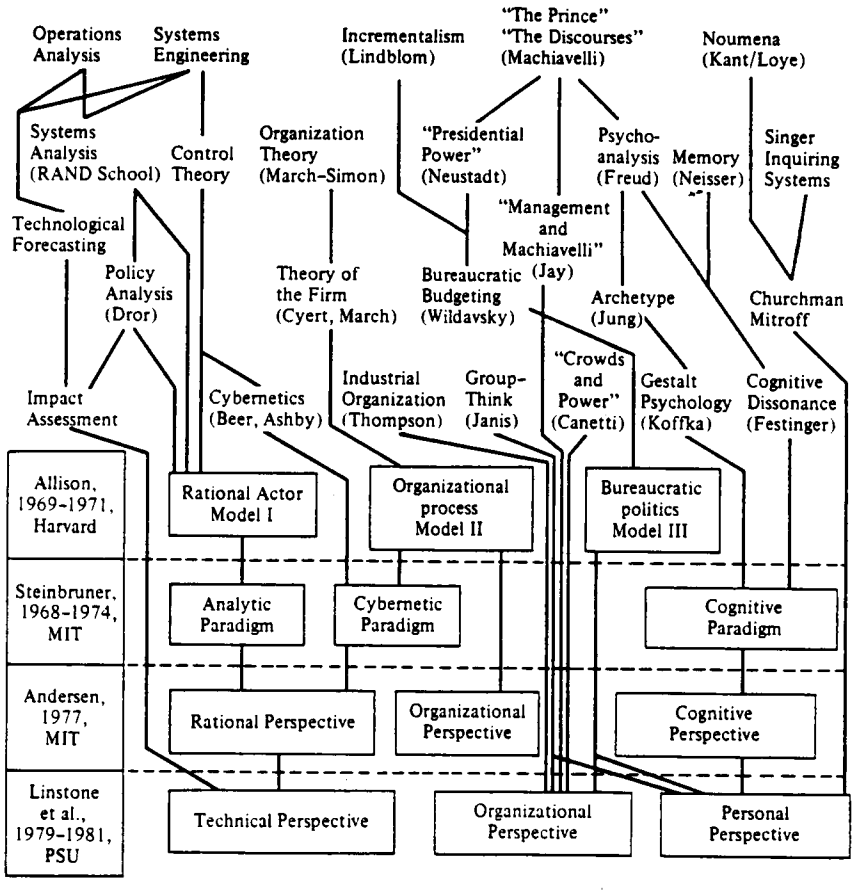
Allison relied on a variety of sources for his three models; suggested origins are presented in **Figure 2.2**. This study drew on the conceptual work of several researchers over an extended period. A combination of the Rational Man and Bureaucratic Politics model was found most appropriate in describing the process leading to the decision to blockade Cuba. Allison's findings suggest that previous decisions arising from an organization are the best predictors of future actions and the process can be compared with a bargaining game.

Organizational decision making as a process involving multiple phases was described

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39 Ibid., pp. 321-330.

40 Linstone, H., *Multiple Perspective for Decision Making: Bridging the Gap Between Analysis and Action*, Elsevier Science Publishing, New York, NY, 1984, pp. 26-29.



*Note: Only representative sources are shown.

Figure 2.2. A Comparison of Allison's Multiple Models with Suggested Sources
Source: H. A. Linstone, *Multiple Perspectives for Decision Making: Bridging the Gap Between Analysis and Action*, Elsevier Science Publishing, New York, NY, 1984.

early by Dewey.[41] He proposed five phases of deliberate thought in decision making: 1) solution suggestion, 2) intellectualization of problem difficulty, 3) hypotheses development, 4) reasoning concerning the hypotheses developed, and 5) hypotheses testing.

While there is some disagreement as to the number of stages in the decision process, there is a consensus that choice results from several steps. For explanatory purposes, the phase theorem of Brim, et. al.[42] is presented as typical of that appearing in the literature. These authors propose six distinct phases in the decision making process: 1) problem identification, 2) information search, 3) the derivation of possible solutions 4) an evaluation of identified solutions 5) the selection of a strategy, and 6) the implementation of a selected strategy.[43]

Witte empirically investigated the decision phase theorem in a study of 233 firms in West Germany concerning the purchase of electronic data processing equipment.[44] The decision processes of these firms were investigated over the course of eighteen months via the use of document analysis. Findings from this study validated the existence of phases in organizational decision making. However, the number of phases is still open for debate as Witte's hypothesized five step process was rejected.

Propositions resulting from Witte's research suggest that organizational decisions 1) are multi-operational, and multi-temporal processes, 2) do not include only one final decision, but consist of a plurality of sub-decisions, and 3) involve information-gathering, alternative-

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41 Dewey, J., *How We Think*, D. C. Heath, Lexington, MA, 1910.

42 Brim O., D. Glass and N. Goodman, *Personality and Decision Processes: Studies in the Social Psychology of Thinking*, Stanford, CA, 1962.

43 Ibid., p. 9.

44 Witte, E., "Field Research on Complex Decision-Making Processes - The Phase Theorem," *International Studies on Management and Organization*, Vol. 2, 1972, pp. 156-182.

developing, and alternative evaluating operations distributed over the duration of the process.[45]

Witte summarized his study findings as follows:

> We believe that human beings cannot gather information without in some way simultaneously developing alternatives. They cannot avoid evaluating these alternatives immediately, and in doing this they are forced to a decision. This is a package of operations and the succession of these phases over time constitutes the total decision process.[46]

Mintzberg et. al.[47] validated the existence of a variety of decision processes and the relevance of the Rational model to business decision methods. Findings from this study agreed with Witte's conclusions that no simple sequential relationship exists between the phases of a strategic decision process.

Mintzberg's work considered how organizations go about making unstructured strategic decisions. From an examination of twenty five-decision processes involving manufacturing and service firms, institutions and various governmental bodies, three distinct decision phases were found to exist. The recognized phases (identification, solution development, and selection) resemble Simon's earlier trichotomy of intelligence, design and choice. Further, three sets of routines (decision control, communication, and political) are held to support the main decision phases. Finally, six dynamic factors are proposed to help explain the relationships between the main phases and support routines. Together, these twelve elements compose the strategic decision process.[48]

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45 Ibid., p. 177.

46 Ibid., p. 180.

47 Mintzberg, H., D. Raisinghani, and A. Theoret, "The Structure of Unstructured Business Decisions," *Administrative Science Quarterly*, Vol. 2, 1976, pp. 246-275.

48 Ibid., pp. 251-252.

The three main phases of Mintzberg's decision process were not shown to have a sequential relationship. In fact, within each phase decisions were observed to follow one of the three routines alluded to above. For example, during the identification phase decision recognition and diagnosis routines are used. During the solution development phase search and design routines are followed. Evaluation-choice and authorization routines are found in the selection phase. Therefore, the decision phases and their subroutines may occur in any order and may repeat themselves. The result of this work was a finding that decision phases in a rational strategic decision process may branch, bound, cycle and recycle.[49]

Mintzberg et. al. developed a General Model of the Strategic Decision Process (**Figure 2.3.**) to illustrate the structure of all twenty five-decision processes. The model reveals at least two routines that must be part of any choice procedure; namely, recognition of the problem situation and the evaluation-choice of a solution. Interrupts to the choice process were found to be present in many of the twenty-five decisions. The most common types of interruptions were internal, political, new option, and external. Scheduling, feedback and timing delays were also revealed to be common in each of the routines.[50]

Application of Mintzberg, et. al. General Model of the Strategic Decision Process to the decisions under study resulted in seven different path configurations for the three main phases of the model. Diagnosis was found to be the most important routine as it determines to a large extent the subsequent course of action. The authors submitted the model as a plausible means of explanation for the strategic decision process, but reiterated the need for more empirical work to

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[49] Ibid., pp. 251-253.

[50] Ibid., p. 266.

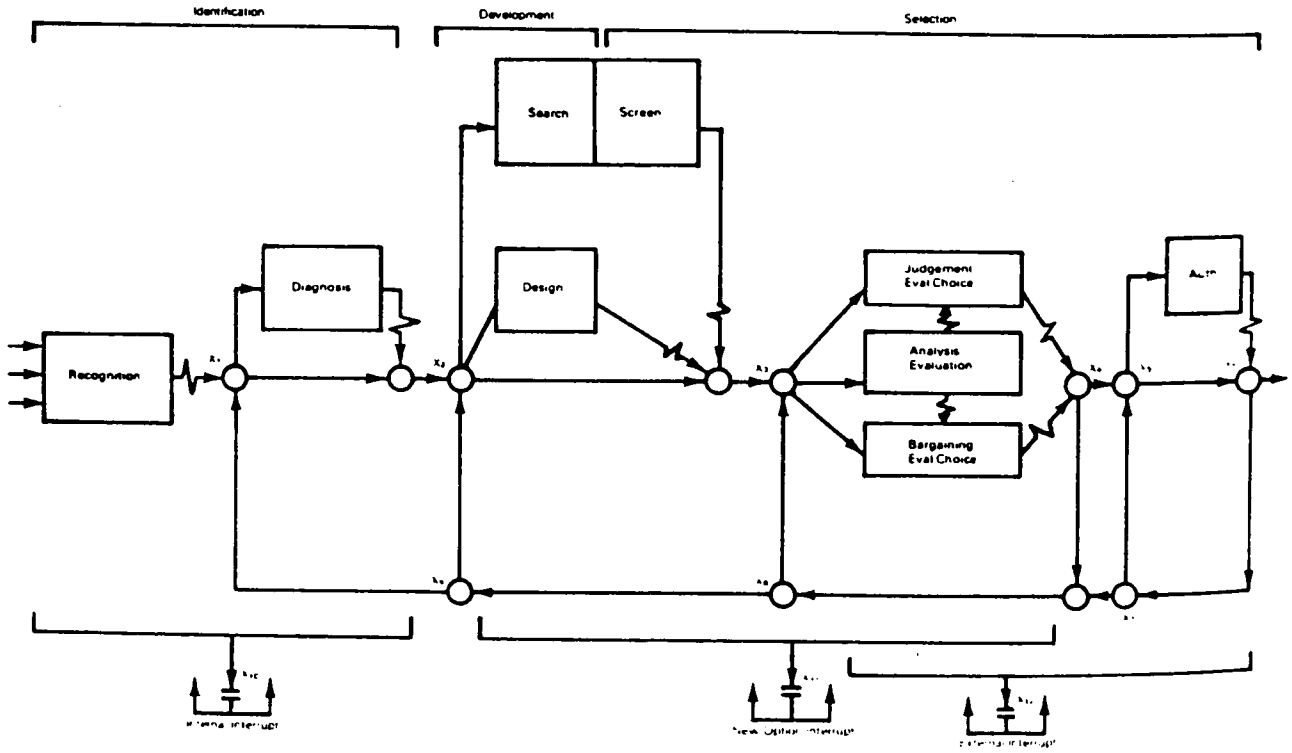


Figure 2.3. A General Model of the Strategic Decision Making Process
Source: H. Mintzberg, D. Raisinghani and A. Theoret, "The Structure of Unstructured Decisions," *Administrative Science Quarterly*, Vol. 21, 1976.

fill in gaps still existing in this field.[51]

The theory of rational and bounded rationality in organizational decision making is also portrayed as a continuum in the literature. Much of the work in this area has attempted to show how decision makers move between degrees of rationality and bounded rationality via increasing conflict. Janis[52] considered this occurrence in his study of several strategic decision situations, most notably the Bay of Pigs fiasco and escalation of the Vietnam war. This effort resulted in a pattern of decision making behavior he termed "groupthink," a compulsive tendency of cohesive groups to seek concurrence.

Groupthink theory is rooted in the phenomena of social conformity that is regularly observed in studies on group dynamics. Cohesive group members tend to default to a congruence-seeking mode of thinking which overrides realistic appraisals of alternative courses of action. Mental efficiency, reality testing and moral judgments deteriorate as a result of group pressures. Groupthink symptoms occur when members of the decision making unit are motivated to avoid being too harsh in their judgment of their leaders' or fellow group members' ideas.[53]

Internalization of the groups' norms can lead to intentional suppression of critical thought in groupthink. The main principle of this theory of decision making is presented by Janis as follows:

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51 Ibid., pp. 273-274.

52 Janis, I., *Groupthink: Psychological Studies of Policy Decision and Fiascoes*, Houghton Mifflin Co., Boston MA, 1982.

53 Ibid., pp. 16-23.

> The more amiability and esprit de corps there is among the members of policy-making ingroup, the greater the danger that independent critical thinking will be replaced by groupthink, which is likely to result in irrational and dehumanizing actions directed against outgroups.[54]

Janis postulated eight main symptoms of groupthink: invulnerability, rationale, morality, stereotypes, pressure, self-censorship, unanimity and mindgards. When a significant number of these symptoms were found to exist in a decision making unit, negative consequences from inadequate solution evaluation usually resulted. These consequences are manifested in six different behavior patterns:

> First, the group limits its discussions to a few alternative courses of action. . .without an initial survey of all the alternatives that might be worthy of consideration.
>
> Second, the group fails to reexamine the course of action initially preferred by the majority after they learn of risks and drawbacks they had not considered originally.
>
> Third, the members spend little or no time discussing whether there are non-obvious gains they may have overlooked or ways of reducing the seemingly prohibitive costs that made rejected alternatives appear undesirable to them.
>
> Fourth, members make little or no attempt to obtain information from experts within their own organizations who might be able to supply more precise estimates of potential losses and gains.
>
> Fifth, members show positive interest in facts and opinions that support their preferred policy: they tend to ignore facts and opinions that do not. The members spend little time deliberating about how the chosen policy might be hindered by bureaucratic inertia, sabotaged by political opponents or temporarily derailed by common accidents. Consequently, they fail to work out contingency plans to cope with foreseeable setbacks that could endanger the overall success of their chosen course.[55]

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54 Janis, I., "Groupthink," in *Decision Making: An Organizational Behavior Approach* (edited by J. Pennings) Markus Wiener Publishing, USA, 1986, p. 98.

55 Ibid., p. 102.

Janis made several recommendations, derived from his studies of highly successful group decisions, for preventing groupthink. He offered nine specific actions which prescribed divergence-inducing antidotes to groupthink. Among others, these included the creation of a devil's advocate, the introduction of outside experts, and constructive argument. The goal was to encourage innovation and critical thinking to avoid the fiascoes which routinely result from groupthink behavior.[56]

A synthesis of the rationality versus bounded rationality debate supports several observations. First, empirical research reveals the existence of cognitive limits to the rational model. Organizational decision makers appear to 1) satisfice instead of optimize, 2) fail to conduct comprehensive searches, and 3) discover many of their goals during the search process. Second, most decision processes are phase structured usually involving problem identification, alternative development and solution selection. However, the decision process cycles through these steps and often repeats itself. Finally, problem complexity, the degree of uncertainty involved, and conflict among members influences the path of the decision process. It is likely many of these characteristics will be present in a group decision concerning the selection of a strategic third party logistics supplier.

Politics and power

The genesis of the Political model of organizational decision making lies in the political science literature. Much of this work involves the conflictual nature of the legislative (decision) process. Choices are held to be the result of actions derived from decision makers with different goals coming together through coalitions, with the preferences of the most

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[56] Ibid., p. 103.

powerful always prevailing. In the Political model, people are considered individually rational in decision making, but not cooperatively so.

Organizations are viewed as political systems in the Political model. They are composed of coalitions of individuals with competing interests. Each member may share some of the firm's goals but they also have personal goals that conflict with the firm's objectives. These conflicting differences arise from three sources: 1) varying perspectives on the shape of the future, 2) prejudices inherent from one's position in the organization and 3) disputes concerning personal ambitions and interests.

The core of the Political model of organizational decision making is the process by which conflict is resolved. Decisions and choices are held to follow the desires of the most powerful people. Decision makers attempt to influence the balance of power (the ability to influence) by using political means such as the formation of coalitions, the use of outside experts, and the control of critical information. The political view of strategic decision making has resulted in two streams of literature: 1) the organization as a political system and 2) the use of power in the decision process.

Pettigrew's study of a computer equipment purchase decision by a British retailer, Parnells, provides an example of the firm as a political system.[57] This study focused on how three individuals in Parnell's Management Services group behaved during the procurement process. Through the use of document content analysis, Pettigrew revealed how the decision process developed into a competitive struggle for power. This struggle involved the head of the

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[57] Pettigrew, A., "The Industrial Purchasing Decision as a Political Process," *European Journal of Marketing*, Vol. 9, No. 1, 1975, pp. 5-19.

Management Services department and two of his subordinates, a systems department manager and a programming manager.[58]

The head of Management Services gained a major tactical advantage in the struggle for power as a result of his placement as a gatekeeper on the communication route between Parnell's Board of Directors (the ultimate decision making body) and his subordinates and between potential computer suppliers and the Board. In agreement with the Political model, each manager in the Management Services department had distinct, and conflicting preferences regarding computer suppliers. The department head favored the current vendor, while his subordinates preferred two other potential suppliers. These differences resulted from perceptions of quality and technology, and from differences in self-interest based on the position each manager held in the firm.[59]

The department head was successful in retaining the current vendor by controlling the flow of information. This finding specifically draws attention to influence via the manipulation of communication and its impact on the industrial purchasing decision. Further, the study validated the depiction of a business firm as a political organization.[60]

The use of power in the Political model of organizational decision making is exemplified by empirical evidence derived from Baldridge's[61] study of New York University's (NYU) decision to convert from an open enrollment, part-time institution to a research-focused university. An abstract representation of a simple Political model is presented in **Figure 2.4**.

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58 Ibid., p. 6.

59 Ibid., pp. 6-7.

60 Ibid., p. 17.

61 Baldridge, J., *Power and Conflict in the University: Research in the Sociology of Complex Organizations*, John Wiley and Sons, New York, NY, 1971.

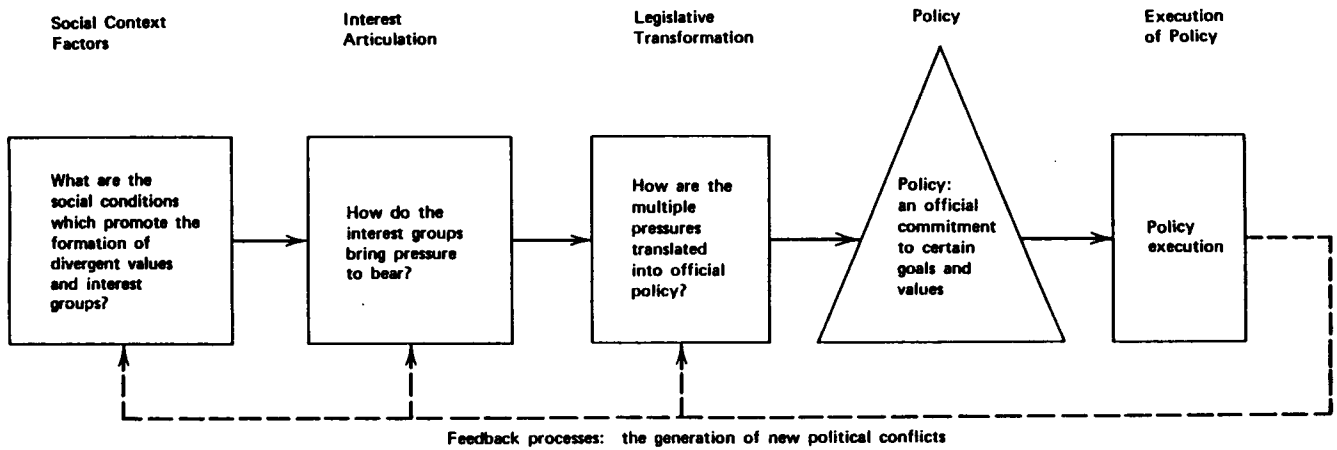


Figure 2.4. A Simple Political Model of the Decision Making Process
Source: J. Baldridge, *Power and Conflict in the University: Research in the Sociology of Complex Organizations*, John Wiley and Sons, Inc., New York, NY, 1971.

The decision to change the strategy of the university pitted the Commerce and Education schools against the administration, trustees, and the graduate Business school. Conflicts resulted among deans, department heads, faculty and administration from fundamental differences in self-interest.

The resulting decision in the NYU study was predicated on the inequalities of power existing within the structure of the university. The weak Commerce department lost to the power of the university's central administration and the character of NYU was changed. Conclusions from this research reveal that the origin of power in an organization is multi-faceted, complex in its derivation and oftentimes not easily identified.

In the NYU study, strategic conflict refers to groups within the academic community that conflict on certain self-interest issues while simultaneously cooperating on areas of common interests. The self-interest issues of the group(s) holding the most power are resolved when the legislative process translates their pressure or influence into policy.[62]

Empirical research has validated the main assumptions underlying the Political model of organizational decision making. Decision making units are composed of individuals with partisan conflicting desires. Choice is significantly political in that powerful people are the most influential in any decision. Group members use political techniques such as coalition building, and the control of strategic information to strengthen their base of power. Whether politics arise from conflict or are the result of a power vacuum in an organization is still open for debate. In any event, politics are important in the organizational decision process and positions of influence must be regarded as critical to decision making concerning industrial procurement issues such as the selection of a third party logistics supplier.

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[62] Ibid., p. 70.

The garbage can model of organizational decision making

Cohen, et. al.[63] offer an alternative conceptualization of organizational decision making with their Garbage Can model. The authors presented this model largely as a result of their belief that the Rational and Political models of choice lacked sufficient explanation of decision making in a complex, dynamic, ambiguous world. A central assumption of this model is the existence of organized anarchies or decision situations (institutions or choices plagued by extreme ambiguity).[64]

Decision making in the face of extreme ambiguity is characterized by three properties in the Garbage Can model. The first concerns the existence of problematic preferences. These are inconsistent and ill-defined preferences held by decision makers. Preferences or goals are considered to be discovered through action since they often function as drivers leading to decisions. A second characteristic is the presence of unclear technology. Decision makers posses only a vague understanding of means and ends. Knowledge is gained through trial and error procedures and pragmatic inventions of necessity. The final general property of the model concerns fluid participation in the decision process. Participants come and go according to their level of interest, energy and time.[65]

The Garbage Can theory presents the organization as an entity with ever changing boundaries and decision makers; therefore, the identification of decision makers is difficult.

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63 Cohen, M., J. Marsh, and J. Olsen, "A Garbage Can Model of Organizational Choice," *Administrative Science Quarterly*, Vol. 17, 1972, pp. 1-25.

64 Ibid., p. 4.

65 Cohen, M., J. Marsh and J. Olson, "A Garbage Can Model of Organizational Choice," in *Decision Making: An Organizational Behavior Approach* (edited by J. Pennings) Markus Wiener Publishing, USA, 1986, pp. 285-307.

The authors did not offer these characteristics as omnipresent in every organization, but they saw evidence of them in any organization part of the time.[66]

This model describes the chance confluence of four streams impacting the decision process: 1) choice opportunities-events requiring a decision, 2) solutions seeking problems 3) participants-with varying amounts of interest and time, and 4) problems-pressures from within and without the organization. Decisions in the Garbage Can model depend to a large extent on timing and luck. They are not the result of analytic investigation based on wholly rational criteria or the power of political coalitions.

Empirical investigation has substantiated a few of the attributes set forth in the Garbage Can model. Characteristics of some organizations have been found to resemble anarchies in work by Kreiner[67] and that by Levitt and Nass.[68] Rommetviet's[69] study of the process used to decide where to locate a medical school in Tromso, Norway also revealed an apparent random confluence of multiple streams in the final decision.

Other work such as Magjuka's[70] on the reform of a public school's curriculum reveals the Garbage Can model to be less robust than other decision making frameworks. The results of

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66 Ibid., p. 287.

67 Kreiner, K., "Ideology and Management in a Garbage Can Situation," in *Ambiguity and Choice in Organizations* (J. Marsh and J. Olsen, Eds.) Universitetsforlaget, Bergen, Norway, 1976, pp. 156-173.

68 Levitt, B. and C. Nass, "The Lid on the Garbage Can: Institutional Restraints on Decision Making in the Technical Aspects of College-Test Publishers," *Administrative Science Quarterly*, Vol. 34, 1989, pp. 190-207.

69 Rommetviet, K., "Decision Making Under Changing Norms," in *Ambiguity and Choice in Organizations* (J. Marsh and J. Olsen, Eds.) Universitetsforlaget, Bergen, Norway, 1976, pp. 140-155.

70 Magjuka, R., "Garbage Can Theory of Decision Making: A Review," *Research in the Sociology of Organizations*, Vol. 6, 1988, pp. 225-259.

this study revealed the Garbage Can model to be valid only at the individual participant level. The overall pattern of participation in the decision process was found to be predictable, rational and purposeful.

Pinfield's[71] study of human resource strategy development by the Canadian government found some support for the Garbage Can model. However, conclusions from this work revealed that participation in the decision making process is not fluid but is the result of institutional roles, the stage of the decision process and politics.[72]

While aspects of the Garbage Can model have been observed, empirical research has failed to validate all the assumptions underlying this theory. The concept may not be an explanation of the decision making process at all but rather an aberration of one of the other theories of choice. While some of the characteristics of the Garbage Can model may exist in any organization at a given point in time, it is unlikely the decision making process can be described by chance and routine uncertainty.

Strategic Decision Making Summary

A synthesis of existing research in the strategic organizational decision making literature provides a foundation for the structure and mechanisms comprising group choice. The most salient point regards an understanding that crucial decision making is bounded by rationality and influenced by politics. Bounded rationality determines the limit of knowledge and structures the cycling nature of the process. Politics have been shown to strongly influence the social context and outcome of organizational decision making.

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71 Pinfield, L., "A Field Evaluation of Perspectives on Organizational Decision Making," *Administrative Science Quarterly*, Vol. 31, 1986, pp. 365-388.

72 Ibid., p. 386.

The use of control through the manipulation of power and authority in strategic decision making is a second observation apparent from previous work in this area. Conflict resolution via politics, power or bargaining must be considered in evaluating the dynamics surrounding group choice. The degree of group congruence seeking which results from the political structure of an organization also warrants analysis.

The existence of phases or steps in the decision making process is apparent in strategic group decision making. Of importance is the identification of stage types and number of steps involved in the decision process employed to acquire strategic services. Further, the nature of phase cycling and recycling is important since it influences information and communication requirements. The degree to which standard operating procedures act as a precedent for strategic decision making is also important in any evaluation of organizational action.

The role of chance must be considered in a study of group behavior and decision making. To what degree does fate impact the composition and preferences of participants in a decision making unit? Does luck and timing have any significant application to the outcomes resulting from organizational decisions involving strategic issues? These questions must be addressed in any analysis of strategic organizational decision making such as that represented by the selection of a third party logistics supplier.

Industrial Buyer Behavior

The study of institutional buying behavior is an endeavor to understand how a group of business managers, a decision making unit (DMU), with a variety of backgrounds, motives, influences, and evaluative criteria interact to reach a procurement decision which meets both organizational and personal goals. A critical aspect of this exercise involves a proper grasp of the degree of influence held by each DMU participant and the effectiveness of this source of control during the various stages of the procurement process.

The manner in which a firm buys can be envisioned as a series of decisions occurring over time.[73] This observation provides the impetus for accessing how organizations go about acquiring industrial goods and services. An evaluation of the variables thought to influence organizational purchasing decisions can be used to explain why organizations buy as they do.

Previous researchers have conceptualized industrial purchasing in several different ways.[74] The characterizations span a continuum from a sequence of discrete linear events to a series of complex decisions involving intricate relationships and numerous environmental factors. In any event, attention has focused on the economic, organizational, behavioral, and channel variables impacting the decision process which defines industrial purchasing. Studies of the relationships among key influence variables and the process used to reach industrial procurement decisions have resulted in a number of organizational buying behavior frameworks.

The conceptual approaches used to characterize the industrial buying process are derived from the fields of economics, marketing, purchasing, and organizational psychology. Webster and Wind[75] identified four major categories of organizational purchasing frameworks. They are as listed as follows:

- Non-task oriented models,
- Task-oriented models,
- Decision-process models, and
- Complex models

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73 Corey, E., *Procurement Management: Strategy, Organization and Decision Making*, CBI Publishing Co., Boston, MA, 1978.

74 For example, see Webster and Wind, *Organizational Buying Behavior*, Prentice-Hall, 1972, J. Sheth "A Model of Industrial Buyer Behavior," *Journal of Marketing*, Vol. 37, and Bonoma, Zaltman and Johnson, "Industrial Buyer Behavior," *Marketing Science Institute*, Cambridge, MA, 1978.

75 Webster, R. and Y. Wind, *Organizational Buyer Behavior*, Prentice-Hall, Englewood Cliffs, NJ, 1972.

> Task models are those emphasizing task-related variables (such as price [quality, assurance of supply, etc.]) whereas the non-task models include models that attempt to explain organizational buying behavior based on a set of variables (such as the buyer's motives) which do not have a direct baring on the specific problem to be solved by the buying task, although they may be important determinants of the final purchasing decision.[76]

The decision-process models are generally more detailed models that depict the buying decision as a sequence of discrete steps through which the organization proceeds. Finally, complex models combine various factors of organizational buying behavior in an attempt to explain why organizations chose to buy as they do, as well as how they buy.

Webster and Wind's taxonomy will be used to structure a review of industrial buying behavior. This will provide insight into the process likely to be applicable to the procurement of third party logistics services. It will also assist in the formulation of a conceptual model for this type of purchase.

Task-oriented models of buying behavior

The task-oriented models are derived primarily from economics and the behavioral sciences. They are concerned with the situation specific variables associated with a given purchase and do not attempt a comprehensive explanation of organizational buying behavior. These models strictly evaluate one aspect of the purchasing process. The simplest model of this type is the Minimum-Price model which is taken from micro-economic theory. This framework assumes the firm will always attempt to obtain the minimum price it pays for goods and services to maximize its profits.

Another type of simple task-oriented model is the Lowest-Total-Cost model which takes into consideration non-price factors such as inferior quality, delivery service, and inconsistent

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[76] Ibid., p. 12.

performance. Even though this model expands the number of variables used in modeling buyer behavior, it suffers from many of the same limitations faced by the minimum price-model.

A behavioral science model very similar to the Lowest-Total-Cost model is the Rational Buyer model first introduced by Copeland[77] in 1924. This model of industrial purchasing behavior is based on a theory presented by the Greek philosopher Aristippus around 400 BC. In this model, the purchaser rationally evaluates all alternatives and the expected pay-off associated with each one and selects the option expected to yield the maximum gain.

The behavioral sciences have also produced another task-oriented buyer behavior model which deals with the impact of vendor loyalty on purchasing behavior. Webster and Wind[78] describe this as the Source-Loyalty model. [It]. . .

> assumes that inertia is a major determinant of buying behavior and stresses habitual behavior, and the tendency to favor previous suppliers. [This model]. . .recognizes that much organizational buying is routine decision making. . .[Further]. . .it is consistent with the observation that purchasing managers are busy people who try to establish relationships with vendors that are likely to be self-perpetuating and easily maintained. . .[and]. . .is consistent with the notion of "satisfaction" as an alternative to maximization of behavior.[79]

Another task-oriented model, The Buyclass model, (see table below) was developed by Robinson, Faris and Wind in 1967.[80] This paradigm segregates industrial buying into three decision areas: a new task, a modified re-buy and a straight re-buy. These decisions can be

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77 Copeland, M., *Principles of Merchandising*, A. W. Shaw Company, Chicago, IL, 1924.

78 Webster and Wind, Op. Cit., p. 116.

79 Ibid., p. 118.

80 Robinson, P., C. Faris, and Y. Wind, *Industrial Buying and Creative Marketing*, Allyn and Bacon, Boston, MA, 1967.

further segregated by three dimensions of difference: the uniqueness or newness of the problem, the information requirements of the buying decision, and the consideration of new alternatives.

Webster and Wind's Buyclass Model

	Dimensions	**of**	**Difference**
Buying Situation	Newness of Problem	Information Requirements	Consideration of New Alternatives
New Task	High	Medium	Important
Modified Re-buy	Medium	Moderate	Limited
Straight Re-buy	Low	Minimal	None

Of the three types of buying situations depicted above, the new task involves the most risk for the buyer as well as the most complex decision making process. In this type of market, the supplier must identify the potential prospects, communicate with a DMU that usually involves individuals from more than one part of the organization and minimize the level of risk perceived by the DMU. This model has been modified over the years to include other dimensions such as product characteristics and categories. In spite of its simplicity, the model provides much insight into the buyer's perspective and has been used as an aid to industrial market segmentation.[81]

Non-task oriented models of buying behavior

Non-task oriented models focus primarily on non-economic determinants of behavior and tend to be more complex than the task-oriented models. In application, these models rely on perfect competition and its assumptions, i.e., perfect information, complete substitutability, etc. Obviously, there are few purchases in which these assumptions are valid. However, in

[81] Ibid., p. 17.

commodity markets, this type of model can be useful in explaining buying behavior. Two frameworks, the Perceived-Risk model and the Diffusion-of-Innovations model, best illustrate non-task structures.

The Perceived-Risk model states that buyers are more likely to reduce their level of perceived risk when making a purchase than to maximize any potential pay-off. It attempts to portray the compromises inherent in organizational decision making, rather than the likelihood of optimizing outcomes. This model was initially introduced into the field of consumer buyer behavior by Bauer in 1960. He defined perceived risk as a combination of uncertainty concerning the outcome of a purchasing decision and the potential consequences of alternative decisions.[82]

Much subsequent research utilizing the Perceived Risk model has focused on the identification of strategies used by industrial buyers to reduce their level of risk. For example, Webster and Wind[83] have classified these strategies as: 1) information acquisition and processing, 2) goal reduction, 3) loyalty, and 4) investment reduction. Various types of risk exist from the purchasing decision, such as the acquisition of a product or service which may not perform reliably or cost effectively and psychological risk resulting from how others view the decision.

Whereas the Perceived-Risk model focuses on the behavior and motivations of an individual firm, the Diffusion-of-Innovations model examines the interaction of a group of

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82 Bauer, R., "Consumer Behavior as Risk Taking," in *Dynamic Marketing for a Changing World*, American Marketing Association, Chicago, IL, 1960.

83 Webster and Wind, Loc. Cit., p. 128.

entities or a market. A representative of this type model, as defined by Rogers and Shoemaker,[84] consists of four primary dimensions:

1. The innovation: an idea, practice, or object perceived as new by an individual or other relevant buying unit,
2. The channels through which the innovation is communicated,
3. The time required for this communication, and
4. The social system in which the communication occurs.[85]

The Diffusion-of-Innovations model applied to industrial buying attempts to investigate three areas of purchasing:

- The organizational, cultural, legal, environmental, or social factors that may retard or facilitate diffusion of a new product or service,
- Characteristics that encourage or dissuade innovative industrial buying behavior, and
- The extent to which particular attributes of a new product or service are more prone to diffusion than others.[86]

The application of the Diffusion-of-Innovations model has been especially useful in understanding buying behavior surrounding the purchase and adoption of new products and services such as third party logistics. Webster and Wind state that this model is consistent with their Perceived Risk model. The difference resides in the observation that the Diffusion-of-Innovations model pertains to the firm, whereas the Perceived-Risk model focuses on the individual.

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84 Rogers, E. and F. Shoemaker, *Communications of Innovations: A Cross-Cultural Approach*, The Free Press, New York, NY, 1971.

85 Ibid., p. 63.

86 Moriarty, R., *Industrial Buying Behavior*, Lexington Books, Lexington, MA, 1983, p. 83.

Decision-process models of buying behavior

Beginning in the 1950's, researchers began to borrow concepts from other disciplines to empirically investigate the organizational buying process. Models of this type were developed by Cyert, Simon and Trow[87] as well as Webster.[88]

In 1956, Cyert et. al.[89] made an initial attempt to understand the process used by multi-person decision making units in non-routine purchasing decisions. This was also the first empirical study of its type and involved a manufacturing firm's decision concerning the acquisition of consulting services to study the purchase of data-processing equipment. The research was also the first to question the rational choice process assumed to be the predominate paradigm for industrial purchasing.

Data for this study was obtained by direct observation of the purchasing unit assigned responsibility for the selection of a data processing consultant. Findings of the research revealed three important characteristics of the industrial procurement process:

1. Common processes or steps exist, and they reoccur to form the basic activities of the entire decision process. These common processes are:
2. A variety of communication processes (written and oral) which act as filters. They are crucial to organizational decision making, and
3. Problem solving processes that are present to search for alternative courses of action to solve the buying problem.[90]

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87 Cyert R., H. Simon, and D. Trow, "Observation of a Business Decision," *Journal of Business*, Vol. 29, 1956, pp. 237-248.

88 Webster, F., "Modeling the Industrial Buying Process," *Journal of Marketing Research*, Vol. 2, 1965, pp. 370-376.

89 Cyert, R., H. Simon, and D. Trow , Op. Cit., pp. 237-238.

90 Ibid., pp. 247-248.

This seminal study began investigation into how firms go about making decisions for industrial purchases. The research also was the first to classify purchasing decisions based on their complexity. A continuum of decisions was proposed ranging from highly repetitive programmed decisions, concerned with routine products or services, to highly unstructured or non-programmed decisions, dealing with unique purchases. Further, this work provided the cornerstone for two of the critical constructs underlying the current premises of organizational buyer behavior theory - the existence of hierarchical classes of purchases and the procurement decision as a process.

The next phase of development in the modeling of industrial purchasing was introduced by Webster.[91] In 1965 he presented a landmark article which revealed four stages or steps constituting the industrial procurement process. Webster's model divided the two behavioral theory decision making assumptions of search and choice into four phases:

1. Problem recognition - resulting from a divergence between a desired goal and actual performance,
2. Assignment of buying authority and responsibility - a process by which the roles of organizational members are defined,
3. A search process - routine procedures to obtain information and establish selection procedures,
4. A choice process - the procedure used for selecting between alternatives[92]

Webster's four stage decision process model provided the groundwork for subsequent research in the concept of phases in the purchasing process. Following this early work in conceptualizing industrial procurement as a multi-stage process, Robinson, Webster and Wind[93]

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91 Webster, F., Op. Cit., pp. 370-376.

92 Ibid., p. 375.

93 Robinson, P., C. Faris, and Y. Wind, *Industrial and Creative Marketing*, Allyn and Bacon, Inc., Boston, MA, 1967.

developed what has been described as a breakthrough model in this field. The model, named Buyphase, expanded Wind's four stage decision process framework to an eight segment model consisting of:

- Anticipation or recognition of a problem and a general solution,
- Determination of characteristics and quality of needed item,
- Description of characteristics and quantity of needed item,
- Search for and qualification of potential sources,
- Requisition and analysis of proposals,
- Evaluation of proposals and selection of supplier(s),
- Selection of an order routine, and
- Performance feedback and evaluation.[94]

A expansion of the Buyphase model occurred when the three classes of purchases identified by Robinson, et. al.,[95] i.e., new task, modified re-buy and the straight re-buy, were added to create the Buygrid model (**Figure 2.5.**). This model was found to be one of the most descriptive of the industrial buying process at the time. It considered the importance of the purchase, the uniqueness of the purchase and the level of difficulty involved in the evaluation of alternatives in a somewhat combined manner. This model is further examined in the next section dealing with complex models of industrial buying behavior.

Ozanne and Churchill[96] built on the Buyphase model, and offered an Industrial-Adoption-Process Model for organizational purchasing (**Figure 2.6.**). The Industrial-Adoption-Process model combines the buying-process approach and the diffusion-of-innovations approach.

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94 Ibid., p. 67.

95 Ibid., p. 76.

96 Ozanne, U. and G. Churchill, "Adoption Research: Information Sources in the Industrial Purchase Decision," in *Marketing and the New Science of Planning*, (R. King, Ed.) American Marketing Association, Chicago, IL, 1968.

		Buyclasses		
		New Task	Modified Rebuy	Straight Rebuy
Buyphases	1. Anticipation or recognition of a problem (need) and a general solution			
	2. Determination of characteristics and quantity of needed item			
	3. Description of characteristics and quantity of needed item			
	4. Search for and qualification of potential sources			
	5. Acquisition and analysis of proposals			
	6. Evaluation of proposals and selection of supplier(s)			
	7. Selection of an order routine			
	8. Performance feedback and evaluation			

Figure 2.5. The Buygrid Model
Source: P. Robinson, C. Faris, and Y. Wind, *Industrial Buying and Creative Marketing*, Allyn and Bacon, Boston, MA, 1967.

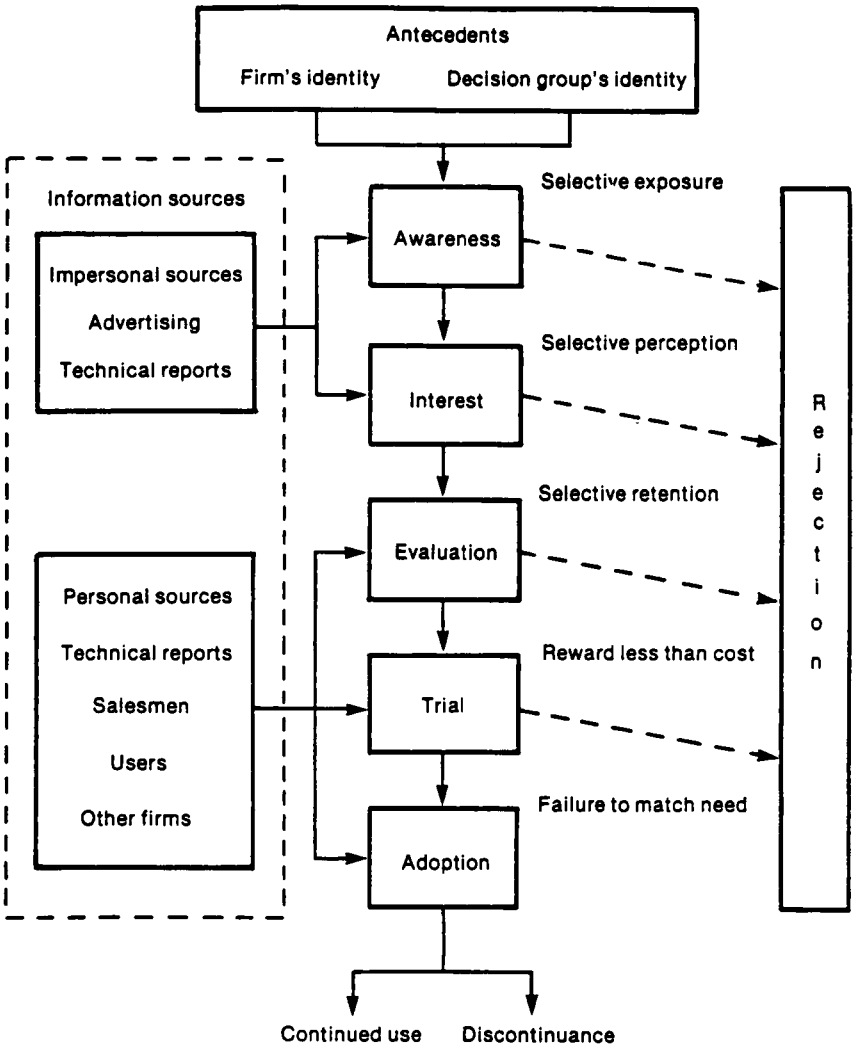


Figure 2.6. The Industrial Adoption-Process Model
Source: U. Ozanne and G. Churchill, "Adoption Research: Information Sources in the Industrial Purchasing Decision," in *Marketing and the New Science of Planning* (Edited by R. King) American Marketing Association, Chicago, IL., 1968.

There are five stages to adoption in this conceptualization: awareness, interest, evaluation, trial, and adoption. Similarities exist between the Industrial-Adoption-Process model and the Buyphase model. Whereas the Buyphase framework views a procurement decision from an internal purchasing perspective, the Industrial-Adoption-Process model takes an external point of view.

The external and internal perspectives of organizational purchasing were united in the Purchase Decision-Process model (**Figure 2.7.**) by Moriarty and Galper.[97] This paradigm includes problem recognition and awareness of product type as the first stage of the buying process; either of these factors is held to initiate action. The Purchase Decision-Process model also includes the search stage from the Buyphase model and the trial stage from the Industrial Adoption-Process model. Further, it includes two feedback loops, recognizing that dissatisfaction can occur at numerous points in the process.[98]

Expanding on the decision-process model logic, Hillier[99] identified four different stages in the buying process characterized by the scope of the decision task. His stages are depicted as the following different types of decisions:

- Precipitating decisions,
- Product decisions,
- Supplier decisions, and
- Commitment-procurement decisions.[100]

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97 Moriarty R. and M. Galper, "Organizational Buying Behavior: A State-of-the-Art Review and Conceptualization," MSI Working Paper No. 78-101, *Marketing Science Institute*, Cambridge, MA, 1978.

98 Ibid., p. 101.

99 Hillier, T., "Decision-Making in the Corporate Industrial Buying Process," *Industrial Marketing Management*, Vol. 4, 1975.

100 Ibid., p. 46.

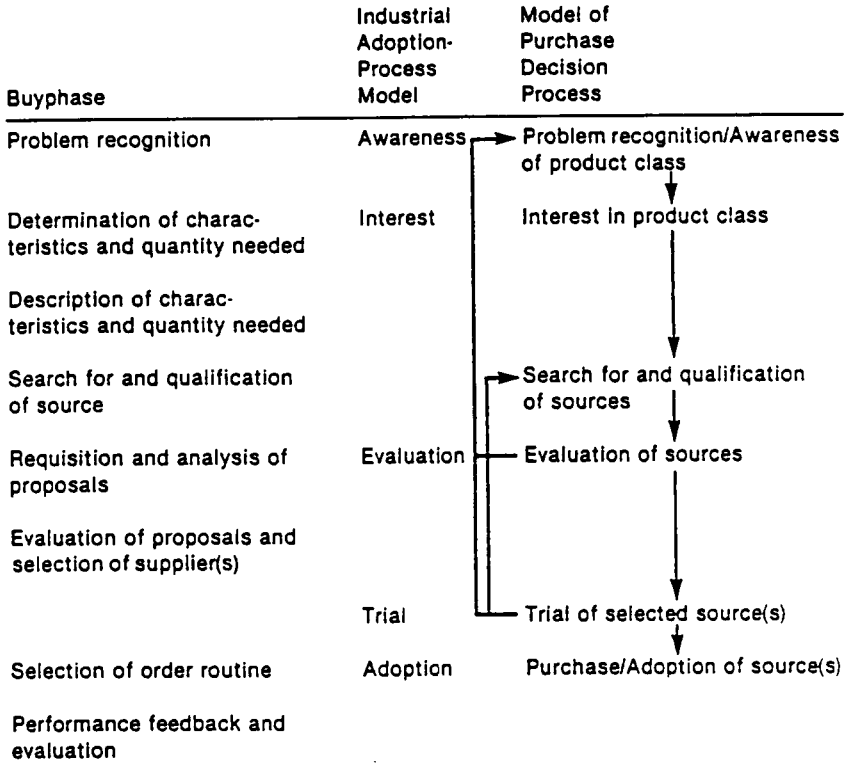


Figure 2.7. The Purchase Decision-Process Model
Source: R. Moriarty and M. Galper, "Organizational Buying Behavior: A State-of-the Art Review and Conceptualization," *Marketing Science Institute*, Cambridge, MA, 1978.

The decision process models utilize a multi-stage procedure in their attempts to break the buying process down to discrete, understandable steps. This type of framework tends to over simplify the actual buying process; however, it has been useful in the design of the complex models of buying behavior which are discussed below.

Complex models of buying behavior

Complex models are those which incorporate both task and non-task variables in an attempt to explain industrial buyer behavior. Developments to date range from highly conceptual, abstract models to operational applications, all of which contain a variety of variables and processes. Some of these models have been empirically validated while others are yet to be operationally defined.

The Buygrid model by Robinson, Faris, and Wind[101] combined the Buyclass and Buyphase models into a two-dimensional representation of industrial procurement. This has been a useful tool for both academics and marketing personnel interested in organizational buying behavior. The framework is a purely descriptive model and does not hold itself out to fully explain the decision process. However, it does provide a valuable classification scheme for organizational buying variables and the processes used in industrial acquisitions.[102]

Webster and Wind[103] introduced a complex conceptual model, The Organizational Buying model (**Figure 2.8.**), which includes environmental, organizational, interpersonal or social, and individual buying determinants. This model implies that each of these factors impact individual and group decision making processes and the final buying decision. For example,

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101 Robinson, P., C. Faris and Y. Wind, Op. Cit. p. 24.

102 Ibid., p. 149.

103 Webster, F. and Y. Wind, "A General Model for Understanding Organizational Buying Behavior," *Journal of Marketing*, Vol. 36, 1972, pp. 12-19.

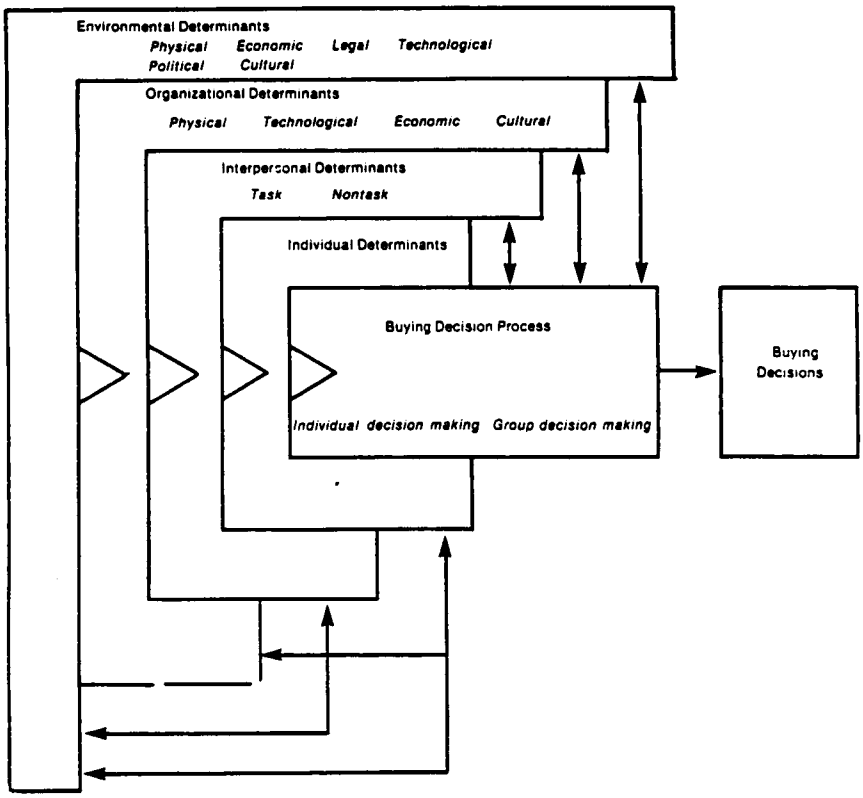


Figure 2.8. The Organizational Buying Model
Source: F. Webster and Y. Wind, "A General Model for Understanding Organizational Buying Behavior," *Journal of Marketing*, Vol. 36, 1972.

purchase decisions are held to be influenced by such factors as trade unions, government, technology, and an individual's assumptions, expectations and attitudes.[104]

The Organizational Buying model also presents the concept of a buying center which defines a specific multi-person group composed of individuals with distinct roles who interact during the buying decision process. These individuals take on five specific functions: users, influencers, buyers, deciders, and gatekeepers. A further explanation of the five roles is presented below. The purpose of the Organizational Buying Model was threefold: 1) to identify the variables impacting the buying decision, 2) to reveal the various relationships among the key variables in the purchasing environment, and 3) to provide guidelines for future research in the area of organizational buying behavior.[105]

To explain the role of organizational influences on buying behavior, the Webster and Wind model relies on Leavitt's[106] four elements of the purchasing organization: people, technology, structure and task. These elements are used in the development of the buying center concept, i.e., multiple people within the organization who participate in the procurement process. Further, the model recognizes the purchasing process may be centralized or decentralized.

Interpersonal relations and dynamics in the decision making unit are an important determinant of buying behavior of organizations. The Organizational Buying model identifies the following five roles played by participants in the decision making process:

Users: Those who initiate the buying process most often. They play an important role in defining specifications.

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104 Ibid., p. 14.

105 Ibid., p. 18.

106 Leavitt, H., "Applied Organizational Change in Industry: Structural Technical and Human Approaches," in *New Perspectives in Organizational Research*, Wiley and Sons, New York, NY, 1964.

Influencers: This category includes a wide variety of opinion leaders whose judgments or perceptions affect a decision.

Buyers: This is the individual who negotiates the purchase - ranging from the president to a purchasing agent.

Deciders: Those who actually make the purchase decision. Usually there are formal and informal decision makers.

Gatekeeper: Any individual who regulates the flow of information. This person is often the purchasing agent.[107]

Webster and Wind's Organization Buying model has been widely accepted by researchers and regularly used in the literature on buying centers. However, it has little empirical substantiation in the area of interpersonal behavior and has been used mostly at the individual rather than the group level.

In 1973 Sheth[108] proposed a general model of industrial buyer behavior, the Industrial Buyer Behavior model, which employed a stimulus-response approach in its presentation of influence variables. The model was depicted in a system format (**Figure 2.9.**) and included joint decision making which is characteristic of many industrial buying decisions. Buyer expectations concerning brands and suppliers are explicitly included in the framework and are held to be primary influence variables. The conceptualization was comprised of four major elements:

1. Expectations of the individual participants in the decision,
2. The Industrial buying process,
3. The decision making (conflictual resolution), and
4. Situational factors[109]

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107 Moriarty, R., Op. Cit. p. 34.

108 Sheth, J., "A Model of Industrial Buyer Behavior," *Journal of Marketing*, Vol. 37, No. 4, 1973.

109 Ibid., p. 45.

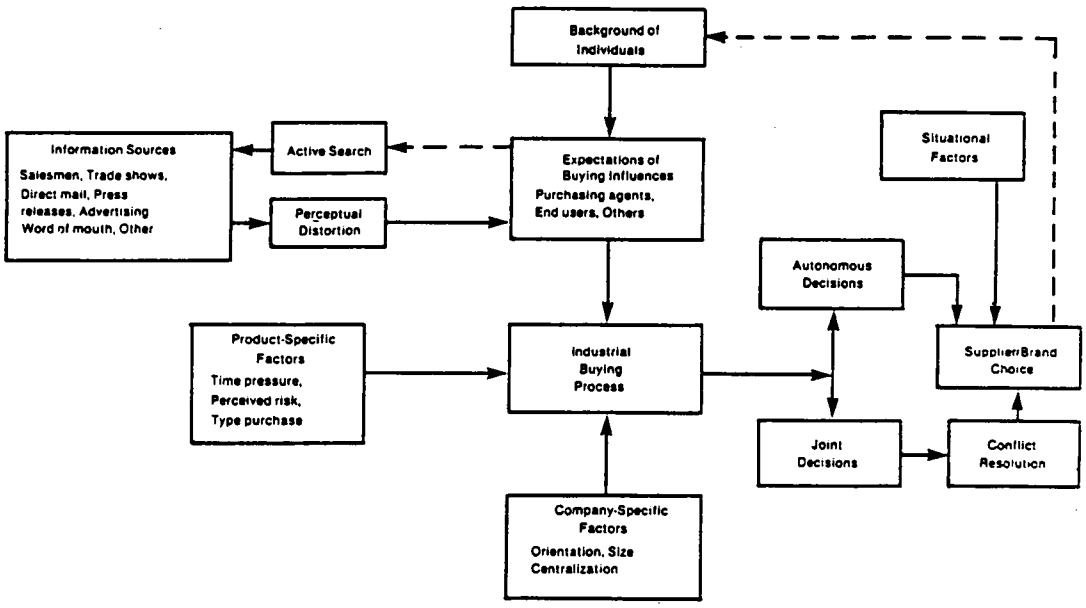


Figure 2.9. The Industrial Buyer Behavior Model
Source: J. Sheth, "A Model of Industrial Buyer Behavior," *Journal of Marketing*, Vol. 37, 1973.

Sheth's model attempted to explain all types of industrial buying decisions including the simple and complex. It recognized the differences in expectations concerning product attributes and suppliers between members of the decision making unit. Further, the model considered product specific variables such as the routine nature of the purchase and company specific variables such as a firm's size and managerial strategy. These two variables were held to largely explain or determine the industrial buying process.[110] Situational factors were also included as decision influencers in the Sheth model. The process was depicted as resolving in an autonomous or joint decision. At the center of the model was a cell labeled the "industrial buying process" in which considerable interaction was assumed to occur.[111]

The Industrial Buyer Behavior model was instrumental in demonstrating two key aspects of organizational procurement; namely, the complexity of industrial buyer behavior and the identification of important explanatory variables. It provided a descriptive stimulus-response model of industrial buyer behavior, and unified a variety of theories, concepts and empirical research which preceded its development.

The Sheth model attempted to depict the relationships among the relevant variables as well as their identification. It provided some order to previous research in the area and definitely exposed the complexity of these types of decisions. However, it did not explain the industrial buying process or how the relationships between the variables involved in the process might change during the decision period.

The Webster/Wind and Sheth models served to identify the salient variables that impact industrial procurement decisions and they outlined the relationships among the variables.

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110 Ibid., p. 49.

111 Ibid., 53.

However, while these models suggested potential strategies for industrial marketing, they did not offer a template for how to manipulate the controllable marketing variables of promotion, pricing, product/service offering, or delivery.

In 1977, Bonoma, Zaltman and Johnston[112] proposed two changes to existing theories of industrial procurement. First, they suggested that buying behavior be considered as a system of exchange and proposed to study it using a dyadic model which included at least two individuals. The logic behind this method recognized that practically all institutional purchasing behavior is the result of an interactive process involving multiple participants. Second, these researchers revealed four types of influence on the industrial buying process. They were presented as intra-departmental, inter-departmental, intra-organizational, and inter-organizational influences.[113]

The Bonoma et. al. model (**Figure 2.10.**) highlighted the fact that industrial buying behavior is a two-way exchange. It took into account the dyadic perspective and introduced a level of complexity that was missing from previous industrial purchasing models. This model recognizes that the behavior of participants in a decision making unit is the result of group interaction and changes in their environment.

The first operational model of industrial buyer behavior, the Industrial Market Response model, was developed by Choffray and Lilien[114] (**Figure 2.11.**). This model recognized organizational decision making processes for industrial purchases as responses to the four marketing variables controllable by a seller, i.e., price, promotion, market offering and delivery.

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112 Bonoma, T., W. Zaltman and W. Johnston, "Industrial Buyer Behavior," *Marketing Science Institute*, Cambridge, MA, 1978.

113 Ibid., 73.

114 Choffray, J. and G. Lilien, "Assessing Response to Industrial Marketing Strategy," *Journal of Marketing*, Vol. 42, 1978.

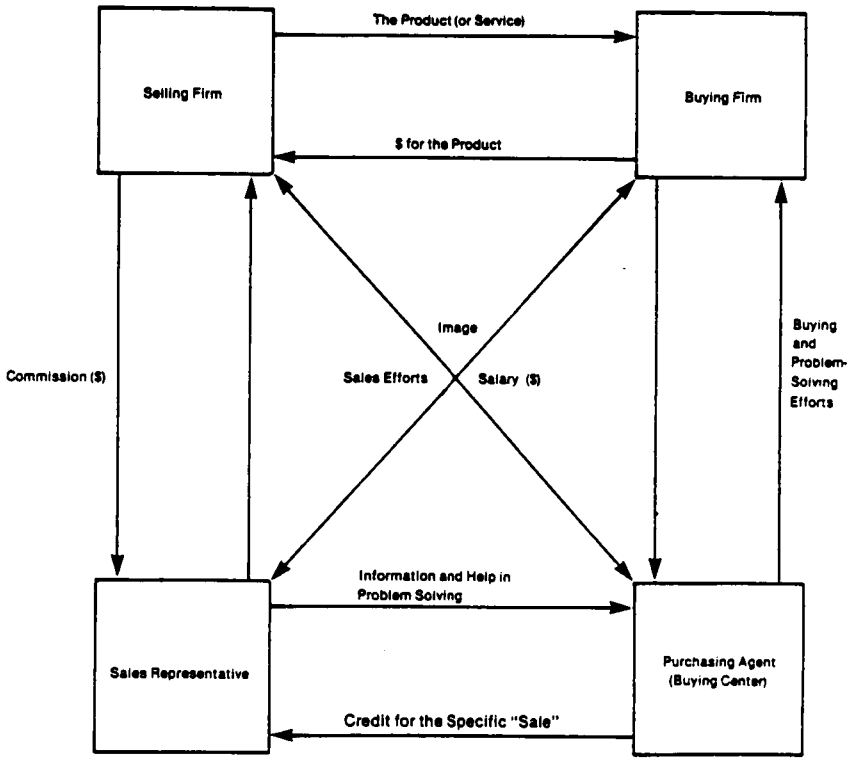


Figure 2.10. The Industrial Buying Process as an Exchange
Source: G. Bonoma and W. Johnston, "Industrial Buying Behavior," *Marketing Science Institute*, Cambridge, MA, 1979.

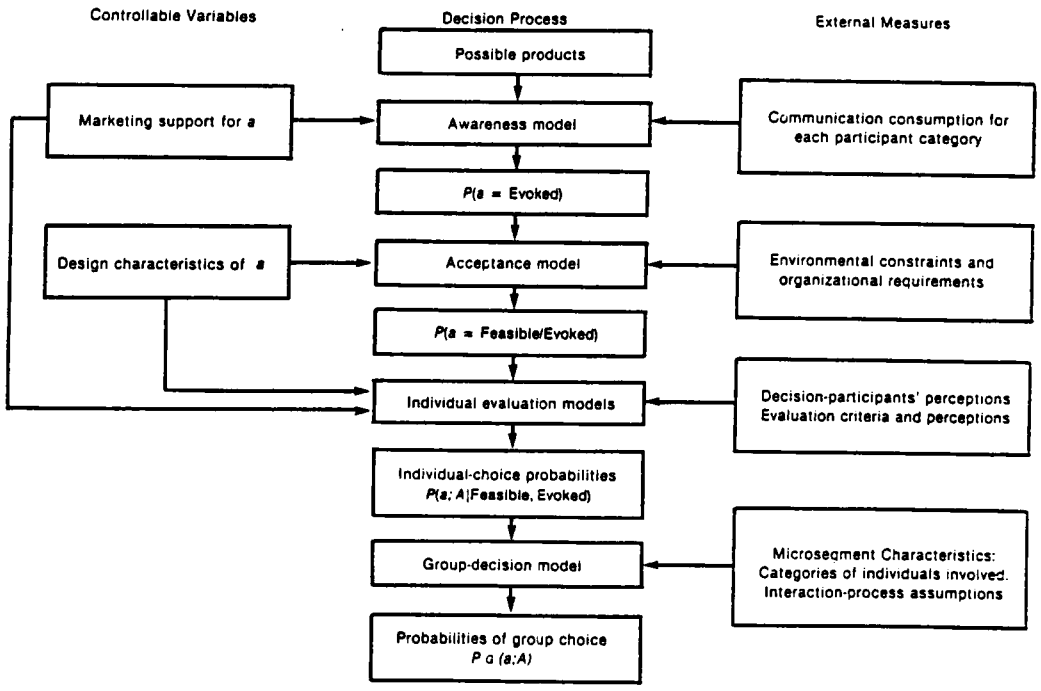


Figure 2.11. The Industrial Market-Response Model
Source: J. Choffray and G. Lilien, "Assessing Response to Industrial Marketing Strategy," *Journal of Marketing*, Vol. 42, 1976.

The Industrial Market-Response model is divided into three sections: controllable variables, the decision process, and external measures. The controllable variables relate to the marketing support and design characteristics provided for the product or service offering. The overall model also includes four sub-models: the awareness model, the acceptance model, the individual-evaluation model and the group-decision model. Each of the four sub-models is specified in terms of the probability of a specific response to a particular brand, denoted as $\underline{a}$ in the model, which is a component of a specific class of products or services, appearing as $\underline{A}$.[115]

The Industrial Market Response model was built on the following two salient assumptions:

1. Buying center membership is revealed by the functions of the participants involved in the process of industrial procurement, and
2. Decision making participants of the same job function, i.e., plant engineers, always use identical product-evaluation criteria and share the same sources of information for reference purposes.[116]

While the model's main assumptions have been questioned, it did provide the first of its type to be empirically capable of analysis. Also, it attempted to operationally define vague terms such as a buying center. Finally, this model demonstrated the importance of using two different units of analysis when researching organizational buying behavior, i.e., the individual and a decision making unit. Perhaps the most valuable contribution of the model is its approach to combining industrial buyer behavior with managerial decision making especially for the procurement of new products or services.

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115 Ibid., p. 28.

116 Ibid., p. 30.

Industrial Buyer Behavior Summary

The existing body of knowledge on industrial buyer behavior has demonstrated a progression from one-variable explanations of conduct to highly complex frameworks. Several conclusions can be drawn from this stream of literature. First, much previous research has assumed that industrial buyer behavior can be studied by evaluating the action of individuals in the purchasing firm. This has led to the development of concepts which are somewhat limited in scope. These constructs tend to revolve around personal choices, attitudes, expectations and decision criteria. Theory generated from this approach is predicated on one's acceptance of the assumption that industrial buyer behavior can be explained by studying the influence of variables found to be unique to individuals. While these variables are important, consideration must also be given to environmental influences and the interaction factors impacting group decision.

A second observation from existing research regards the analogy between stimulus response theory and industrial buyer behavior. A cause and effect paradigm is proposed as the predominate method of explanation for the actions of industrial buyers. They are held to respond to stimuli received mainly from industrial marketing efforts. This is a somewhat constrained view and does not consider the interaction of the buyer with the other members of the decision making unit or the environment. For example, if one evaluates the process using a dyad or system as the unit of analysis, the casual nature of interactions can be amenable to a transactional perspective of analysis. This approach allows the examination of such facilitating constructs as interdependence, trust, and exchange. These are certain to be present in the relational transactions upon which the industrial purchasing process is based and they require examination.

A third finding from the buyer behavior literature review concerns the rationality of the decision process underlying industrial purchasing. This concept implies economic optimization in all strategic decision making. However, in view of the high degree of interaction among

decision making participants, it is likely that social and political factors will play a significant role in the decision process. Power, influence and reputation will undoubtedly appear as significant variables when considering the interactive nature of organizational decision making.

The structured planning and orderliness of the industrial buying process is another conclusion which can be drawn from previous work. Many existing frameworks present the process as a series of discrete steps occurring in a linear order. This is certainly true for some industrial purchases, especially frequently reoccurring straight re-buys of products or services involving little risk. However, when new or modified re-buys involving a high degree of uncertainty are present, the process becomes disjointed, resulting in interaction and communication within and outside the decision making unit. Appropriate concepts for these types of purchases include the degree of communication and participation by all those involved in the process.

A great deal of effort has been extended in identifying the variables involved in industrial buying and formulating models to explain the operation of these variables. But, much of the previous research has reduced the procurement process to a series of isolated events. The components of these events are studied from a stimulus-response perspective. Results drawn from this type of individualistic evaluation are then combined to reform the process. In effect, a complex transaction based on relational interdependence is reduced to microanalysis of a limited unit of evaluation.

The organizational buyer behavior literature reveals strategic industrial purchasing to be a complex undertaking involving numerous environmental factors and a series of decision steps leading to a choice. Previous research explains the need to identify participants in the decision making unit and understand their motives and preferences from an individual and corporate perspective. The literature also emphasizes the influence of decision protocols, conflict

resolution techniques and problem solving methods. Consideration of these factors are appropriate to the study of third party logistics procurement.

Transportation Purchasing

Introduction and historical overview

The five basic modes composing the U.S. transportation industry display a variety of cost profiles and economic structures. The industry exhibits attributes of monopoly, oligopoly, and competition and tends to be somewhat unstable concerning demand and competition. Primarily as a result of discrimination on the part of railroads in the latter third of the 19th century, Congress decided to regulate the industry as a business directly involved with the public interest. The basis for this regulation relied on ancient English (common) law. As technology changed and other modes were developed or improved, Congress chose to extend the basic model of rail regulation to water, pipeline, motor and air carriers.

Transportation marketing and purchasing under regulation revolved around the activities of monopolistic rate bureaus, the Interstate Commerce Commission (ICC), and highly specialized traffic managers. Congress delegated to the ICC decisions concerning entry, exit, pricing and promotion for interstate commerce. Consequently, the market was constrained by bureaucratic control and archaic rules for almost 100 years.

A significant misapplication of resources resulted under regulation. Carriers had little incentive to improve service or reduce cost. Few differences existed in the level of service quality offered by carriers within a given mode and transportation rated were static in almost all cases. Carrier certification or qualification referred to the legal, regulatory environment not business evaluation processes. Private carriage was usually the only alternative available to those unhappy with the system as it existed under regulation.

Acquiring transportation services under regulation

Before the advent of economic deregulation, the most substantive transportation purchasing decision was the choice of mode to be utilized. Buyers typically allowed vendors to control inbound freight movements as part of the purchase agreement. Most transactions with carriers were at arms length and adversarial in nature. Freight charges were often included in the price of products. Due to service level and price uniformity provided by carriers within a given mode, conventional purchasing strategy specified acquisition on a delivered price basis. Regulation provided a stable environment, but at a tremendous cost to consumers and certain sectors of the transportation industry itself.

As observed twenty years ago by John Hutchins of Cornell University, "should the present system, which was built up mainly in the twenties and thirties, be greatly changed there would undoubtedly be much more competition, much more discrimination, many mergers, many failures, many new service patterns, and drastic financial changes."[117] As time has proven, these were prophetic words.

The shift to time based manufacturing and distribution

The decade from 1970-80 brought about a revolution in manufacturing techniques, inventory control strategies, information systems and communications for industrialized nations which is still continuing today. These changes were driven by tremendous increases in fuel prices, high levels of inflation, rapid technological change, and increasing competition in world markets. By 1980, four major deregulatory legislative acts were passed that dramatically changed the profile and operating environment of the U.S. transportation industry. The total impact of economic deregulation is uncertain at this date as changes are still occurring in the

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[117] Rathmell, J., *Marketing in the Service Sector*, Winthrop Publishers Inc., Cambridge, MA, 1974.

industry. For example, excess capacity protected under regulation is continuing to be eliminated. However, some results are apparent and they bode well for most sectors of the economy.

In a recent study[118] by the Brookings Institution, surface freight deregulation was found to be extremely beneficial to shippers and their customers. "Total annual benefits from rate and service changes amount to $20 billion [in 1988 dollars]. . . Deregulation has also enhanced railroad profitability by $2.9 billion annually. The truckload sector of the trucking industry has benefited slightly. But the LTL [less-than-truckload] sector of the trucking industry has lost $5.3 billion in profits annually from deregulation."[119] The authors of this research concluded that deregulation of freight transportation has had a net beneficial impact on the American economy. In effect, wealth has been redistributed from labor and LTL carriers to consumers and the railroads.

Deregulation resulted in an unprecedented influx of new suppliers in the motor carrier and air passenger/cargo industries. The changing regulatory environment prompted railroads to abandon unprofitable routes, trim excess labor, embrace new technology and merge in an effort to survive and grow. Many new short line railroads, with nonunion labor, have resulted from the entrepreneurial purchases of abandoned Class 1 track and facilities. Aggressive pricing has significantly reduced overall freight rate levels for most goods. In some instances, freight transportation has become a commodity purchase. But, with the move to time based manufacturing and retailing, transportation has become the key link for success in the chain uniting suppliers and their customers, i.e., manufacturers, assemblers, distributors and retailers.

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118 Winston, C., T. Corsi, C. Grimm and C. Evans, *The Economics Effects of Surface Freight Deregulation*, The Brookings Institution, Washington DC, 1990.

119 Ibid., p. 5.

Following a major loss of market share in a number of industries during the 1970's and 1980's, many U.S. firms wisely revamped methods of production, inventory control, and distribution. Time based techniques were adopted. For example, in the auto industry, General Motors, Ford and Chrysler returned to Henry Ford's original method (lean manufacturing) of automobile building. This technique, today called Just-In-Time (JIT) manufacturing, permits no buffer inventories, requires short lead times, small replenishment quantities and the procurement of high quality products and services. Quick Response retailing and Efficient Consumer Response food distribution techniques represent the expansion of JIT techniques within current marketing and logistics channels.

The adoption of total quality management

Concurrent with the massive change in technology, production and distribution techniques, many U.S. firms switched from narrow, sub-optimizing, functional management approaches to the Total Quality Management (TQM) philosophy. This process, based on the reduction of process variation and system re-engineering, dramatically changed the business environment. Team based approaches to problem solutions and system improvement have been implemented. Management has recognized the value of labor's expertise and has actively requested its input and participation in the design and implementation of process changes.

The satisfaction of internal as well as external customers has become a prerequisite to the provision of a quality product or service. Reward structures have been revamped to encourage team participation and cooperation. The focus has changed from an inward, sub-optimizing perspective to a customer driven external viewpoint. While the first applications of the TQM process in the U.S. were product oriented, service quality has not been ignored.

Marketing has embraced the quality philosophy ". . .to improve the value customers receive from doing business with their suppliers."[120]

Manufacturing, marketing, finance, and distribution became more integrated as a result of Manufacturing Requirements Planning (MRP), Materials Resource Planning (MRPII) Direct Product Profitability, Electronic Data Interchange, Artificial Intelligence, Expert Systems and Distribution Resource Planning. The systems approach to logistics management has evolved to a seamless pipeline perspective including all members of the supply chain. The preeminent goal is the provision of value and satisfaction to both internal and external customers.

Value is commonly viewed by transportation purchasers as consistent, above average performance at an acceptable price. Numerous studies[121] have confirmed shippers' needs for consistent deliveries, competitive prices, minimal loss/damage, error free administration and communication. As mentioned above, time based manufacturing, inventory, and distribution techniques mandate high quality and short lead times. To meet these requirements, firms have reduced their vendor base and encouraged suppliers to relocate near assembly or manufacturing points.

Partnerships and strategic alliances

Supplier reduction has occurred for a number of reasons primarily related to the minimization of process variation, cost reduction and service improvement through consolidated purchasing. This transition has been occurring since the mid-1970's. The progression has been

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120 Byrne, P. and W. Markham, *Improving Quality and Productivity in the Logistics Process: Achieving Customer Satisfaction Breakthroughs*, Council of Logistics Management, Oak Brook, IL, 1991, pp. 19-20.

121 For example, see F. Saleh and B. LaLonde, "Industrial Buyer Behavior and the Motor Carrier Selection Decision," *Journal of Purchasing*, Vol. 8, No. 1, J. Stock and B. LaLonde, "The Purchasing Approach to Mode and Carrier Selection," *Journal of Purchasing and Materials Management*, Spring 1978 and R. Krapfel and J. Mentzer, "Shippers' Transportation Choice Process Under Deregulation," *Industrial Marketing Management*, Vol. 11, 1982.

from vendor reduction to vendor stratification to supplier certification. Long term relationships (or partnerships) have been formed to reduce risk and leverage the strengths of all partners for mutual benefit. In some instances strategic alliances and sole sources of supply have been adopted.

The Council of Logistics Management has defined a partnership as ". . . a relationship between two entities in the logistics channel that entails a sharing of benefits and burdens over some agreed upon time horizon. [An alliance is defined by the same organization as] . . . a contractual relationship between two independent entities in the logistics channel to achieve specific objectives and benefits."[122] The benefits of a successful partnership relationship with a transportation carrier are similar to those with a provider of goods, namely, an improvement in quality, a mutual dedication to cost and risk reduction, the sharing of information, and the leveraging of technology.[123]

As the Total Quality Management process evolves and is disseminated throughout U.S. industry, the trend toward partnerships and strategic alliances with logistics providers is likely to increase. This move toward relationship based management coupled with the extremely competitive environment facing most firms today will tend to favor certain types of service suppliers. Those with stable balance sheets, and adequate capitalization will be in the best position to endure the current restructuring of the U.S. economy. This includes the ability to earn required profits in the face of highly volatile rate levels and the continuing elimination of

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122 LaLonde, B. and M. Cooper, *Partnerships in Providing Customer Service: A Third Party Perspective*, Council of Logistics Management, Oak Brook, IL, 1989, p. 6.

123 Gentry, J., "Strategic Alliances in Purchasing: Transportation is the Vital Link," *International Journal of Purchasing and Materials Management*, Summer, 1993.

excess transportation capacity. Further, the need for advanced technology in communications and information transfer tailored to individual customers will enhance the competitive position of large, financially stable providers who are experienced in collaborative relationships.[124]

Time based manufacturing and distribution methods require an integration of many business processes. Transportation purchasing is included in this loop. Since deregulation, the use of contracts has been the preferred method of acquiring transportation services. The number of contracts has increased significantly in the previous ten years. "Railroads went from using 768 contracts at the end of 1981 to more than 12,000 by the end of 1983. Between 1980 and 1984, the number of motor carriers deriving more than half their revenue from negotiated contract rates almost doubled."[125] Contracting has resulted in mutual benefits for those partnerships based on a true long run risk/reward sharing perspective. Purchasers have obtained improved service at reduced prices and providers have experienced lower costs, guaranteed volume, and improved profitability.

To ensure the long term consistent supply of quality service at competitive prices, many transportation purchasers are choosing between carriers by using a continuous rating system. These methods are commonly referred to as vendor certification or qualification programs. The impetus for these evaluation tools is the Total Quality Process that began in the U.S. during the 1980's. Again, the purpose is the reduction of variation in product or service provision. "To implement transportation quality control, the key is to negotiate quantifiable service performance standards with carriers and. . .track and document carriers' performance."[126]

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124 Dillon, T. and N. Webb, "Putting Partnering and Shipping Together," *Purchasing World*, March, 1990, pp. 36-42.

125 Gentry, J. and M. Ferris, "The Increasing Importance of Purchasing in Transportation Decision Making," *Transportation Journal*, Fall 1992, p. 66.

126 Ibid., p. 66.

As more companies move to time based manufacturing and distribution methods, the demand for a structured approach to logistics supplier selection and evaluation will intensify. The next iteration of time based methods will most likely involve flexible or cellular manufacturing techniques. These systems entail the production of a large variety of products in small batches without provision for inventory at any point in the process. The ramifications of a logistics system failure may include the total shutdown of a production or distribution facility. Continuous monitoring and measurement will be a way of life for all suppliers serving these types of manufacturers.

Strategies for the application of relationship based management

Partnerships are not valuable for the acquisition for all types of transportation service. Strategic alliances should be reserved for strategic needs. As alluded to previously, some transportation today is strictly a commodity buy. A viable strategy for these purchases involves reducing the carrier base (but still using multiple suppliers in a hierarchical format) and using contracts to tie assured volume to reduced rates. At another level there is a need for more specialized and expedited service with timely information exchange. The relationship with these suppliers should recognize the additional value added in service provision, but it still does not warrant the administrative expense and time involved in a partnership.[127]

Critical service provision, such as that necessary for the support of time based manufacturing and distribution, requires working closely with transportation suppliers. These carriers are the most likely to impact a firm's total cost and service in a significant manner. Relationship based management such as "partnershipping" or strategic alliances are called for at

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[127] Bradley, P., "Get What You Need but Need What You Get," *Purchasing*, June 12, 1990, p. 78.

this point. It is here that mutual benefits must be derived and long lasting commitments assured.[128]

Carrier selection and procurement

Mode and carrier selection have long been important areas of concern for industrial buyers. Transportation has always represented a significant portion of total logistics cost for most manufacturers, distributors and retailers. These costs have decreased significantly as a result of economic rate deregulation and the liberalization of supplier entry and exit requirements. However, transportation costs today still account for approximately sixty cents of every dollar spent for logistical support.[129] In today's JIT manufacturing environment and Quick Response retailing arena, the correct selection of mode and carriers is a strategic decision.

As a result of the significant logistical cost and service tradeoffs surrounding proper mode and carrier selection, this topic has historically been the subject of procurement model development and application. Analysts have been interested in defining the total demand for transportation service, the modal split of this demand, the cost implications of mode choice and more recently, the impact of service requirements on proper carrier selection. This area provided subject matter for the development of a seminal approach to logistical purchase modeling, the Inventory Theoretic method. The approach is still being refined and enriched today. Additional approaches for procurement in this field include applications of the Trade-Off, Behavioral, and Constrained Optimization models.

Decision makers traditionally involved in purchasing logistical services have searched for a sound methodology for mode and carrier choice. Transportation impacts time and place

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128 Ibid., p. 79.

129 Coyle, J., E. Bardi, and J. Langley, Jr., *The Management of Business Logistics, 5th Edition*, West Publishing, St. Paul, MN, 1992.

utility but is intangible in other aspects. Therefore, modeling efforts in this area have evolved over time in an attempt to realistically define and measure the salient variables and relationships between these variables. This task is an art and work continues with renewed interest as a result of management's strategy to reduce their vendor base and form long term relationships with suppliers.

Today many carriers are considered partners and shippers expect a higher level of commitment from them. In a growing number of cases, carriers are viewed as extensions of shippers and are critical for marketplace differentiation and competitive advantage enhancement. Freight transportation selection research began with the macro issues of freight demand and product flow by lane. It has evolved into an endeavor to identify the variables that drive the carrier selection decision and the attributes which provide customer satisfaction and add value.

Transportation modeling efforts in freight transportation selection began in the 1960's. Howard[130] reported the results of his work on the interdisciplinary study of buyer behavior at the University of Pittsburgh in 1963. In this project he found the carrier selection decision to be similar in structure to other types of business decisions. His method of analysis, described as the Shipper Decision Analysis, required ". . . lengthy interviews with the man who makes the decision, the information he uses and . . . [a] . . . scientific test to determine whether he has told you the truth."[131]

The critical step in Howard's Shipper Decision Analysis is the construction of a flow chart of the transportation purchaser's decision process. The flow chart model of the decision process is then tested against previous decisions made by the purchaser to determine whether the

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130 Howard, J., "The Analysis of Shipper Decisions on Carrier Selection," *Transportation Journal*, Vol. 1, No. 1, Summer 1963.

131 Ibid., p. 36.

model will predict the proper response. No graphical or quantitative representation of the model was provided in this research effort. However, Howard proposes ". . . a computer simulation of the decision process is desirable if the decision process is complex enough to justify it."[132]

The abstract mode approach

A more rigorous approach to mode selection was presented by Quandt and Baumol[133] in their development of the theory of abstract modes. This procurement model reduces a mode to a vector of values which represent cost and service parameters that are of concern to transportation purchasers. The result of an application of this model was a prediction of demand by mode based on desired attributes rather than administrative control. It was initially applied to passenger transportation and is considered the classical method of predicting aggregate demand for transportation service.

The inventory theoretic approach

The abstract mode was enhanced by Baumol and Vinod[134] by extending the concept to include the abstraction of commodities for freight transportation and the application of standard inventory theory. Application of the model resulted in mode selection and an estimation of aggregate demand using an indifference map approach. Freight in transit is viewed as inventory on wheels and the critical trade-off becomes that of price and speed. Demand was incorporated into the Inventory Theoretic model by evaluating a shipper's attempt to maximize profit from the shipments of his goods. Supplier selection is dependent on the mode offering the lowest cost for delivery.

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132 Ibid., p. 37.

133 Quandt, R. and W. Baumol, "The Demand for Abstract Transport Modes: Theory and Measurement," *Journal of Regional Science*, Vol. 6, 1966.

134 Baumol, W. and H. Vinod, "An Inventory Theoretic Model of Freight Transport Demand," *Management Science*, Vol. 16, No. 7, 1970.

Langley enhanced the inventory theoretic approach to freight transportation selection by revealing invalid assumptions in the functional relationships which exist between the relevant variables of transportation, warehousing and inventory.[135] Specifically, he pointed out the error in assuming constant transportation rates in these models. Further, he developed four alternate distributions for transportation costs and observed ". . . that while demand increases are often accompanied by lower per-unit transportation costs, the relative importance of transportation cost will increase."[136] Langley also noted that ". . . increases in product value tend to lower EOQ values. . . and proper inventory strategy is dependent on the correct application of the transportation rate functional form and the value of the product."[137]

Another early modal selection model was developed by Ballou and DeHayes.[138] This model was one of the first to consider the variability of transit time as a relevant factor in mode choice. Specifically, the authors proposed ". . . consignees should give greater consideration to delivery schedule variations in goods shipped to them and less attention to the average speed at which the goods can be transported."[139] This model was also one of the first to consider the total cost of inventory and transportation for both the shipper and consignee. Mode selection was shown to impact both shipper's and receiver's costs and thus required an interfirm analysis

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135 Langley, C. J. Jr., "The Inclusion of Transportation Costs in Inventory Models: Some Considerations," *Journal of Business Logistics*, Vol. 2, No. 1, 1981.

136 Ibid., p. 122.

137 Ibid., pp. 122-123.

138 Ballou, R. and D. DeHayes, "Transportation Selection by Interfirm Analysis," *Transportation and Distribution*, June 1967.

139 Ibid., p. 34.

for proper decision making. Only by utilizing this methodology could the best balance between delivery service and cost be determined.

The traditional transportation purchasing paradigm

In the 1970's, attention began to focus on the process of the transportation purchasing paradigm. Motor carrier selection was researched by Saleh and LaLonde[140] to identify the behavior of buyers of this service. The authors proposed the "Buygrid Analysis Framework," adapted from Robinson, Faris, and Wind, as the most appropriate in motor carrier selection. A case study method was used to gather relevant attitudinal variables and develop hypotheses.

The method of analysis in this research relied on non-parametric statistical tools. Findings revealed that ". . . motor carrier selection exhibits a low degree of planning and deliberation throughout the entire decision making process."[141] The testing of a corollary hypothesis resulted in a conclusion that motor carrier selection decisions were considered to be relatively low risk decisions and occupied a low priority in the shipper's hierarchy of decision considerations. While these findings seem incongruent today, it must be remembered this study was performed long before passage of the Motor Carrier Act of 1980.

Additional research in mode selection, as it relates to the traditional transportation purchasing paradigm, was conducted by Stock and LaLonde.[142] Using the Buygrid model and its eight buying phases, a study was conducted to determine whether the ". . . distribution mode

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140 Saleh, F. and B. LaLonde, "Industrial Buyer Behavior and the Motor Carrier Selection Decision," *Journal of Purchasing*, Vol. 8, No. 1, 1972.

141 Ibid., p. 31.

142 Stock, R. and B. LaLonde, "The Purchasing Approach to Mode and Carrier Selection," *Journal of Purchasing and Materials Management*," Spring 1978.

selection decision could be characterized using existing models of industrial behavior."[143] Another goal of this research was the identification of variables used in mode selection.

Responses for this research were obtained via interviews with and mail questionnaires from traffic managers in three large Midwestern cities. Flow charts developed from the survey and interview results revealed four stages involved in the transportation purchasing process: 1) problem recognition, 2) search, 3) choice and 4) post-choice evaluation.

The findings of this Stock and LaLonde study demonstrated that industrial buyer behavior theory applies to logistical procurement. The significance of these findings was indicated in the author's statement regarding the factors found to be influential for services versus goods provision:

> In the purchase of goods, previous research has suggested that cost factors are generally the most important elements of the industrial purchasing decision. However, in the purchase of services, cost is not the most important factor. Rated consistently higher than cost were factors generally considered to be service related, e.g., customer service, time-in-transit, pickup and delivery, etc.[144]

This work was also the first to reveal the procedures used by shippers to evaluate modal performance. The most common means of evaluation utilized a review of on-time deliveries and pickups, an analysis of customer complaints and a review of loss and damage experience. Shipment tracing and distribution audits were also referenced as somewhat commonplace in mode evaluation.

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143 Ibid., p. 3.

144 Ibid., p. 5.

The behavioral model of carrier selection

Craig[145] expanded the modeling of transportation mode selection with his Behavioral Model of Modal Selection (**Figure 2.12.**). This model recognizes mode selection as being critical to issues of average inventory, customer service levels, warehouse location, material handling and packaging. He also observed ". . . modal selection is, if done properly, logistics system design."[146]

The inclusion of non-transportation costs in mode selection was first proposed by Roberts.[147] Craig also included such variables in his behavioral model. Model inputs included rates, transit time, dependability, materials handling, packaging, special services, and loss and damage. The transportation purchaser's motives, decision evaluators (rules for ranking), and predispositions were used as methods of analyses. Constraints, such as financial and competitive pressures, were considered to be environmental forces which inhibited optimal mode selection.[148]

Output for Craig's behavioral model included the actual mode selected, customer satisfaction levels attained and total system cost. A feedback loop from customers and total logistics system expense modified the purchaser's evaluators and satisfaction. Craig postulated carrier selection as a cyclical process beginning with a disturbance in contentment with existing suppliers. This usually occurs as the result of a service deficiency.[149]

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145 Craig, T., "A Behavioral Model of Modal Selection," *Transportation Journal*, Spring 1973, pp. 24-28.

146 Ibid., p. 24.

147 Roberts, M., "Transportation Coordination and Distribution Efficiency," *Journal of Transport Economics and Policy*, Vol. 3, No. 2, May 1969.

148 Ibid., p. 26.

149 Craig, Op. Cit., p. 28.

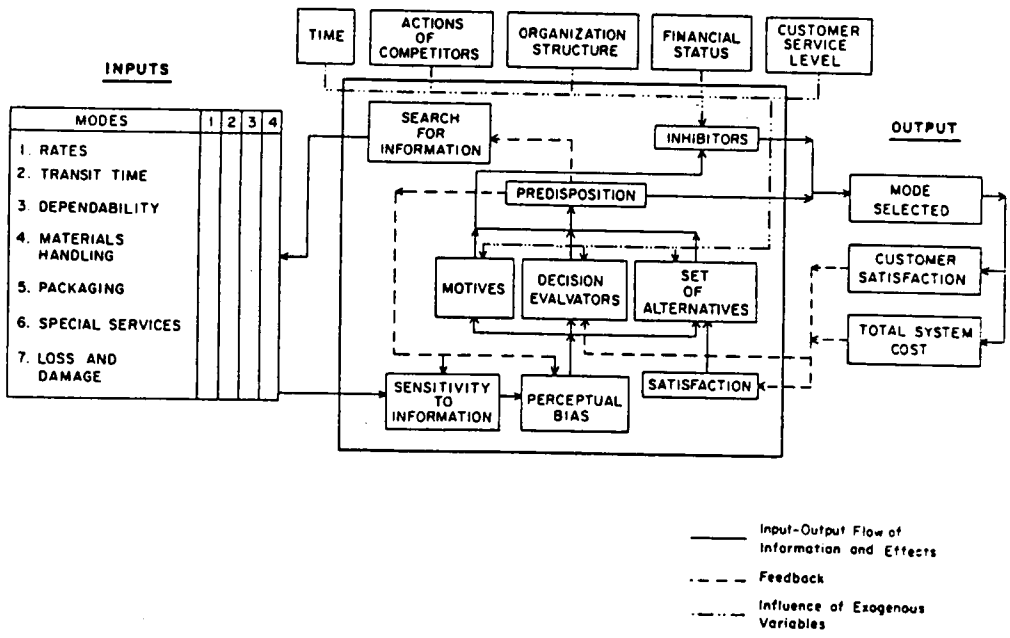


Figure 2.12. A Behavioral Model of Modal Selection
Source: T. Craig, "A Behavioral Model of Modal Selection," *Transportation Journal*, Vol. 12, No. 3, 1973.

The objective of the Behavioral Model of Modal Selection is the provision of a better understanding of the decision process for traffic managers. Its intent is to minimize personal bias and to realize that ". . . diligent rate analyses or sophisticated simulations will make a stronger contribution to the selection procedure."[150]

The issue of carrier selection was first investigated by Bardi in his study of household goods shipment by industrial firms.[151] He proposed carrier service to be the relevant carrier selection determinant as ". . . allowing for the existence of slight rate disparities, transportation cost should not be an important criterion in the carrier selection decision."[152]

A mail questionnaire was used to gather the data from 186 firms in Bardi's study. Twenty-one specific selection determinants were identified in the areas of cost, transit time, reliability, capability, availability, security, user satisfaction and carrier information. Conclusions from this initial study on individual carrier selection ranked service factors as the thirteen highest determinants of procurement.[153]

Two works in the mid 1970's, a British and an Australian study, examined the factors surrounding the decision to change transport suppliers and policy issues regarding subjective factors used in modal choice. The U.K. study[154] identified a dissatisfaction gap for motor and rail modes and calculated a "relative attitude" gap surrounding a combination of ten cost and service variables. Findings from this study included an observation that supplier changes occur

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150 Ibid., p. 28.

151 Bardi, E., "Carrier Selection from One Mode," *Transportation Journal*, Fall, 1973.

152 Ibid., p. 24.

153 Ibid., p. 28.

154 Cunningham, M. and R. Kettlewood, "The Influence of the Image of Suppliers on Buyer Behavior in the Freight Transport Market," *International Journal of Physical Distribution*, Vol. 5, No. 5, 1975.

". . . from a deterioration in the service provided or rates charged by their current supplier, from organizational changes in the customer's buying centre or from a reconsideration of customers' requirements and objectives."[155] Sales pressure from competing suppliers was held to be ineffective in creating dissatisfaction with current suppliers.

The Australian study[156] examined the determinants of modal choice for shipments between Melbourne and Sydney; responses were obtained from a representative sample of shippers in this lane. Open-ended questions were used to identify the factors normally considered in choosing a mode for these shipments. The respondents used a multiplicity of modal choices including private truck fleets, common motor carriers, "hot shot" road service, unit trains, normal freight trains, water and air carriers. The most important factors in determining modal choice were service related with loss and damage experience, inventory in-transit, and carrier capacity held to be top priorities. Other significant factors were an ability to control the shipment and reliability.

The modal selection decision model

Stock and LaLonde revisited the mode selection issue and developed a Modal Selection Decision Model in 1977 (**Figure 2.13.**).[157] As a result of mail questionnaires returned from

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155 Ibid., p. 241.

156 Gilmor, P., "Some Policy Implications of Subjective Factors in the Modal Choice for Freight Movements," *Logistics and Transportation Review*, Vol. 12, No. 1, 1976.

157 Stock, J. and B. LaLonde, "The Transportation Mode Revisited," *Transportation Journal*, Winter 1977.

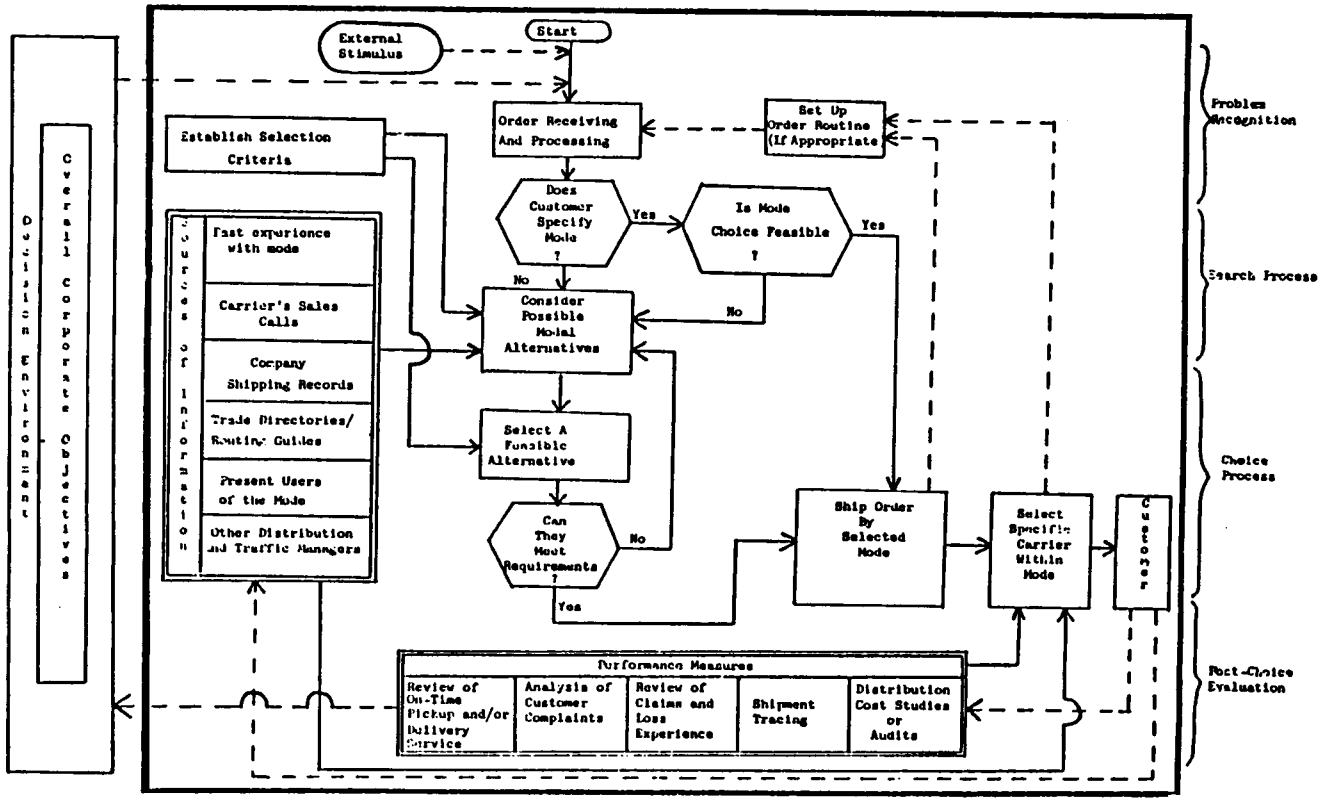


Figure 2.13. The Modal Selection Decision Model

Source: R. Stock and B. LaLonde, "The Transportation Mode Decision Revisited," *Transportation Journal*, Vol. 17, No. 2, 1977.

357 firms in three industry groups, customer service related factors were revealed to be key determinants in a decision to change modes or shift traffic between modes. Consistent on-time pickups and deliveries were held to be the most important factors in these decisions. However, price or rate levels were revealed to be the second most important determinant.

The Modal Selection model developed for this study incorporated the firm's overall corporate objectives, previously established selection criteria, internal and external sources of modal information, and performance measures as inputs to the decision process. A feedback loop from the customer continually revised performance measures and the firm's sources of modal information.

A number of significant implications were posited from the Modal Selection model. Chief among these are:

> Service factors are important in evaluating modes/carriers, for measuring their performance, and are the primary cause for mode/carrier switching . . . [they]. . . will require that the operational and managerial procedures of a mode/carrier include such service elements.

Although service is becoming increasingly more important in the mode selection process, price still remains a critical factor. Many firms select modes primarily because of their cost.[158]

McGinnis[159] acknowledged service variables such as speed, reliability and dependability were more important than rates or cost in freight transportation choice. He followed this conclusion with a proposition that shipper attitudes toward the array of variables thought to impact carrier selection were influential in the decision process. Shipper attitudes toward the

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158 Ibid., p. 147.

159 McGinnis, M., "Shipper Attitudes Toward Freight Transportation Choice: A Factor Analytic Study," *International Journal of Physical Distribution and Materials Management*, Vol. 10, No. 1, 1979.

importance of freight rates, speed, reliability, loss and damage, inventories, company policy, and the influence of a shipper's customers were evaluated using factor analysis.

Findings from this research revealed speed and reliability were the most important factors, followed by freight rates and loss and damage, in the transportation provider decision. However, no one factor was found to constantly dominate the others. Further findings related external market influences and market competitiveness to be of equal importance with inventory concerns. This led to speculation that ". . . past research in transportation and modal choice may have overlooked variables that are as important as inventory levels."[160]

The implications of McGinnis' work are threefold. First, transportation mode/carrier choice was shown to be an extension of a shipper's overall marketing strategy and not an isolated decision. Second, any analysis of a carrier's market must include external pressures in shipper markets which effect transportation choice. Finally, carrier marketing strategies must respond to all shipper needs.

The trade-off approach

A further extension of purchasing behavior in carrier selection was presented by Daley and Lambert[161] in their Trade-Off Approach to carrier selection based on attitude theory. The Rosenberg[162] model (a multiattribute attitude model) was chosen by these authors to examine the tradeoffs assumed to be made by transportation purchasers in the carrier selection decision. This

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160 Ibid., p. 30.

161 Daley, J. and Z. Lambert, "Toward Assessing Trade-Offs by Shippers in Carrier Selection Decisions," *Journal of Business Logistics*, Vol. 2, No. 1, 1980.

162 Rosenberg, M., "Cognitive Structure and Attitudinal Affect," *Journal of Abnormal Social Psychology*, Vol. 53, 1956, pp. 367-372.

model was chosen as "[it]. . . closely parallels the concepts, principles, and past research found in physical distribution and traffic management on mode/carrier selection."[163]

Ten service and cost variables were chosen as trade-off factors. Initially a shipper's selection goals were determined and importance ratings assigned to the variables impacting these goals. The next step in this approach required the difference in ratings be determined and combined with the shipper's perceived differences in carriers.[164]

The model's ability to predict carrier preferences was tested by establishing a matrix of stated carrier evaluations (columns) and predicted preferences (rows). Accuracy was measured by dividing each column total by row total to yield percentages which correspond to accuracy rates. A second method proposed to test the model employs correlation analysis and can be used at the individual shipper level or for an entire population of shippers.[165] Daley and Lambert concluded that buyer behavior research strongly supports the use of multiattribute attitude models in predicting the carrier preferences of shippers and in determining a shipper's response to change in a carrier's performance. The Rosenburg model was recommended as a logical starting point in applying an attitudinal trade-off analysis to carrier selection.[166]

The revealed preference approach

Another method of modal choice appearing in the transportation purchasing literature is the Revealed Preference approach. This technique recognizes that competition does not exist in an equal manner for all traffic. The reasoning behind this fact is related to such factors as shipment size, length of haul and shipment value. By reviewing the presence of these variables

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163 Daley and Lambert , Op. Cit., p. 38.

164 Ibid., p. 36.

165 Ibid., p. 45.

166 Ibid., pp. 51-52.

and the modal split of demand, a preference will be revealed for each mode and define the degree of competition. Competition is said to exist when a commodity is transported by more than one mode, assuming more than a negligible amount of freight is moved by at least two modes. A frequent criticism of this approach regards the arbitrary definition of competitive and noncompetitive traffic.[167]

The general transportation choice model

After the economic deregulation of the modes in the late 1970's and 1980, a renewed interest in transportation procurement was evidenced. In 1982, Mentzer and Krapfel hypothesized ". . . due to the environmental change taking place, many of the old ways of choosing mode, legal form and carriers are now simply irrelevant."[168] The authors also noted previous research had been limited to the investigation of product attributes. They proposed a model encompassing new variables such as individual, corporate, and environmental as well as traditional "product" factors. This model, referred to as the General Transportation Choice model, (**Figure 2.14.**) incorporated the above mentioned factors in a model with a process flow orientation. The selection decision was presented as hierarchical in the following format: mode first, legal form second, and carrier selection last.

A second model called the Adaptive Response Model (**Figure 2.15.**) was presented in this research as a supplement to the General Transportation Choice Model. The purpose of this

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167 Cunningham, W., "Freight Modal Choice and Competition in Transportation: A Critique and Categorization of Analysis Techniques," *Transportation Journal*, Summer 1982.

168 Krapfel, R. and J. Mentzer, "Shippers' Transportation Choice Process Under Deregulation," *Industrial Marketing Management*, Vol. 11, 1982, p. 118.

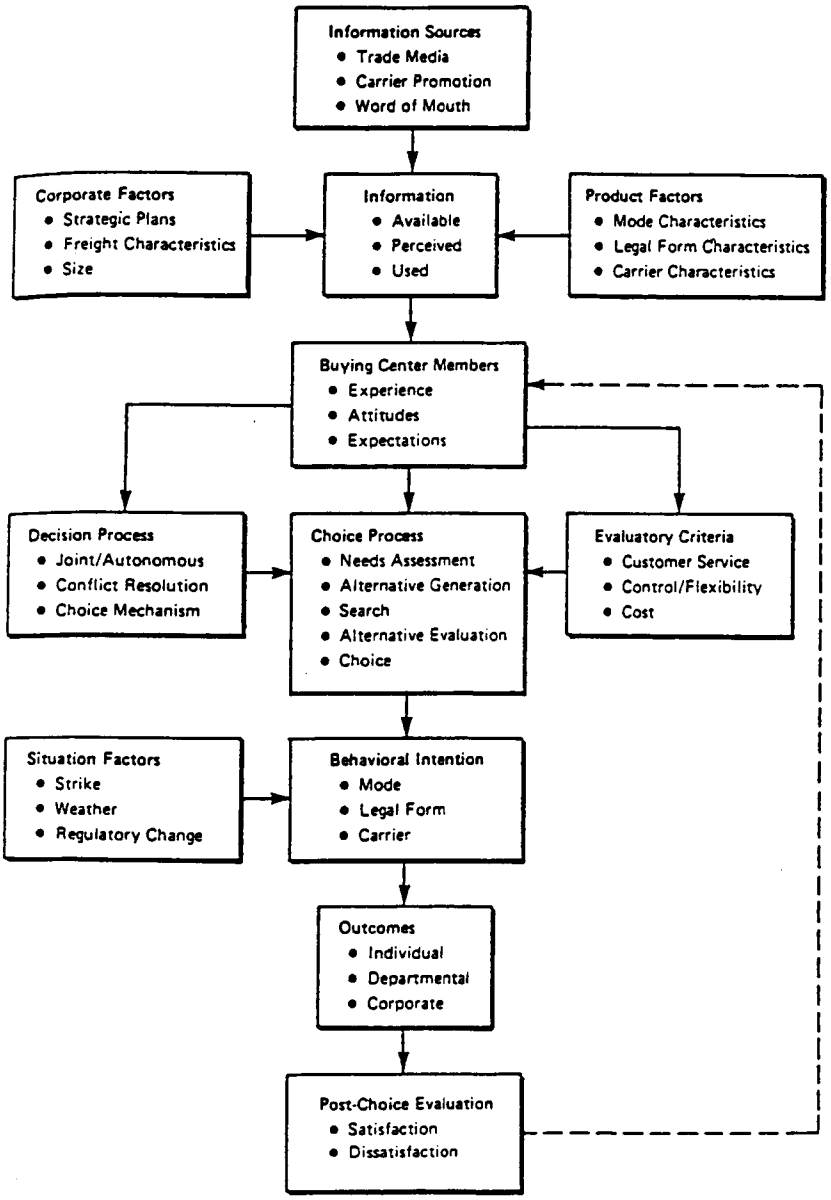


Figure 2.14. The General Model of Transportation Choice
Source: J. T. Mentzer and R. Krapfel, "Shippers' Transportation Choice Processes Under Deregulation," *Industrial Marketing Management*, Vol. 12, 1982.

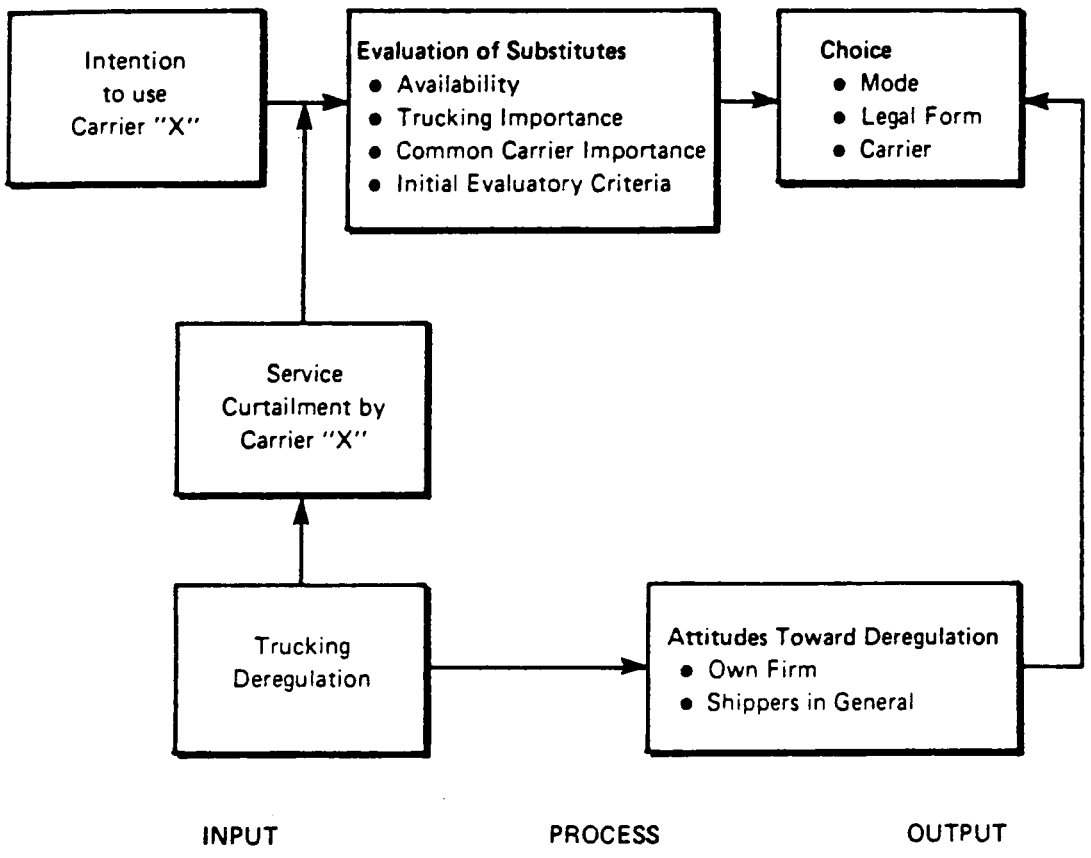


Figure 2.15. The Adaptive Response Model to Service Curtailment
Source: J. T. Mentzer and R. Krapfel, "Shippers' Transportation Choice Processes Under Deregulation," *Industrial Marketing Management*, Vol. 12, 1982.

model was to predict a shipper's response to the discontinuance of service permitted by deregulation legislation.[169]

An empirical study of both models was conducted to test their validity. A questionnaire was mailed to traffic executives to gather inputs on shipper's transportation statistics and attitudinal and behavioral intentions. Data analysis utilized stepwise multiple regression. The conclusions from this study revealed the ". . . entire range of evaluatory criteria do not come into play in every choice situation."[170] The authors speculated that interactions between the variables or the lack of importance of some variables in a given decision were the reasons for the results. The selection decision under deregulation was considered to be more complex since regulatory constraints previously limiting the range of options were disappearing.

A comprehensive study of the impact of deregulation on shippers was conducted by Williamson, et al., in 1983.[171] Aspects of this research dealt with mode and carrier selection. A mail survey sent to members of the American Society of Transportation and Logistics and the Council of Logistics Management obtained 378 usable responses on qualitative and quantitative data concerning factors of deregulation reform. Findings regarding mode and carrier selection revealed cost and consistency of transit times to be the most important variables for both the mode and carrier selection decision. This study was the first to report the importance of flexibility (willingness to negotiate rates and service) in freight transportation supplier selection.

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169 Ibid., p. 121.

170 Ibid., p. 124.

171 Williamson, K, M. Singer and R. Peterson, "The Impact of Regulatory Reform on U.S. For-Hire Freight Transportation," *Transportation Journal*, Summer 1983.

Baker[172] also suggested the selection decision had changed as a result of deregulation. She proposed three major revisions to previous research and suggested that:

1. The evaluation phase of the process will be as important as, if not relatively more important than, the selection decision,
2. Modal decisions will need to be examined more often, and
3. The choice of carrier will become the premier decision.[173]

Baker relied on loss/gain theory in supplier selection decisions. With this approach, losses are weighted more heavily than gains in the decision process and she proposed carrier selection to be a decision based on the maximization of gains. The carrier elimination decision, on the other hand, is viewed by decision makers as a loss minimization decision. Empirical research was conducted to test these propositions.[174]

Responses were solicited from a nationwide survey of Fortune 1000 companies and traffic executives. Data was obtained from responses to questions concerning shipping practices since the passage of the Motor Carrier Act of 1980. Findings of this research reinforced the trade-off between price and service in matters of selection and retention of motor carriers. Specifically, the results suggested poor performance in pickup service, transit time reliability, and carrier financial stability were the leading factors in the carrier elimination decision. Price or cost was viewed as the single most important factor in choosing a motor carrier. The most important implication of this work was held to be ". . . less emphasis on pricing as a competitive weapon and focus instead on service differentiation."[175]

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172 Baker, G., "The Carrier Elimination Decision: Implications for Motor Carrier Marketing," *Transportation Journal*, Fall 1984.

173 Ibid., p. 21.

174 Ibid., p. 24.

175 Ibid., p. 28.

Additional work by Chow and Poist[176] reported transportation purchasers did not formally measure the quality of service information necessary to analyze the total cost trade-off that may result from using other alternatives. Further, they related that a significant number of decision makers did not even record information on carrier attributes that ranked highly in the selection process.

Brand and Grabner also visited the question of carrier selection since deregulation and noted ". . . the methods used to select carriers have changed significantly, . . . particularly with respect to the role of negotiation and the use of bid packages.[177] These authors also noted the relative importance of selection criteria had not changed significantly since deregulation.

JIT and freight transportation provider decision making

Bagchi, et al.,[178] investigated the impact of JIT manufacturing and inventory techniques on carrier selection decisions. Factor and correlation analysis were used to measure previously identified variables held to be important in carrier selection. Results of this research indicated JIT firms placed a greater emphasis on transit time and the reliability of transit time. This is understandable in view of the reduced inventory levels inherent in this type of management. JIT firms were also shown to place a greater importance on carrier rates and the carrier's willingness to negotiate. This finding is also plausible as JIT shipments tend to be smaller and thus not eligible for volume discounts normally extended by carriers. The implications of this research

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176 Chow, G. and R. Poist, "The Measurement of Quality and Service and the Transportation Service Decision," *Logistics and Transportation Review*, Vol. 20, No. 1, 1984.

177 Brand, R. and J. Grabner, "An Examination of the Carrier Selection Process in a Deregulated Economy," *Proceedings of the Council of Logistics Management Annual Meeting*, Vol. 1, Council of Logistics Management, Oak Brook, IL, 1985.

178 Bagchi, T., T. Raghunathan and E. Bardi, "The Implications of Just-In-Time Inventory Policies on Carrier Selection," *Logistics and Transportation Review*, Vol. 23, No. 4, 1987.

advised firms considering JIT manufacturing and inventory methods to place greater attention on customer service and rate-related factors in the carrier selection decision.

Further research on the implications of JIT and carrier selection was presented in research by Garreau, et. al.[179] in a joint study involving shippers in France and the U.S. The findings of this research indicated on-time performance, tracing capability and responsiveness to be critical selection factors in both countries. The implications of this work revealed large carriers with significant vehicle fleets, extensive information technology, and broad geographical coverage appear to have a competitive advantage in servicing JIT based businesses.

The U.S. motor carrier industry was again examined regarding the impact of deregulation on the procurement decision by Raghunathan, et. al., in 1988.[180] The authors developed a regression model, testing factor importance in the selection and evaluation of carriers. The variables for this model were obtained from the results of a mail questionnaire completed by members of the Council of Logistics Management.

Findings of this study emphasized the significance of carrier financial stability in the selection decision. This is understandable in light of the large number of motor carrier bankruptcies which followed deregulation. The model results also reiterated the prominence of customer service attributes in carrier selection since deregulation. Follow-up research by these authors revealed ". . .a greater emphasis was placed on the rate-related factor by those shippers

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179 Garrearu, A., T. Lieb and R. Milen, "JIT and Corporate Transport: An International Comparison," *International Journal of Physical Distribution and Logistics Management*, Vol. 21, No. 1, 1988.

180 Raghunathan, T., P. Bagchi, and E. Bardi, "Motor Carrier Services: The U.S. Experience," *International Journal of Physical Distribution and Materials Management*, Vol. 18, No. 5, 1988.

that experienced increased carrier length of stay,. . . [and]. . . increased selection for reasons other than carrier turnover."[181]

An alternative method of analysis for carrier selection was presented by Bagchi in 1989.[182] The Analytic Hierarchy Method was recommended as a replacement for previously used ranking methods. This method was held to be superior in handling the simultaneous consideration of non-quantitative variables in the carrier selection process. The model can best be described as an eigenvalue priority assignment framework. A decision maker develops priority vectors for criterion variables and comparison matrices for use in the decision process. The main advantage of this purchasing model is the ease in which it makes pairwise comparisons of variables held to be evaluated simultaneously in the carrier selection. Customer service, claims handling, cost, and financial stability were variables used in a hypothetical application of the model.

Coulter, et al.[183] extended the earlier work of Cooper and Rose[184] in the development of the Segment Competition Matrix to help carriers identify how service dimensions were related to market share. An empirical analysis of this model led to the identification of five major factors which should be considered by carriers when they are choosing market segments and developing marketing strategies. The factors are reliability, risk avoidance, customer service,

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181 Bardi, E., P. Bagchi, and T. Raghunathan, "Motor Carrier Selection in a Deregulated Environment," *Transportation Journal*, Fall 1989.

182 Bagchi, P., "Carrier Selection: The Analytic Hierarchy Process," *Logistics and Transportation Review*, Vol. 25, No. 1, 1989.

183 Coulter, R., W. Darden, M. Coulter, and G. Brown, "Freight Transportation Carrier Selection Criteria: Identification of Service Dimensions for Competitive Positioning," *Journal of Business Research*, Vol. 19, 1989.

184 Cooper, M. and R. Rose, "The Segment Competition Matrix: A Strategic Management Tool for the Transportation Industry," *Transportation Journal*, Fall 1985.

"personalizing," and handling. A further observation from this research revealed the significance of carrier employees in offering superior service in a differentiated and personalized manner.

In 1991, Abshire and Premeaux[185] extended Krapfel and Mentzer's previous work on shipper's perceptions of motor carrier selection variables since deregulation. Analysis of variance was used to determine if differences existed in the perception of carrier selection variables between shippers and carriers. Findings of this research indicated carriers overrated eleven of the selection criteria rated as moderately important by shippers. However, this was shown not to negatively impact shipper satisfaction as long as the factors were not over emphasized to the detriment of more significant criteria. Four factors rated important to shippers were underrated by carriers resulting in a predicted decrease in shipper satisfaction. Implications from this study encouraged carriers to identify and concentrate on those elements of their customer service mix which were considered to be the most important by shippers in the procurement decision.

Recent work by Foster and Strasser[186] has reinforced the belief of some carriers that factors ranked highly important in carrier selection are not the same factors to be rewarded in carrier performance assessment. This study explored how carriers and shippers viewed the importance of factors held to be important in carrier selection in relation to performance and rewards. Performance assessment and rewards received by carrier and shipper employees were examined to determine management's priorities.

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185 Abshire, R. and S. Premeaux, "Motor Carrier Selection Criteria Perceptual Differences Between Shippers and Carriers," *Transportation Journal*, Fall 1991.

186 Foster, J. and S. Strasser, "Carrier/Modal Selection Factors: The Shipper/Carrier Paradox," *Transportation Research Forum*, Vol. 31, No. 1, 1990.

Findings revealed the means for all appraisal factors, except for reducing damage claims, were significantly different between shippers and carriers. Significant implications of this research were noted by the authors as follows:

> Shippers agree more than carriers that their appraisals are based on adhering to production schedules, improvement in service consistency, and reductions in cost, time and complaints. In contrast, carriers agree more than shippers that their performance is assessed on better meeting the needs of shippers, increasing shipper contacts and increasing new accounts.[187]

The constrained optimization model

Another recent study in freight selection procurement resulted in the development of the Constrained Optimization model by McGinnis, Corsi and Roberts.[188] These researchers posited transportation selection as a constrained optimization process. In essence, this model minimizes total transportation cost subject to a host of non-transportation cost variables. Many of the non-transportation cost variables are qualitative in nature and are not measured in the same manner as transportation rates. Also noted with this model are methodological problems related to the attempt to quantify the qualitative variables. The model will not permit selection of a mode or carrier unless the non-transportation constraining variables are satisfied.

The Constrained Optimization Model is described by McGinnis, et. al. as:

$$TR_1 + SPC_1 + SDP_1\ SSN_1 = TR_2 + SPC_2 + SDP_2 + SSN_2$$

where : TR = Modal Costs shown by Transportation Rates
SPC = Shipper Product Characteristics
SDP = Shipper Distribution Patterns
SSN = Service Needs

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187 Ibid. p. 209.

188 McGinnis, M., T. Corsi, and M. Roberts, "A Multiple Criteria Analysis of Modal Choice," *Journal of Business Logistics*, Vol. 2, No. 2, 1981.

The framework developed by McGinnis, et al. represents an enhancement to the state-of-the art of transportation purchasing modeling. This conceptualization recognizes freight transportation procurement as a dynamic process which varies greatly depending on the shipper's markets and competition. Choice depends on a multiplicity of constraints which change within and between shippers. The most significant of these constraints relate to reliability, time, damage, the shipper's market, carriers, and products.

The Constrained Optimization model has the ability to distinguish between varied states of restriction by individual selection factor. If the constraint tradeoffs constitute a relaxed state, the transportation rate will become more important and many modes or carriers may be considered. For a condition of extremely limiting constraints, only one mode and a few carriers may be eligible for consideration.

Transportation Purchasing Summary

A summary of the literature from transportation purchasing provides insight into the cost, operational, and behavioral variables shown to influence supplier selection. Given the impact of transportation on total logistics cost and customer service, the identification and relative importance of these variables is imperative. Models which consider the behavioral variables influencing mode and carrier selection, i.e., Craig 1973, Bardi 1974, Stock and LaLonde 1977 and McGinnins, et. al. 1981, appear to offer the greatest contribution to the study of third party logistics procurement.

The previous conceptualizations and empirical validations of the trade-off theory provide insight into the decision processes involved in the choice of a supplier for logistical services. The traditional trade-off between cost and service is relevant to the procurement of third party logistics services. Transportation procurement research since deregulation offers the most value to an examination of logistics outsourcing.

This type of study, i.e., Mentzer and Krapfel 1982, often views the decision as a process involving variables which were not previously considered. These approaches include individual, corporate, and environmental variables and their influence on conflict, cooperation and negotiation. Given the importance of long term contractual relationships in many logistics procurement decisions today, this genre of research includes helpful constructs which can be used in the study of industrial buyer behavior and organizational decision making as it pertains to the selection of a third party logistics supplier.

Supplier Selection

The subject of supplier selection has long been of interest to those marketing and purchasing industrial goods and services. Research in this area has traditionally been devoted to quantifying the tangible aspects of the selection decision, e.g., costs and product quality. However, the genre of supplier selection literature most relevant to third party logistics procurement is that published in the last ten to fifteen years. During this period, researchers began to examine supplier selection in an environment encouraging the development of long term business alliances rather than short term adversarial relationships.

While researchers are still concerned with eliminating subjectivity and quantifying as many variables as possible, attention has increasingly turned to examining the qualitative factors associated with supplier selection. The ramifications of a wrong decision in a strategic alliance selection decisions are much greater than those surrounding poor choice in an arms length purchasing situation. Thus, today's successful supplier selection methods must seek to identify and properly consider numerous tradeoffs among multiple criteria.

Much of the theoretical and empirical research devoted to the construction of supplier selection frameworks is of primary interest in this final section of the literature review. A secondary focus regards the relative importance of selection criteria in strategic alliance

decisions. Most recent supplier selection literature can be categorized by the type of model posited within the research, i.e., normative or descriptive. Therefore, this section will be structured in accordance with that format. Previous research in the area of third party logistics supplier selection will be included in this classification scheme as appropriate.

Conceptual and prescriptive research in supplier choice

Narasimhan[189] recognized that supplier selection methods have historically involved much subjectivity and relied on some type of factor weighting and ranking technique. He also acknowledged that more complex operations research selection models existed but were not used because they were too complicated for business managers. Thus, the analytic hierarchy process (AHP) was recommended to provide a simple and systematic approach to supplier selection that would accommodate both the tangible and judgmental factors involved in supplier selection.

The analytic hierarchy process functions by decomposing a complex problem into multiple levels consisting of elements and subelements. The lowest level of the hierarchy represents the potential choices facing the decision maker. For instance, see **Figure 2.16.** for an example of a hypothetical supplier selection decision presented as a hierarchy.

The AHP involves multiple steps leading to a decision. The first requires the construction of the above mentioned hierarchy. The second step involves the establishment of relative weights for each of the elements and subelements appearing in the hierarchy. This is accomplished by requiring ". . . buyers to evaluate the elements in a pairwise fashion relative to each of the elements at a higher level."[190]

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189 Narasimhan, R., "An Analytical Approach to Supplier Selection," *Journal of Purchasing and Materials Management*, Winter, 1983, pp. 27-32.

190 Ibid., p. 29.

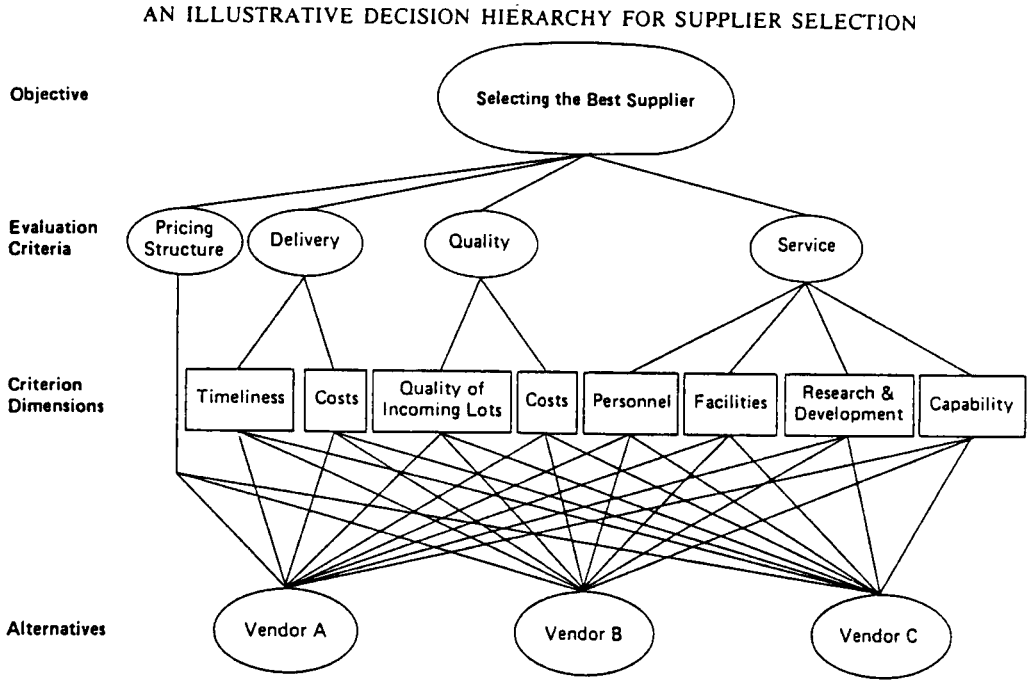


Figure 2.16. Supplier Selection Using AHP
Source: Narasimhan, R., "An Analytic Approach to Supplier Selection," *Journal of Purchasing and Materials Management*, Winter, 1983.

Buyers communicate pairwise comparisons in a verbal manner and their responses are converted to a numerical scale. Thus, subjectivity is not entirely eliminated when applying the analytic hierarchy process to supplier selection decision. The pairwise comparisons allow the construction of a matrix and use the of an eigenvector or geometric average to rank potential suppliers. The final step is the selection of the highest ranking supplier. In essence, the AHP simultaneously develops criterion weights and ranks suppliers.[191]

Nydick and Hill[192] built on Narasimhan's introduction of AHP to supplier choice by presenting a hypothetical example of the method's application in a supplier selection decision. This portrayal resulted in a prescriptive model consisting of the following five steps:

- Establish evaluative criteria for suppliers' proposals
- Obtain pairwise comparisons of the evaluative criteria and compute weights for the criteria
- Obtain measures that indicate how well each potential supplier achieves the criteria specified in step 2
- Using data from step 3, rank suppliers and compute corresponding priorities
- Using data from 2 and 4, determine the priorities of each supplier concerning the goal of the hierarchy.[193]

The authors offer a hypothetical example of the model with a goal of selecting the best supplier. Quality, price, service, and delivery, were used as evaluative criteria and multiple suppliers were involved. The example is presented as a formal methodology to structure the supplier selection decision. The AHP method was also held to be appropriate for group decisions concerning supplier selection. This was accomplished by allowing each buyer to

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191 Ibid., 28-30.

192 Nydick, R. and R. Hill, "Using the Analytic Hierarchy Process to Structure the Supplier Selection Procedure," International Journal of Purchasing and Materials Management, Spring 1992, pp. 31-36.

193 Ibid., p. 33.

perform the AHP analysis and subsequently holding group discussions on all individual proposals until a consensus was reached.[194]

Timmerman[195] stated that the best predictor of a potential supplier's ability to add value was its record of previous performance. He examined three approaches to performance verification and supplier selection: 1) the categorical approach, 2) a cost ratio method, and 3) a linear averaging tool. The categorical method requires the buyer to develop a list of relevant performance variables and rate suppliers on each variable. The rating often consists of a categorical grade, such as, satisfactory, neutral and unsatisfactory. Each variable is weighted equally and a simple summation determines the final score. The supplier with the highest weighted average score is usually chosen.[196]

The cost ratio approach to supplier selection requires the buyer to determine all direct and internal costs associated with each purchase, e.g., quality, service and delivery. The internal costs are then summed and expressed as a percentage of the total value of the anticipated purchase. This percentage is used to increase price quotations received from the potential suppliers. The supplier with lowest total cost, direct and indirect, is selected.[197]

The linear average approach is similar to a weighted-point method as supplier performance variables are rated and weighted according to their relative importance. Next, a specific procedure is developed to quantitatively evaluate supplier performance on each factor.

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194 Ibid., p. 34-35.

195 Timmerman, E., "An Approach to Vendor Performance Evaluation," *Journal of Purchasing and Materials Management*, Winter 1986, pp. 2-8.

196 Ibid., p. 3.

197 Ibid., p. 3.

Finally, each factor weight is multiplied by a supplier's corresponding performance number and the results are summed to yield a final rating for each supplier.[198]

Thompson[199] modified the weighted point supplier selection method to incorporate uncertainty with the use of Monte Carlo simulation. This simulation method was used to model buyers' perceptions of uncertainty surrounding their predictions of a supplier's future performance. The enhanced weighted-point model was referred to as a Vendor Profile Analysis (VPA).

In effect, the VPA model is essentially no different from any linear compensatory weighted model except that performance ratings are randomly generated using the Monte Carlo simulation technique. In this model, the buyer is required to provide only reasonable high and low estimates for each criterion to be evaluated. The high and low estimates are used as input to the simulation process. The simulation technique derives a frequency distribution for each supplier representing the range of expected performance from a given supplier. The supplier with the highest expected performance and least variability is selected.[200]

Cooper and Gardner[201] investigated supplier selection by determining why, when and how to establish a successful long term business relationship. This was accomplished by mapping their findings from a literature review of marketing and logistics onto the results from a review of interorganizational research. The authors posited a continuum of possible business

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198 Ibid., p. 4

199 Thompson, K., "Vendor Profile Analysis," *Journal of Purchasing and Materials Management*, Winter 1990, pp. 11-18.

200 Ibid., pp. 13-14.

201 Cooper, M. and J. Gardner, "Building Good Business Relationships: More than Just Partnering or Strategic Alliances," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 6, 1993, pp. 14-26.

relationships from arms length to full vertical integration. Next, the reasons firms enter business relationships were examined from a marketing and logistics and interorganizational perspective. The two approaches were then reconciled to explain how, when and why businesses decide to enter short or long term relationships.

Successful partnerships and/or strategic alliances, such as many third party logistics relationships, are held by Cooper and Gardner to require the following characteristics:

- Sharing of benefits and burdens - joint acceptance of business risks
- Extendedness - building trust and long term loyalty
- Operating controls - allowing each firm some oversight over the other party to ensure optimal efficiency
- Corporate culture bridge building - establish common agendas and goals[202]

The authors posited that strategic alliances occur when there is a need to reduce the conflict inherent from business conducted between two organizations of widely disparate size. Also, the grounds for an alliance were based on the need to reciprocate on business matters to obtain mutual goals. Another reason for the formation of strategic alliances related to the efficiency generated from meshing two organizations operations, communications and information systems. A need for stability, i.e., to defuse the effects of market uncertainty was also held to favor the establishment of a partnership. Finally, the need for legitimacy in the marketplace, such as the alignment of a third party logistics supplier with a Fortune 500 client, was also posited as a condition favoring the formation of strategic alliances.[203]

Aertsen[204] also examined the circumstances under which a strategic alliance between a manufacturer, distributor, or retailer and a third party logistics supplier was likely to occur. He

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202 Ibid., pp. 18-19.

203 Ibid., pp. 20-21.

204 Aertsen, F., "Contracting Out the Physical Distribution Function," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No., 1, 1992, pp. 23-29.

applied Oliver Williamson's theory of transaction cost economics (TCE) [205] to the integration of the physical distribution function to explain why some firms choose to subcontract the provision of logistics services. In essence, TCE states that a transaction can occur within the market environment, subject to a price mechanism reflecting factors influencing supply and demand, or in a hierarchy requiring a coordination of efforts. The theory assumes that the most efficient means for a given transaction will prevail.

Three types of transaction costs are set forth in TCE: information, bargaining, and enforcement. The existence of these costs may favor the use of hierarchical organizations rather than markets to carry out transactions such as the provision of logistics services. Also, transactions are held to differ by three dimensions: asset specificity, frequency and uncertainty. Asset specificity, or the need of a client and/or supplier to incur specific investments to facilitate transactions, was held to be the most important of the three critical attributes as it contributes to high supplier switching costs.[206]

Aertsen stated that a firm's propensity to outsource logistics cannot be explained solely by the amount of specific assets required for the completion of a transaction. He held that the degree of difficulty associated with performance measurement also plays a significant role in the logistics outsourcing decision. Aertsen maintains that outsourcing will be hindered if complex interactions between a client and provider inhibit the ability to discern responsibility for performance shortcomings.[207]

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205 Williamson, O., *Markets and Hierarchies: Analysis and Antitrust Implications*, The Free Press, New York, NY, 1975.

206 Aertsen, Op. Cit., p. 26.

207 Ibid., p. 27.

Aertsen's application of TCE to logistics outsourcing resulted in the following matrix:

	Performance Measurable	Performance Not Measurable
Non-Specific Assets	Outsource	Outsource & Monitor
Specific Assets	Outsource & Safeguard	Do Not Outsource

In each of the four cells depicted above, a different type of relationship exists depending on the degree of asset specificity and ease of logistics performance measurement. The continuum ranges from outsourcing without built-in controls (a commodity buy with no switching costs) to total in-house logistics provision. Aertsen concludes that relationships requiring controls should use electric data interchange monitoring capabilities and the safeguards found in joint ventures.[208]

Descriptive and empirical research in supplier selection

Gregory[209] described a supplier selection method used by Texas Instruments (TI) which attempted to document and analyze all the relevant factors germane to the firm's supplier selection decisions. The method was an adaptation of a matrix approach devised by Procurement Associates, Inc.[210] It utilized a tool known as a sourcing worksheet (SW). This technique generated a score for each potential supplier's proposal and was devised to reduce the amount of subjectivity involved in supplier choice.

The SW involved five major areas of evaluation for each potential supplier, i.e., proposal responsiveness, technical competence, quality, cost and a general category. Subcategories were developed for each of the five major categories and suppliers were rated according to a set of

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208 Ibid., p. 27.

209 Gregory, R., "Source Selection: A Matrix Approach," *Journal of Purchasing and Materials Management*, Summer 1986, pp. 24-29.

210 McDonald, P., *Subcontract Management and Advanced Purchasing Techniques: Volume 1*, 1981, Procurement Associates, Covina, CA

previously determined benchmarks. Weights were assigned to each major category to reflect the importance of purchasing requirements. A supplier's total score was determined by summing each subcategory and dividing the result by the weight assigned to the major category. The resulting ratio was multiplied by one hundred to obtain a score for each major category. All five category scores were then summed to reveal the supplier's final rating. The model allowed for adjustment, if a supplier could not be rated on a particular subcategory. Also, judgment points were added to or subtracted from a supplier's final rating to consider such factors as small or minority business proposals.[211]

Team evaluations were encouraged in the TI procedure to limit bias in supplier selection. The method was not devised to eliminate price or cost analyses. However, its purpose was to provide a logical template for supplier selection. The supplier with the highest total SW score was still subject to a price or cost analysis to satisfy audit or contract requirements. In essence, the Texas Instruments' SW matrix method was formulated to document and validate the selection of one supplier over another supplier. While the model provides a step-by-step method for supplier evaluation, it is limited in its ability to generate highly discriminating detail between potential suppliers.[212]

Ellram[213] investigated the process involved in the selection of a supplier for a partnership type of business relationship. As partnerships are commonly assumed to be different from arms length transactions, she posited that additional selection factors must be considered. Through a series of case studies involving firms with partnership purchasing experience, the

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211 Ibid., pp. 25-26.

212 Ibid., pp. 27-28.

213 Ellram, L., "The Supplier Selection Decision in Strategic Partnerships," *Journal of Purchasing and Materials Management*," Fall 1990, pp. 8-14.

following four categories of supplemental factors were developed: 1) financial, issues 2) corporate culture, 3) technology and 4) miscellaneous factors.

The financial selection issues in Ellram's study involved more than the price or cost of the immediate product or service to be purchased. For example, long-term economic performance and the financial stability of a potential supply partner were deemed to be critical selection factors. Several intangible factors, such as trust, strategic fit, and management attitudes were noted to be present in strategic alliance selection decisions. Technology issues were concerned with current applications and an assessment of the supplier's future capability. Miscellaneous factors such as a potential supplier's safety record and reputation with customers were also found to be important in long term business alignment.[214]

Ellram's examination of the differentiating factors involved in suppler partnership decisions revealed that qualitative variables are important in this type of selection decision. Obviously, these factors are not easily quantified; however, they are not any less important than the traditional variables, e.g., cost, quality, service, etc., considered in arms length supplier selection decisions. Further findings from this work suggested that existing supplier selection models should be revised to accommodate additional variables in partnership selection decisions.[215]

A normative guide was devised by Ellram[216] as a follow-up to her research concerning the differences between evaluative factors in arms length versus partnership supplier selection

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214 Ibid., pp. 12-13.

215 Ibid., pp. 13-14.

216 Ellram, L., "A Managerial Guideline for the Development and Implementation of Purchasing Partnerships," *International Journal of Purchasing and Materials Management*, Summer 1991, pp. 2-8.

decisions. A five-phase guide was developed by combining the findings from a purchasing literature review with case studies of organizations involved in successful partnerships,. The intent of this guide was to reveal the sequence of events leading to the establishment of an international purchasing partnership. The five stages consisted of 1) a need determination phase, 2) the identification of potential partners, 3) a screening and selection step, 4) a formal relationship initiation phase and 5) an ongoing evaluation phase.

The supplier selection stage in Ellram's evolutionary model stresses the need to include traditional quantitative and nontraditional qualitative factors in partnership purchasing decisions. The process used to identify potential suppliers recommended the inclusion of representatives from any area of the firm, e.g., purchasing, quality control, engineering, etc., with knowledge concerning potential vendors. A team approach, utilizing each department's functional expertise, was suggested for supplier screening. After an initial screening was completed, the remaining supplier candidates were to be contacted to determine if they were interested in establishing a long term business relationship. Assuming a candidate expressed interest, final supplier choice was based on ". . . perceived availability, quality, overall fit, . . . a detailed financial and operating analysis, visits to plant locations, and the development of a thorough understanding of the supplier's operation." [217]

A key determinant of supplier selection concerns the type and quality of information supplied or available to decision makers during their evaluation and screening of potential suppliers. Monczka, et al.[218] investigated the type of information most useful in various sourcing

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217 Ibid., pp. 5-6.

218 Monczka, R., E. Nicholas, Jr. and T. Callahan, "Value of Supplier Information in the Decision Process," *International Journal of Purchasing and Materials Management*, Spring 1992, pp. 20-30.

decisions. This study expanded previous research[219] which postulated five basic types of information as most useful to buyers making supplier selection decisions. The information was categorized in the previous study as follows: 1) the financial status of supplier, 2) types of good and services marketed by the provider, 3) payment terms, 4) size of supplier's manufacturing facilities and 5) labor union expiration dates.

To determine the type of information currently valued by industrial purchasers, Monczka, et. al. obtained data via a telephone interview on six types of purchasing decisions. The qualitative data resulting from the telephone interviews was analyzed using factor and multiple discriminant analysis. When comparing the results of the most recent study (1989) with the previous study (1981), differences were noted in the type and value of information most helpful to purchasing professionals. The recent study identified the following five types of supplier information as most valuable: 1) customer references regarding quality of supplier's product or service, 2) customer ratings of delivery performance, 3) total lead time, 4) past pricing practices, and 5) engineering support and design capabilities. While the current study was not longitudinal in nature, differences between the two studies were noted to be at least partially the result of changes in the perceived value of information over time.[220]

While the recent Monczka, et al. study did not specifically investigate the type and value of information most useful to firms purchasing strategic services, the results of this research provide insight into the type of information considered critical in today's purchasing environment. Buyers appear to highly value customer references concerning the quality and delivery capability of potential suppliers. The role of certain types of information is critical to

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219 Monczka, R., L. Giunipero, and R. Reck, "Perceived Importance of Supplier Information," *Journal of Purchasing and Materials Management*, Spring 1981, pp. 21-29.

220 Monczka, Op. cit., 1992, p. 28.

supplier choice. One might expect firms purchasing third party logistics services to value customer references since this type of acquisition represents a unique buy with a moderate to substantial degree of risk for many firms.

The relative importance of supplier selection criteria occurring since the shift to business relationships favoring closer ties between buyers and suppliers was recently examined by Wilson.[221] The globalization of business was indicated as the reason for increased partnerships between firms in the U.S. in recent years. This longitudinal study involved supplier selection research conducted during the previous twenty years, including research by Lehmann and O'Shaughnessy[222] and Evans,[223] and a current study on the importance of supplier choice factors. The purpose of the comparison was to identify the extent to which the criteria surrounding supplier choice had changed because of a shift to longer term business relationships.

As indicated above, the relative importance of supplier selection factors has been previously examined. Findings from this type of research revealed that, except for minor purchases, the following five key criteria affect supplier selection:

- Performance - (quality) how well the product or service is suited to the desired application.
- Economic - (price) costs associated with procuring and using the product or service.
- Integrative - (service) amount of customer orientation displayed by a potential supplier.
- Adaptive - (delivery) certainty that supplier will deliver specified product or service.
- Legalistic - the extent of legal constraints associated with procurement of the product .[224]

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221 Wilson, E., "The Relative Importance of Supplier Selection Criteria: A Review and Update," *International Journal of Purchasing and Materials Management*, Summer 1994, pp. 35-41.

222 Lehmann. D. and J. O'Shaughnessy, "Difference in Attribute Importance for Different Industrial Products," *Journal of Marketing*, Vol. 38, April 1974, pp. 36-42.

223 Evans, R., "Product Involvement and Industrial Buying," *Journal of Purchasing and Materials Management*, Summer 1982, pp. 23-28.

224 Lehmann, D. and J. O'Shaughnessy, "Decision Criteria Used in Buying Different Categories of Products," *Journal of Purchasing and Materials Management*, Spring 1982, p. 10.

Wilson investigated the relative importance of the five basic selection criteria across four different types of purchasing situations: 1) routine, 2) procedural, 3) performance, and 4) political problem purchases. Performance problem purchases, in which there is doubt about whether the product or service will perform satisfactorily, are most related to the issue of third party logistics procurement. Political problem purchases, in which a large capital outlay is required and the buying situation involves personnel from different functional and organizational levels, are also likely to mirror third party logistics purchasing. Historically, service has been shown to be the most important selection factor for performance problem purchases. Also, price, supplier reputation, and reliability have usually been judged the most important for political purchase problems.[225]

Using a decompositional decision evaluation method for three hypothetical product and/or service purchasing decisions involving thirty-two corporate buying centers, Wilson measured the relative importance of supplier selection criteria today. Findings from this study revealed that, over time, quality has increased, price may be less significant, delivery declined and service gained in importance as supplier selection factors.[226]

When examining changes in the relative importance of selection factors across product categories, several modifications were noted by Wilson. For performance problem and political problem purchases, quality and service had apparently become more important and delivery less important over the years. However, the significance of price differed between these two types of purchases. For political problem purchases, price was revealed to have dropped markedly in importance as a selection factor. On the other hand, price remained relatively unchanged in

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225 Wilson, Op. Cit., p. 37.

226 Ibid., p. 39.

importance for performance problem purchases. The results of this study appeared to indicate that price has dropped in overall importance as a primary attribute in supplier choice. The research also demonstrated that quality and service tend to overshadow price and delivery as importance factors relating to supplier selection in most purchasing decisions today.[227]

Lieb[228] has twice investigated the use of third party logistics services by American manufacturers. Both monographs obtained data via a mail survey and, among other questions, examined the decision making process involved in the selection of third parry logistics suppliers. The initial descriptive study published in 1992 found that corporate and divisional levels of management were most likely to initiate an investigation into the use of third party logistics. The findings also revealed that sales calls by third party representatives and discussions with other logistics professionals provided most purchasers with an awareness of the firms offering contract logistics services. Further, survey respondents indicated that the decision to use third party services involved multiple functional areas. The five most frequently cited areas were: finance, manufacturing, marketing, information systems, and human resource management.[229]

Cost and service factors were noted in the first Lieb study as equally important in the final selection of a third party logistics supplier. Other selection variables mentioned as important were 1) the buyers previous experience with the third party provider, 2) the capability of the supplier's management team, 3) company reputation, and 4) financial stability. The most common services purchased were warehouse management and shipment consolidation. Also,

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227 Ibid., pp. 39-40.

228 See Lieb, R., "The Use of Third Party Logistics Services by Large American Manufacturers," *Journal of Business Logistics*, Vol. 13, No. 2, 1992, pp. 29-42. and Lieb, R., R. Millen and L. Wassenhove, "Third-Party Logistics Services: A Comparison of Experienced American and European Manufacturers," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 6, 1993, pp. 35-44.

229 Lieb, Op. Cit. (1992), pp. 31-33.

most buyers reported negotiating contracts of one to three years for the services they purchased.[230]

Lieb's second study compared the experience of U.S. and European manufacturers concerning the use of third party logistics. A portion of this study examined the decision making process used by firms in their decision to outsource logistics. Findings revealed that a single management level (corporate) was overwhelming involved in the decision by U.S. and European manufacturers to employ third party logistics firms. However, the results revealed that both groups relied on managers from several functional areas in the decision making process. Marketing and finance were the areas most frequently included by European firms while U.S. manufacturers involved manufacturing as well as marketing and finance.[231]

Buyers of third party logistics services from both groups expressed reservations concerning the ability to obtain an adequate level of service and a potential loss of control from logistics outsourcing. Other concerns of purchasers were the ability to determine the true cost of third party logistics services and morale problems resulting from reorganizations. Findings from this study mirrored the previous study concerning the importance of information sources for the purchase of third party logistics services.

Sales calls by third-party representatives and discussions with logistics colleagues were the most frequently mentioned reference sources. The latest study also revealed that U.S. and European managers consider cost and service variables to be equally weighted as the two most important third party logistics supplier selection factors. Other important choice factors were

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230 Ibid., p. 34.

231 Lieb, et. al., Op. Cit. (1993), pp. 38-39.

supplier capability, previous experience with the provider and the reputation of the third party firm.[232]

The buying practices of European firms concerning logistical alliances was investigated by van Laarhoven and Sharman,[233] employing case studies to gather primary data. A total of fifty users and twenty providers of third party logistics services participated in a study examining the reasons for increased logistical alliances in Northern Europe. In this study, an alliance was defined as one which lasted at least one year, included both transportation and warehousing services, and employed a single provider for the services. Findings from the study revealed that price or cost was the single most important selection factor used to screen potential providers. Fifty-two percent of users indicated price as the deciding factor in their selection decision. Other important selection factors mentioned by the users were the level of specialized logistics knowledge exhibited by the seller (39%), an ability to improve existing service levels (39%), the continued use of an existing distribution network (31%) and a willingness to establish a tailored network (29%).[234]

The European study also indicated that many buyers of third party logistics services use a hard negotiating approach involving competitive bidding. Only fourteen percent of the firms interviewed limited negotiations to an existing provider on a single source basis. Many (30%) chose to negotiate with at least four potential suppliers or accepted competitive bids (42%) from an invited group of third party logistics sellers. Formal contracts with detailed performance

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232 Ibid., pp. 39-40.

233 van Laarhoven, P. and G. Sharman, "Logistics Alliances: The European Experience," The *McKinsey Quarterly*, Number 1, McKinsey Consulting, 1994, pp. 39-49.

234 Ibid., p. 43.

goals were negotiated for the services in almost all cases; however, only twenty-five percent of the agreements contained penalties for unsatisfactory performance by the service provider.[235]

Supplier Selection Summary

A review of supplier selection literature reveals that most of the existing research is oriented toward the purchase of products rather than services. The synthesis also shows that much subjectivity is routinely involved in industrial purchasing, especially when long-term business alignment is being considered. Researchers have proposed a multiplicity of tools to remove bias from the decision making process, but the problem still exists. Most selection methods currently involve some type of cost and quality analysis in conjunction with an evaluation of qualitative factors. Quality, delivery and price are the traditional selection factors considered by industrial buyers. The review indicates that most evaluation programs are a variation of one of three basic types: 1) the categorical approach, 2) a weighted point plan, or 3) a cost ratio method.

The previous work of Cooper and Gardner, and Aertsen provides an initial attempt to build a theoretical base for supplier selection as it pertains to strategic business alliances. Empirical validation of the concepts outlined by these authors is required to substantiate or refute the proposed theories. Ellram's descriptive research has resulted in a normative supplier selection model for international partnership purchasing decisions. The framework is similar to those presented in the industrial buyer behavior section above.

One of the most interesting observations from the supplier selection literature regards the changing importance of selection criteria over time. It appears that price may no longer the primary determining factor in supplier selection for many purchases today. However, when one

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235 Ibid., p. 44.

examines the work specifically pertaining to third party logistics, price is still found to be a very important selection variable. The literature also reported that buyers are increasingly relying on customer references to measure intangible factors such as delivery and service. These variables are at the heart of third party logistics provision and they must play an important role in any study of supplier selection.

Conclusions from the Literature Review

Evaluation of the collateral and related literature provides a foundation for a conceptualization of the process used by industrial firms to acquire contract logistics services. While no single framework depicted the specific process used by industrial buyers to acquire strategic services, the literature provided the elements and configurations likely to be present in this type of decision. Several observations are apparent regarding the formulation of a theoretical model of supplier selection for the provision of third party logistics services. These observations involve individual, organizational and environmental influence variables and the interaction of the factors as outlined below.

The appropriate unit of analysis for a study of third party logistics procurement must involve multi-participants for the development of an adequate research strategy. An identification of the number and type of decision phases and the degree of branching, bounding and recycling is required to properly frame the process. Also, a conceptualization must acknowledge that supplier selection involves rational analysis tempered by behavioral considerations.

A recognition of the goals and motives of individual participants is required to ascertain sources of conflict. The use of politics and power must be considered, as they are likely to influence the structure of corporate choice in the selection of a third party logistics supplier. The degree of congruence-seeking present within the group will impact the process, especially in the

selection and evaluation phases. Also, an examination of bargaining in the resolution of conflict warrants investigation and attention.

Knowledge of the sources of information and communication protocols used by a purchasing unit will assist in determining the requirements for decision resolution. An identification of the different roles played by participants is vital for a clear understanding of the source of power and its leverage for control. Further, environmental influences and the impact of extra-organizational entities such as consultants and third party logistics sales agents must be considered to fully understand the methodologies utilized in reaching a group consensus.

The importance of task and non-task variables and how they impact supplier screening, evaluation and final choice is necessary. In addition, the role of suppler reputation, trust, and interdependence to selection is critical in understanding the process and final decision. Further, a consideration of the amount of time available to reach a group decision is appropriate to position this element as a constraint to or enhancement of the process.

It is apparent from recent research in supplier selection that qualitative criteria have become much more important in the decision process, especially in the establishment of strategic alliances. This is likely tied to the changes in philosophy and operational considerations concerning long-term business alignment versus the traditional paradigm of arm's length purchasing. Concepts such as trust, management attitude, depth of expertise, strategic fit, and goal compatibility are certain to play important roles in the selection of an external logistics provider.

An investigation of the methods used to measure and establish importance for qualitative and quantitative criteria is imperative in a study of third party logistics procurement. An examination of external logistics procurement is required to initially describe the buying process used by industrial buyers. Knowledge of the buying process will provide insight into the

benefits desired by purchasers. This will aid an attempt to segment the market by causal factors. The development of an expository model of the buying process and segmentation of the third party logistics market by customer specified benefits are the two overall goals of this research. The next chapter will describe a research design to acquire and analyze the data and accomplish these goals.

CHAPTER III

RESEARCH METHODOLOGY

Introduction

The study conceptualization outlined in the initial chapter provided the research design for this dissertation. The purpose of this chapter is to explain the methodology used in data collection, analysis and interpretation. A triangulated approach to discovery and investigation was employed to address the primary research questions, subproblems, and achieve the dissertation's objectives.

The methodology followed the process depicted in the flowchart appearing in chapter one. For convenience, the model appears again in this chapter as **Figure 3.1**. The research began with a literature review and evolved through three distinct stages. The initial step involved the use of a focus group interview to generate constructs and provide prescientific knowledge. The focus group also served to guide the development of a topical outline and research questions for subsequent field case studies and a cross-industry mail survey of third party logistics buyers.

The second phase of the research design relied on multiple field case studies to characterize the decision process resulting in the selection of a third party logistics provider. The focus group and case studies also provided insight into the purchasing philosophies of industrial buyers concerning contract logistics and assisted in the design of the mail questionnaire. Descriptive data from the mail survey was also used to augment the findings from the case studies and more fully describe supplier selection strategies.

The final phase of the research methodology utilized supplier selection data from the nationwide mail survey referenced above. Buyer responses to the questionnaire were

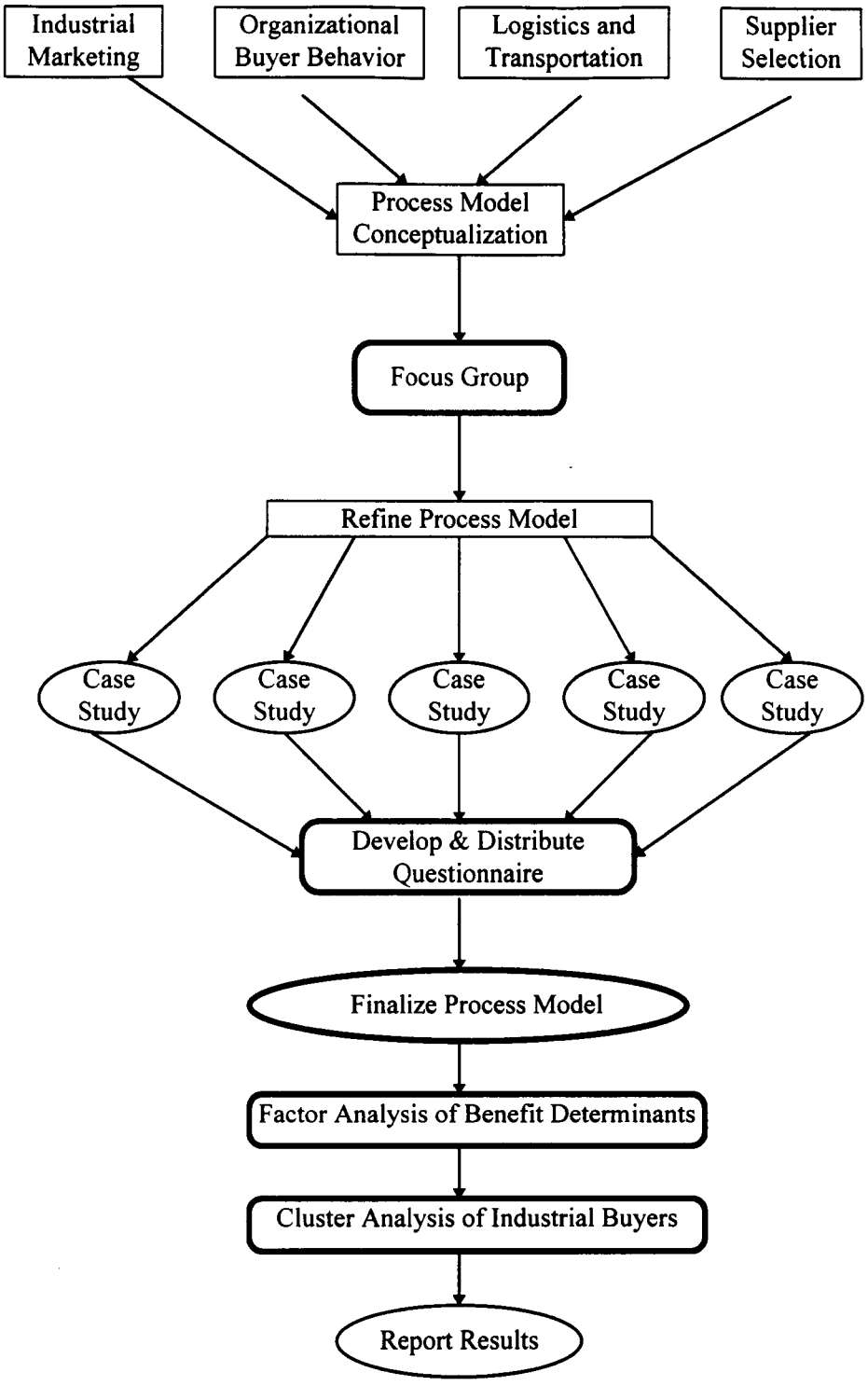


Figure 3.1. Research Design Flowchart

employed to empirically determine the benefits desired by third party logistics purchasers and the feasibility of benefit based customer segmentation in this market. The research design guiding the last phase of the dissertation represented an adaptation of the method used by Moriarty[236] in his study of the segmentation potential of the non-intelligent data terminal market. This design was particularly appropriate as contract logistics services, like non-intelligent data terminals, are purchased for a wide variety of industrial applications.

As revealed in the review of related literature, many of the existing organizational decision making frameworks rest on unsubstantiated theory. Further, a large number of the previous attempts to model industrial buyer behavior relied on hypothetical purchasing decisions. This research investigated actual decision making.

There is an inherent fallacy in a prospective approach to industrial buying research; namely, organizations do not always behave as anticipated. Therefore, this study was predicated on a research design which obtained data from actual third party logistics purchasers in a current or retrospective manner. All focus group, case study and mail survey participants were represented by one the following categories:

(1) Buyers personally involved in the purchase of contract logistics services in the previous two years, or

(2) Buyers currently evaluating the acquisition of third party logistics services.

The remainder of this chapter presents the subproblems used to address the three primary research questions raised in chapter one:

How do industrial buyers select third party logistics suppliers?

What benefits are desired by purchasers of third party logistics services?

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[236] Moriarty, Rowland T., *Industrial Buying Behavior*, D. C. Heath and Company, Lexington, MA, 1983.

Can the third party logistics market be segmented into homogeneous groups of industrial buyers based on the benefits sought in the acquisition of these services?

Answers to the subproblems facilitated accomplishment of the dissertation's overall research objectives; namely,

To model industrial buying behavior as it pertains to the purchase of third party logistics services, and

To determine whether benefit based buyer segments are present in the third party logistics market.

Data requirements, sources, and collection techniques are presented in this chapter. A detailed plan of investigation for each phase is also included.

Problem Development and Primary Research Objectives

Current interest in industrial buyer behavior and market segmentation as it relates to third party logistics resulted from the numerous organizational and environmental changes reviewed in chapter one. It is the intent of this section to present the primary objectives of the study and the subproblems addressed to successfully attain the primary objectives. Three distinct research categories were used to classify the dissertation's primary goals:

1. Macro knowledge of the new market,
2. Micro knowledge of buyer behavior, and
3. Benefit determination and buyer segmentation.

Each of the objectives, along with pertinent research questions, is presented below.

Macro knowledge objectives

As third party logistics represents a new concept to many firms, the first objective was to determine how industrial buyers perceived this phenomena. A proper definition of the concept is critical to providers of contract services in the specification of their market offerings and strategy development. Also, the long-term viability of external logistics service provision depends on a

proper understanding of what customers expect when they decide to outsource this strategic service.

Objective 1 Define and describe the concept third party logistics.

How did existing and potential purchasers of third party logistics services interpret the term third party logistics?

What specific services did they include in third party logistics?

What stimulated industrial buyer interest in third party logistics?

Which current providers were known by industrial buyers?

What strengths and weaknesses of current providers were recognized?

What logistical functions were likely to be outsourced?

How did industrial buyers view the future of these services?

The answers to the macro knowledge research questions provided preliminary insight into the third party logistics market and buyer perceptions concerning existing services and providers. This information established the base for a more detailed analysis of the decision process at the individual firm level. Determining how a decision making unit selected a third party supplier was critical to the development of a conceptual model of the process. This was the focus of the micro knowledge research objectives and questions.

Micro knowledge objectives

The first overall objective of this study concerned the identification, description, and explanation of the organizational decision process leading to the choice of a third party logistics provider. The accomplishment of this objective resulted in the construction of a conceptual model of the process. The framework is depicted and fully explained in the findings from Phase II appearing in the next chapter. The development of such a model required 1) a detailed understanding of the decision making unit, 2) the number and sequence of the steps or phases in

the process, 3) the importance of information and communication and 4) the evaluation methods employed. The next primary research objective and questions addressed these areas of concern.

Objective 2 Characterize the buying process for third party logistics services.

Who identified the need to evaluate third party logistics?

How were decision making units established?

What roles were played by decision making unit participants?

Did the process follow a structured path or was the effort largely open-ended?

What information was needed during the process? What were the sources of this information?

How did communication flow during the process?

How were potential suppliers selected? What screening criteria was employed?

What types of evaluation were used in the choice of a supplier?

How was the shift to third party logistics implemented?

Answers to the above questions and attainment of the micro knowledge research objective provided a detailed explanation of the process used by firms to select a supplier and adopt contract logistics. The answers to these questions also allowed insight into two key areas; namely, "Who is involved in the decision process," and "How is a supplier selected."

Buyer segmentation objective

Knowledge of the buying decision process is important because it can provide the basis for effective market segmentation. The second overall objective of this research was to determine whether third party logistics buyers could be segmented by the benefits derived from the purchase and use of these services. "A market segment is a group of actual or potential customers who meet two criteria: all members of the segment have the same value system and

priorities with respect to the particular product and/or service offering. . . and. . . the marketer's cost of serving each customer in the segment is approximately the same."[237]

Benefit based segmentation has been adopted widely by marketers of consumer goods and services; however, the method has seldom been used by industrial marketers. Haley explained benefit based segmentation as . . .

> an approach to market segmentation whereby it is possible to identify market segments by causal factors rather than descriptive factors . . . The belief underlying this segmentation strategy is that the benefits which people are seeking in consuming a given product are the basic reasons for the existence of true market segments.[238]

Industrial marketers have traditionally segmented their customers by descriptive factors such as company size and industry sector.[239] While industrial market segmentation from the seller's perspective is common, it may be inferior to segmentation by desired benefits. The third research objective and questions addressed the issue of customer segmentation in the third party logistics market.

Objective 3 Determine whether knowledge of third party logistics buying behavior can be used to segment industrial customers.

What benefits were sought by industrial buyers in their acquisition of third party logistics services?

Did the desired benefits differ between and among buyers?

How much variability existed in the provision of the desired benefits among suppliers in the industry?

Can benefit based segmentation variables be determined via a knowledge of the buying process and purchasers' preferences?

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237 Faris, Charles W., "The Industrial Buying Decision Process" in *The Handbook of Marketing Research* (Robert Ferber, Editor), McGraw-Hill, NY, NY, 1974, pp. 4-21.

238 Haley, R., "Benefit Based Segmentation: A Decision Oriented Tool," *Journal of Marketing*, Vol. 32, 1968, pp. 13-20.

239 Moriarty, Op. Cit., p. 93.

Answers to the segmentation questions assisted in determining whether buyer groups were amenable to differentiation by benefits in the third party logistics market. Attainment of objective three provided the data necessary to segregate the market into homogeneous customer groups for market strategy purposes. Knowledge of how and why a customer buys can aid third party logistics marketers in the effective allocation of promotion and sales dollars. It can also permit suppliers to tailor their market offerings and service delivery.

Research Design

Research design represents the complete strategy employed to attack the primary research problem(s) of the study. It addresses four fundamental questions with respect to the data employed in the research process:

(1) What data is needed?
(2) Where are the data located?
(3) How will the data be secured?
(4) How will the data be interpreted?[240]

In nonexperimental research the term design takes on an somewhat altered meaning from that commonly accepted for experimental research. Experimental research routinely employs a specific design to address a given topic. Nonexperimental research, as conducted in this dissertation, ". . . focuses more on methods of investigation (e.g. survey, participant observation, etc.) rather than the design of the study."[241] The overall purpose of research design has been characterized as the control of variance in the research endeavor.[242]

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240 Leedy, P., *Practical Research: Planning and Design, Third Edition*, Macmillan Publishing Co., New York, NY, 1985, p. 96.

241 Drew, C. and M. Hardman, *Designing and Conducting Behavioral Research*, Pergamon Press, Inc., Elmsford, NY, 1985, p. 106.

242 Kerlinger, F., *Foundations of Behavioral Research, Third Edition*, Harcourt Brace Jovanovich, New York, NY, 1986, p. 280.

The nature of the research conducted herein was primarily exploratory, descriptive and inductive. The basic design relied on descriptive and analytical survey techniques. This section explains the investigative strategy for each of the three phases of the research. A discussion of the purpose of each phase, sampling plan, data collection instrument and method of analysis is included.

Phase I *Describing Third Party Logistics*

The purpose of the initial phase of the research concerned the need to describe the phenomena. As contract logistics is a new industry in the United States, a preliminary investigation was needed to determine how industrial buyers perceived the services offered and the viability of this market. The critical questions addressed in this phase were:

> How do industrial buyers perceive existing third party logistics services and the suppliers which currently compromise the market?
>
> What motivates a firm to consider the purchase of third party logistics services?
>
> Once a decision has been made to outsource logistics, how do firms proceed in the acquisition process?

Phase I: Focus Group

Since this phase of the study was exploratory with the purpose of generating and refining theoretical ideas and constructs, a focus group was selected as the preferred method of discovery.[243] The strength of this method for an exploratory approach, which seeks to generate scientific constructs and validate them against everyday experience, has been described by Hess.[244] The advantages of the focus group method relate to a number of factors, most notably

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243 Calder, Bobby J., "Focus Groups and the Nature of Qualitative Marketing Research," *Journal of Marketing Research*, Vol. 14, 1977, p. 356.

244 Hess, John M., "Group Interviewing" in *Marketing and the New Science of Planning* (edited by R. L. King), American Marketing Association, Chicago, IL, 1968, p. 194.

synergism, i.e., a group effort produces a wider range of information, insights, and ideas than the culmination of separately secured responses from a number of individuals.[245]

Focus group sampling plan and data collection

Homogeneity within a group is deemed most appropriate when the purpose of the focus group is exploratory in nature. "The participants should be homogeneous in relation to the topic under discussion, i.e., all should either have or have not been exposed to the purpose of the study.[246] The type of focus group employed in this research was a full group (eleven managers recruited on the basis of their common demographics, attitudes, or buying patterns) led by a professional moderator for a period of two hours. This type of group has been found to be most useful in addressing the issues present in this phase of the research, i.e., habit and usage studies and idea generation.[247] Participants were recruited from a group of senior logistics, purchasing, financial, manufacturing and human resource managers who had recently (within the last two years) been involved in the procurement or evaluation of third party logistics services.

Potential focus group participants were identified by the research sponsor, the principal advisor to this dissertation and O'Hare In-Focus, a professional marketing company. Several industrial directories were used by the marketing company to identify candidates for the focus group. Telephone recruiting for the group interview was conducted by the marketing company and the actual session was held at the company's facility near Chicago, Illinois.

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245 Ibid., p. 194.

246 Axelrod, M., "Ten Essentials for Good Qualitative Research," *Marketing News*, Vol. 8, 1975, p. 9.

247 Greenbaum, Thomas L., *The Handbook for Focus Group Research*, Lexington Books, NY, 1993, pp. 24-27.

The focus group represented a non-probability sample. For exploratory research utilizing a focus group, sample generalizability is not meaningful. The purpose of exploratory focus groups is to suggest constructs or provide comparisons with everyday knowledge. The results do not constitute a scientific test and are more appropriately used for prescientific endeavors such as deriving questions to be used in subsequent qualitative or quantitative research. Sample generalizability refers to quantitative research. It is inappropriate to consider focus group findings generalizable.[248]

Data was obtained during the focus group interview via written notes and poster board charts. A professional moderator coordinated the group; however, the format was open-ended to facilitate idea generation. The focus group outline with topic areas and specific questions is included in Appendix A.

The strengths of the focus group method are derived from a compromise between the strengths found in other qualitative research methods. "Like participant observation, they allow access to a process that qualitative researchers are often centrally interested in: interaction. Like in-depth interviewing, they allow access to the content that. . . [researchers]. . . are often interested in: the attitudes and experiences of informants."[249] Thus, focus groups offer a compromise that is superior to either of the other two methods when both participant observation and direct interviewing are desired simultaneously.

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248 Calder, Op. Cit., p. 361.

249 Morgan, D. and M. Spanish, "Focus Groups: A New Tool for Qualitative Research," *Qualitative Sociology*, Vol. 7, No. 3, 1984, p. 260.

Focus group analysis

Analysis of the recorded data obtained from the focus group followed the method prescribed by Krueger.[250] This procedure involves translating raw data (respondent comments) to descriptive statements and then to an interpretative summary. In essence the researcher must ". . . identify those opinions, ideas, or feelings that repeat even though they are expressed in different words and styles."[251] This is accomplished by 1) preparing a written summary of the focus group as soon as possible after the meeting, 2) reading the transcript of the focus group, and 3) listening to any audio tapes of the meeting.

A summary of conclusions was prepared from the focus group interview adhering to Krueger's recommendations. His guidelines involve the following five factors: 1) the variety and context of the words and phases used, 2) the context of comments and responses, 3) the internal consistency of positions taken by respondents, 4) the specificity of responses, and 5) the purpose of the group meeting.[252]

Focus groups are considered to be especially useful in the developmental phases of a research program. The major purpose of this method is the generation of hypotheses and constructs. It does not usually permit generalization and findings should be validated by a quantitative study. Objectivity is important to minimize bias and its is incumbent on the moderator to assure that all participants have an equal opportunity to express themselves to minimize the chance of bias. Validity refers to the ability of the responses to measure that which

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250 Krueger, Richard, *Focus Groups: A Practical Guide for Applied Research*, Sage Publications, Newbury Park, CA, 1988, pp. 106-121.

251 Ibid., p. 209.

252 Ibid., p. 113-116.

is intended in the discussion. The skill of a professional moderator is required to improve clarity on any issue discussed.[253]

Phase II: Field Case Studies

The objective of this research phase involved a detailed examination of the process used by multiple-person decision making units to select a third party logistics provider. These investigations determined the individuals involved in the decision, the criteria for evaluation and selection and the protocols followed in the purchase. The results of these efforts aided the formulation of a conceptual model of the decision process. The model is anticipated to assist buyers and sellers of third party logistics services by providing an analytical description of the purchasing process, identification of the key variables, and insight into their relationships. While no one model can accurately describe the contract logistics buying process for all firms, it can provide an analytical structure to investigate the complex relationships likely to occur in this type of purchase.

Since the results of field case studies answer "how" and "why" type questions which focus on a contemporary event, research propositions were used to provide guidance during this phase of the research.[254] Propositions serve to ". . . direct attention to something that should be examined within the scope of the study."[255] The source of the data, sampling plan, data collection instrument and method of analysis are presented below for case study phase of the research.

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253 Goldman, A., "The Group Depth Interview," *Journal of Marketing*, Vol. 26, No. 3, 1962, pp. 61-68.

254 Yin, Robert K., *Case Study Research: Design and Methods*, Sage Publications, Newbury Park, CA, 1989, pp. 13-16.

255 Ibid., p. 30.

Phase two: case study propositions

The initial proposition related to the importance of risk in third party logistics procurement decisions. For most firms, contract logistics purchasing represents a "new buy" situation and therefore entails a substantial degree of perceived risk. This level of risk causes the firm to proceed in a cautious and conservative manner in the purchasing decision. The research questions attempted to acquire knowledge of how risk impacts the decision making process.

Proposition 1 The procurement of third party logistics services involves a substantial degree of perceived risk.

What were the areas of perceived risk associated with a purchase of third party logistics?

How was this risk managed?

What levels of management were involved in the decision?

The second proposition recognized that power plays an important role in organizational decision making. When one party uses power to gain a desired outcome, one of three possible consequences will result: ". . . compliance (short-lived erratic response), identification (predictable response from the expertise that others see in the powerful party) or internalization (long lasting cooperation based on similar objectives)[256] The research questions for this proposition attempted to measure how power influences the decision process.

Proposition 2 The exercise of power within a decision making unit simplifies the decision making process.

When power was exercised, did the purchase process become more streamlined?

When power was used in the decision making process, was the time spent in problem definition and supplier evaluation reduced?

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256 Kasulis, J. and R. Spekman, "A Framework for the Use of Power," *European Journal of Marketing*, Vol. 14, No. 4, 1980, pp. 180-191.

The third proposition recognized that the external environment may affect the decision process. Hambrick holds that the external environment affects the structure and strategy of the organization.[257] For instance, time constraints have been noted to speed up a procurement process.[258] Finally, the relationship between information availability and the level of uncertainty experienced in the purchasing decision has been investigated.[259] The research questions associated with this proposition attempted to define the impact of the external environment on the decision process.

Proposition 3 Environmental uncertainty will increase the size of the decision making unit and prolong the decision process.

Did the fact that the third party logistics industry is composed of a number of new supplier entrants increase the number of people involved in this purchasing decision?

Did the degree of uncertainty present complicate the purchasing process and compromise the confidence placed in your final supplier choice?

The final proposition investigated the role of information and communication in the decision process. For new buy situations, incorporating a substantial degree of risk, an increased amount of supplier information and communication is required. The research questions for this proposition attempted to measure the role and importance of information and communication in third party logistics supplier selection.

Proposition 4 Cost and service performance data, verified by professional colleagues (internal and external to the firm) with experience in the acquisition of third party logistics services, represent the most highly valued sources of information to decision makers.

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257 Hambrick, D., "Some Tests of the Effectiveness and Functional Attributes of Miles and Snow's Strategic Types," *Academy of Management Journal*, Vol. 26, No. 1, 1983, pp. 5-26.

258 Ruekert, R. O. Walker and K. Roering, "The Organization of Marketing Activities: A Contingency Theory of Structure and Performance," *Journal of Marketing*, Vol. 49 (Winter), 1985, pp. 13-25.

259 Dwyer, F. and M. Welsh, "Environmental Relationships of the Internal Political Economy of Marketing Channels," *Journal of Marketing Research*, Vol. 22 (November), 1985, pp. 347-358.

What form of reference material provided the most utility during the procurement process?

How did information influence the development of selection criteria?

What were the most important communication links during the procurement process?

What were the deciding factors in the decision to select your current supplier or derive your existing "shortlist"?

Case study methodology

The propositions and research questions indicated the need for detailed and comprehensive information from decision making unit participants. This need required the use of a method which allowed "how" and "why" questions to be asked about a contemporary set of events, over which the investigator has little or no control."[260] The primary method employed for this task was a series of exploratory field case studies. However, descriptive statistics compiled from attitude and buying process questions included in the nationwide mail study were also used to augment data from the field case studies. These two methods of data collection and discovery provided a broad base for a detailed characterization of the purchasing process from the third party logistics buyer's perspective.

"Exploratory case studies have three purposes: to discover significant relations in the field situation, to discover relations among variables, and to lay the ground-work for later, more systematic and rigorous testing of hypotheses."[261] These goals describe the intent of phase two of this dissertation. As suggested by Yin, the case study method was also augmented by document analysis and archival record searches, when such data was available.[262]

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260 Yin, Op. Cit., p. 20.

261 Kerlinger, Op. Cit., p. 373.

262 Yin, Loc. Cit., pp. 86-89.

Case study sampling plan and data collection

The field case studies followed a semi-structured format using open-ended questions. The outline used to guide the face-to-face interviews is presented in Appendix B. The use of an outline allowed the researcher to structure information gathering and obtain responses in a uniform manner across all respondents.

The process involved in the case study method requires a researcher to probe with in-depth questions to reveal attitudes and relationships. The insight provided from this information should generate a detailed understanding of the case study participant's perspective and facilitate the accumulation of data.[263] Written notes were taken during the interviews in an outline format and a summary was prepared after each case study was completed (see Appendix B). Archival data submitted to the researcher by the case study participants was also used in compiling the case study summaries.

The goal of a field case study is the identification of data which can be replicated from a number of different sources. This method facilitates model conceptualization and construction while enhancing the development of theory.[264] Conclusions drawn from each study were used to modify the case study questions before additional interviews were conducted. This practice served to modify the interview guide to include any unanticipated areas of investigation.

Potential case study participants were derived from the recommendations of the research sponsor and the principal advisor to this study. As the intent of this research was produce a universal characterization of the third party logistics buying process, no demographic

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263 Patton, M., *How to Use Qualitative Methods in Evaluation*, Quest Publishers, Beverly Hills, CA, 1987, pp. 108-109.

264 Eisenhart, K., "Building Theories from Case Study Research," *Academy of Management Journal*, Vol. 14, No. 4, 1989, pp. 532-534.

constraints were placed on potential case study participants. However, each firm selected had recently (within the last 2 years) purchased third party logistics services or was currently engaged in the buying process.

Potential case study firms were contacted by telephone to advise them of the research and determine their willingness to participate in the case studies. Companies expressing interest received a follow-up letter further explaining the purpose of the research and a copy of the case study interview outline presented in Appendix B. A total of five in-depth field case studies were conducted.

An attempt was made to include as many members of the decision making unit as possible for each firm. Participants were senior managers from purchasing, finance, logistics, and manufacturing. Only those directly involved in the evaluation, recommendation or selection of a third party logistics supplier were included.

Case study data analysis

Yin's[265] method of data analysis was used in compiling case study results. This involved the application of pattern matching logic across all of the case study narratives. In essence, empirically based patterns of behavior, attitudes or policy were compared with those expected in the a priori propositions. Cross analysis between cases was then conducted to validate any findings or conclusions.

Explanation building was also used to develop theory concerning the decision making process and formulate a descriptive model of third party logistics procurement. The goal of explanation building is to analyze the case study data to explain the phenomena under study. It is an iterative process consisting of the following steps:

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[265] Yin, Loc. Cit., pp. 109-113.

1. Develop an initial theoretical statement or proposition;
2. Compare the findings of an initial case against the previously developed statement or proposition;
3. Revise the statement or proposition;
4. Compare other details of the case against the revision;
5. Revise the statement or proposition again;
6. Compare the latest revision to the data from a second, third, or more cases, and
7. Repeat this process as many times as necessary.[266]

Phase III: Mail Survey

The purpose of the final phase of the methodology was to ascertain whether knowledge of industrial buyer behavior in the purchase of third party logistics could be used to segment customers. This phase of the research involved a national mail survey of third party logistics buyers. Quantitative measurements were obtained on thirty variables critical to the third party logistics supplier selection decision. This data was statistically analyzed to determine the benefits buyers were seeking in their purchase of contract logistics and whether this information could be used to group the buyers into customer segments.

Market segmentation research questions and hypothesis

It was assumed the third party logistics market could be segmented. Most consumer and industrial markets are amenable to segmentation by some method. There are two basic approaches to market segmentation, i.e., from the seller's perspective or from the buyer's viewpoint. Market segmentation from the seller's perspective occurs by creating partitions based on readily observable attributes and then attempting to determine how and why buyers differ in their purchasing behavior. Marketers usually segment industrial customers from the seller's

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[266] Ibid., pp. 113-115.

perspective. Common bases of industrial market segmentation are industry type, company size, geographic location or some other easily identifiable demographic characteristic.

The second general type of market segmentation, i.e., from the buyer's perspective, is known as benefit based segmentation. Benefit based segmentation has been widely used in consumer marketing; however, their is scant evidence in the literature that this approach has been adopted by industrial marketers. One may presume the reluctance of industrial marketers to attempt benefit based market segmentation lies in the difficulty of determining exactly what benefits industrial buyers value.

As third party logistics is a new market in the U.S., it is unlikely the benefits sought by industrial buyers are well known. This phase of the research investigated whether benefit based segmentation was appropriate for the third party logistics market. The data gathered in this phase allowed the testing of a hypothesis concerning the benefits sought by industrial buyers in their purchase of contract logistics. This issue was formally addressed by the following research question and hypothesis:

Question Do industrial buyers from different industries seek distinct benefits in their acquisition of third party logistics services?

H_0: Third party logistics buyers representing different industries do not differ in the benefits they are seeking.

H_1: Third party logistics buyers representing different industries differ in the benefits they are seeking.

Mail study sampling plan

The population of interest in this phase of the research was industrial purchasers of third party logistics services. However, since the third party logistics market is new to the U.S., no readily identifiable user population existed. While a random, systematic or stratified sample of a

population of known users was desired, this was not possible. Therefore, an effort was made to construct a population of third party logistics for research purposes.

In an effort to obtain responses representative of U.S. third party logistics users, three sources were used. The first entailed the construction of a data base resulting from a review of well known logistics popular press articles for the previous two years. As the use of third party logistics has been widely publicized recently, this literature was viewed as a rich source of potential survey respondents. Another source used in identifying third party logistics users was the promotional material distributed by the providers of these services. As reported in numerous trade journal articles within the last two years, at least fifty firms are marketing third party logistics services. Over three hundred potential mail study participants were identified from the first two sources.

A final source of potential survey respondents was obtained from the membership roster of the Council of Logistics Management (CLM). The membership of this organization was noted to include many firms currently using or evaluating third party logistics. Twenty-three industries are represented by the Council's members. A data base of potential survey respondents was constructed from the CLM roster by identifying the most senior managers representing U.S. manufacturing and merchandising firms. Approximately one-thousand potential survey respondents were identified from this source. A combination of the two data bases resulted in a sample population consisting of one-thousand, two-hundred and seventy-nine different firms. Survey respondents were offered a summary of the research findings for completion of the questionnaire.

Mail study data collection

A national, self-administered mail survey of current and potential third party logistics users was conducted. The survey instrument, including participants' aggregate responses, appears in Appendix C. The purpose of this survey was to obtain data in the following areas:

1. The importance of each supplier selection criterion (benefit),
2. The amount of industry variability for each selection criterion, and
3. Descriptive information about each respondent and their employer.

The questionnaire included a list of thirty selection criteria (**Table 3.1.**) associated with the purchase of third party logistics. These criteria were developed from the literature review, case studies and preliminary interviews with third party logistics providers and users. An evaluation of the survey responses for the thirty selection criteria provided input for the creation of dependent variables which were analyzed via two multivariate statistical techniques described below. The dependent variables represented the benefits sought in the purchase and use of contract logistics services.

Deriving benefit determinants

As displayed in **Table 3.1.**, each respondent was asked to rate the importance of each of the thirty selection criteria and the amount of industry variability associated with each criteria. The scale for each answer ranged from one to seven, with the higher end of the scale representing high importance and variability, respectively. From these ratings, a final set of determinant variables was derived for each of the selection criteria across all respondents by multiplying each importance rating by its variability rating.

Table 3.1. Mail Survey Instrument -- Importance and Variability Questions

Variable	Importance Rating							Variability Rating						
	Please rate the importance of each of the following selection criteria to you during the time you were making your most recent third party logistics acquisition decision. *(Circle a number from 1 to 7 to show how important each factor was to you personally)*							Also, please rate your opinion of how much difference there is among suppliers in the industry on each of the selection criteria. *(Circle a number from 1 to 7 to show how much difference you think there is among suppliers in the industry on each factor)*						
	Importance to You							Suppliers in the Industry						
	Not Important						Very Important	All about the same						Differ Widely
Provision of integrated logistics services	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Single contact point	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Continuous improvement	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Direct control of all services provided	1	2	3	4	5	6	7	1	2	3	4	5	6	7
International capabilities	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Breadth of service	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Required services at lowest price	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Quality of service	1	2	3	4	5	6	7	1	2	3	4	5	6	7
EDI capabilities	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Confidentiality during negotiations	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Warehouse mgmt. system	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Software/systems capability	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Proven track record of experience	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Financial strength	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Asset ownership	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Depth of management expertise	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Experience in your industry	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Time in business	1	2	3	4	5	6	7	1	2	3	4	5	6	7
References from current customers	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Strategic partner potential	1	2	3	4	5	6	7	1	2	3	4	5	6	7
ISO 9000 certification	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Gain sharing from productivity improvements	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Compatible culture	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Skill level of workers	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Quick response to customer requests	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Non-union work force	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Contract/pricing flexibility	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Willingness to assume existing assets	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Overall cost of service	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Operational flexibility	1	2	3	4	5	6	7	1	2	3	4	5	6	7

The technique described above to construct determinacy variables was first presented by Myers and Alpert.[267] The wisdom behind this method is based on the following assumption: a factor plays a significant role in decision-making only when it is important to the individual and factor variability is present in the industry. Thus, a third party logistics selection factor is a determinant in supplier selection when it is perceived as important to the industrial buyer and a perception of supplier variability exists.

The thirty determinant variables across all the survey respondents were examined via graphical plots, and skewness and kurtosis statistics were calculated to determine whether the determinant variables were likely to have been obtained from a normally distributed population. These tests were conducted to ensure that the data were appropriate for use with the statistical methods employed to analyze the data. The determinant variables were also standardized about a mean of 0.0 and a standard deviation of 1.0 for ease of interpretation.

Statistical analysis

The technique used to identify benefit based market segments was based on the use of two multivariate statistical methods, i.e., factor and cluster analysis. The first entails an aggregation of the dependent variables (benefit determinants) and the second groups the survey respondents according to their ratings of the determinants. All statistical analyses were completed with SPSS® for Windows™ 5.01 and SAS® Version 6.0.3 statistical software; a personal and mainframe computer were used. The two statistical methods are described below.

Factor Analysis

Factor analysis is a term used to refer to a ". . . broad category of approaches to conceptualizing groupings (or clusterings) of variables and an even broader collection of

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267 Myers, J. and M. Alpert, "Determinant Buying Attitudes: Meaning and Measurement," *Journal of Marketing*, Vol. 32, 1968, pp. 13-20.

mathematical procedures for determining which variables belong to which groups." [268] It is a multivariate procedure which investigates relationships among numerous variables across multiple observations. The procedure has widespread application and is routinely used to reduce complex correlations to fewer dimensions. It was derived in the field of psychology during the first decade of this century and Charles Spearman is usually referred to as the "father" of factor analysis.[269] Numerous examples of its use have appeared in logistics and transportation literature.[270]

In this study, factor analysis was specifically used to analyze the relationships among the determinant scores for each of the thirty supplier selection benefits across all survey respondents. Input data for factor analysis is usually expressed in a table format with columns and rows constituting a matrix, such as a correlation or covariance matrix.

One purpose of factor analysis is ". . . to summarize the interrelationships among variables in a concise but accurate manner as an aid in conceptualization."[271] The technique can provide both qualitative and quantitative insight. It can lead to a parsimonious description of variable interrelationships through a reduction in the number of variables used for subsequent analysis. Factor analysis can also provide a method of deriving new variables, often referred to as latent variables or constructs, which may be used to develop hypotheses for future theoretical

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268 Nunnally, J., *Psychometric Theory*, McGraw-Hill, New York, NY, 1978, p. 327.

269 Gould, S., *The Mismeasure of Man*, W. W. Norton and Company, New York, NY, 1981, p. 237.

270 For example, See Dadzie, K. and W. Johnston, "Skill Requirements in Physical Distribution Management Career-Path Development," *Journal of Business Logistics*, Vol. 5, No. 2, 1984, or Sterling, J. and D. Lambert, "Establishing Customer Service Strategies Within the Marketing Mix," *Journal of Business Logistics*, Vol. 8, No. 1, 1987 or Richard, M., S. LeMay, and G. Taylor, "A Factor-Analytic Logit Approach to Truck Driver Turnover," *Journal of Business Logistics*, Vol. 16, No. 1, 1995.

271 Gorsuch, R., *Factor Analysis*, W. B. Saunders Company, Philadelphia, PA, 1974, p. 2.

or empirical research. Further, the procedure may be used to test the validity of previously defined factors and/or distinctions thought to exist in a given data domain.[272] The various uses of the factor analysis lead to a distinction concerning an application of these statistical methods.

Factor analysis is routinely used in exploratory and confirmatory research. The difference between the two applications relates to the explicit specification of hypotheses at the initiation of research. Confirmatory factor analysis is appropriate when the investigator holds specific and detailed opinions, derived from previous research, regarding relationships among the variables under study. Thus, the statistical technique is used to directly test previously defined hypotheses. Results of the study are based on a rejection or a failure to reject the pre-established hypotheses.[273] In confirmatory factor analysis, the previously established factors and their loadings are tested on sample data.

While it is better to begin any analysis with specific hypotheses, this has not been common practice in the use of factor analysis.[274] Usually a stepwise approach has been employed when researchers did not possess enough information to formulate specific hypotheses based on previous knowledge or had doubts concerning the validity of existing hypotheses.

The two step process of exploratory factor analysis begins by condensing the correlated variables that measure relationships among the entities under study. Next, the condensed variables are grouped to form a limited number of new variables referred to as factors. The extent of variable condensation is expressed by the average percentage of shared variance, i.e.,

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272 Ibid., pp. 3-4.

273 Gorsuch, R., "Exploratory Factor Analysis," appearing in *Handbook of Multivariate Experimental Psychology* (edited by J. Nesselroade and R. Cattell) Plenum Press, New York, NY, 1988, pp. 235-236.

274 Nunnally, Op. Cit., p. 348.

communality, explained or resolved by the factors. The final step involves the rotation of the factors to assist in interpreting factor analytic results.

Rotation does not increase the amount of shared variance explained or resolved by the variables constituting the factors. It merely redistributes it to assist the researcher in factor identification and definition. Rotation facilitates the derivation of simple structure, i.e., a condition in which each variable loads on as few factors as possible.[275] The criteria for simple structure and the logic behind this condition was first set forth by Thurstone.[276]

In exploratory factor analysis the researcher is limited in his ability to select variables that ensure theoretical relevance in an initial solution. Factor rotation is usually assumed to be required to enhance the likelihood that the identified factors will meet relevant research criteria. The initial variables are usually selected with the understanding that rotation will be required to provide a meaningful interpretation of the factor analytic results.[277]

Factor analysis assumes that the observed variables used in an experiment, research effort, etc. are linear associations of some underlying (unseen or hypothetical) factors.[278] The most common measure of linear relationship between two variables is the Pearson correlation coefficient. If two variables are correlated, they are often assumed to be associated with one another. Covariance is another measure of linear association routinely used by researchers.[279] However, mere correlation never implies causation. Correlation can result solely from the fact

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275 Ibid., pp. 348-349.

276 Thurstone, L., *Multiple Factor Analysis*, University of Chicago Press, Chicago, 1947, p. 335.

277 Gorsuch, Op. Cit., p. 162.

278 Kim, J. and C. Muller, *Factor Analysis: Statistical Methods and Practical Issues*, Sage Publications, Beverly Hills, CA, 1978, p. 8.

279 Koopmans, L., *Introduction to Contemporary Statistical Methods*, Duxbury Press, Boston, MA, 1987, p. 175 and p. 466.

that measurements from two variables are negatively or positively related to one another. The relationships between variables are often investigated because of the correlation existing among them. One may suspect that a reason or reasons exist to explain the association between and among variables; however, causation must always be confirmed by means other than correlation.

Correlation coefficients and covariance matrices are often used as input to factor analysis. In fact, factor analysis has been described as ". . . a mathematical technique for reducing a complex system of correlations into fewer dimensions."[280] The definition of the term factor has multiple meanings. It is often used to reference a hypothetical, unmeasured, and unobserved variable usually referred to as a common factor. While an alternate definition implies that the newly constructed dimension is merely a new linear combination of existing and previously observable linear combinations. When used in this manner the dimension is usually called a component.[281]

Factor analysis is implemented by factoring a matrix. An analogy of this procedure relates to the simplification of numerous mathematical expressions by removing the common multipliers of all terms, i.e., factoring. The factor extraction method used in this study was principal components.

Factor Extraction using the Principal Components Model

Geometrically, the process of factor extraction can be envisioned as placing axes through a swarm of points in hyperspace. The linear association among the original variables, i.e., correlation coefficients, is actually represented by vectors of unit length radiating from a common point. When the measurements between a pair of variables are highly correlated, their

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280 Gould, Op. Cit., p. 245.

281 _____, SAS/STAT© User's Guide, Version 6, Fourth Edition, Volume 1, *SAS Institute, Inc., Cary*, NC, p. 774.

vectors are in close proximity to one another in hyperspace. The degree of correlation between any two vectors is represented by the cosine of the angle between them. When two vectors overlap, their correlation is perfect (+1.0) and there is no angle between them. If two vectors are exactly 90 degrees apart, they are independent of one another and reflect no correlation (0.0). When one vector lies exactly opposite of another vector (180^0 apart), they are said to have a perfect negative relationship (-1.0).[282]

When factoring a cluster of vectors into fewer dimensions using the principal components method of extraction, one places the initial axis such that it resolves the most possible variance. In essence, this results from identifying a grand average among all the vectors. The first line or axis placed through the vectors lying in hyperspace, i.e., the first principal component, represents the largest amount of variance resolved by the vectors lying closest to it.[283] The vectors represent measurements on the variables under study and the process is similar to fitting a least squares line through a data set.

Variance unresolved or unexplained by the first line is resolved by the fitting of additional axes. The second axis, representing the next dimension or factor, is placed so that it resolves more of the remaining variance than any other possible line drawn perpendicular to the first axis. This dimension is called the second principal component; it lies at a ninety degree angle to the first factor. Subsequent lines are drawn in a like manner, i.e., perpendicular to all previous axes, and continue to resolve a steadily decreasing amount of remaining variance.[284]

The proximity to which a vector of measurements lie in relation to the perpendicular or

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282 Gould, Op. Cit., p. 247.

283 Ibid., p. 247.

284 Ibid., pp. 245-247.

orthogonal axes determines their relationship to the factors. This relationship is referred to as the loading of a variable on a factor. If a vector of measurements lies in very close proximity to only one axis, the variable represented by the measurements is said to be a "pure" measure of the factor. If all vectors lie in close proximity to one and only one axis, simple structure is said to exist. However, this is seldom the case in most factor analysis applications and it is usually necessary to rotate the factor vectors (axes) to enhance interpretation of the extraction results and find simpler structures.[285]

Factor Rotation

Rotation can be illustrated by envisioning the factor vectors as movable in a manner similar to the hands of a clock. One of the factor vectors can be moved to any point in the geometric space in an attempt to identify a simpler structure than that existing after initial factor extraction. As long as the factors remain at right angles to one another, there is no correlation among or between the factor vectors, i.e., an orthogonal rotation.[286]

If simple structure can be obtained with an orthogonal rotation of the factors, two important characteristics of the unrotated factor matrix are transferred to the rotated solution. The first carryover concerns the amount of resolved or explained variance between the two solutions. It is identical. Therefore, the simpler solution does not forfeit any explanatory capability. The second transfer from an orthogonal rotation to a simpler structure regards the fact that the sum of products in any two rows of the rotated factor matrix is the same as that appearing in the unrotated matrix. The same common variance is resolved in both cases. Thus,

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285 Kerlinger, F., *Foundations of Behavioral Research*, Holt, Reinhart and Winston, Inc., New York, NY, 1986, pp. 574-575.

286 Nunnally, Op. Cit., pp. 370-371.

from a statistical point of view, the rotated solution is no different from the unrotated solution.[287]

There are two basic types of factor rotation: orthogonal and oblique. Orthogonal has been discussed above. Oblique rotation, like the orthogonal procedure, is a statistical method which seeks to identify a simpler structure than that existing after initial factor extraction. However, this procedure allows the factor axes to be rotated without the orthogonal restriction. Thus, vectors may reside at angles more or less than ninety degrees from the factor axes and are no longer statistically independent. Several different rotation algorithms are routinely used, i.e., equamax, promax, varimax, etc.

A varimax rotation was selected for use in this study as ". . . it comes closest to the graphical simple structure solution, or, in other words, Thurstone's simple structure goal."[288] Varimax rotation is a technique which searches for placement of factors axes which maximize the amount of variance resolved or explained by each rotated factor axis. After initial factor extraction using principal components, variance is often low on the first principal component. This results because all measurements loading on the first component have about the same positive projection and a limited amount of spread. The variance of a factor axis refers to the dispersion of measurements on it.[289]

The varimax algorithm is a function of the variance associated with the variables loading on a given factor. As the incidence of high and low loadings increase, the variance of the squared factor loadings increase. The largest amount of variance results when the loadings are close to zero or one. Thus, maximizing the variance (varimax) of squared factor loadings can

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287 Ibid., pp. 370-371.

288 Rummel, R., *Applied Factor Analysis*, Northwestern University Press, Evanston, IL, 1970, p. 392.

289 Gould, Op. Cit., p. 300.

result from an orthogonal rotation. The varimax method of factor rotation is generally regarded as an optimum orthogonal rotation technique.[290]

In the principal components method of factor estimation, an unrotated solution is obtained to determine the starting point for rotation. The initial step (factor extraction) identifies common variance and the second step (factor rotation) partitions the common variance so it is more easily understood. However, before rotation one must decide how many factors are to be extracted. This procedure requires the researcher to differentiate between meaningful and trivial factors.

Determining the number of non-trivial factors

"The number-of-factors problem has no general solution."[291] Finding this elusive quantity has been likened to ". . . determining the exact distance of the horizon from any fixed height in rolling country."[292] The "true" number of factors are always greater than the number of variables used in any single experiment or research effort. The number of variables and observations used in any study will establish an upper limit for the potential number of factors that can be extracted. Thus, the decision to stop extracting factors must be based on dimensions which encompass only non-trivial common variance, i.e., covariance.[293]

There are three types of variance present in any data matrix subjected to factor analysis: common (that which one variable has in common with at least one other variable), specific (variance attributable to only one variable) and random error, such as that attributable to faulty

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290 Rummel, Op. Cit., p. 391-392.

291 Ibid., p. 354.

292 Cattell, R., "The Scree Test for the Number of Factors," *Multivariate Behavioral Research*, Vol. 1, No. 2, 1966, p. 247.

293 Ibid., pp. 245-246.

measurement .[294] One should attempt to retain only those factors possessing meaningful common variance. The definition of trivial common variance depends of a number of considerations, e.g.:

1. Whether factor analysis is used for exploration or confirmation,
2. Sample size and the measurement reliability of tests used in the research,
3. Whether factor correlations need to be precise for subsequent higher order analysis, and
4. The nature of the research design concerning factor parsimony.[295]

The objective is to extract only those factors which account for non-trivial variance and eliminate those which include variance that is not meaningful to the study. An extensive amount of research has been conducted over many years in an effort to produce a definitive methodology for determining the number of factors. The resulting methods can be summarized as those employing inferential criteria, mathematical criteria or rules of thumb.[296] A taxonomy of commonly used methods is presented in **Figure 3.2**.

Inferential approaches employ statistical tests based on a probability model that evaluates the chance occurrence of a common factor for any given sample size. These methods also include generalizability and meaningfulness. Generalizable algorithms attempt to maximize the fit of factors derived from a sample to all the factors possible from the universe of variables in a given domain. Meaningfulness relates to the use of subjective probability criteria employed by experts in a given field to accept or reject factors as trivial or non-trivial.[297]

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294 Rummel, Op. Cit., pp. 102-103.

295 Cattell, Op. Cit., p. 245.

296 Rummel, Op. Cit., 350.

297 Ibid., pp. 354-356.

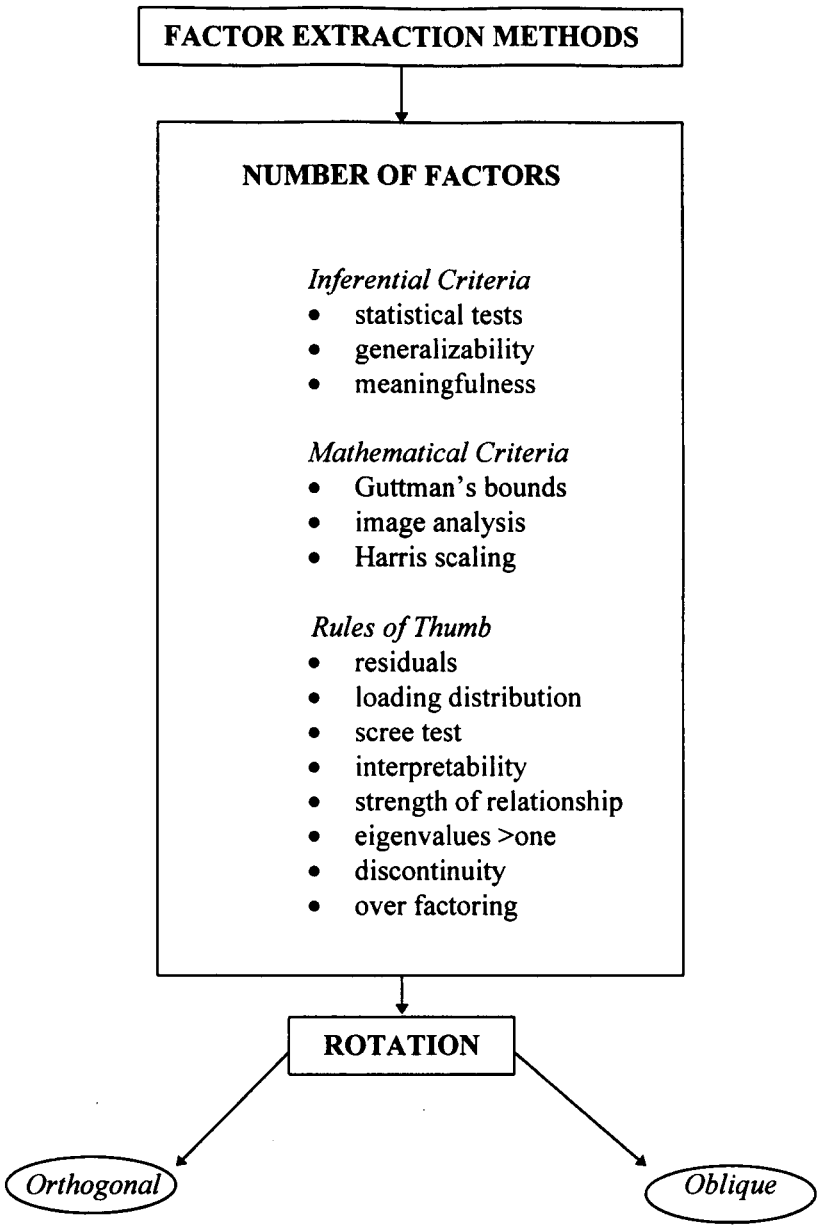


Figure 3.2. Determining the Number of Factors
Source: Adapted from R. Rummel, *Applied Factor Analysis*, Northwestern University Press, Evanston, IL, 1979, p. 350.

Mathematical approaches to determining the number of factors are based on theories involving a population correlation matrix, i.e., how many factors exist in a given sample of possible variables, not individuals, used in an experiment. Bounds for the number of factors are defined by tests of statistical significance. Using these methods, the number of factors present is a function of the rank of the correlation matrix. The number of statistically significant factors is equivalent to the rank of the correlation matrix.[298]

Rules of thumb or guidelines have been developed as a result of many years of experience with factor analysis by researchers intimately familiar with a particular model. While they are not based on mathematical theorems, many have been empirically validated as accurate in most applications. These techniques include such rules as the percent of variance extracted, eigenvalues greater than one, discontinuity and the scree test.[299] "The concern with factors which are useful for a particular theoretical propose, as opposed to determining the "proper" number of factors is probably the basis for the feeling that statistical and mathematical approaches are not always accurate."[300]

An identification of the correct number of factors is important as the accuracy with which a data matrix can be parsimoniously reproduced (one goal of factor analysis) is primarily a function of the number of factors extracted. However, no one study by itself will be able to establish the optimum number of factors. Only re-analysis of the same data using different research methodologies resulting in replication of the findings will lead to the discovery of the correct number of factors for a domain. The number of true factors must be determined like the

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298 Gorsuch, Op. Cit. p. 143.

299 Rummel, Op. Cit., pp. 359-365.

300 Gorsuch, Op. Cit. p. 57.

findings for any empirical proposition - through the convergence of results from many diverse research efforts.

Applying factor analysis in this research

Principal components was the specific algorithm used to extract factors from the thirty supplier selection determinants in this study. Non-trivial factors were determined via the Scree Test.[301] The resulting factors were rotated using the varimax method to derive a simpler structure. Three factors were obtained using the techniques described above. These factors represent the benefits desired by the third party logistics buyers responding to the mail survey. In the final phase of the buyer segmentation analysis, the variables describing the three benefit factors were used to construct a correlation matrix. This matrix served as data input to an agglomerative hierarchical clustering algorithm for the purpose of empirically identifying third party logistics market segments.

Cluster analysis overview

Cluster analysis is a multivariate statistical technique related to factor analysis. Furthermore, factor analysis has been described as a form of cluster analysis.[302] In essence, both of these techniques assist in identifying groups in data, especially when more three dimensions are considered. Whereas factor analysis is routinely used to group variables, cluster analysis is more commonly used to combine cases or observations, e.g., third party logistics buyers. However, cluster analysis may also be used for variable reduction.

There is no universally accepted definition of a cluster and a variety of meanings are

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301 Cattell, Op. Cit., 245-276.

302 Nunnally, Op. Cit., p. 430.

present in the literature.[303] A cluster is usually described as a group of objects which are alike in some manner. Everitt provides a meaningful geometric definition as follows:

> A cluster may be defined as entities representing ". . . points in a p-dimensional space, with each of the p variables being represented by one of the axis of this space. The variable values for each entity now define a p-dimensional coordinate in this space. Clusters may now be described as continuous regions of this space containing a relatively high density of points, separated from other such regions by regions containing a relatively low density of points."[304]

Cluster analysis is a method of classifying objects, entities, variables, etc. The term actually refers to a wide variety of statistical tools used to group entities into homogeneous subgroups according to some measure of similarity. The algorithms forming cluster analysis have been existence since the beginning of the twentieth century; however, most of the literature on the subject has appeared in the last thirty years. This is undoubtedly due to the widespread availability of advanced computer technology to researchers. A 1962 textbook on the subject, *Principles of Numerical Taxonomy*, by the biologists Robert Sokal and Peter Sneath, is usually recognized as the stimulus for the most recent development and growth of the discipline.[305]

Discriminant analysis is another multivariate technique used to differentiate between groups. However, this procedure differs from cluster analysis in that it identifies differences between groups on an a priori basis. Cluster analysis does not presume any previous knowledge concerning the number and/or types of groups existing in a data set. The algorithms forming cluster analysis help to establish new classification schemes or identify groups within a mixture

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303 For example, see Everitt, B., *Cluster Analysis*, Halstead Press, New York, NY, 1980 or Aldenderfer, M. and R. Blashfield, *Cluster Analysis*, Sage Publications, Beverly Hills, CA, 1984 or Anderberg, M., *Cluster Analysis for Applications*, Academic Press, New York, NY, 1973 or Lorr, M., *Cluster Analysis for Social Scientists*, Jossey-Bass, Publishers, San Francisco, CA, 1983.

304 Everitt, Op. Cit., p. 60.

305 Aldenderfer and Blashfield, Op. Cit., p. 7.

of several populations.

Cluster analysis is widely used in a variety of fields. Numerous applications can found in the life sciences (biology, zoology, etc.), medical sciences (psychiatry), behavioral and social sciences (psychology, education, etc.), earth sciences (geography), engineering (artificial intelligence) and decision sciences (marketing research, operations research, etc.).[306]

A number of applications of cluster analysis are apparent in the disciplines referenced above; however, the major goals of these algorithms can be summarized as follows:

- To identify accurate classification schemes,
- To enhance model fitting,
- To enable prediction based on groups,
- To test hypotheses concerning groups,
- To facilitate data exploration,
- To generate hypotheses, and
- To condense data.[307]

Numerous cluster analysis techniques exist (far more than the number of factor analysis methods) and the literature on the subject is distributed throughout many journals and textbooks in various fields. However, a useful classification of cluster analysis algorithms has been provided by Cormack.[308] He has summarized the classification rules as follows:

1. Hierarchical methods which successively classify the identified groups into subsequent classes until only one cluster remains. The grouping sequence may be displayed via a dendrogram when hierarchical algorithms are utilized.

2. Optimization techniques which form groups in accordance with a pre-defined clustering criterion. The groups resulting from these methods form partitions in the data that are mutually exclusive.

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306 Anderberg, Op. Cit., pp. 5-6.

307 Ball, G., *Classification Analysis*, Stanford Research Institute (SRI Project 5533), Stanford University, Stanford, CA, 1971.

308 Cormack, R., "A Review of Classification (with discussion)," *Journal of the Royal Statistical Society, Series A*, Volume 134, Part 3, 1971, pp. 321-367.

3. Density or "hill and valley" methods in which groups are identified by searching for regions of high entity concentration surrounded by areas of lower entity concentration.

4. Clumping techniques in which the groups or classes may overlap, and

5. Other methods which do not clearly fit in any of the four previous groups.

Selecting an appropriate clustering algorithm can be a daunting task given the wide array of choices and types available. In evaluating the methods one soon learns that most are biased toward identifying clusters possessing certain characteristics such as the number of members included in a cluster, the shape of the clusters, or the dispersion of clusters.

Simulation studies have been performed to test how well a given algorithm will recover known clusters in a data set. Milligan[309] has reviewed many of the validity studies that include Monte Carlo experiments. The consensus from this research asserts that the average linkage technique and Ward's minimum-variance method provide the best overall performance.

Kuiper and Fisher[310] noted that Ward's minimum-variance method[311] was significantly better than any of the other five hierarchical methods they tested in reproducing known clusters of any size. Ward's method is sometimes referred to as the error sum of squares or Trace W algorithm. Blashfied[312] also examined four hierarchical methods using fifty different data sets and found Ward's method provided the best recovery rate. Finally, Monte Carlo tests by

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309 Milligan, G., "A Review of Monte Carlo Test of Cluster Analysis," *Multivariate Behavioral Research,* Vol. 16, pp. 379-407.

310 Kuiper, R. and L. Fisher, "A Monte Carlo Comparison of Six Clustering Procedures," *Biometrics*, Vol. 31,1975, pp. 777-783.

311 See Ward, J., "Hierarchical Grouping to Optimize an Objective Function," *Journal of the American Statistical Association*, Vol. 58, 1963, pp. 236-244 and Ward, J. and M. Hook, "Application of a Hierarchical Grouping Procedure to a Problem of Grouping Profiles," *Educational and Psychological Measurement*, Vol. 23, 1963, pp. 69-81.

312 Blashfield, R., "Mixture Model Test of Cluster Analysis: Accuracy of Four Agglomerative Hierarchical Methods," *Psychological Bulletin*, Vol. 83, 1976, pp. 377-388.

Edelbrock,[313] requiring at least an 80% recovery rate for acceptance, revealed that Ward's minimum-variance method was highly accurate.

As a result of the validation tests referenced above and evidence that Ward's minimum-variance method had been successfully used in previous research[314] to identify benefit based market segments, a decision was made to employ the algorithm in this study. Ward's minimum-variance algorithm is an agglomerative hierarchical method of cluster analysis. Moreover, it is a method which forms clusters via successive fusions of entities into groups. Each observation, e.g., third party logistics buyer, serves as a cluster at the beginning of the process. Similar observations are grouped, one by one, by some measure of similarity until all observations finally reside in one large cluster. The objective of the process is to identify the clustering stage at which the "true" number of groups exist.

A dissimilarity matrix, derived via a transformation of the correlation matrix, usually serves as input to an agglomerative hierarchical clustering method. The process of producing the hierarchy from a dissimilarity matrix using any agglomerative hierarchical clustering method is accomplished by the following algorithm:

- Let d_{ij} denote the dissimilarity between the ith and jth individuals, and D_{ij} represent the dissimilarity between the ith and jth groups formed.
- Define each individual as a group, i.e., $D_{ij} = d_{ij}$ initially.

Step 1: Start with N clusters each containing a single entity forming a N x N symmetric matrix of distances (or similarities),

Step 2: Search the symmetric distance matrix for the nearest (most similar) pair of clusters. Let the distance between the "most similar" cluster U and V be defined as d_{UV},

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313 Edelbrock, C., "Comparing the Accuracy of Hierarchical Clustering Algorithms: The Problem of Classifying Everybody," *Multivariate Behavioral Research*, Vol. 14, 1979, pp. 367-384.

314 See Moriarty, R., *Industrial Buying Behavior*, Lexington Books, Lexington, MA, 1983.

Step 3: Merge clusters U and V. Label the newly created cluster (UV). Update the entries in the symmetric distance matrix by initially deleting the row and column corresponding to clusters U and V and then adding a row and column corresponding to the distances between cluster (UV) and the remaining clusters,

Step 4: Repeat steps 2 and 3 a total of N-1 times until only one large cluster, containing all the entities, remains. Record the identity of the objects forming the clusters as they are merged and the levels (distances) at which the mergers took place.[315]

Agglomerative hierarchical clustering methods all begin with the computation of a similarity or distance matrix between the objects. They all end with a dendrogram providing a two dimensional display of the successive cluster fusions. Differences between the algorithms are dependent on the methods used to calculate the distance or similarity between an object and a group or between groups. Some of the methods, such as Ward's minimum-variance algorithm, are better suited to distance matrices rather than similarity matrices.

Ward's minimum-variance method of cluster analysis

The Ward method of cluster analysis is based on the premise that the most accurate representation of a data set, i.e., the one containing the least error, exists when each object (third party logistics buyer) forms a group or cluster. Therefore, as the number of clusters decrease from k, k-1, k-2, . . . 1, the groupings of increasingly dissimilar objects yield less precise information. At each level of the clustering process the objective is to create a group such that the sum of squared within-group deviations about the group mean, for each object, is minimized for all objects at the same time. The value of the objective function is expressed as the error sum of squares, i.e., the within-group sum of squares. Each reduction in the number of clusters is accomplished by considering all possible N(N-1)/2 object pairs and selecting the pair for which the increase in the error sum of squares is the least. As clusters are combined they are treated as

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315 Adapted from Johnson, R. and D. Wichern, *Applied Multivariate Statistical Analysis*, Prentice-Hall, Englewood Cliffs, NJ, 1982, pp. 543-544.

one unit, i.e., a new cluster.[316]

When the complete hierarchical solution has been attained and only one cluster remains, the error sum of squares history may be examined to determine the relative homogeneity of the clusters formed. This progression may visualized by plotting the increase in the error sum of squares at each iteration of the clustering process "against" the number of clusters formed. A sharp increase in the error sum of squares indicates that accuracy has been significantly compromised and the clustering process should be terminated.[317]

An overview of Ward's minimum-variance method can be provided by in elementary example. Assume a researcher desires to group five individuals on the basis of their rating of a single variable. The values of the variable for each of the five study participants are as follows:

Individual Number	Variable Rating
1	1
2	2
3	7
4	9
5	12

The error sum of squares (ESS) is calculated as:

$$\text{ESS} = \sum_{i=1}^{n} x_i^2 - \frac{1}{n}\left(\sum x_i\right)^2$$

where x_i the rating of the *i*th individual. Initially, each individual constitutes a group or cluster,

316 Lorr, Op. Cit. p. 90.

317 Ibid., p. 90.

so the ESS is zero. The two individuals whose fusion results in the minimum increase in the ESS are merged to form the first cluster composed of multiple individuals. For the data in the above example, individuals 1 and 2 are the first to be combined.

The ESS for the creation of the first cluster is 0.5 [5-(9/2)]. At the next stage, individuals 3 and 4 are merged to form the second cluster, increasing the ESS by 2.0 [130-(256/2)] to 2.5. Next, individual 5 is merged with the group formed by 3 and 4, and the ESS increases by 12.7 [274-(784/3)] to 15.2. Finally, the last two clusters are fused and the ESS increases by 71.6 [279-(961/5)] to 86.6 The results of the clustering process for this example are displayed in the dendrogram appearing as **Figure 3.3.**[318]

The Ward method is initiated by transforming the correlation (similarity) matrix to a dissimilarity matrix. Correlation coefficients may be transformed to dissimilarities by several methods. Two common transformations are: a) subtract the absolute value of the correlation coefficient from 1 or b) subtract the squared correlation coefficient from 1. Whereas correlation coefficients range from +1.0 to -1.0, the dissimilarity measurements vary from 0.0 to 1.0. The higher the dissimilarity coefficient, the more dissimilar are the two objects. The computer software used in this phase of the research (SPSS® for Windows™ Release 5.1 and SAS ™ Version 6.0.3) requires the user to select the method by which the dissimilarities, i.e., proximities, are to be calculated. The conventional method of squared Euclidean distance was selected for used in this study.

For each cluster created via Ward's method, the means for all the variables used in the research are initially calculated. Next, for each individual, the squared Euclidean distance to the cluster means is determined. These distances are then summed for all of the individuals. At

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[318] Adapted from Everitt, B., *Cluster Analysis*, Halstead Press, New York, NY, 1980, pp. 31-32.

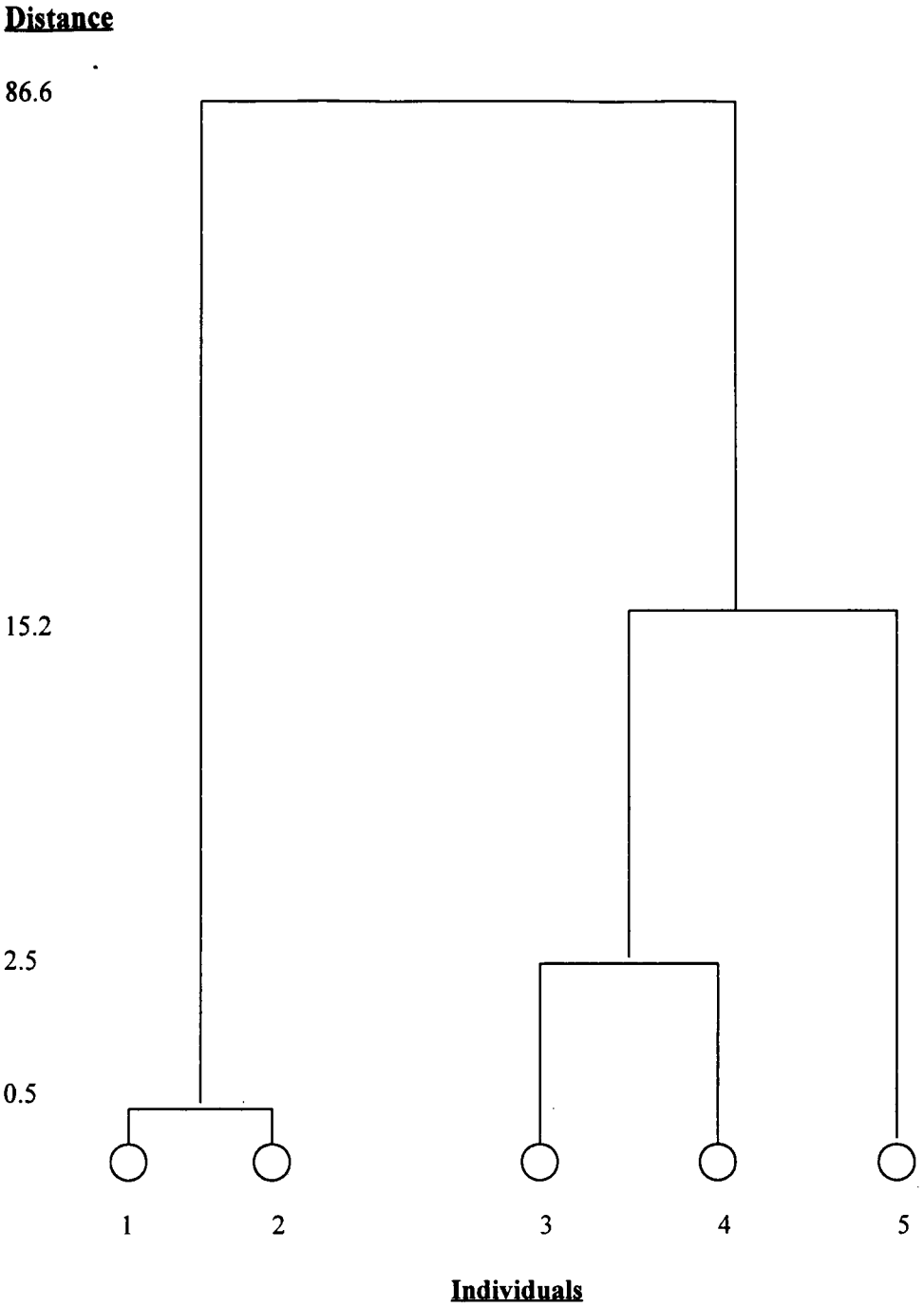


Figure 3.3. Dendrogram of Ward's Clustering Example
Source: B. Everitt, *Cluster Analysis*, Halstead Press, New York, NY, 1980, p. 32.

each stage in the combination process, the two clusters that are fused are those that result in the smallest increase in the total sum of the squared within-cluster distances.[319]

Identifying clusters

The objective of the clustering process is to assist in determining the number of "natural" groups existing in a data set. This requires the researcher to identify some intermediate point in the clustering process that produces a meaningful number of clusters. A plethora of "stopping" rules have been proposed over the years to assist the researcher in determining the number of natural clusters present. Empirical tests have been conducted on some of these rules.[320]

A common method for determining the appropriate stopping point in agglomerative hierarchical clustering is to locate the stage in the grouping process at which a large increment in distance is required to create the next cluster. For example, if six distinct natural clusters exist in the scatter plot and a researcher decides to reduce the number to five, the distance between the two newly formed clusters will be relatively large. The results of the clustering process are displayed in an agglomeration schedule or table. This table describes when each cluster (a cluster can refer to an individual object or a multiple object group) is combined with another cluster.

Applying cluster analysis in this research

Ward's minimum-variance agglomerative hierarchical method of cluster analysis was used to group the third party logistics buyers participating in this research. A correlation matrix of the fourteen variables composing the three benefit factors served as input to the algorithm. Squared Euclidean distances were calculated to determine the similarity between and among the buyers. Four clusters were identified by plotting the distance statistics, i.e., semipartial

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319 Norusis, M., *SPSS Professional Statistics*™, SPSS Inc., Chicago, IL, 1994, p. 98.

320 See Milligan, G. and M. Cooper, "An Examination of Procedures for Determining the Number of Clusters in a Data Set," *Psychometrika*, Vol. 50, No. 2, 1985, pp. 159-179.

R-squared coefficients, "against" the number of clusters appearing in the agglomeration schedule. A significant increase in distance was noted between the formation of the four cluster configuration and a three cluster configuration. Dendrograms and "icicle" plots were constructed to assist in the identification of clusters.

Reliability of the four cluster configuration was tested by randomly splitting the data base in-half and clustering the two revised data sets. Four clusters resulted for each of the revised data sets. The buyers composing the clusters in the sub-groups displayed the same characteristics as those compromising the original four groups. Consistency of the four cluster configuration was also verified by grouping the data using another agglomerate hierarchical clustering algorithm, i.e., the average linkage between groups method. This technique is also referred to as the unweighted pair-group method using arithmetic averages (UPMGA).

Behavioral profiles were developed of the buyers forming each of the four groups. The buyers' ratings of the fourteen supplier selection variables constituting the three benefit factors were compared to identify differences between the clusters. Two major and two minor market segments were identified. Demographic comparisons of the buyers were conducted to provide a method of identifying the purchasers by secondary references sources, e.g., publications classifying firms by industry type, sales level, scope of operation, channel function, etc.

Chapter IV

RESEARCH RESULTS AND ANALYSIS

Phase I: Description of Third Party Logistics

An exploratory in-depth focus group interview involving experienced third party logistics buyers was conducted in Chicago, Illinois on December 2, 1993 from 3:00 p.m. to 5:00 p.m. It was held at O'Hare In-Focus, a professional marketing company. The session was conducted by a professional moderator, Mr. Jim Bateman of Caterpillar Logistics Services, Inc., the principal advisor to this dissertation, Dr. C. John Langley, Jr. and the researcher. The purpose of the focus group was to:

- learn how third party logistics is perceived by industrial buyers;
- provide an overview of the acquisition process for third party logistics services across a wide variety of firms and industries;
- refine the research design used in subsequent case studies; and
- develop and test questions to be used the mail survey.

Some of the participants in the focus group interview were selected from recommendations of the research sponsor and the principal advisor. Other candidates were identified from industrial directories by the professional marketing company. Each of the candidates was a senior manager personally involved in the evaluation and/or purchase of third party logistics services for their firm. A range of management positions across a variety of industries participated in the focus group (see **Table 4.1.**) Representatives from logistics, finance, information systems, manufacturing and general administration were included.

Telephone recruiters from the focus group facility contacted potential participants and verified their experience as current or recent purchasers of contract logistics services. The telephone recruiting effort resulted in confirmations from eleven senior managers representing a

Table 4.1. Focus Group Participants

Company Name	Location	Participant's Title
American National Can, Inc.	Chicago, IL	Senior VP Operations Services
General Motors Corporation	Detroit, MI	Director Material Transportation
Safety-Kleen Corporation	Elgin, IL	Distribution Manager
Reliable Corporation	Bartlett, IL	VP Distribution and Operations
Intrupa, Inc.	Greys Lake, IL	Chief Financial Officer
Stephan Company	Northfield, IL	VP - Logistics
Fel-Pro, Inc.	Skokie, IL	VP - International Operations
Abbot Laboratories	Abbott, IL	Operations Manager -- Logistics Planning
Morton International	Chicago, IL	VP - Materials Management
Snap-On Tools	Kenosha, WI	Senior VP Manufacturing and Technology
Donaldson Company, Inc.	Minneapolis, MN	Director of Distribution and Transportation

variety of industries and firm sizes. A list of all focus group participants (by management title), company names and locations appears in **Table 4.1.** All eleven managers verbally agreeing to participate in the research were present for the focus group interview.

The composition of the focus group reflected a cross section of U.S. industry. Representatives from automobile manufacturing, chemicals, pharmaceuticals, office products, and metal fabrication were among those in attendance. The participants were employed by large, publicly held corporations as well as smaller, privately owned organizations. Many of the managers had international experience with third party logistics, as their firms either sourced or distributed products outside the United States. A variety of services were currently being outsourced or considered for outsourcing by the firms represented in the focus group interview. Examples included order processing, inventory management, dedicated contract warehousing, transportation, freight bill auditing/payment, fleet management and reverse logistics for product returns.

Structure for the focus group interview was provided by an topical outline (see Appendix A). However, the questions were not always posed in the order appearing on the outline. Flexibility in questioning was maintained to encourage participation and probe areas warranting extended investigation. Key questions posed during the interview related to:

1. Defining third party logistics from the industrial buyer's perspective;
2. Determining the need for third party logistics services;
3. The advantages and disadvantages of logistics outsourcing;
4. Buyer perceptions of current providers; and,
5. The elements of the buying process.

The principal advisor and researcher assisted the moderator by clarifying subjects, record keeping and encouraging discussion progress. Data was obtained during the interview via poster board charts and written notes. A detailed summary was prepared from these sources after the interview was completed. A comprehensive list of excerpts from the focus interview is included in Appendix A.

Phase I: Research Results and Analysis

The moderator began the session by explaining the purpose of the study, introducing the research team, and inviting the participants to introduce themselves and briefly describe their experiences with contract logistics. As indicated above, the participants held a variety of functional positions and represented a wide variety of business types. Eight of the eleven managers (72.7 %) indicated their firms were presently contracting some of their logistical requirements to third party suppliers. The remaining three stated that they were currently involved in the evaluation or selection of an external logistics supplier.

The initial question posed to the group concerned the meaning of the term third party logistics. A consensus of the buyers' opinions resulted in the following definition:

> Third party logistics are activities provided by an external supplier to accomplish logistics functions that are not desired to be completed and/or managed within the buying and selling organization.

The group elaborated on this definition by offering examples of functions typically associated with logistics outsourcing, i.e., transportation, warehousing, consolidation, etc. A diverse list of other activities was also mentioned including the management of household goods movement, the development of an EDI clearinghouse, and the provision of temporary logistics management services. The participants viewed these activities as possible candidates for outsourcing. **Table 4.2.** provides a complete list of the activities that the buyers associated with third party logistics.

Table 4.2. Third Party Logistics Activities

Logistics Function	Activities
Transportation	Shipping Forwarding (De)Consolidation Contract Delivery Freight Bill Payment/Audit Household Goods Relocation Load Tendering Brokering
Warehousing	Storage Receiving Assembly Return Goods Marking/Labeling Kitting
Inventory Management	Forecasting Location Analysis Network Consulting Slotting/Layout Design
Order Processing	Order Entry/Fulfillment
Information Processing	EDI/VANS Routing/Scheduling Artificial Intelligence Expert Systems
Packaging	Design Recycling

The next discussion topic dealt with the level of buyer awareness regarding third party logistics providers. The group listed twenty-five different companies currently offering contract logistics services. The demographics of these providers ranged from firms with small to large revenues, local to international operations and minimal to vast experience. The mention of most provider names brought nods of approval and familiarity from members of the focus group, though it was obvious that others were known only by the participant who raised the firm's name.

A question regarding a possible taxonomy for provider firms generated a great deal of discussion and interest among the participants. A number of classification techniques were mentioned. One method suggested was the categorization of providers by their origin, i.e., transportation or warehousing. Another participant proposed a system based on the type of specialized services offered. A third response indicated that the level of integration or breadth of services offered was a good means of differentiating providers. A fourth method of characterizing differences in providers concerned the marketplace's recognition of a supplier's core competencies. Other techniques mentioned included the ownership of capital-assets versus non-asset based suppliers, work force demographics -- union versus non-union, the type of industries served and the providers' scope of geographic operation.

A consensus of the participants' observations indicated the most important distinguishing characteristic among third party providers concerns core competencies. Firms with readily identifiable core strengths and operational expertise appeared to instill a level of comfort in the buyers that firms with undefined competencies and peripheral experience could not provide. Thus, the group indicated that third party suppliers with experience, focus, and expertise were regarded as more competent than suppliers who profess to be "all things to any customer."

The next topic posed to the group concerned the essential capabilities and/or characteristics required by industrial buyers in their acquisition of third party logistics services. This subject

elicited a wide variety of comments and suggestions. The participants were in strong agreement that financial strength, compatibility of information systems, technical competence, price, credible client references, and capacity were very influential provider evaluation factors. The group indicated these were prerequisites for third party providers -- if a potential supplier did not possess these attributes, it would not be considered by the participants. Other important attributes mentioned were flexibility, responsiveness, direct or transferable expertise, a knowledgeable sales force, and experience within a particular industry.

When the group was questioned about the most critical variable in the provider evaluation process, responses revealed that this factor varies and is dependent on the buyer's need(s). However, most of the answers supported the importance of a provider's core competencies. Confidence and trust in a supplier were revealed to be crucial in the selection of a third party supplier. Issues of expertise, reputation, experience and reliability were often mentioned by participants in relation to their emphases on supplier core competencies. When the subject of price was raised, most of the group indicated that it was used as a tie-breaker, or considered a secondary issue to service, in their evaluation of potential providers.

The myriad responses regarding important provider evaluation factors, differentiating characteristics and internal attributes revealed that buyers are not seeking a standard offering or "canned" solution. The focus group participants reported that they view their logistical needs and problems as unique, requiring individual attention and custom solutions. They suggested that providers must attempt to diagnose and conceptualize a potential client's needs, ask the proper questions, and tailor their offerings to meet and exceed customer expectations.

Figure 4.1. outlines participants' observations on the value of third party logistics as measured by the perceived advantages and disadvantages of sub-contracting logistical activities and management. There was no consensus concerning the benefits or detriments of outsourcing

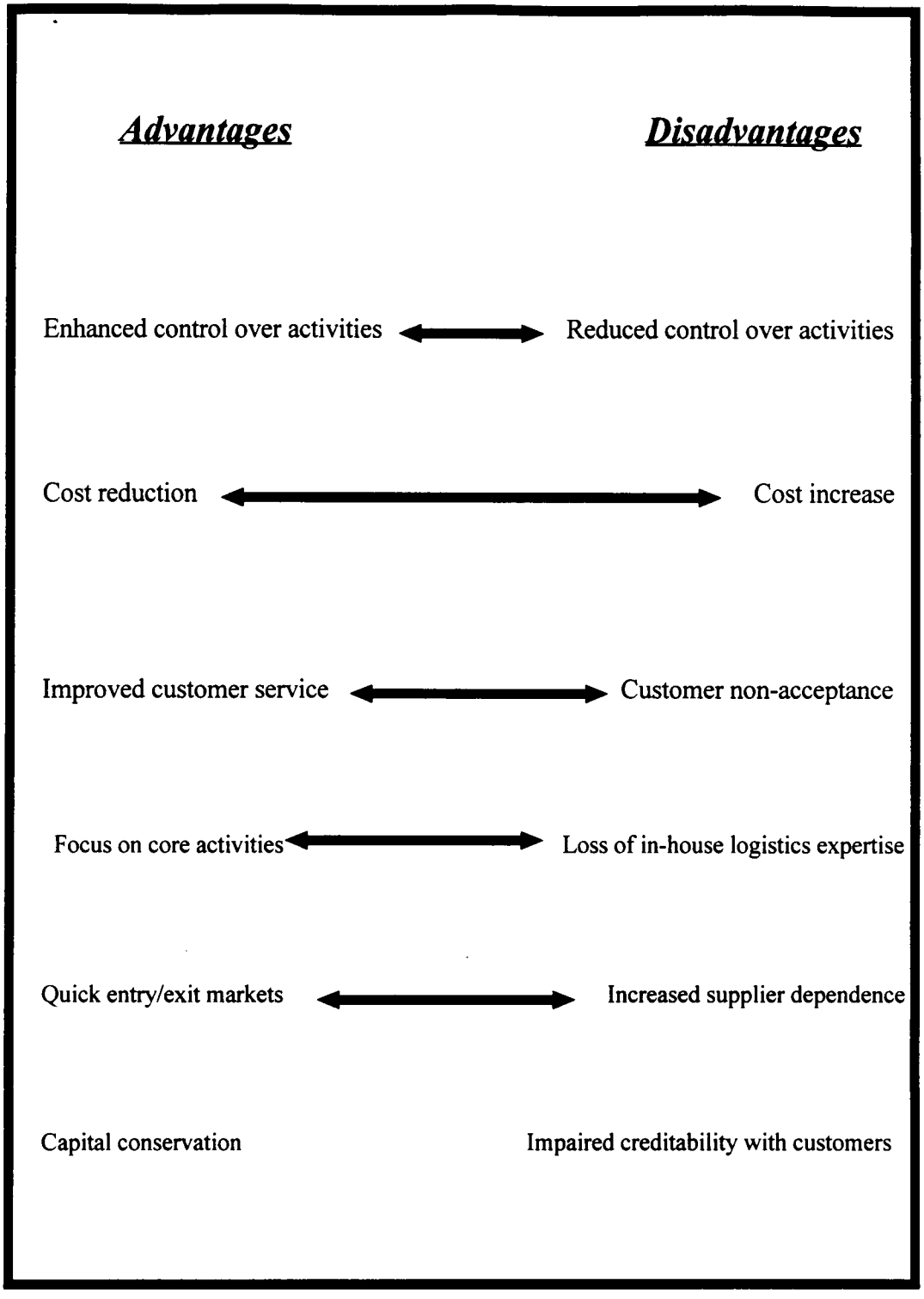


Figure 4.1 Focus Group Participants' Perceptions of Third Party Logistics Value

logistics. In fact, for every advantage offered, except capital conservation, there was at least one offsetting comment regarding a reciprocal disadvantage. The responses reflected the personal experiences and beliefs of the senior managers concerning the viability and applicability of third party logistics services. These comments reinforced the concept of unique customer needs requiring tailored solutions from potential suppliers.

Previous research has reported a number of reasons for the ever increasing interest in logistics outsourcing. Factors such as globalization and deregulation,[321] the trade-off between asset specificity and performance measurement,[322] corporate restructuring,[323] the need for additional space, changes in logistics management, and labor issues[324] have been mentioned. Focus group participants validated these reasons or "trigger" events by indicating their decisions to outsource were motivated by:

1. Corporate cost/headcount reduction programs
2. Market/product line expansions, especially international operations
3. Increasing customer demands
4. CEO directives to investigate the possibility of outsourcing

The discussion regarding these issues generally focused on the need to preserve capital and/or reduce organizational risk.

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321 Sheffi, Y., "Third Party Logistics: Present, and Future Prospects," *Journal of Business Logistics*, Vol. 11, No. 2, 1990, pp. 27-39.

322 Aertsen, F., "Contracting Out the Physical Distribution Function: A Trade-Off Between Asset Specificity and Performance Measurement," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 1, 1992, pp. 23-29.

323 Lieb, R., "The Use of Third-Party Logistics Services by Large American Manufacturers," *Journal of Business Logistics*, Vol. 13, No. 2, 1992, pp. 29-41.

324 LaLonde, B. and A. Maltz, "Some Propositions About Outsourcing the Logistics Function," *International Journal of Logistics Management*, Vol. 3, No. 1, pp. 1-11.

The final research topic concerned the method used by the participants to evaluate and select a third party supplier. A group consensus revealed that a team approach is commonly employed within a multiple stage buying process. The buying teams were reported to be multi-disciplinary in composition and routinely included decision makers from several managerial levels. Group comments revealed that the amount of time involved in any one buying stage and the total duration of the selection process depended on the strategic implications of the outsourcing decision. However, analysis, judgment and/or bargaining were reportedly used to evaluate each potential provider's core competencies, reputation, and integrity.

The most common screening methods employed were client reference checks, advice from professional colleagues, and site visits to current customers and the third party provider's corporate location. The focus group participants agreed that potential suppliers must demonstrate an ability to match their expertise with a customer's needs during the selection phase of the buying process. If suppliers fail to convince potential purchasers of this ability, they are likely to be eliminated as viable candidates.

The first phase of the research provided a productive means of gathering preliminary information on a wide variety of third party logistics issues, including simple definitions of concepts and more comprehensive process descriptions. The focus group was conducted to provide basic exploratory information concerning the concept of third party logistics and to formulate research questions to be addressed in the subsequent phases of this study. Thus, the results discussed below must be considered prescientific. A consensus of the participants' responses to the primary investigative issues and implications from this phase of the research resulted in the following five results or research propositions:

- Proposition 1 - Third party markets in the U.S. are growing and expanding rapidly.

The diverse list of activities that the participants included as third party logistics services supports the observation that much opportunity for growth exists in the contract logistics market. While most of the current activity is related to functional tasks such as transportation and warehousing, the majority of participants reported that diverse activities such as consulting, forecasting, and temporary management services would be valuable to their firms in the future.

- Proposition 2 - Multiple reasons explain U.S. buyers' interests in contract logistics.

The participants readily acknowledged that their interest in logistics outsourcing is often tied to a trigger event outside their control. Factors such as market expansions, global sourcing and distribution, corporate mandated cost reduction programs, employee reductions-in-force, and a change in management were often mentioned as the impetus for evaluating third party logistics. The focus group data revealed that outsourcing can allow management to enhance its flexibility without additional capital expense and may sometimes result in a reduction of overall logistics cost. A very important external issue, increasing customer expectations, was also reported to be spawning interest in contract logistics. Third parties were reported to be of much service in these situations, as customer requirements often exceed the capacity and capabilities of an in-house logistics organization or its ability to provide the required services in a cost effective manner.

- Proposition 3 - Third party solutions must be tailored to a customer's specific needs.

Buyers' responses revealed that organizations perceive their logistical outsourcing needs to be unique. Therefore, suppliers were advised to tailor their offerings to each potential client. In the eyes of the focus group participants, it was more important for providers to develop long term, mutually beneficial solutions than to provide quick fixes that do not address the real needs of the customer or generate reasonable returns.

- Proposition 4 - Core competencies and focused capabilities are critical third party logistics supplier evaluation and selection criteria.

The consensus of the group was that too many third party suppliers purport to be experts in all areas of logistics, though few, if any, can actually provide truly integrated services effectively. The participants also indicated that the concept of "one stop shopping" often created a level of uncertainty and suspicion. Providers were advised to concentrate on their core competencies and not try to be "all things to all people." Credibility and trust were noted to be imperatives in the selection of a third party provider. These attributes were said to result from experience, operational capabilities and an understanding of logistics cost.

- Proposition 5 - Suppliers must understand the third party logistics buying process to effectively sell their services and provide value to industrial buyers.

The focus group participants depicted the third party logistics purchasing process as similar to the models employed for other strategic goods and services, i.e., a multi-step procedure involving representatives from numerous functional areas and organizational levels. The group strongly suggested that third party logistics providers understand what firms are seeking to obtain by outsourcing logistics. The buying process was noted to vary considerably depending on the complexity and risk involved in the outsourcing decision. References and recommendations from trusted colleagues were reported by the participants to be highly valued as verification of a supplier's competency and capability.

Phase I Implications

The research propositions presented above represent an initial effort to identify and measure buyers' perceptions of third party logistics services and providers. It is apparent from participant responses that the concept of logistics outsourcing is receiving a great deal of attention and scrutiny. The market is growing rapidly as more firms adopt contract logistics to reduce cost, enhance flexibility and improve customer service. While the research method chosen for this phase

of the study does not allow generalization to a larger population, the results provide an important characterization of buyers' views and expectations. The results also provided insight into issues deserving further investigation. These areas are addressed in the next two phases of the research.

The acquisition strategies discussed by the focus group participants revealed that the motivation for outsourcing logistics is routinely related to solving a problem rather than enhancing an opportunity. However, purchasers do not appear to be searching for a "quick fix." Suppliers must be willing to help diagnose customers' needs and conceptualize solutions that will improve business processes and prove beneficial to both parties. This usually requires a tailored or custom-made service offering.

One of the most revealing findings of the focus group was the level of importance participants placed on the need for integrated logistics services supplied by a single provider. Judging from present day supplier advertisements, one would think that "one-stop shopping" was mandated by the majority of third party logistics buyers. However, data from this phase of the research revealed that buyers are more likely to be seeking the solution for a singular need or the fulfillment of a specific task when they initially consider third party logistics.

Core competencies, reputation and trust were noted to be critical in the selection of a third party logistics provider. The focus group participants reported that buying teams require provider credibility and competence to be validated through external sources such as client references and business associates. This implies that a knowledge of the buying process is imperative in understanding why and how organizations purchase third party logistics services.

The focus group interview provided an overview of third party logistics from the industrial buyer's perspective. The results were broad in scope providing the second degree constructs of third party logistics benefits and value. A number of detailed research questions were also derived for use in the subsequent case studies and nationwide mail survey of third party logistics buyers.

The focus group established a knowledge base from which more substantive qualitative and quantitative research could be conducted. The next phase of the research describes the results of an in-depth study of the buying process utilizing field case studies and a nationwide mail survey. It addresses the research propositions raised in chapter three and provides the data necessary to construct a theoretical model of the contract logistics buying process.

Phase II: In-Depth Examination of the Buying Process

A detailed understanding of the third party logistics acquisition process is necessary to determine the objectives of industrial buyers purchasing these services. Every purchase is undertaken for the purpose of providing a benefit or benefits. These desired benefits manifest themselves in the search for problem solutions or opportunity enhancements. A proper perspective of the benefits desired by contract logistics buyers can assist in identifying customer segments and marketing strategy formulation. A accurate depiction of the buying process may also aid those considering the purchase of third party logistics by providing structure to the supplier selection decision.

This section of the research relied on in-depth case studies and the results from a nationwide mail study to characterize the contract logistics buying process. The results of this phase include a theoretical model of the purchasing process and an explanation of the framework. The theoretical propositions set forth in chapter three guided the case study investigations. The propositions and the research questions composing them are addressed in the following case study analyses and findings.

The field case studies were conducted to provide a comprehensive understanding of why and how industrial buyers purchase third party logistics services. The buying teams involved in the case studies were identified from a list of potential firms provided by the research sponsor. Each of these firms had recently (within the previous two years) completed the decision process leading to

the selection of a third party logistics provider or were currently involved in the evaluation or selection of a supplier. Senior managers involved in the buying process were contacted by the researcher via telephone and the study's purpose was described. A copy of the topical case study outline (see Appendix B) was provided to those expressing interest in the study. A total of five organizations agreed to participate in the research. Two large automobile manufacturers, a telecommunications company, a computer hardware firm and a recreational vehicle producer were the subjects of the clinical studies.

All case study interviews were conducted at the subject firms' corporate locations and included only key decision makers involved in the buying process. Data was obtained via written notes and archival records. As reviewed in chapter three, Yin's[325] method of cross-case analysis, pattern matching and explanation building was used to evaluate the field case studies and formulate results. The case study summaries, including participants (by organizational title), firms involved (by industry type), and facility locations, appear in Appendix B.

A nationwide mail study was also used in this phase of the research as another means of discovery. Descriptive data obtained from the survey results assisted in providing a comprehensive depiction of the buying process (see Appendix C for the survey instrument and participant responses). Qualitative and quantitative questions were raised in the mail questionnaire to augment data obtained from the case studies. Responses to these questions provided a broad perspective on many third party logistics purchasing issues. The next section describes the mail survey sampling plan, participants and implications of the response rate.

Mail survey response and implications

The results of the literature review, focus group and case studies provided the foundation

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325 Yin, R., *Case Study Research: Design and Methods*, Sage Publications, Newbury Park, CA, 1991.

for a national survey of existing and potential third party logistics users. As this industry is very new to the U.S., no reference sources were available to identify current or previous users. Therefore, an attempt was made to survey the most probable population of current third party logistics users and industrial buyers likely to purchase the services in the future. Three sources were consulted in an effort to derive the population, i.e., popular press publications, third party provider literature and the current membership list of the Council of Logistics Management.

A review of trade journal articles and supplier brochures for 1993 and the first six months of 1994 yielded the names of 312 firms reportedly using third party logistics services. Management names, job titles and corporate addresses were obtained for 254 of these firms from secondary reference sources such as the *Directory of Logistics Executives* published by Traffic Service Corporation.

The Council of Logistics (CLM) membership roster was categorized by membership type to include only those individuals representing manufacturing or merchandising firms. This classification technique netted a total of 1,025 organizations. The survey questionnaire was forwarded to the most senior manager appearing on the membership list, when multiple CLM members were noted for a potential respondent firm.

The mail survey was reviewed by the case study participants and selected contract logistics providers to remove ambiguity in question wording and ensure that all the major issues relating to third party logistics purchasing were addressed by the instrument. A total of 1,279 questionnaires were mailed to the managers identified using the sources and methods described above. Data collection encompassed a two month time period and included many of the procedures specified by Dillman.[326] For example, each survey form was accompanied by a

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[326] Dillman, D. A., *Mail and Telephone Surveys: The Total Design Method*, John Wiley and Sons, New York, NY, 1978.

cover letter personally signed by the researcher (see Appendix C). This document explained the purpose of the study and requested completion and return of the questionnaire. A self-addressed, postage-paid envelope was provided with the survey to encourage participation in the research. Respondents were promised a summary of the research findings in return for completing the questionnaire.

The surveys were distributed during the first three weeks of June, 1994. Five weeks were allowed for questionnaire completion and return to the researcher. Survey receipt for inclusion in the research was curtailed on August 1, 1994. Data entry and computer analysis were initiated during the first two weeks of August, 1994.

A total of 263 completed questionnaires were received by the August 1 deadline. Forty-four mailings were return unopened as a result of failures to reach intended recipients. This was usually the result of improper or inadequate addresses. The completed questionnaires provided an overall mail survey response rate of 21.3% (263/1235).

The survey responses were classified by industry type. This was accomplished by matching participants' responses to a survey question with the membership coding method used by the CLM. The mail survey asked each respondent to indicate the principal type of product manufactured or distributed by their organizational unit (see Q30, Appendix C). Industry classification for the mail study respondents was determined by matching answers to Q30 with the twenty three industry classifications used by the Council of Logistics Management to differentiate its membership.

The taxonomy resulting from the procedure described above is presented in **Table 4.3.** Buyers from nineteen different industries completed the mail questionnaire. The largest percentage of responses (61.9%) came from the following five industries: automotive and transport equipment (9.9%), chemicals and plastics (11.4%), electronics (10.6%), food and

Table 4.3. Mail Survey Respondents by Industry

INDUSTRY	PERCENT OF RESPONDENTS
Appliances	0.8
Automotive and Transport Equipment	9.9
Building Materials/Lumber Products	1.9
Chemicals and Plastics	11.4
Clothing and Textiles	5.7
Computer Hardware and Equipment	8.0
Construction and Farm Equipment	2.7
Department Store / General Merchandise	2.7
Electronics and Related Instruments	10.6
Electrical Machinery	3.0
Food and Beverage	18.6
Furniture	0.0
Hardware	0.8
Machine Tools and Machinery	3.4
Fabricated Metal Products	0.8
Mining and Minerals	0.0
Office Equipment and Supplies	3.0
Paper and Related Products	3.8
Petroleum and Petrochemicals	0.0
Pharmaceuticals	11.4
Primary Metals	0.0
Rubber Products	1.1
Other, please specify	0.4
TOTAL	**100.0**

beverage (18.6), and pharmaceuticals (11.4%).

A further description of the mail survey respondents was provided via other demographic data obtained from the questionnaire. Respondents were queried concerning their firm's relative position in the supply chain, e.g., wholesaler, retailer, etc., annual sales revenue and their organization's geographical scope of operation (Q26, Q27, and Q28). A summary of the answers to these questions is displayed in **Table 4.4.** The responses revealed that many of the mail study participants represent large manufacturing firms conducting business on a broad geographic scale. The demographic profile of managers electing to complete the mail questionnaire is similar to that depicted in other recent studies involving mail surveys of third party logistics users.[327]

The response rate to the mail survey for this dissertation was similar to that appearing in recent logistics and transportation literature. A review of three major logistics journals, i.e., *The International Journal of Physical Distribution and Materials Management*, *The Journal of Business Logistics* and *The Transportation Journal*, for the period 1985-1986 noted response rates for mail studies ranging from 14.6% to 33.8%.[328]

Much research has been conducted on mail survey response rates and potential study bias.[329] A great deal of debate surrounds how the response rate to a mail questionnaire may

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327 For example see Lieb, R., "The Use of Third-Party Logistics Services by Large American Manufacturers," *Journal of Business Logistics*, Vol. 13, No. 2, 1992 and Lieb, R., R. Millen and Luk van Wassenhove, "Third Party Logistics Services: A Comparison of Experienced American and European Manufacturers," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 6, 1993.

328 Novack, R., *Logistics Control: An Approach to Quality*, unpublished doctoral dissertation, The University of Tennessee, 1987, p. 104.

329 For example see Lambert, D. and T. Harrington, "Measuring Non-Response Bias in Customer Service Mail Surveys," *Journal of Business Logistics*, Vol. 11, No. 2, 1990 or Ognibene, P., "Correcting Non-Response Bias in Mail Questionnaires," *Journal of Marketing Research*, Vol. VIII, 1971 and Finn D., C. Wang, and C. Lamb, "An Examination of the Effects of Sample Composition Bias in a Mail Study," *Journal of the Market Research Society*, Vol. 25, No. 4, 1978.

Table 4.4. Demographic Profile of Mail Survey Respondents

CLASSIFICATION MEASURE	PERCENT OF RESPONDENTS
Type of Organization	
Raw Materials Supplier	2.5
Component Manufacturer	9.6
Finished Product Manufacturer	63.1
Wholesaler	12.1
Retailer	10.2
Other, please specify	2.5
TOTAL	**100.0**
Annual Sales	
Less than $10 Million	0.0
$10 Million to $100 Million	11.0
$100 Million to $500 Million	22.1
$500 Million to $1 Billion	23.4
Greater than $1 Billion	43.5
TOTAL	**100.0**
Geographical Scope of Operation	
International	55.8
North America	21.2
U.S. - national	17.3
U.S. - regional	5.1
Local	0.6
TOTAL	**100.0**

introduce error into research findings. In fact, several experts question the reliability of results derived from mail studies experiencing response rates below fifty percent, or those in which researchers fail to document the similarity between respondents and non-respondents.[330] However, the ability to determine non-respondent characteristics has been found to be limited when a mail survey is used for data collection.[331]

Notwithstanding the limitations of a mail survey in obtaining reliable data, there can be valuable information provided from a survey experiencing a low response rate. This is especially true when the researcher is seeking general patterns and approximations rather than precise projections and detailed analysis. This type of information is also valuable when limited data is available concerning the universe under study. While the results from a mail questionnaire with a low response rate cannot be claimed to represent the sample surveyed, the data can provide insight into the opinions of an important group of respondents.[332]

The respondents to the mail questionnaire used in this research were not required to identify themselves. This was done to ensure participant anonymity and encourage participation in the study. However, this practice precluded any comparison between those electing to complete the questionnaire and the population from which they were drawn. Therefore, an assessment of non-respondent bias was not possible. This policy has implications for the findings drawn from this phase of the research. In essence, the results must be considered representative of the firms completing the questionnaire and not necessarily representative of

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330 See Erdos, P. and A. Morgan, *Professional Mail Surveys*, Krieger Publishing Company, Malabar, FL, 1983 and Dillman, D., *Mail and Telephone Surveys: The Total Design Method*, Wiley and Sons, New York, NY, 1978.

331 Dillman, Op. Cit., p. 54.

332 Erdos, Op. Cit., pp. 144-145.

general practice for all industrial buyers of third party logistics services in the United States.

The purpose of the nationwide mail study was twofold: 1) to augment the case studies to more fully describe the buying process and 2) to identify the benefits sought in the acquisition of contract logistics services. The benefits were used the third phase of the research to derive third party logistics market segments. While the response rate to the mail study was not as high as expected, the data obtained did provide the basis for an in-depth examination of the purchasing practices of a large number of important industrial buyers. Furthermore, the actual response rate also provided an adequate sample size for the two statistical tools used to analyze the data in the third research phase., i.e., factor and cluster analysis.

Phase II Analysis and Results

The data obtained from the focus group, case studies and mail survey led to the formulation of a theoretical buying process model of the third party logistics buying process. The framework is depicted in **Figure 4.2.** It consists of the following five stages or phases:

- Stage I: Need Awareness
- Stage II: Solution Development
- Stage III: Supplier Selection
- Stage IV: Service Adoption
- Stage V: Service Assessment

The procurement model seeks to characterize the decision making process used by industrial buyers to purchase contract logistics services. The first stage refers to the time involved in evaluating a current problem or opportunity situation to identify the need for an external purchase of logistics services or management expertise. It includes any implicit or explicit make or buy analysis. The second phase includes the activities involved in devising or identifying feasible solutions and providers to address the problem or opportunity raised in the initial stage. The third stage represents the time and effort devoted to developing supplier qualification criteria and the actual screening of suppliers to determine the most appropriate

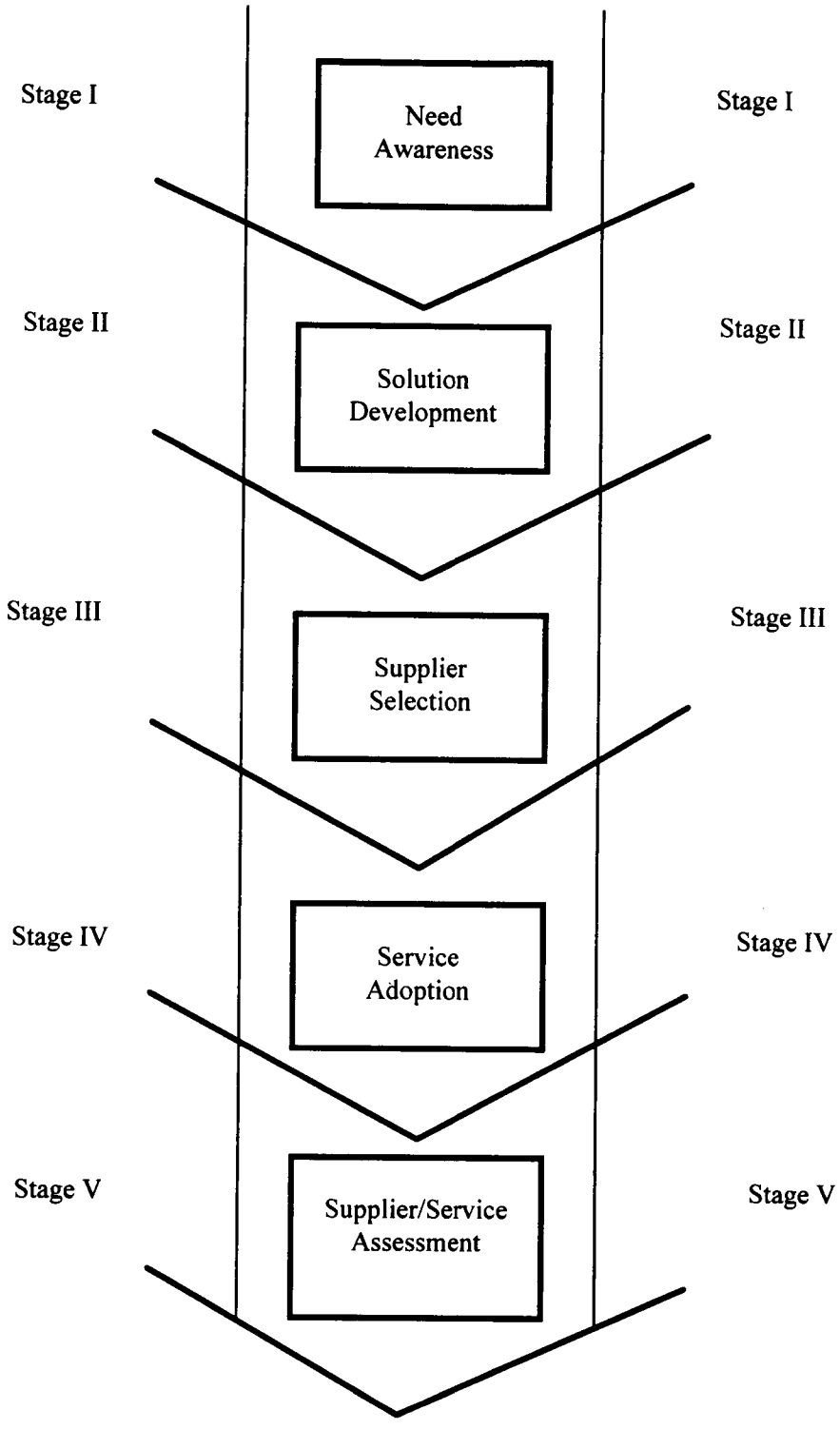


Figure 4.2. The Third Party Logistics Buying Process

solution/provider to meet the firm's need(s). The fourth step entails the initiation of service and management by the selected provider; this effort includes labor, facilities, systems, etc. The final phase of the purchasing process represents the ongoing qualitative and quantitative measurement of provider performance specified in the contract and the breakthrough performance implied in many agreements.

While the five stages of the third party logistics purchasing process are graphically depicted in a sequential manner, this does not imply that every buying team analyzed in this research followed the model exactly as depicted or that each stage was completed in its entirety before the next phase was initiated. In fact, quite the opposite is true. The study data revealed that it is common for firms to cycle and recycle through the phases or even bypass one or more of the stages in the process of selecting a provider and initiating service. A more detailed portrayal of the buying process would include a plethora of arrows and interrupt symbols between and among the various phases. In essence, no simple linear relationship exists between the distinct stages of the third party logistics procurement process. These decisions are made by people and thus, the procedure is influenced by such nebulous but real concepts as power, conflict, and compromise.

The purchase of third party/contract logistics services, especially integrated services, is often considered a strategic decision. The strategic decision making process can be characterized in several ways, e.g., by its uniqueness, complexity, open-ended nature, and uncertainty. The logistics outsourcing decision is most often accompanied by a substantial degree of risk as this type of purchase usually represents a new buy for the firm. Therefore, little information or experience exists to guide the process. A buying team, composed of managers from several functional areas and organizational levels, is established to find a solution to a problem or take advantage of a perceived opportunity.

One of the primary constraints facing a researcher investigating industrial purchasing is the difficulty of efficiently obtaining data from all the participants involved in the decision making process. Traditionally, strategic decision making in organizations has been researched by the following methods: 1) direct observation of the buying team's actions and communications, 2) a review of organizational records, 3) interviews with members of the buying team, and 4) the use of questionnaires.[333] This study used all of the above methods, except direct observation, in an attempt to discern the nature of third party/contract logistics procurement. A consensus of the findings from this research provides an analysis of the buying process. Each stage or phase of the procurement model is explained in the following five sections.

Stage I: Need Awareness

The first stage of the buying process occurs when a firm recognizes a problem (need) or an opportunity that must be addressed by the external purchase of logistics service. Problems usually result in crisis or non-crisis situations. Opportunities constitute another reason for the initiation of the purchasing process. Non-crisis problems are often influenced by multiple stimuli whereas crisis problems and opportunity decisions are more likely the result of a single influence. The stimuli may originate inside or outside the organization.

The third party logistics procurement decisions investigated in this research resulted from non-crisis problems and could be more appropriately referred to as opportunity-problems. For example, of the twenty events listed in the mail survey (Q6) as potentially significant in the decision to outsource logistics, the top three reasons or "trigger" events were:

1. Search for cost reduction
2. Reduce employee base and Capacity (space) constraints [tie]

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333 Mintzberg, H., D. Raisinghani and A. Theoret, "The Structure of 'Unstructured' Decision Processes," *Administrative Science Quarterly*, Vol. 21 (June), 1976, p. 247.

3. Improve logistics customer service

Data from the case studies revealed how and why organizations recognize their need to outsource logistics. Need conceptualization can result in a very detailed description of the firm's requirements, with tightly drawn specifications, or a very general statement, such as the development of a world-class integrated logistics system. In other words, needs can be well-defined or broadly envisioned.

The telecommunications firm and European auto manufacturer case studies (see Appendix B for all case study data) reflect problem diagnoses resulting in very specific statements of need. For example, the telecommunications firm defined its logistical need as improved inventory management and customer service. In essence, the company lacked core competency in certain functional areas and space constraints were exacerbating the situation. The buying task force decided to meet this need by acquiring external services provided by an experienced supplier with expertise in picking/packing, inventory control and transportation management.

The European automaker's problems stemmed from the need for more space in its decisions to outsource the supply of packaging material and the handling of a new line of parts. A need for lower cost in the routine delivery of bumpers to production plants resulted in logistics outsourcing in a third decision. In each of these three instances, the automaker defined its problems and needs very narrowly. In fact, potential third party logistics suppliers actually served to broaden the thinking of the buying team concerning their firm's needs and recommended a more integrated approach to solving the problems.

The U.S. automaker's decision to outsource the management of its less-than-truckload (LTL) shipments and the European auto manufacturer's desire to re-engineer its European distribution system represent need awareness efforts resulting in somewhat more nebulous

conceptualizations. In both of these examples, the buying teams did not have a well defined image of the problems or opportunities prompting the decision to investigate logistics outsourcing. Therefore, the procurement process was tedious and lengthy, resulting in a great deal of phase recycling. For example, it took the U.S. automaker six months to arrive at an initial definition of its needs. Furthermore, the European automaker had not definitively examined its requirements even though the buying team admitted the problem of excess spare parts inventory in its tri-level distribution network had been evident for several years.

An influential inside or outside supporter is usually required in the initial stage of the buying process to promote the concept of logistics outsourcing. Organizations do not usually welcome change, especially far reaching modifications such as the complete outsourcing of the logistics function. Therefore, it is imperative that an influential supporter be involved to keep the concept of for-hire logistics alive during the first stage in the buying process. Results from mail study (Q12) acknowledge that executive management and financial managers are important in recognizing the need for logistics outsourcing. Moreover, the individuals holding positions in these areas were often noted to be significant supporters or "champions" of third party/contract logistics.

Outside individuals can also serve as important champions of the logistics outsourcing cause. For example, auditors from a public accounting firm played a key role in the recreational vehicle manufacturer's decision to consider for-hire logistics. Furthermore, this group was instrumental in convincing executives of the need for corporate wide logistics management. This advice resulted in the hiring of a vice-president of logistics and a concerted effort to pursue logistics outsourcing. Also, consultants were very influential in leading the computer hardware company's executives to investigate the use of an external supplier for the global distribution of

the firm's products. Clearly, an influential contract logistics champion can lead an organization to perceive the need for the external provision of logistics services and distribution management.

The translation of generic needs, such as reduced cost and improved service, to a tangible statement of requirements is usually a task assigned to a buying team or task force. These teams are often composed of internal logistics managers supported by experts from several functional and administrative areas. This is the group charged with the responsibility of determining which tangible market alternatives are compatible with the firm's logistical service needs. As logistics outsourcing often represents a new buy situation for a company, technical personnel are influential in defining needs and the specification of alternatives.

The needs awareness stage is the point at which a potential supplier can gain a competitive advantage in the purchasing process. Unfortunately, providers are not usually aware of a firm's decision to evaluate logistics outsourcing until after the internal buying team has determined the firm's needs and moved to the solution development or supplier selection stage. In any event, the initial phase provides a potential provider with the opportunity to convince the buying team of its problem solving capabilities through advertising, specialized information, client references, etc., if it has the opportunity to become involved at the beginning of the purchasing process.

Stage II: Solution Development

The second step in the contract logistics buying process is the identification of viable alternatives for problem resolution or opportunity enhancement. This phase can be static or dynamic in nature with a variety of techniques employed to further the buying process. Some of the more common techniques used at this stage are:

- Memory search -- the buying team taps into its internal "memory" bank, human or paper, to identify possible options.

- Trap search -- the buying team seeks the generation of alternatives by letting potential suppliers know that the firm is "in the market."
- Active search -- the buying team is proactive is seeking alternatives either through wide area screening or a narrow focus.[334]

Examples of all three types of solution development techniques were noted in this research. For instance, in the telecommunications case study the buying team relied solely on the memory and experience of its senior logistics manager to identify potential suppliers and solution alternatives for its revised Holland distribution operation. Further, the U.S. automaker's procurement team sent letters to major transportation suppliers, known to be engaged in third party logistics, inviting them to an information session to derive potential alternatives. Finally, the recreational vehicle manufacturer adopted an active search campaign contacting sources provided by the company's auditors, an international economic development agency and a broker of third party logistics management services.

Third party logistics buyers responding to mail study (Q2) expressed a preference (72.4%) for integrated logistics services as a feasible alternative or solution to their logistics problems or opportunities. However, a note of caution must be emphasized at this point. When the mail study participants were asked (Q3) which services should be included in the service package, many indicated that only the basic functions of transportation, warehousing, freight bill payment and logistics information systems were desired.

The mail study results do not support the notion that a typical third party logistics customer is seeking the supply of fully integrated logistics services under the management of a single supplier. In fact, only 20.9% of current contract logistics users reported (Q8) that the services they were currently purchasing were significantly integrated by their supplier(s).

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334 Ibid., p. 255.

Respondents to the survey questionnaire (Q14) revealed that the most common advantages of logistics outsourcing were:

- Increased flexibility (60.0%)
- Reduced costs for the outsourced activities (58.1%),
- Reduced employee base (51.6%), and
- Improved customer service levels (49.7%)

It is clear that any potential solution alternatives must deliver these results to be seriously considered by a decision making unit. Providers must determine the alternatives that produce these essential advantages and market them aggressively. Further, it is necessary to ascertain the alternatives that will result in benefits which can augment the essential requirements and provide enhanced value.

Communication and information are the keys to establishing credible solution development alternatives. As referenced above, the purchase of contract logistics services is a new experience for most firms and as such requires the accumulation of knowledge. This is usually obtained via an educational process relying on written documents and informed dialogue. For example, the U.S. automaker essentially allowed invited suppliers to draft a request for proposal (RFP) which was later submitted back to them for response purposes. Moreover, the telecommunications company followed a similar strategy when a member of the buying team took a preliminary copy of the RFP to ten Amsterdam providers and asked them to comment on the provisions of the document. Finally, the computer hardware firm hired a logistical consulting company to assist in benchmarking its current performance and to identify potential global integrated logistics support system alternatives.

The case studies revealed that most important sources of information regarding supplier identification and solution alternatives are those available through secondary communication channels, e.g., client references and advice from trusted professional colleagues of the buyers.

Practically every member of the case study buying teams reported heavy reliance on one or both of these information sources. Potential suppliers must demonstrate credibility to be considered as candidates. Supplier reputation is obviously very important at this stage in the buying process. Site visits to supplier locations and references from existing customers were reported to be ideal methods of substantiating performance.

Many third party logistics acquisitions represent custom made or tailored solution purchases. The buying team may begin with a generalized image of their ideal solution, e.g., the computer hardware manufacturer's global logistics system and the U.S. automaker's re-engineered LTL parts support network. Decision makers often factor their alternatives into a sequence of nested design and search cycles, essentially simulating a decision tree diagram. The decisions at each node tend to become more narrow and lead to a refined statement of potential solutions. An optimal solution alternative is often derived by this recursive technique. As this is a time consuming and expensive procedure, organizations are not usually willing to devise and consider multiple custom made alternatives. Therefore, it is imperative for potential suppliers to become involved in the buying process as soon as possible and provide timely information via technical experts.

When an existing standard service offering is appropriate, the number of potential suppliers considered may be larger than the number evaluated for a tailored solution. For example, the telecommunications firm began their initial screening process with more than ten potential suppliers. While the recreational vehicle maker's decision to eliminate its multiple distributors and turn over European distribution to a single Amsterdam supplier may not be considered a routine service request, many of the agreement's features were operationally straight-forward. Thus, the company began its supplier selection process with a list of nine potential providers. Responses to the mail survey (Q11) revealed that the typical third party

logistics purchaser initially identifies 6.66 suppliers on average and formally evaluates 3.44 during the supplier selection stage.

Stage III: Supplier Selection

The supplier selection stage is often considered the final step in the decision process. However, data from the case studies indicated that the selection process is ongoing even to the point of signing the formal contract. The selection stage itself may be made up of a series of steps, e.g., formulating selection criteria, determining who will be allowed to respond to a request for proposal, etc. This stage can either be short or long in duration and depends on the nature of the problem or opportunity being addressed and the experience of the buying team.

As services are more difficult to evaluate that products, contract logistics purchasing decisions are inherently risky. To minimize risk, a task force buying approach is typically used in the selection of a third party/contract logistics provider. Greater horizontal and vertical organizational involvement is present in a buying team of this genre. Often the degree of buying center centralization and specialization increases in these situations.

Results from the field case studies and mail questionnaire (Q11) disclosed that supplier selection is a multiple step process involving three to six candidates. Initial screening is usually based on qualitative factors such as reputation and verbal or written responses to informal requests for information. An example of this policy includes the case study involving the recreational vehicle manufacturer. A decision was made to exclude any supplier that did not maintain a "presence" in the United States, when such presence was defined as merely the ability to submit all facsimile transmissions to a domestic telephone number. Another example of such preliminary screening was the computer hardware company's decision to exclude potential suppliers based on their verbal responses to a telephone call inquiring about the availability of a global, integrated logistics support system.

Initial screening is more oriented to eliminating what is not feasible than with determining what is appropriate for evaluation. Screening questions the validity of alternatives that have never been used before and tends to reduce the alternatives to a number which can be stored and later considered in-depth by the buying task force. Screening can sometimes be part of the previous buying stage (solution development) as indicated in the computer hardware company example discussed above.

The case studies revealed that supplier selection results from three methods of discernment; namely, analysis, bargaining, and judgment. Of these, judgment appears to be the most important, especially in the final choice of a provider. Analysis is used solely by members of the buying task force, as they are the most technically proficient and best qualified to evaluate the specific costs and service capabilities of potential suppliers. Bargaining was found to be used throughout the selection process to reach a consensus on many issues, such as the criteria to be used for initial supplier qualification and the screening and/or elimination of providers.

Judgment was present in the discernment modes of analysis and bargaining. For example, quantitative analyses involved the subjective assignment of numerical weights and ratings. This was evident in the recreational vehicle case study (see Exhibit CS 2.2. in Appendix B). Judgment in bargaining was also apparent in the U.S. auto manufacturer's interim decision to re-evaluate the management of its LTL shipments by a single contract logistics provider. This occurred because the final four candidates selected by the procurement team did not include a supplier preferred by one of the influential members of the business award council.

Results from the mail study (Q17) disclosed that an average of 2.7 suppliers constitute a typical purchaser's "short list" during the final selection decision. The most important or determinant selection criteria were ascertained by asking mail survey respondents to rate the importance of thirty factors or benefits likely to result from the purchase of contract logistics

(Q18). The thirty selection criteria were derived from the literature review, focus group, case studies and preliminary discussions with third party logistics suppliers and users. Participants were also asked to rate the difference they perceived among suppliers on each of the thirty factors or benefits. A selection criteria determinant score was derived by multiplying the importance rating by the difference rating for each of the thirty selection factors. This technique provided the data for a subsequent determination of the benefits desired by third party logistics buyers. The methodology, statistical analysis and findings from this portion of the research are reported in the next section (third party logistics market segmentation) of this chapter.

The case studies revealed that supplier selection involves multiple screenings and steps. An example of this process is provided by the recreational vehicle manufacturer's approach to selecting a supplier for distribution of its products in Europe. A comprehensive qualitative and quantitative service evaluation tool was prepared to judge invited responses to a formal request for proposal. An analysis of service capabilities was conducted before any costs were considered. The initial service comparisons eliminated three of the original five invited bidders. A visit to customers of the two remaining bidders was conducted to substantiate performance capabilities and evaluate cultural compatibility.

The results of the service and cost evaluations, as well as the customer references, revealed that the two finalists were equally qualified. However, at this point in the decision process the buying team revised its selection criteria to include a factor not previously considered. This resulted from new information supplied to the buying team. In essence, the team learned that senior management would not support the selection of any supplier currently distributing a competitor's products. This immediately eliminated one of the two finalists from further consideration. Thus, the final supplier selection decision was contingent on screening criteria developed late in the procurement process.

Survey responses to question ten (Q10): "In what year did you complete your most recent third party logistics supplier selection decision?" indicated an increasing frequency of logistics outsourcing. The most common response was the year 1994 (42.6% of respondents) This year accounted for the highest number of supplier selection decisions even though only eight months of the year had elapsed when the survey "cutoff" date was reached and the results were compiled. These findings emphasize the trend toward increased logistics outsourcing. The survey data also revealed that a complex, risky purchase decision, such as third party logistics procurement, includes a lengthy period between need recognition and the final selection of a supplier. The average time period reported by mail survey respondents (Q9) was 7.84 months, with a range from 1 month to 36 months.

The selection of a third party logistics provider has been shown to involve a high degree of communication and interaction between members of the buying task force, other users of contract logistics, and provider personnel. Trust is an imperative part of the final selection decision. After using analysis, bargaining and judgment during the selection phase, the final decision between potential suppliers on the buyer's "short-list" often relies on the degree of trust the buying team places in provider personnel. Responses to the mail study (Q13) revealed that 31.4% of the industrial buyers experienced elevated internal controversy over the logistics outsourcing decision. Trust and confidence in the selected supplier were shown to be required to reduce the personal and corporate risk associated with outsourcing logistics.

Stage IV: Service Adoption

The fourth stage of the buying process encompasses the initiation or implementation of the logistical alliance between the buying organization and service provider. While one might surmise that service implementation begins at the date and time specified in the formal contract, this is not always the case. In fact, implementation often begins in the supplier selection stage

and can play a prominent role in the final choice of a provider. For example, if a provider cannot respond to a client's proposed service implementation timetable, the firm may be removed from further consideration. Implementation plays a key role in customer satisfaction as the transition from proprietary service provision to third party status represents the first tangible opportunity for measurement of an external provider's performance.

The implementation period can be very short or long depending on the needs of the customer and the scope of the services and management functions to be outsourced. The telecommunications case study provides an example of a short time horizon for full service implementation. Only two weeks were allowed for the changeover after the formal contract was signed. The supplier had to assume responsibility for all logistics functions on short notice, since the lease on the buyer's existing logistics facility expired at the conclusion of the two week implementation time period. A short time period for service adoption may be likely if the services to be provided are minimally integrated or space constraints are driving the logistics outsourcing decision.

The computer hardware case study offers an example of service adoption in firms seeking to radically change their network or re-engineer the entire logistical process. The structure of this service adoption plan was sequenced and hierarchical in scope. Furthermore, a time phased approach was utilized. The transition was from simple functions that are less risky and apparent to the final customer to more comprehensive, complex and visible operations.

The service adoption strategy of the computer firm consisted of six phases or steps. Each step included more complexity and control and was accompanied by its own set of cost expectations and service performance criteria. The buying team staggered the transition to full service implementation in an attempt to ensure service continuity and cost control. This strategy also served as an incentive approach to service implementation. The selected provider was not

allowed to progress from one phase to the next, therefore assuming more responsibility and earning additional revenue, until it proved it could meet the cost and service expectations at its current level of service provision. The transition plan included the following sequence of events:

Phase 1: Award responsibility for transportation from manufacturing sites to distribution facilities or from one distribution facility to another.

Phase 2: Turn over responsibility for warehousing configuration and systems management.

Phase 3: Shift, to the outside supplier, management of transportation from distribution centers or manufacturing sites to customers.

Phase 4: Turn over responsibility for operation of U.S. warehouses to a third party.

Phase 5: Transfer responsibility for European line-haul movements and freight forwarding to external provider.

Phase 6: Allow third party supplier to assume control of European warehousing.

Each of these six phases was anticipated to last three months; therefore, the entire implementation time period was scheduled to stretch over one and one-half years. The computer hardware firm's buying team anticipated no increase in cost or service degradation during the transition period. Failure to meet these expectations would prohibit the selected supplier from assuming any additional business. Assuming all six phases were successfully completed, the next stage of the implementation process required a redesign of the current network. This was the real goal of the company's decision to outsource logistics. While no timetable was established for the re-engineering project, it is certain this part of the service adoption phase will be the deciding event in the continuation of the newly formed logistical alliance.

As noted in the case study examples referenced above, the service adoption stage of the procurement process can be relatively straight forward and simple or comprehensive and complex. Supplier expectations may be clearly stated in a formal contract or set forth loosely in a "memorandum of understanding." In any event, the transition to external service provision and

management is a critical part of the purchasing process. Even if a supplier is successful in surviving the first three stages of the purchasing process, the business can be lost during the service adoption phase. Unfortunately, a provider usually determines this fact retrospectively, when the agreement is canceled or the contract is allowed to expire without a chance for renewal.

While most respondents to the mail study reported satisfaction (29.9% indicated extreme success and 56.6% noted moderate success) with their logistics outsourcing experiences (Q16), 17.2% of firms currently using third party logistics indicated that their transition to contract logistics was unsatisfactory during the implementation stage (Q15). Unsatisfactory performance during the implementation stage can negatively impact service assessment and impair perceptions of improvement. The implications of service performance are investigated in the final stage of the buying process.

Stage V: Service Assessment

The final phase of the buying process does not end as long as the logistics alliance is in effect. The outcome of this phase determines whether the buyer will initiate the procurement process again to seek an alternate solution, replace a supplier, or continue with the current agreement. Data from the case studies reveals that the measurement of performance is both qualitative and quantitative. Service is tracked much more frequently than cost. However, this does not imply that cost is not important. As indicated in stage one (need assessment) and stage three (supplier selection), some firms employ third party logistics suppliers primarily for cost reduction. An illustration of service assessment is provided in the following case study example.

The telecommunication manufacturer's agreement with its supplier required service levels to be monitored informally on a daily basis. Cost and procedures compliance were to be reviewed on a monthly basis in accordance with a thirteen page evaluation instrument. The longevity of this agreement was dependent on the buyer's future plans, as the company was

attempting to develop a global logistics strategy. Cost emphasis was apt to be the preeminent measure of performance in the existing agreement since the buying team intended to benchmark all costs and charges at the end of the contract period.

Perhaps the most significant evidence of the importance of this phase of the purchasing process is the tendency of a third party logistics user to change suppliers or return to the proprietary provision of logistical support and management. Results from mail study (Q4) revealed that 48.1% of current third party logistics users have either brought outsourced activities back in-house or changed suppliers. Thus, the service assessment stage is ongoing and obviously the most important phase of the buying process for incumbent suppliers.

Phase II Implications

Four theoretical propositions guided this phase of the research. Their purpose was to direct the case study investigations to the salient aspects of the third party logistics buying process. Each of the propositions is addressed below with regard to their influence on the development of a theoretical third party logistics purchasing framework.

The first proposition related to the amount of risk involved in a third party logistics purchasing decision. Specifically, this proposition theorized that the procurement of third party logistics involves a substantial degree of perceived risk. Findings from the case studies revealed that the greatest area of concern was a loss of control possibly resulting from logistics outsourcing. Existing levels of customer service, e.g., on-time pickup and delivery, order fill accuracy and productivity, order cycle time, etc., were considered to be the areas most at risk.

Few case study participants considered the risk of increased cost to be great from purchasing contract logistics services. In fact, most were confident that costs would either remain at existing levels or be reduced. However, some participants were cognizant of the

potential for high supplier switching costs, especially when the firm purchased integrated services requiring specialized assets provided by a single supplier.

Several industrial buyers mentioned the likelihood of increased corporate risk from the loss of in-house expertise as a result of logistics outsourcing. Most stated that future management oversight may be hindered as knowledgeable in-house logistics managers retired or left the company. The internal controversy (personal risk) resulting from a third party logistics purchase decision was noted by 31.4% of the industrial buyers responding to the mail study (Q13) to be higher than that associated with similar corporate decisions. However, 52.2% of those completing the mail questionnaire stated that the contract logistics purchasing decision entailed about the same amount of internal controversy as other corporate decisions in which they regularly participated.

The risk from loss of control was managed by an expanded information search to obtain unbiased evaluations of supplier capabilities and performance during the purchasing process. This new information was obtained from trusted business colleagues with first-hand knowledge of the suppliers under review. Performance data was also obtained via interviews with existing and former customers of the providers being considered. Further, customer service levels were expressly delineated in formal contracts governing third party logistics service agreements. Finally, performance was noted to be monitored informally on a daily basis and formally every month or calendar quarter.

Multiple levels of management from a variety of functional areas were found to be routinely involved in the third party logistics buying decision. This practice served to minimize corporate and personal risk. The most common buying team configuration consisted of individuals from middle management; however, it was not uncommon to find directors and

general managers included. The recommendations of the buying team were usually submitted to a senior management committee for final authorization.

The second proposition dealt with the exercise of power in the decision making process. In effect, the proposition set forth the theory that the exercise of power within the third party logistics decision making unit simplified supplier selection. The results of the case studies determined that the exercise of power by senior management responsible for final authorization of the purchasing decision did serve to simplify choice during initial supplier identification and final negotiations. Power resulted from fact that the third party logistics purchasing team's choice was ultimately dependent on senior management's approval and authorization of their supplier choice.

Controversy over potential candidates ceased as soon as the third party logistics purchasing team was able to ascertain the desires of senior management concerning viable suppliers. This practice served to streamline the entire buying process, once the desires of senior management were apparent. Only suppliers with a favorable chance of winning final authorization from senior management were invited to submit bids or seriously considered as providers.

The third proposition stated that environmental uncertainty will likely increase the size of the decision making unit and prolong the decision process. The case study results revealed that buying team size was impacted by the fact that the third party logistics market is relatively new and includes a large number of new suppliers. External advisors in the form of consultants were noted to be directly involved in need assessment, supplier identification and evaluation. These individuals were also found to be formal members of the decision making unit in several instances.

Environmental uncertainty in the form of limited information served to extend and complicate the decision process. As the case study firms did not have direct purchasing experience with many of the potential suppliers, it was necessary to identify viable sources of data and substantiate performance capabilities. This was accomplished by visiting existing and previous customers of the suppliers and obtaining advice from trusted professional colleagues. The necessity of going outside the firm to obtain this information lengthened and complicated the purchasing process.

The final theoretical proposition stated that cost and service performance data, verified by trusted professional colleagues and former and existing customers, represented the most highly valued source of information to members of the third party logistics purchasing team. The case study examinations of the buying process validated this proposition. They revealed that advice from business associates external to the buying firm and responses from former and current customers provided the most utility to the purchasing team members. Another valuable source of information was the advice obtained from consultants familiar with the contract logistics industry. Further, written responses to formal requests for proposals or quotes were also valued by the purchasers. Finally, the quality and professionalism of sales presentations provided information and insight into a potential supplier's perspective of the industry and the business under consideration.

Information obtained from consultants and experienced buyers of third party logistics services was used to define the firm's service needs and structure its purchasing documents, i.e., requests for information, proposals and quotes. Moreover, specific supplier selection criteria was formulated from the recommendations of these individuals. This type of interaction formed the most important communication links during the procurement period. The most vital information relating to final supplier selection was knowledge of the specific providers likely to

be favored and authorized by senior management. Once this knowledge was obtained, the next most important information resulted from a potential supplier's ability to instill trust and confidence in its performance and convince the buying team that the firm would meet its service and cost commitments.

The buying process for third party logistics services has been shown to consist of five distinct stages or phases. The model is not unlike those resulting from similar research on the purchase of other services acquired by organizations.[335] Although depicted sequentially in the abstract model of the process formulated for this research, no linear path can be assumed. In some decisions a phase may be omitted entirely and interrupts, restarts, cycling and recycling through the stages are common. Individual phases may contain sub-decisions and the amount of time and effort involved in each step can varies depending on the organization's previous experience with outsourcing and the perceived level of risk involved in the purchase. Analysis, bargaining and judgment were found to be used in the supplier selection process. Of the three, judgment was noted to be the most important criterion, once a firm completed its initial screening and reached its final list of two or three potential suppliers.

Contract logistics purchases are accomplished by a multiple person decision making unit or buying task force. These groups are formal organizational entities and exhibit a specialized structure. They are composed of members from various functional areas and routinely include individuals from several management levels.

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335 For example, see Day, E. and H. Barksdale, Jr., "Organizational Purchasing of Professional Services: The Process of Selecting Providers," *Journal of Business and Industrial Marketing*, Vol. 9, No. 3, 1994 or Novack, R., "Industrial Purchasing: A Managerial Model of Corporate Quality Planning, Management and Control," *International Journal of Physical Distribution and Logistics Management*, Vol. 21, No. 1, 1991.

The actual size and membership of the buying team is usually unknown to outsiders. Members of the group assume different roles, i.e., analyst, influencer, decider, etc., in the decision making process. Buying team membership in a particular phase of the procurement process is often a function of desired influence. This reflects the fact that the decision outcome potentially impacts a number of departments, groups or individual managers. Finally, an influential internal or external "champion" is usually required to promote the concept of logistics outsourcing, especially the purchase of integrated logistics services provided by a single supplier.

Phase III : Benefit Based Market Segmentation

The final phase of the research investigated whether benefit based buyer segments are present in the third party logistics market. Data from the mail survey was used to determine the benefits desired by industrial buyers in their purchase of third party logistics services. Market segments were derived by grouping the buyers seeking similar benefits.

The mail questionnaire included a list of thirty different supplier selection criteria or purchasing benefits (see **Table 4.5.**). These measures were derived from the qualitative research, i.e., focus group, case studies, preliminary interviews with providers and users and the literature review. Two questions were posed for each of the thirty criteria. Participant responses to these questions provided the data for creating variables amenable to statistical analysis. The thirty variables related to five major areas of third party logistics purchasing: 1) quality of services provided, 2) information system capacity and adaptability, 3) provider capability, 4) provider flexibility and 5) price/cost/value.

As depicted in **Table 4.5.,** each mail survey respondent was asked to provide two distinct ratings for each of the thirty supplier selection criteria. The first of these related to the degree of personal importance placed on each selection criteria during the decision making process. The

Table 4.5. Mail Survey Instrument -- Importance and Variability Questions

Variable	Importance Rating	Variability Rating
	Please rate the importance of each of the following selection criteria to you during the time you were making your most recent third party logistics acquisition decision. *(Circle a number from 1 to 7 to show how important each factor was to you personally)*	Also, please rate your opinion of how much difference there is among suppliers in the industry on each of the selection criteria. *(Circle a number from 1 to 7 to show how much difference you think there is among suppliers in the industry on each factor)*
	Importance to You Not Important ... Very Important	Suppliers in the Industry All about the same ... Differ Widely
Provision of integrated logistics services	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Single contact point	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Continuous improvement	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Direct control of all services provided	1 2 3 4 5 6 7	1 2 3 4 5 6 7
International capabilities	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Breadth of service	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Required services at lowest price	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Quality of service	1 2 3 4 5 6 7	1 2 3 4 5 6 7
EDI capabilities	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Confidentiality during negotiations	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Warehouse mgmt. system	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Software/systems capability	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Proven track record of experience	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Financial strength	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Asset ownership	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Depth of management expertise	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Experience in your industry	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Time in business	1 2 3 4 5 6 7	1 2 3 4 5 6 7
References from current customers	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Strategic partner potential	1 2 3 4 5 6 7	1 2 3 4 5 6 7
ISO 9000 certification	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Gain sharing from productivity improvements	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Compatible culture	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Skill level of workers	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Quick response to customer requests	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Non-union work force	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Contract/pricing flexibility	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Willingness to assume existing assets	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Overall cost of service	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Operational flexibility	1 2 3 4 5 6 7	1 2 3 4 5 6 7

second rating measured the amount of variability, for each criteria, perceived to exist in the industry among third party logistics providers. A Likert scale anchored at 1 and 7 was used for each importance and variability response. The lower end of this scale, i.e., 1, 2, etc. represented minimal importance and variability, while the upper end reflected higher significance and increased variability.

A new variable, referred to as a determinant, was created from participants' importance and variability ratings of the thirty selection criteria. The new determinant variables were created by multiplying the importance rating by the supplier variability rating. The distribution of each of these newly formed variables were evaluated, using "box and whisker plots" and D'Agostino's[336] test of skewness and kurtosis, to determine whether the determinants were likely to have been obtained from a normally distributed population.

Several correlation matrix adequacy tests employed later in the analysis assume the data was obtained from a normally distributed population. Therefore, it was necessary to conduct a normality test of the determinant variables. The results of the "box and whisker" plot evaluations and D'Agostino test statistics indicated that one would fail to reject the null hypothesis that the sample was from a normal distribution. Therefore, use of the correlation matrix tests, described later in this chapter, were deemed appropriate.

The purpose of creating the determinant variables was to model the interactive influence of the importance and variability measures used by industrial buyers in their evaluation and selection of a third party logistics supplier. Myers and Alpert[337] initially devised this technique

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336 D'Agostino, R., A. Gelanger, and R. D'Agostino, Jr., "A Suggestion for Using Powerful and Informative Tests of Normality," *The American Statistician*, Vol. 44, No. 4, 1990, pp. 316-321.

337 Myers, J. and Alpert M., "Determinant Buying Attitudes: Meaning and Measurement," *Journal of Marketing*, Vol. 32, 1968, pp. 13-20.

to investigate buyer behavior and the decision making process leading to a purchase decision. Succinctly stated, these researchers posited a variable as significant in a purchasing decision only when it is considered important and a high degree of variability is perceived to exist among potential suppliers.

For example, a contract logistics buyer may rate confidentiality during negotiations as very important and choose a rating of 6 or 7 for this variable. However, this same individual may believe that all potential suppliers offer the same level of protection during the negotiating process and select a rating of 1 or 2 to measure industry variability on this issue. Thus, the confidentiality variable would not be a salient factor in the final selection of a third party logistics supplier as determinacy is a function of perceived importance and variability.

Thirty new determinant variables were created in the manner described above for each respondent. The degree of determinacy for each variable was predicated on amount of importance and variability expressed by each respondent's rating of the thirty purchasing benefit variables. The thirty determinants served as surrogates for third party logistics benefits in this study. They also served as the dependent variables in the analysis described below.

A ranking of the determinant variables according to their average across all of the mail survey respondents provided insight into the relative importance of each variable in the third party logistics supplier selection decision. In essence, the higher the rating, the more important a determinant was assumed to be in the decision making process. **Table 4.6.** displays the stack ranking of the thirty determinant variables across all of the respondents according to their average scores.

It is apparent from the ranking of the determinant variables that the quality of service provided was, on the average, the single most important variable in the supplier selection process for the buyers responding to the mail survey. The depth of managerial expertise residing

Table 4.6. Mean Ranking of Determinant Variables

RANK	DETERMINANT MEAN	VARIABLE NAME
1	33.50	Quality of Service
2	30.48	Depth of Management Expertise
3	30.44	Operational Flexibility
4	29.61	Overall Cost of Service
5	29.58	Quick Response to Customer Requests
6	29.42	Proven Track Record of Experience
7	29.02	Financial Strength
8	28.29	Experience in your Industry
9	26.55	Continuous Improvement
10	26.36	Software/Systems Capability
11	25.55	Compatible Culture
12	25.40	Contractual/Pricing Flexibility
13	24.83	Breadth of Services Provided
14	24.80	Required Services at Lowest Price
15	24.79	Skill Level of Workers
16	24.63	EDI Capabilities
17	24.44	Strategic Partner Potential
18	23.84	Single Contact Point
19	23.14	Gain Sharing from Productivity
20	22.77	Provision of Integrated Logistics Services
21	22.52	Direct Control of All Services Provided
22	22.03	Time in Business
23	20.84	Non-union Work Force
24	20.46	Warehouse Management System
25	20.44	References from Current Customers
26	20.43	International Capabilities
27	19.33	Asset Ownership
28	18.50	Confidentiality During Negotiations
29	14.93	ISO 9000 Certification
30	14.67	Assume Ownership of Existing Assets

within a potential supplier and the degree of operational flexibility determinants tied for the second most important element in the decision making process. The least influential variables related to a provider's willingness to assume a buyer's existing logistical assets and whether the potential supplier held any ISO 9000 certifications. In any event, this ranking represents the consensus across all of the respondents and significant differences may exist among subgroups. It is the goal of this phase of the research to determine whether the respondents can be segregated into homogeneous groups based on the integration of benefits they seek as individual buyers of third party logistics services.

Reduction of the determinant variables

It is possible to gather data from industrial buyers at varying levels of detail. Respondents could be asked to rate a potential supplier's flexibility at an aggregate level or specific elements of flexibility could be measured. For example, a survey participant could be asked to rate a provider's ability to respond quickly to customers' requests and the supplier's willingness to share gains resulting from buyer induced productivity improvements. In effect, the aggregate measure of corporate flexibility is less informative than the more specific indices of quick response capability and the willingness to share gains resulting from productivity improvements.

As observed above, data can be acquired at varying levels of specificity. One could obtain limited information in the form of a few aggregate attributes of buyer behavior and infer that these results represented more specific characteristics. Another technique would remove the ambiguity resulting from conjecture and gather data at a highly specific level. The latter approach was followed in this research. This was done to ensure the accuracy of benefit specification as this is critical to any attempt to derive market segments based on benefits rather than mere buyer demographics. Further, if one assumes that a high degree of correlation is likely

to exist among some of the highly specific attributes, this methodology allows the aggregation of highly specific purchasing traits into parsimonious macro measures. On the other hand, it is not possible to gather data at an aggregate level and disaggregate it for analysis purposes. By collecting data on the thirty selection criteria, specificity, accuracy, and flexibility of the data base was enhanced.

The objective of this phase of the study was to use the buying behavior data base to identify the determinants of third party logistics benefits and describe market segments. Tradeoffs exist in marketing approaches to segmentation. A marketer can attempt to offer a few products or services to meet the needs of most potential buyers or provide more tailored offerings and attempt to appeal to almost every individual. A similar analogy is appropriate in determining the level of service attribute specificity to be used in deriving market segments from this research.

One must decide how much detail is necessary. For example, the use of all thirty attributes of third party logistics buyer behavior measured in this study would likely be untenable in deriving and implementing a marketing strategy. Also, the provision of only a few highly aggregated attributes, with little detail on buyer perceptions and attitudes, would be of limited value in designing a marketing plan.

In an effort to provide a balance between two little information and too much detail, a decision was made to condense the thirty supplier selection determinants based on correlations among the variables using factor analysis, a multivariate statistical procedure. This procedure was employed to reduce the number of determinant variables used in the analysis and to assist in describing the correlations among the variables.

Factor analysis

The method used to reduce the dependent variables in this study, i.e., the thirty supplier

selection determinants, was factor analysis. The factors were extracted using the principal components method followed by a varimax rotation to simple structure. Variable reduction with factor analysis is based on the similarities existing between and among the variables included in the observed data. The similarities are expressed as linear combinations and are most readily presented in a matrix format. The correlation matrix for the thirty variables included in this study is presented in **Table 4.7**. Construction of the correlation matrix and all factor analysis computations in this phase of the research were accomplished using SPSS® for Windows™ Release 5.1 statistical software.

A correlation matrix can allow one to make inferences about variables even though it merely displays the linear relationships existing among variables. For example, relatively high correlations exist between a number of the thirty determinants, e.g. determinants 2 and 12 (Breadth of Services Offered and Provision of Integrated Logistics Services: 060) and determinants 10 and 29 (Depth of Management Expertise and Proven Track Record of Experience: 0.62). Further insight may be obtained by reviewing the correlations existing between and among the top five variables depicted in the previous stack ranking (**Table 4.6.**) of the determinant means. Some of the correlations of note are:

- Quick Response & Customer Requests & Operational Flexibility .570
- Quality of Services & Quick Response to Customer Requests .442
- Overall Cost of Service & Operational Flexibility .476
- Depth of Management Expertise & Operational Flexibility .526
- Depth of Management Expertise & Quick Response to Customer Response .482

The correlation matrix of the thirty determinant variables reveals that 43.4% of the coefficients are greater than 0.30 and all variables have at least one large correlation with one of the other variables in the data set. The relationships displayed by the five determinants above and their stack order ranking indicate that a flexibility and expertise factor may exist in the third party logistics supplier selection decision. In any event, analysis of the correlation matrix

Table 4.7. Correlation Matrix of Determinant Variables

No.	Variable Name	Var 1	Var 2	Var 3	Var 4	Var 5	Var 6	Var 7
1	ASSUME ASSETS	1.0000						
2	BREADTH OF SERVCS.	.27754	1.0000					
3	CONFIDENTIALITY	.27596	.18650	1.0000				
4	CONTRACT FLEXIBILITY	.26657	.27871	.28421	1.0000			
5	CONTINUOUS IMPROVE.	.19811	.23746	.25169	.33196	1.0000		
6	COMPATIBLE CULTURE	.25500	.21870	.28868	.46039	.20325	1.0000	
7	DIRECT CONTROL	.25515	.33563	.20025	.28620	.22296	.25476	1.0000
8	EDI CAPABILITIES	.21284	.26204	.27982	.20396	.19003	.21202	.28852
9	INDUSTRY EXPER.	.21092	.19498	.20646	.26584	.10941	.32449	.26688
10	MGMT. EXPERTISE	.19310	.25169	.29123	.45689	.34790	.47656	.31126
11	GAIN SHARING	.31382	.30719	.26702	.41577	.27326	.40438	.17015
12	INTEGRATED SERVCS.	.40502	.60435	.28980	.24697	.32722	.26158	.27489
13	INT'L. CAPABILITIES	.14425	.39658	.24865	.11029	.23178	.10160	.24537
14	ISO 9000	.39717	.31355	.20375	.29635	.39053	.22760	.30943
15	LOWEST PRICE	.11093	.21624	.18952	.39768	.12388	.21711	.24305
16	NON-UNION OPER.	.07077	.11805	.12241	.35034	.27043	.24146	.04347
17	OPERATING FLEXIBILITY	.18136	.19290	.28807	.48346	.27223	.34835	.25327
18	ASSET OWNERSHIP	.32813	.37308	.35299	.34568	.30882	.32492	.21322
19	QUALITY OF SERVCS.	.12331	.27913	.26178	.19448	.23326	.26737	.25853
20	QUICK RESPONSE	.16836	.21332	.28401	.42641	.30700	.33212	.19145
21	CUSTOMER REFERENCES	.27722	.34857	.35309	.32443	.28666	.27664	.32351
22	SINGLE CONTACT POINT	.21430	.35127	.38561	.43270	.29739	.28518	.43772
23	SKILLED WORK FORCE	.18667	.21301	.35014	.43197	.23479	.46909	.18452
24	FINANCIAL STRENGTH	.25055	.25151	.32311	.46768	.22732	.37196	.20817
25	STRATEGIC PARTNER	.35322	.28642	.25559	.24175	.35724	.28615	.21543
26	SOFTWARE/SYSTEMS	.25190	.38754	.17101	.30464	.19222	.29015	.35830
27	TIME IN BUSINESS	.20211	.19691	.24362	.34796	.21813	.27175	.24972
28	TOTAL COST OF SERVCS.	.23821	.15863	.22806	.47336	.17137	.34478	.25755
29	TRACK RECORD	.11225	.24231	.17269	.39544	.25862	.38328	.28698
30	WAREHOUSE MGMT. SYS.	.39325	.36408	.26989	.21714	.18080	.23397	.19496

		Var 8	Var 9	Var 10	Var 11	Var 12	Var 13	Var 14
8	EDI CAPABILITIES	1.0000						
9	INDUSTRY EXPER.	.21386	1.0000					
10	MGMT. EXPERTISE	.35087	.39170	1.0000				
11	GAIN SHARING	.21073	.18191	.36691	1.0000			
12	INTEGRATED SERVCS.	.30397	.24090	.21829	.21171	1.0000		
13	INT'L. CAPABILITIES	.08470	.13230	.21433	.18484	.32762	1.0000	
14	ISO 9000	.22134	.26479	.20803	.31700	.39561	.44979	1.0000
15	LOWEST PRICE	.12084	.25294	.33114	.29121	.17777	.11000	.13803
16	NON-UNION OPER.	.04074	.12517	.28731	.22300	.12400	.07647	.17980
17	OPERATING FLEXIBILITY	.31700	.15437	.56389	.22639	.23856	.13621	.21255
18	ASSET OWNERSHIP	.34229	.26270	.42486	.28406	.54544	.27484	.40764
19	QUALITY OF SERVCS.	.29138	.39392	.36962	.17034	.22702	.16914	.14780
20	QUICK RESPONSE	.30721	.30914	.49762	.27574	.23814	.13125	.32170

Table 4.7. (continued)

No.	Variable Name	Var 8	Var 9	Var 10	Var 11	Var 12	Var 13	Var 14
21	CUSTOMER REFERENCES	.43657	.33830	.43767	.33301	.36175	.20011	.36890
22	SINGLE CONTACT POINT	.20230	.19129	.34103	.24532	.38314	.28545	.24044
23	SKILLED WORK FORCE	.28545	.36209	.51811	.33045	.24530	.18840	.25524
24	FINANCIAL STRENGTH	.32140	.37353	.56041	.32840	.29556	.18789	.16531
25	STRATEGIC PARTNER	.13714	.25794	.35594	.39517	.40259	.19855	.40561
26	SOFTWARE/SYSTEMS	.40528	.37667	.36033	.21156	.45122	.20871	.34497
27	TIME IN BUSINESS	.35456	.50939	.43349	.22607	.27644	.10659	.26481
28	TOTAL COST OF SERVCS.	.23522	.23677	.44016	.37650	.12062	.03678	.12926
29	TRACK RECORD	.34795	.41503	.61573	.26642	.21791	.09572	.20069
30	WAREHOUSE MGMT. SYS.	.29703	.36319	.37192	.24440	.31332	.12563	.30328

		Var 15	Var 16	Var 17	Var 18	Var 19	Var 20	Var 21
15	LOWEST PRICE	1.0000						
16	NON-UNION OPER.	.20240	1.0000					
17	OPERATING FLEXIBILITY	.39498	.33512	1.0000				
18	ASSET OWNERSHIP	.26251	.25774	.29804	1.0000			
19	QUALITY OF SERVCS.	.26070	.19179	.41874	.22653	1.0000		
20	QUICK RESPONSE	.22604	.29908	.58258	.33581	.44283	1.0000	
21	CUSTOMER REFERENCES	.22121	.17859	.27127	.43671	.23709	.37042	1.0000
22	SINGLE CONTACT POINT	.31552	.08398	.32492	.36479	.28689	.40518	.29550
23	SKILLED WORK FORCE	.24730	.20276	.43451	.34798	.39747	.58079	.37857
24	FINANCIAL STRENGTH	.15638	.11211	.37615	.47006	.33975	.36738	.32271
25	STRATEGIC PARTNER	.06548	.13211	.29058	.34788	.27492	.32590	.30443
26	SOFTWARE/SYSTEMS	.23471	.05050	.29109	.33842	.25699	.35966	.41974
27	TIME IN BUSINESS	.21131	.19682	.20487	.38060	.28866	.27915	.42081
28	TOTAL COST OF SERVCS.	.54045	.28908	.52481	.24150	.36422	.33507	.18990
29	TRACK RECORD	.23179	.13966	.37113	.39467	.42984	.39976	.39414
30	WAREHOUSE MGMT. SYS.	.19108	.07875	.22436	.29562	.22448	.29618	.24572

		Var 22	Var 23	Var 24	Var 25	Var 26	Var 27	Var 28
22	SINGLE CONTACT POINT	1.0000						
23	SKILLED WORK FORCE	.38883	1.0000					
24	FINANCIAL STRENGTH	.36284	.53119	1.0000				
25	STRATEGIC PARTNER	.11638	.27937	.29919	1.0000			
26	SOFTWARE/SYSTEMS	.25787	.37262	.26585	.36861	1.0000		
27	TIME IN BUSINESS	.25696	.36158	.44128	.33036	.36459	1.0000	
28	TOTAL COST OF SERVCS.	.27148	.35278	.35296	.18577	.27127	.19172	1.0000
29	TRACK RECORD	.35449	.45025	.57135	.34782	.34087	.53250	.26528
30	WAREHOUSE MGMT. SYS.	.21730	.36216	.29516	.33418	.47980	.23067	.18521

	Var 29	Var 30
TRACK RECORD	1.0000	
WAREHOUSE MGMT. SYS.	.21018	1.0000

initiates the variable reduction process. Succinctly stated, it serves as input to the more sophisticated factor analysis model.

Appropriateness of factor analysis

Several tests are available to evaluate the applicability of a given correlation matrix to factor analysis. The Kaiser-Meyer-Olin (KMO)[338] index is a measure of sampling adequacy which compares the observed (sample) correlation coefficients to the partial correlation coefficients. The index is calculated by dividing the sum of the squared simple correlation coefficients, between all pairs of variables, by the sum of all squared partial correlation coefficients. If the sum of the squared partial correlation coefficients is small, the resulting KMO statistic will approach the number one. Small values of the KMO index indicate that factor analysis may not be appropriate, as the correlations between variable pairs cannot be explained by the other variables.

Kaiser[339] states that KMO values in the 0.90's should be considered exceptional, 0.80's as very good, 0.70's as middling and 0.60's as marginal. Any score below 0.50 is considered unacceptable by Kaiser. The KMO measure of sampling adequacy for the data used to formulate the correlation matrix in this study was calculated to be 0.875; therefore, factor analysis was considered appropriate in this phase of the research.

Factor extraction from the thirty supplier selection determinants

Using the correlation matrix as input, the next step in the reduction of the thirty determinant variables required the selection of a model for factor extraction. As discussed in chapter three, the principal components methods was chosen for use in this research. In this

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338 Kaiser, H. and J. Rice, "Little Jiffy, Mark IV," *Educational and Psychological Measurement*, Vol. 34, 1974, pp. 111-117.

339 Kaiser, H., "An Index of Factorial Simplicity," *Psychometrika*, Vol. 39, pp. 31-36.

method linear combinations of the observed variables, i.e., the thirty determinant variables, are formed. The initial principal component accounts for or resolves the largest amount of variance in the sample. The second principal component resolves the next largest amount of variance and it is not correlated with the first principal component. Subsequent components explain progressively less variance and they are all uncorrelated with each other.

It is possible to compute as many components as variables; however, parsimony is not achieved in this manner. When every component is included in a solution, total variance for each variable is accounted for and there is no need for a factor representing any unique variance. The percentage of variance accounted for by the common components or factors, i.e., communalities, is one for all variables when the principal components model is used. In essence, this method transforms a group of correlated variables to a set of uncorrelated variables or principal components.

To simplify interpretation, the thirty determinant variables were standardized about a mean of 0.0 and a standard deviation of 1.0 before application of the principal components algorithm. Thus, each determinant had a variance of 1.0 and the total variance summed to 30.0 in this application. The initial statistics resulting from the principal components model are presented in **Table 4.8.** The column labeled "Eigenvalue" refers to the total variance resolved or explained by each factor. The column labeled "Pct of Var" reveals the percentage of total variance attributable to each factor. The final column displays the cumulative percent of variance explained by a particular factor and all those that precede it in the table. Variable names and factor numbers are displayed on the same line; however, this does not imply correspondence between a variable and a factor for any given line. In other words, the first factor may not be composed of a linear combination of variables that includes the first variable and so on.

Table 4.8. Initial Statistics -- Principal Components

Initial Correlation Matrix

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
Assume Assets	1.00000	*	1	9.49379	31.6	31.6
Breadth of Servcs.	1.00000	*	2	2.17818	7.3	38.9
Confidentiality	1.00000	*	3	1.58668	5.3	44.2
Contract Flexibility	1.00000	*	4	1.30485	4.3	48.5
Continuous Improve.	1.00000	*	5	1.21393	4.0	2.6
Compatible Culture	1.00000	*	6	1.08468	3.6	56.2
Direct Control	1.00000	*	7	1.05543	3.5	59.7
EDI Capabilities	1.00000	*	8	.98088	3.3	63.0
Industry Exper.	1.00000	*	9	.90647	3.0	66.0
Mgmt. Expertise	1.00000	*	10	.87614	2.9	68.9
Gain Sharing	1.00000	*	11	.82602	2.8	71.7
Integrated Servcs.	1.00000	*	12	.79436	2.6	74.3
Int'l. Capabilities	1.00000	*	13	.72706	2.4	76.8
ISO 9000	1.00000	*	14	.69430	2.3	79.1
Lowest Price	1.00000	*	15	.65797	2.2	81.3
Non-union Oper.	1.00000	*	16	.62532	2.1	83.4
Operating Flexibility	1.00000	*	17	.56601	1.9	85.2
Asset Ownership	1.00000	*	18	.53903	1.8	87.0
Quality of Servcs.	1.00000	*	19	.48160	1.6	88.6
Quick Response	1.00000	*	20	.45135	1.5	90.1
Customer References	1.00000	*	21	.41882	1.4	91.5
Single Contact Point	1.00000	*	22	.38928	1.3	92.8
Skilled Work Force	1.00000	*	23	.36730	1.2	94.1
Financial Strength	1.00000	*	24	.30928	1.0	95.1
Strategic Partner	1.00000	*	25	.29917	1.0	96.1
Software/Systems	1.00000	*	26	.28355	.9	97.0
Time in Business	1.00000	*	27	.26086	.9	97.9
Total Cost of Servcs.	1.00000	*	28	.23420	.8	98.7
Track Record	1.00000	*	29	.20988	.7	99.4
Warehouse Mgmt. Sys.	1.00000	*	30	.18363	.6	100.0

Using the scree test to determine the number of factors

As indicated in chapter three, a variety of procedures have been proposed to find the "true" number of factors necessary to parsimoniously resolve the variance existing among the variables in a data set. The Scree Test was used in this research as it ". . . provides a solution with the minimum number of factors accounting for the maximum amount of variance."[340] The Scree Test was developed by Cattell[341] after many years of experience with factor analysis. Much experimentation revealed that variance levels off when the factors are largely measuring random error. The test is applied by plotting a factor "against" the proportion of variance that it extracts. A curve fitted to the plots for all of the factors included in an analysis results in a negative slope.

The number of the factor is usually plotted as the abscissa and the value of the factor (eigenvalue) is placed along the ordinate. The difference in variance between successive plotted factors will decrease until random error or trivial factors are reached. At this point, the curve will level off and the incremental difference between successive factors will be approximately the same. The resulting diagram is referred to as a Scree Plot because the random error or trivial factors depict scree -- the rubble that has fallen off a mountain and lies at its base. Empirical tests[342] of the Scree Test have revealed that the scree begins at the *k*th factor, where *k* is the true number of factors.

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340 Gorsuch, Op. Cit., p. 152.

341 Cattell, R., "The Scree Test for the Number of Factors," *Multivariate Behavioral Research*, Vol. 1, No. 2, 1966, pp. 245-276.

342 See Tucker, L., R. Koopman and R. Linn, "Evaluation of Factor Analytic Research Procedures by Means of Simulated Correlation Matrices," *Psychometrika*, Vol. 34, 1969 or Cattell R. and J. Jaspers, *A General Plasmode (No. 30-10-5-2) for Factor Analytic Exercises and Research*, Multivariate Behavioral Research Monographs, Monograph No. 67-3, 1967 and Cliff, N., "The Relation Between Sample and Population Characteristic Vectors," *Psychometrika*, Vol. 35, No. 2, 1970.

The initial results of applying the principal components model to the correlation matrix formed by the thirty determinant variables were presented in **Table 4.8**. The Scree Plot used to determine the number of meaningful factors for this data is presented in **Figure 4.3**. A "cut off" point is determined by observing where the factors curve above the straight line formed by the non-meaningful or trivial factors. The trivial factors include unique and random error variance and are not of interest in this analysis. The plot reveals a distinct break between the steep slope of the first three factors and a gradual trailing off of the remainder of the factors. Therefore, a three-factor model was selected as appropriate for use in this research.

The principal components model was applied to the correlation matrix a second time specifying the extraction of three factors and a varimax rotation of the factors. The results of this application, i.e., the factor pattern matrix, are displayed in **Table 4.9.** Each row presents the coefficients used to describe a standardized variable in terms of the three factors. The coefficients are called factor loadings since they represent the importance is assigned to each factor. Variables with large absolute value coefficients are closely related to factors.

When the estimated factors are uncorrelated, i.e., orthogonal or statistically non-dependent, the loadings represent the correlations between the factors and the variables. The matrix of correlations depicted between the variables and factors is called the factor structure matrix. When the factors are not dependent upon one another, as in this study, the factor structure matrix and pattern matrix are identical. The matrix of correlations depicted between the variables and factors is called the factor structure matrix.

Since the factors are uncorrelated, the coefficients are not statistically dependent. They represent the unique contribution of each factor and are correlations between the factors and the variables. To evaluate how well the three factor model represents the thirty original determinant variables, the proportion of the total variance for each variable explained by the three factors was

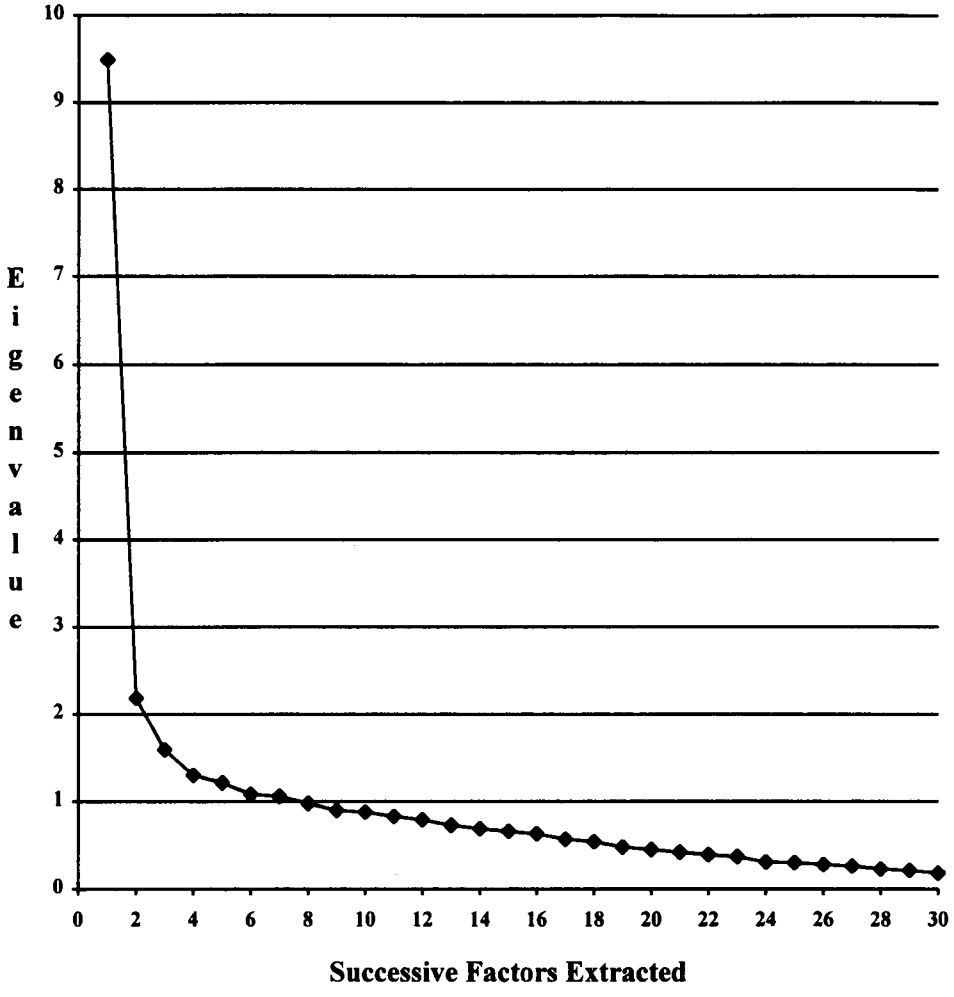


Figure 4.3. Scree Plot of Factors

Table 4.9. Factor Extraction -- Principal Components

Initial Correlation Matrix

Variable Name	Factor 1	Factor 2	Factor 3
Management. Expertise	.73338		
Skilled Work Force	.67119		
Financial Strength	.65282		
Contract Flexibility	.64930		
Asset Ownership	.64821		
Quick Response	.64743		
Track Record	.64550		-.37734
Customer References	.62374		
Operating Flexibility	.61867	-.37585	
Software/Systems	.60054		
Compatible Culture	.58380		
Time in Business	.58179		-.42188
Single Contact Point	.57502		
Integrated Services	.57285	.52045	
Strategic Partner	.54540		
Quality of Services	.54030		
Total Cost of Services	.53816	-.43144	
Industry Experience	.53681		-.42767
Gain Sharing	.53625		
Breadth of Services	.52976	.43956	
ISO 9000	.52705	.44910	
Warehouse Mgmt. Systems	.51974		
EDI Capabilities	.51045		-.30380
Confidentiality	.50357		
Direct Control	.48930		
Continuous Improvement	.48375		
Assume Assets	.45682	.35948	
Lowest Price	.45131		.30089
International Capabilities	.35967	.42695	
Non-union Operations	.34427		.39162

computed. This index is referred to as the communality of the variables. The communalities for the thirty determinants are presented in **Table 4.10.** It reveals the communalities and factor statistics after the three factors were extracted.

When the principal components model is used to estimate components, the factor statistics are the same in the tables presenting the initial and final statistics. However, the communalities are not the same, as all of the variance associated with each variable is not resolved when only a portion of the total factors (three in this study) are retained.

Communality values can range from a low of 0.0 to a high of 1.0. A value of 0.0 indicates that the common factors resolve or explain none of the variance, while a value of 1.0 reveals that all of the variance is explained by the factors. Any variance not explained by the common factors is due to the unique variance attributable to the variables. In the principal components model uniqueness refers to variance specifically associated with a variable and variance from random error or measurement.

The factor matrix resulting from the extraction phase is usually difficult to interpret as variables routinely "load" on multiple factors. Such is the case in the factor matrix **(Table 4.9.)** resulting from the three factor extraction previously described. From a geometric perspective, loadings represent the projections of each variable on the factor-axes of the data.

There are thirteen variables in **Table 4.9.** which load on more than one factor with a coefficient of 0.30 (absolute value) or higher. Coefficients below 0.30 are not displayed as any loading less than 0.30 was not considered salient to a factor in this study. A "salient" loading is one which is sufficiently high to assume that a relationship exists between the variable and the factor. In addition it usually means that the relationship is high enough so that the variable can aid in interpreting the factor and vice versa. Unfortunately, "there is no exact way to determine

Table 4.10. Final Statistics -- Principal Components

Initial Correlation Matrix

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
Assume Assets	.35395	*	1	9.49379	31.6	31.6
Breadth of Services	.48725	*	2	2.17818	7.3	38.9
Confidentiality	.26946	*	3	1.58668	5.3	44.2
Contract Flexibility	.56335	*				
Continuous Improvement	.32971	*				
Compatible Culture	.37904	*				
Direct Control	.26791	*				
EDI Capabilities	.35746	*				
Industry Experience	.47304	*				
Management Expertise	.63683	*				
Gain Sharing	.36303	*				
Integrated Services	.60401	*				
International Capabilities	.36512	*				
ISO 9000	.51588	*				
Lowest Price	.37170	*				
Non-union Operations	.33837	*				
Operating Flexibility	.57922	*				
Asset Ownership	.46280	*				
Quality of Services	.35417	*				
Quick Response	.48032	*				
Customer References	.43769	*				
Single Contact Point	.36132	*				
Skilled Work Force	.52393	*				
Financial Strength	.51345	*				
Strategic Partner	.35750	*				
Software/Systems	.47003	*				
Time in Business	.51782	*				
Total Cost of Services	.56212	*				
Track Record	.61638	*				
Warehouse Mgmt. Sys.	.34578	*				

salient loadings and . . . only rough guidelines can be given."[343] A lower bound for defining a salient loading level is that of meaningfulness. Only loadings with an absolute value of 0.30 or higher were reported or used for interpretation in this study as it is ". . . doubtful that loadings of any smaller size should be taken seriously."[344] In essence, they do not account for enough variance to be meaningful.

Table 4.10 reveals that the three extracted factors accounted for 44.2% of the total variance. The communalities for the variables range from a low of 0.27 for the Direct Control of All Services Provided and Confidentiality During Negotiations variables to a high of 0.61 for the Proven Track Record of Experience variable. The communality values indicate that the three factors do not fully explain the variance related to some of the variables. A moderate to large degree of specific or error variance is present for these variables. While higher communality values were desired, it is not uncommon for the common factors in exploratory research to account for the amount of variance resolved in this dissertation.[345] The unexplained variance may be unique to specific variables or due to chance, i.e., random error. As this design employed new questions in a relatively unstudied domain, much of the unresolved variance is likely due to measurement or random error.

Factor rotation to obtain a simpler structure

The next phase of the analysis required rotation to assist in a description of the meaningful factors. The rotation process seeks to transform the factor matrix into one that is easier to understand. As discussed in chapter three, the purpose of rotation is to achieve a

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343 Gorsuch, Op. Cit., p. 184.

344 Nunnally, Op. Cit. p. 423.

345 From interview with Dr. David Ludwig, Director of Statistical Consulting, The University of North Carolina at Greensboro, NC.

simpler structure. Ideally, one would like to derive factors such that each variable would have non-zero loadings for only a few factors, preferably one. This assists in differentiating the factors from one another. If multiple factors have high loadings on the same variables, it is difficult to determine how the factors differ.

Factor rotation does not affect the goodness of fit (amount of total variance explained) of a solution. Even though the factor matrix changes, the communalities and the total amount of explained variance does not change. However, the proportion of variance resolved by each factor does change. The amount of explained variance for each factor is redistributed via rotation. Varimax rotation, which seeks to minimize the number of variables with high loadings on a given factor, was used as the method of factor rotation in this study.

The results of the varimax rotation appear in **Table 4.11.** Only loadings of 0.30 or above are displayed. Rotation resulted in an increase in the number of large and small factor loadings. However, many of the variables still reflected "cross loadings" of 0.30 or greater. Thus, a significantly simpler factor structure was not obtained at this juncture in the analysis. However, the variables without salient cross loadings did provide descriptive insight into the factors. The first factor was noted to be associated with supplier longevity and competence and was labeled Reliability. The variables composing the second factor were found to be related to cost and service benefits resulting from the provision of integrated logistics services. Thus, this factor was renamed Synergy to reflect buyers' perceptions regarding the delivery of multiple logistics services managed by a single provider. The third factor was noted to describe the total cost ramifications of logistics outsourcing and was titled Economy. The three factors are interpreted below after simple structure is obtained.

In an effort to improve interpretability and obtain a simpler structure, a decision was made to omit any variables loading on two or more factors at a level of 0.30 or greater. This

Table 4.11. Varimax Rotation

Initial Correlation Matrix

Variable	Factor 1 "Reliability"	Factor 2 "Synergy"	Factor 3 "Economy"
Track Record	.73097		
Time in Business	.69073		
Industry Experience	.66845		
Financial Strength	.61583		.33222
Management Expertise	.58735		.52092
Skilled Work Force	.54815		.44948
EDI Capabilities	.53826		
Software/Systems	.52170	.44107	
Customer References	.48049	.42501	
Quality of Services	.47789		.34105
Integrated Services		.74548	
ISO 9000		.69708	
Breadth of Services		.67042	
International Capabilities		.59826	
Assume Assets		.57012	
Asset Ownership	.35148	.52592	
Strategic Partner	.31626	.48673	
Continuous Improvement		.45420	.34485
Warehouse Mgmt. System	.41308	.41408	
Direct Control	.40696		
Confidentiality		.36113	.30032
Total Cost			.72569
Operating Flexibility			.70288
Contract Flexibility			.67287
Lowest Price			.59087
Non-union Operation			.57243
Quick Response	.42363		.52075
Compatible Culture	.35729		.46483
Gain Sharing		.36580	.46201
Single Contact Point		.38614	.40400

eliminated fifteen of the original thirty determinant variables from the analysis. The variables were removed as cross loadings prohibited meaningful factor interpretation. When variables display salient loadings on more than one factor, it is not possible to distinguish a distinct cluster of intercorrelated variables for a given factor. Thus, one is unable to meaningfully describe the resulting factors. Uncertainty is minimized by eliminating the variables involved in factor cross loadings.

Factor extraction and rotation from the first revision of the correlation matrix

The next step required extraction of three factors from the revised correlation matrix composed of the remaining fifteen determinant variables and varimax rotation to a simpler structure. As with the original correlation matrix, the revised matrix was subjected to the KMO Measure of Sampling Adequacy. The results of this test confirmed that factor analysis was also appropriate with the revised correlation matrix.

Tables 4.12., 4.13. and **4.14.** present the initial statistics, factor matrix and final statistics from an application of the principal components model to the revised correlation matrix. The three extracted factors resolved 51.4% of the total variance represented by the revised fifteen variable correlation matrix. The first factor accounted for 30.7% of the total variance. The second and third common factors resolved 11.9% and 8.9% respectively. Communalities were also increased as only four of the fifteen variables had values lower than 0.40.

Table 4.15. displays the revised rotated factor matrix. A much simpler structure is apparent. All variable cross loadings have been eliminated with the exception of one involving Factors 1 and 3. The variable loading on both of these factors was Direct Control of All Services Provided. Since the purpose of rotation was to achieve simple structure, this variable was eliminated and the remaining fourteen variables were once again submitted to the principal components factor extraction model and a varimax rotation.

Table 4.12. Initial Statistics -- Principal Components

Revised Correlation Matrix

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
Assume Assets	1.00000	*	1	4.59778	30.7	30.7
Breadth of Services	1.00000	*	2	1.78022	11.9	42.5
Contract Flexibility	1.00000	*	3	1.33817	8.9	51.4
Direct Control	1.00000	*	4	.99649	6.6	64.1
Industry Experience	1.00000	*	6	.87614	5.8	70.0
Integrated Services	1.00000	*	7	.78905	5.3	75.2
International Capabilities	1.00000	*	8	.64941	4.3	79.6
ISO 9000	1.00000	*	9	.60989	4.1	83.6
Lowest Price	1.00000	*	10	.50175	3.3	87.0
Non-union Operation	1.00000	*	11	.45345	3.0	90.0
Operating Flexibility	1.00000	*	12	.44255	3.0	93.0
Time in Business	1.00000	*	13	.40278	2.7	95.6
Total Cost of Services	1.00000	*	14	.34667	2.3	98.0
Track Record	1.00000	*	15	.30726	2.0	100.0

Table 4.13. Factor Extraction -- Principal Components

Revised Correlation Matrix

Variable	Factor 1	Factor 2	Factor 3
Contract Flexibility	.67335	-.31500	
Operating Flexibility	.61623	-.38815	
Track Record	.60739		-.47759
Integrated Services	.60100	.47718	
Time in Business	.59800		-.57016
Breadth of Services	.57859	.43893	
Total Cost of Services	.57689	-.51547	
ISO 9000	.56839	.41271	
Direct Control	.56016		
Industry Experience	.54754		-.47607
Lowest Price	.53073	-.39814	
EDI Capabilities	.51327		-.30615
Assume Assets	.48816		
Non-union Operation	.37304	-.32535	
International Capabilities	.38746	.51292	

Table 4.14. Final Statistics -- Principal Components

Revised Correlation Matrix

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
Assume Assets	.33826	*	1	4.59778	30.7	30.7
Breadth of Services	.56225	*	2	1.78022	11.9	42.5
Contract Flexibility	.57254	*	3	1.33817	8.9	51.4
Direct Control	.33907	*				
EDI Capabilities	.36066	*				
Industry Experience	.52685	*				
Integrated Services	.60164	*				
International Capabilities	.49247	*				
ISO 9000	.51148	*				
Lowest Price	.50319	*				
Non-union Operations	.33103	*				
Operating Flexibility	.59298	*				
Time in Business	.68547	*				
Total Cost of Services	.66923	*				
Track Record	.62905	*				

Table 4.15. Varimax Rotation

Revised Correlation Matrix

Variable	Factor 1 "Synergy"	Factor 2 "Economy"	Factor 3 "Reliability"
Integrated Services	.74250		
Breadth of Services	.72544		
International Capabilities	.69959		
ISO 9000	.68283		
Assume Assets	.54221		
Direct Control	.43117		.33454
Total Cost of Services		.80209	
Operating Flexibility		.73240	
Lowest Price		.69012	
Contract Flexibility		.66520	
Non-union Operations		.57047	
Time in Business			.81110
Track Record			.75148
Industry Experience			.70264
EDI Capabilities			.53744

Factor extraction and rotation from the final revision of the correlation matrix

As calculated in the previous two steps, the revised correlation matrix was evaluated with the KMO Measure of Sampling Adequacy. The KMO index was calculated at 0.80 and the revised correlation matrix with fourteen variables was found to be amenable to factor analysis. The initial statistics, factor matrix and final statistics from the third application of principal components appear as **Tables 4.16.**, **4.17.**, and **4.18**. The three extracted factors now resolved or explained 53.1% of the total variance and the communalities were slightly increased again.

The rotated factor matrix is presented in **Table 4.19**. Simple structure was accomplished at this point as no variable loaded on more than one factor with a coefficient greater than 0.30. The first factor, renamed Economy, explained 31% of the total variance. It was composed of the linear combination of five variables, with the largest loading (.80) from the Overall Cost of Service variable. The second factor, labeled Synergy, resolved 12.6% of the total variance and it also consisted of five variables. The Provision of Integrated Logistics Services variable displayed the largest loading (.75) on the second factor. The final factor, titled Reliability, was made up of four variables and accounted for 9.6% of the total variance. The Time in Business variable "loaded" most heavily on this factor.

Cronbach's alpha test of reliability

An internal consistency test, Cronbach's Alpha, was performed on the reduced set of fourteen determinant variables constituting the three factors. This test is based on intercorrelations of the variables which compose a factor. When the items or variables forming a scale have been standardized to a mean of 0.0 and a variance of 1.0, as in this study, Cronbach's Alpha (α) is calculated as follows:

$$\alpha = \frac{k\bar{r}}{1+(k-1)\bar{r}}$$

Table 4.16. Initial Statistics -- Principal Components

Final Correlation Matrix

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
Assume Assets	1.00000	*	1	4.33508	31.0	31.0
Breadth of Services	1.00000	*	2	1.76478	12.6	43.6
Contract Flexibility	1.00000	*	3	1.33756	9.6	53.1
EDI Capabilities	1.00000	*	4	.97301	7.0	60.1
Industry Experience	1.00000	*	5	.89483	6.4	66.5
Integrated Services	1.00000	*	6	.85447	6.1	72.6
International Capabilities	1.00000	*	7	.75761	5.4	78.0
ISO 9000	1.00000	*	8	.61627	4.4	82.4
Lowest Price	1.00000	*	9	.50195	3.6	86.0
Non-union Operation	1.00000	*	10	.45916	3.3	89.2
Operating Flexibility	1.00000	*	11	.44494	3.2	92.4
Time in Business	1.00000	*	12	.40490	2.9	95.3
Total Cost of Services	1.00000	*	13	.34689	2.5	97.8
Track Record	1.00000	*	14	.30856	2.2	100.0

Table 4.17. Factor Extraction -- Principal Components

Final Correlation Matrix

Variable	Factor 1	Factor 2	Factor 3
Contract Flexibility	.68405		
Operating Flexibility	.62761	-.37119	
Track Record	.61148		-.47925
Time in Business	.60639		-.57616
Integrated Services	.60238	.50283	
Total Cost of Services	.58524	-.50572	
Breadth of Services	.56980	.45404	
ISO 9000	.56311	.43137	
Industry Experience	.54927		-.47961
Lowest Price	.53684	-.38947	
EDI Capabilities	.50816		-.30620
Assume Assets	.48535	.30474	
Non-union Operation	.39831		
International Capabilities	.37704	.52406	

Table 4.18. Final Statistics -- Principal Components

Final Correlation Matrix

Variable	Communality		Factor	Eigenvalue	Pct of Var	Cum Pct
Assume Assets	.34340	*	1	4.33508	31.0	31.0
Breadth of Services	.56374	*	2	1.76478	12.6	43.6
Contract Flexibility	.57421	*	3	1.33756	9.6	53.1
EDI Capabilities	.35618	*				
Industry Experience	.53178	*				
Integrated Services	.62642	*				
International Capabilities	.49309	*				
ISO 9000	.51935	*				
Lowest Price	.50462	*				
Non-union Operations	.32700	*				
Operating Flexibility	.59442	*				
Time in Business	.70075	*				
Total Cost of Services	.67113	*				
Track Record	.63134	*				

Table 4.19. Varimax Rotation

Final Correlation Matrix

Variable	Factor 1 "Economy"	Factor 2 "Synergy"	Factor 3 "Reliability"
Total Cost	.80560		
Operating Flexibility	.73550		
Lowest Price	.69435		
Contract Flexibility	.66791		
Non-union Operation	.56452		
Integrated Services		.75390	
Breadth of Services		.72378	
International Capabilities		.70030	
ISO 9000		.68511	
Assume Assets		.54348	
Time in Business			.81945
Track Record			.75195
Experience			.70608
EDI Capabilities			.53571

where k is the number of items in the scale and $\bar{r}$ is the average correlation between the items.[346]

The purpose of conducting the Cronbach Alpha test was to ensure reliability of the fourteen determinants and eliminate any that displayed inconsistency, since they served as input variables to the next phase of the research, i.e., cluster analysis. A satisfactory level of reliability depends on how a test or measure is used. A modest level of reliability (0.70) is considered acceptable for exploratory or basic research.[347]

The result of subjecting the five variables composing Factor 1 to Cronbach's Alpha test of reliability resulted in a score of 0.77. The same test for factors 2 and 3 yielded statistics of 0.75 and 0.72 respectively. Interpretation of these results leads to a satisfactory level of assurance regarding the reliability of the fourteen variables composing the three factors. Thus, it is likely the five variables composing Factors 1 and 2 and the four variables constituting Factor 3 are adequately correlated with other variables which may have been selected to measure the three factors resulting from this research.

Factor analysis results and interpretation

Factor analysis was used in this phase of the research to reduce data and describe interrelationships among the variables. Factor interpretation requires that meaning be given to the factor structure, labels devised for the identified factors and an adequate representation of the findings be provided for understanding an communication.[348] The three factors identified above will be interpreted in this section.

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346 Norusis, Op. Cit., p. 148.

347 Nunnally, Op. Cit., p. 245.

348 Rummel, Op. Cit., p. 472.

The label assigned to a factor is dependent on the perspective of the researcher. Three different perspectives on factors have been posited in the literature.[349] One view regards the factors as solely descriptive of the combined variables. The factor matrix is considered a typology or taxonomy and the factors are but descriptors which facilitate classification. A second position holds that factors are unseen, underlying causes of the relationships among and between the variables. A final perspective regards the factors as new variables that should be labeled only by algebraic symbols. Thus, the naming or labeling of factors is colored by the purpose of the researcher.

The labeling of factors should facilitate communication and not reification. Merely giving a factor a name does not give it reality, as factors can be produced by many things. Anything that causes a correlation among variables can result in a factor. Factors can differ as a result of the type of questions posed, the observations (buyers in this research) included in a sample, and by chance. Factors should always be considered tentative until confirmed or disconfirmed by subsequent research. On the other hand, factors can and do repeatedly appear with different tests, samples and study conditions.[350]

The interpretation of factors in this dissertation is primarily descriptive. However, potential causal relationships are examined since the factors represent a concise description of the benefits sought by many third party logistics buyers. The initial factor identified was composed of a linear combination of five variables, i.e., Overall Cost, Operational Flexibility, Lowest Price, Contract Flexibility, and Non-Union Operations (see **Table 4.19**.). This factor is

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349 See Cattell, R., *Factor Analysis: An Introduction and Manual for the Psychologist and Social Scientist*, Harper and Row, New York, NY, 1952 and Cattell. R, *Personality and Motivation Structure and Measurement*, World Books, Yonkers-on-Hudson, NY, 1957.

350 Kerlingler, Op. Cit., p. 591.

clearly measuring the total cost ramifications of a decision to outsource the logistics function. The cluster of variables composing this factor are concerned with efficiency and the resulting benefit of productivity; thus, Factor 1 was assigned the label "Economy."

The benefit of economy

The Economy factor is composed of variables relating to price and flexibility. This combination is akin to the benefits reported in other recent studies of third party logistics purchasers.[351] These studies noted that the top two benefits resulting from the acquisition of third party logistics was actual or expected cost reduction and enhanced flexibility. There is no doubt that buyers are seeking to reduce cost by outsourcing the supply of logistics services. The Economy benefit was found to be related to contract and operational flexibility and a non-union work force.

Third party logistics buyers require flexibility in contract negotiation and administration as it is impossible to address every conceivable issue affecting a firm's logistical requirements in a single document at one point in time. Operational flexibility contributes to efficiency in myriad ways. Examples include expansion and contraction of assets and labor to reflect changing marketplace needs, a proactive approach to customer service, mobile personnel and equipment, consolidation for scale economies, timely information, and so on. Furthermore, efficiency is related to the stability, flexibility and economy of a non-union work force. Restrictive work rules, high labor costs/benefits and the threat of work stoppages are considered

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351 For example, see Cooke, J., "Third Parties are Gaining Converts," *Traffic Management*, October 1994, van Laarhoven, P. and G. Sherman, "Logistics Alliances: The European Experience," *The McKinsey Quarterly*, No. 1, 1994, Lieb, R., et. al., "Third Party Services: A Comparison of Experienced American and European Manufacturers," *International Journal of Physical Distribution and Logistics Management*, Vol. 23, No. 6, 1993 and Lieb, R., "The Use of Third-Party Logistics Services by Large American Manufacturers," *Journal of Business Logistics*, Vol. 13, No. 2, 1992.

impediments to efficiency.

The benefit of synergy

The second factor was also composed of five variables; namely, Provision of Integrated Logistics Services, the Breadth of Services Offered, International Capabilities, ISO 9000 Certification, and a Willingness to Assume Existing Logistical Assets. The first two variables "loaded" most heavily on the second factor. The importance reflected by these loading were very similar, e.g., 0.75 for Integrated Services Provided and 0.72 for Breadth of Services. The combination of variables composing the second factor relate to the benefits resulting from the coherence and cohesion of multiple services managed in a effective manner. Therefore, this factor was deemed to be measuring association and it was labeled "Synergy."

As logistics is a discipline of tradeoffs, many buyers are undoubtedly seeking to improve the balance between existing costs and service by purchasing third party logistics services. The cost to maintain and administer the proprietary provision of logistical services or the coordination of multiple third party suppliers is often too high in today's global marketplace. Suppliers offering the convenience of integrated logistical services provide benefits to industrial buyers seeking to reduce cost, improve service levels and re-engineer business processes. Systems analysis and supply chain management have proven the benefits of logistics synergy. However, as the focus group participants indicated in Phase I of this research, suppliers must base their service offerings on proven performance and core competencies. Industrial buyers are not seeking "one stop shopping" merely for convenience.

As sources of supply and markets become more diversified and dispersed, third party logistics buyers are increasingly concerned with the challenges associated with international commerce. A commonly recognized tenet of global business activity holds logistical support to be more costly, time consuming and complicated than that required by domestic commerce. The

Synergy factor indicates that the ability to provide unified services on a global scale is an important aspect of the decision process leading to the selection of a third party logistics supplier for some buyers.

Aligned with the importance of international capabilities are ISO certifications. The ability to verify that a process meets world class standards is increasingly important in international business. ISO certification of logistical services is related to the synergistic benefits associated with the provision of integrated logistical support for those requiring high levels of predictability.

The Synergy factor is also related to a supplier's willingness to assume the existing logistical assets of a purchaser. Firms seeking to outsource logistics often own productive assets that must be disposed of in an untimely and costly manner, if the new external provider declines to use them. A large investment is often represented by the land, buildings and equipment needed to provide logistical support to a manufacturer, distributor or retailer. The willingness to assume ownership and use of productive assets enhances the synergy resulting from the supply of integrated services by a third party supplier.

The benefit of reliability

The last factor was composed of the following four variables: Time in Business, Proven Track Record of Experience, Experience in the Buyer's Industry, and Electronic Data Interchange Capabilities. The combination of these variables refers to the benefits resulting from supplier competence, longevity and soundness. Thus, this factor was named "Reliability." The issue of purchasing risk is addressed by this factor as previous studies have shown the "loss of control" to be a purchaser's greatest concern when converting from in-house distribution to the external supply of logistical support services.[352]

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[352] See sources referenced in footnote 351.

The outsourcing of logistics is fraught with uncertainty for the organization and the individuals making the purchasing decision. Contract logistics, especially the provision of integrated services, is relatively new to the United States. Many suppliers have not been in business long enough to establish a viable reputation. The previous studies cited above and the results of this research revealed that the most significant group currently using third party logistics services are large manufacturers engaged in worldwide trade. The corporate and personal ramifications of a logistical failure resulting from an unwise supplier selection decision pose significant risk to these firms and buyers. Thus, supplier competency and dependability are of utmost concern to these buyers when they select a third party logistics supplier.

The time a supplier has been in business is a surrogate for competency. Also, closely aligned with supplier longevity is a provider's proven track record and the amount of experience directly involved in a buyer's industry. The Track Record and Experience variables provided the second and third highest "loadings" (0.75 and 0.71 respectively) on the Reliability factor.

Buyers are seeking to minimize organizational and personal risk in a strategic purchase such as the acquisition of third party logistics services. Purchasing from a reputable and widely recognized supplier minimizes risk and provides a definite benefit to the buyer. This factor also measures reputation and endurance, two items highly desired by those seeking to minimize risk.

The ability to provide electronic data interchange was also included in the combination of variables describing the Reliability factor; however, it displayed the weakest loading (0.54) of the four variables. A supplier with a favorable track record and industry longevity is likely to use new technology and innovative processes. As information has proven critical to logistics productivity improvements and customer service enhancement, buyers expect a reputable supplier to offer EDI services. The benefits from EDI relate to a number of desirable logistical

attributes such as reduced order cycle time, improved fill rates, and lower inventory levels.

Hypotheses derived from the exploratory factor analysis

The use of factor analysis in this study was exploratory in nature. This type of research is ". . . usually undertaken to examine an area so that the next research study might be more powerful. A thorough analysis of the pilot data often suggests many new leads that can be followed up in the next study."[353] These new leads are often expressed as hypotheses involving the factors derived from exploratory research.

The factor analytic findings from this study of third party logistics buyer behavior resulted in the following hypotheses:

- H_0: Industrial buyers are seeking Economic benefits when selecting a third party logistics supplier.
- H_0: Industrial purchasers are seeking Synergistic benefits when they acquire externally provided integrated logistics services.
- H_0: Industrial buyers desire Reliability from the supplier they select to provide external logistical services to their firm.

Subsequent research is required to validate these factors and the variables which describe them. Further research is also necessary to determine if other benefit factors not revealed in this study result from the acquisition of third party logistics services.

Factor analysis implications

The application of factor analysis, using the principal components model followed by a varimax rotation of the non-trivial factors, condensed the original thirty supplier selection determinants to fourteen variables characterized by three factors. The three factors described the benefits third party logistics purchasers are seeking when they acquire these services. Two of

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[353] Gorsuch, Op. Cit. 325.

the factors were composed of five determinants while the remaining factor was formed by four determinants. The three factors revealed that third party logistics buyers desire the benefits of Economy, Synergy and Reliability from their selection of a contract logistics provider.

Sixteen of the original thirty determinant variables were eliminated as "cross loadings" 0.30 or more after rotation inhibited factor interpretation. The final correlation matrix consisted of fourteen determinants. Three iterations of principal components factor extraction and varimax rotation accompanied by two revisions of the correlation matrix were required to obtain simple structure.

The three factors accounted for 53.1% of the total variance in survey responses. As this was an exploratory study, using untested questions and variables, it is likely that measurement error significantly contributed to these results. Also, the resulting three factors are not likely to represent all the benefits sought by third party logistics purchasers. Other factors, representing additional benefits that were not adequately addressed by the thirty original variables, probably exist. Three hypotheses positing an industrial buyer's desire for the benefits of Economy, Synergy and Reliability in the purchase of third party logistics services resulted from this exploratory factor analysis.

The final step in the research used the reduced set of fourteen variables to determine whether benefit based market segments could be identified from the data. While component scores may have been calculated for the three factors and used as input to the next phase of the study, i.e., cluster analysis, a decision was made to use the original fourteen determinants to represent the three benefit factors. This decision was predicated on the knowledge that component scores are not easily interpreted and the correlation matrix of the fourteen original

determinants was more suitable to cluster analysis than the condensed components.[354]

Benefit based market segmentation

Market segmentation attempts to combine homogeneous groups of purchasers by the importance they place on product and/or service selection criteria. Cluster analysis was used in this phase of the research to group the third party logistics buyers responding to the mail study. The grouping was based on the buyer's ratings of the fourteen determinant variables comprising the Economy, Synergy, and Reliability factors identified in the previous section. "All clustering algorithms are procedures for searching through the set of all possible clusterings to find one that fits the data reasonably well."[355]

Ward's minimum-variance agglomerative method was used to cluster the third party logistics buyers according to their ratings of the fourteen determinant variables composing the Economy, Synergy and Reliability factors. A correlation matrix was constructed and served as input to the grouping algorithm. Cluster analysis requires that the correlations be transformed into a dissimilarity matrix as described in chapter three. A method by which proximities or dissimilarities among the objects (industrial buyers) are to be calculated must also be specified. Squared Euclidean distance was the method selected for this analysis.

At the beginning of the grouping process each object represents a cluster in the Ward method. The algorithm calculates the squared Euclidean distance between all the cases or objects (third party logistics buyers) and fuses together the two that are most similar. Similarity in the Ward method refers to the objects which, when joined together, result in the smallest increase in the

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354 From consultation with Dr. David Ludwig, Director of Statistical Consulting, University of North Carolina at Greensboro, NC.

355 Hartigan, J., *Clustering Algorithms*, John Wiley and Sons, Inc., New York, NY, 1975, p. 11.

overall sum of squared within-cluster distances. After the initial fusion, the procedure continues as follows:

> For each cluster, the means for all variables are calculated. Then, for each case, the squared Euclidean distance to the cluster means is calculated. These distances are summed for all of the cases. At each step, the two clusters that merge are those that result in the smallest increase in the overall sum of the squared within-cluster distances.[356]

A history of the entire fusion process is presented in an agglomeration schedule or table. This table displays each stage of the grouping process, the clusters that were merged and the distance at which they were joined. In the Ward method, distance referenced by a Semipartial R-squared coefficient. Clusters are merged together one-by-one until only a single large group, containing all objects, exists. In agglomerative methods, a cluster cannot be split once it is formed, it can only be merged with another cluster.

The object of cluster analysis is to find some intermediate stage in the grouping process that results in a meaningful number of clusters. The agglomeration schedule may be used to assist in locating this point. The coefficients appearing in the schedule may be examined to determine the initial point at which the increase between two adjacent agglomeration stages becomes large. In the Ward method, this increase indicates that the members of the clusters joined together are no longer similar since a substantial increase in the overall sum of the squared within-cluster distances has occurred. Statistics from last ten stages of the clustering process, i.e., the agglomeration schedule, for the third party logistics buyers participating in this research are presented in **Table 4.20**.

The first row appearing in the table represents the stage at which only ten clusters remain in the data set. At this level the multiple object clusters representing cluster 18 and cluster 13 have been combined to decrease the total number of clusters from eleven to ten. This fusion is

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356 Norusis, M., *SPSS Professional Statistics™ 6.1*, SPSS, Inc., Chicago, IL, 1994, p. 98.

Table 4.20. Abbreviated Cluster Analysis Agglomeration Schedule

Third Party Logistics Buyers

Number of Clusters	Cluster (CL) Joined	Semipartial R-Squared Coefficient
•	•	•
•	•	•
•	•	•
10	CL 18 & CL 13	.017889
9	CL 20 & CL 16	.018827
8	CL 12 & CL 27	.022178
7	CL 15 & 9	.027775
6	CL 10 & CL 17	.028859
5	CL 8 & 14	.031825
4	CL 11 & CL 6	.032520
3	CL 4 & CL 7	.057917
2	CL 3 & CL 28	.077395
1	CL 5 & CL 2	.139972

represented by the column labeled Clusters (CL) Joined. The squared Euclidean distance (represented by an increase in the overall sum of the squared within-cluster distances) between clusters 18 and 13 is displayed in the column labeled Semipartial R-Squared Coefficient. The semipartial R-squared coefficients may be used to determine how many meaningful clusters exist in the data set. Small coefficients, relatively speaking, indicate that fairly homogeneous clusters are being merged. Large coefficients reveal that clusters containing quite different members are being joined. The actual value of the coefficient depends on the clustering algorithm and distance measure utilized. The object is to stop the agglomeration process as soon as the increase between two adjacent stages becomes large. Clustering stages which are separated by large incremental distances are likely stopping points.

One method of detecting the appropriate stopping point is to plot distance levels (Semipartial R-Squared coefficients) "against" the number of clusters at each stage of the grouping process. This method was first set forth by Thorndike[357] and later addressed by Kowalski and Bender.[358] It is a technique similar to the Scree Test used to determine the number of factors that will adequately resolve or explain the variance existing among a larger number of variables.

Figure 4.4. displays a plot of the data appearing in **Table 4.20.**, in accordance with the procedure described immediately above. The goal of this procedure is to identify the clustering stage at which the curve initially changes slope or radically "flattens out." The plot reveals a "break" or flattening of the curve at the point between the formation of the forth and third clusters. As can be observed from the values of the semipartial R-squared coefficients appearing on the

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357 Thorndike, R., "Who Belongs in a Family?" *Psychometrika*, Vol. 18, 1953, p. 267-276.

358 Kowalski, B. and C. Bender, "Pattern Recognition: A Powerful Approach to Interpreting Chemical Data," *Journal of the American Chemical Society*, Vol. 94, 1972, pp. 5632-5639.

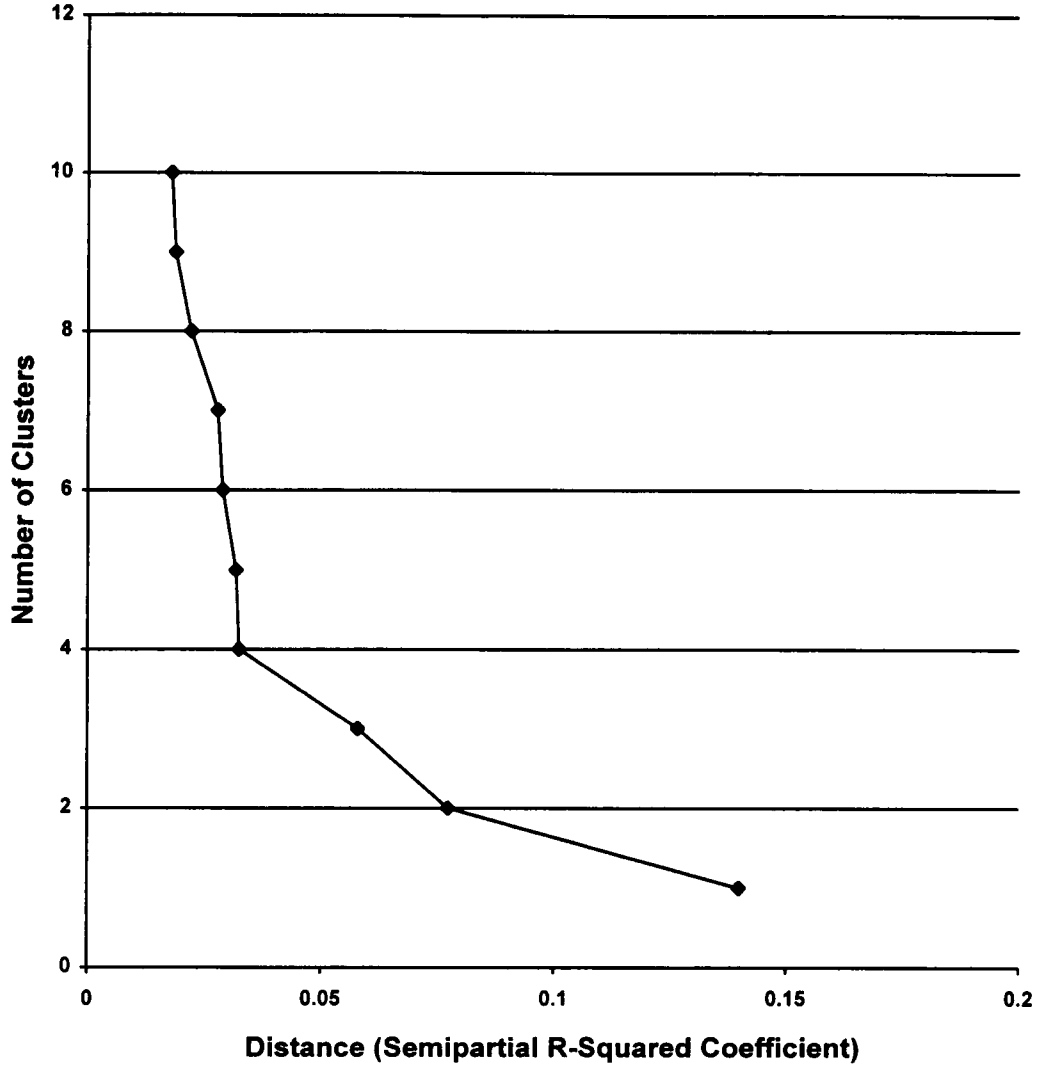


Figure 4.4. **Plot of the Distance Required to Fuse Clusters for the Sample Population**
Ward's Minimum Squared Error Clustering of Third Party Logistics Buyers

X-axis, it is apparent that a significant increase in distance was required to form the three cluster configuration.

In accordance with the logic described above, it is at the four cluster level that one is likely to find the most natural clusters for this data set. The four clusters in this application represent third party logistics market segments. The data was also clustered by the average linkage between groups method to validate the four segment configuration. This algorithm is sometimes referred to as the unweighted pair-group method using arithmetic averages, i.e., UPMGA. It is another frequently used agglomerative hierarchical clustering method. The results of the UPMGA clustering method also revealed that a four cluster configuration provided the most accurate characterization of the data. Further, the UPMGA clusters were very similar to those formed by the Ward method.

The reliability of the clusters formed by the Ward method was also tested. The sample population was randomly split in half and the resulting two data sets were clustered via the Ward algorithm. **Figures 4.5. and 4.6.** present the result of the two analyses. A review of the plots reveals that a four cluster configuration is appropriate for both of the randomly formed groups. The buyers in each of the four segments for both split-half data sets were compared to those forming the four clusters for the entire sample population. The individuals grouped in the split-half analyses were found to posses similar characteristics, e.g., mean evaluations of service attributes and demographic profiles, as those resulting from the analysis of the sample population.

A method of visualizing the grouping history in a hierarchical clustering solution is via a two dimensional display called a dendrogram. A portion of the grouping history for the sample population of third party logistics buyers is presented in the dendrogram appearing as **Figure 4.7**. The dendrogram identifies the clusters being combined and the distances between the coefficients at each stage. In the SPSS statistical package used in this research, actual distances between

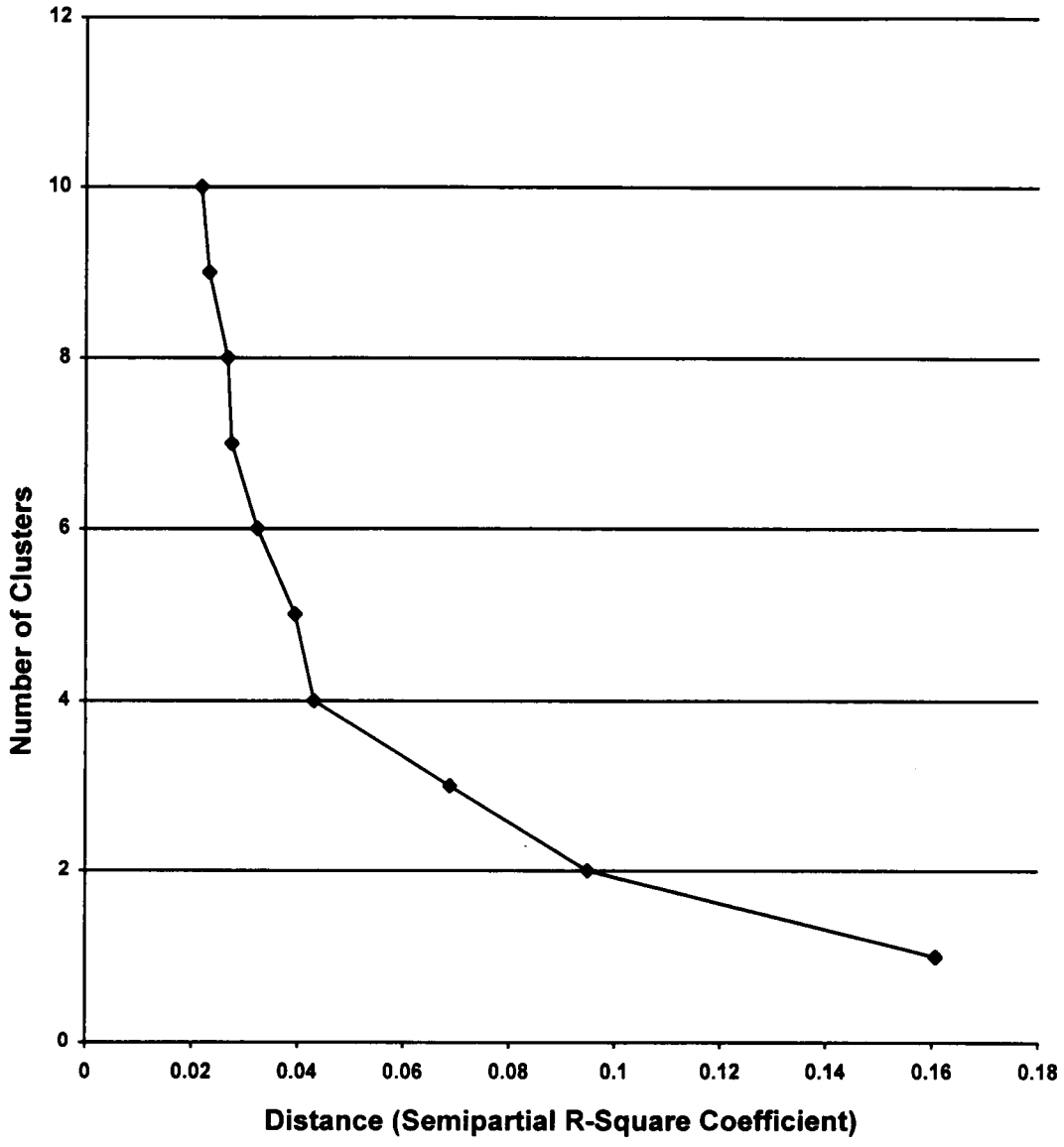


Figure 4.5. **Plot of the Distance Required to Fuse Clusters in the Split-Half Analysis**
Ward's Minimum Squared Error Cluster : 1st Half of the Randomly Split Buyers

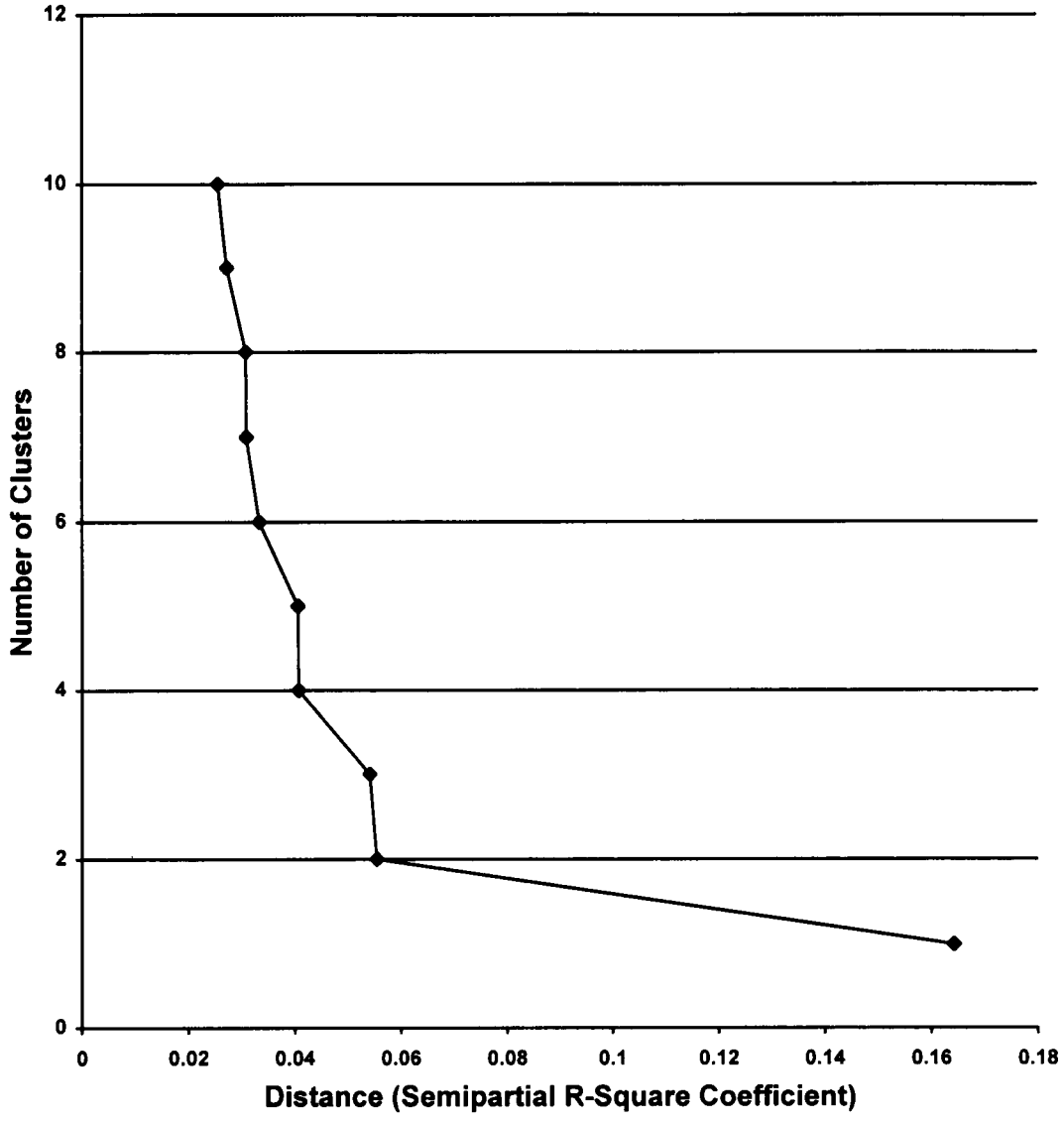


Figure 4.6. **Plot of the Distance Required to Fuse Clusters in the Split-Half Analysis**
Ward's Minimum Squared Error Cluster: 2nd-Half of the Randomly Split Buyers

Figure 4.7. Cluster Analysis Dendrogram of Third Party Logistics Buyers

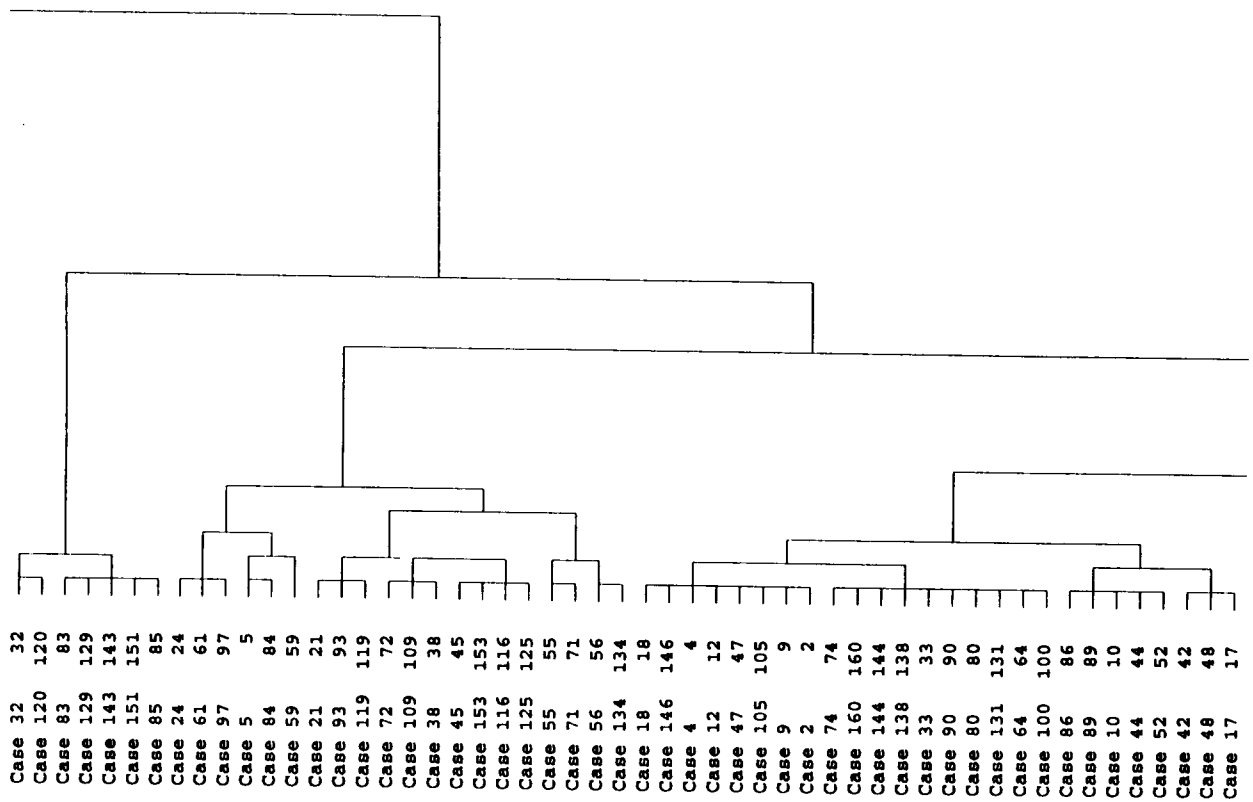


Figure 4.7. (continued)

Figure 4.7. (continued)

clustering levels are re-scaled to indices between 0 and 25 to facilitate a concise display of the process. Without this adjustment, it would take many pages of "output" to represent the clustering history of all the respondents involved in this study. Thus, the ratio of the distances, i.e., changes in semipartial R-squared coefficient values, between the clustering stages is preserved in the dendrogram presented in **Figure 4.7.** However, the scale displayed in the figure does not correspond to actual clustering distances.

The vertical lines appearing in dendrogram refer to single object or multiple object clusters. The horizontal lines indicate the level (distance) at which the clusters were fused. Since many of the distances at the beginning stages are similar in magnitude, it is not easy to ascertain the sequence in which some of the early clusters were formed. This occurs because there was not a large increase in the error sum of squares (semipartial R-squared values) at the early clustering levels since the respondents grouped together were very similar to one another. However, in the last stages of the clustering process the distances at which the clusters were formed are relatively large and much more discernible. For example the last two clusters (CL 5 & CL 2) were fused at an approximate distance of 24 on the Y-axis. The previous two clusters (CL 3 & CL 28) were joined at an approximate distance of 13.5 on the Y-axis. These four groups represent the meaningful clusters (market segments) identified in the plot appearing in **Figure 4.7.** To determine how the clusters differed, behavioral profiles of the third party logistics buyers forming each of the four segments were developed and compared.

The four clusters derived via the Ward clustering algorithm varied in size. The last two groups fused (CL 5 & CL 2) consisted of 39% and 61% of the respondents respectively. These two clusters defined the two major market segments appearing in the data. The remaining two clusters reflected sub-divisions of cluster 2 and composed only a small percentage (4.4% and 12.4% respectively) of the total market represented by the sample population. Behavioral profiles of the

buyers representing the two major segments are presented below while those forming the two small sub-segments appear in the final section of this chapter.

The first major segment (CL 5), representing 39% of the market, consisted of the cases (third party logistics buyers) beginning with case 111 and ending with case 142 in **Figure 4.7.** The second major segment (CL 2) begins at case 32 and ends with case 53. These were the first two groups examined as they remained separate throughout the clustering process until the final fusion stage was reached.

The mean determinacy scores for the fourteen dependent variables, including the sample population and the two major market segments, are presented in **Table 4.21**. In order to provide a common basis for evaluating the major and sub-segments, an index for each of the fourteen dependent variables was developed. This index was created by dividing the mean of each of the fourteen dependent variables, for each segment, by the mean of these variables for the total sample population. This index also appears in **Table 4.21.** This approach was utilized for each of the segment comparisons appearing throughout the analysis to facilitate interpretation of the data.

Comparison of the two major market segments

Table 4.22. compares the two major market segments across the fourteen purchasing attributes employed as dependent variables. Segment 2, constituting 61% of the sample population, rated all of the determinant variables, except International Capabilities, higher than Segment 1. The most notable differences between the two segments related to a potential provider's EDI Capabilities, Willingness to Assume Existing Assets and the Provision of Integrated Logistics Services. These three purchasing attributes served to differentiate the two major market segments.

The two major segments tended to nominally rank many of the purchasing attributes in a similar manner, i.e., both groups ranked Operating Flexibility, Track Record of Experience and Overall Cost of Service as their top three selection variables in a stack order ranking. These

Table 4.21. Comparison of the Segment Means Across the Fourteen Service Attributes

Major Market Segments

Service Attribute	Sample Stack Ranking	Sample Mean 100%	Segment 1 Mean 39%	Segment 2 Mean 61%	Mean Index Segment 1	Mean Index Segment 2
Track Record	3	29.4	24.0	32.8	0.82 *	1.12 *
Time in Business	9	22.0	17.3	25.0	0.79	1.14
Experience	4	28.3	24.0	31.0	0.85	1.10
EDI Capabilities	7	24.6	16.2	29.9	0.66	1.22
Integrated Services	8	22.8	16.4	26.8	0.72	1.18
ISO 9000	12	14.9	12.7	16.4	0.85	1.10
Breadth of Services	6 **	24.8	20.5	27.6	0.83	1.11
Int'l. Capabilities	11	20.4	20.3	20.5	1.00	1.00
Assume Assets	13	14.7	10.1	17.6	0.69	1.20
Overall Cost	2	29.6	25.3	32.4	0.85	1.09
Operating Flexibility	1	30.5	23.8	34.7	0.78	1.14
Contract Flexibility	5	25.4	19.8	29.0	0.78	1.14
Low Price	6 **	24.8	21.5	26.9	0.87	1.08
Non-Union	10	20.8	18.1	22.6	0.87	1.09

* Mean Index = Segment mean divided by sample mean.

** Tie

Table 4.22. Comparison of the Major Market Segments Indexed to the Same Mean *

Service Attribute	Segment 1	Segment 2
Proven Track Record		+ 0.30
Time in Business		+.035
Experience in Buyer's Industry		+ 0.25
EDI Capabilities		+ 0.56
Provision of Integrated Services		+ 0.46
ISO 9000 Certification		+ 0.25
Breadth of Services Offered		+ 0.29
International Capabilities	No Difference	No Difference
Willing to Assume Existing Assets		+ 0.51
Overall Cost of Services		+ 0.24
Operating Flexibility		+ 0.36
Contract Flexibility		+ 0.36
Lowest Price		+ 0.22
Non-Union Operation		+ 0.22

* The mean for each service attribute for both segments was divided by the sample mean to create and index. The entries appearing under each segment represent the positive difference between the two segments.

variables are obviously very important selection criteria for both groups. The rankings imply that a supplier desiring to participate in both of these markets must, at a minimum, provide the benefits of economy and reliability. However, Segment 2 obviously considers EDI capabilities, a Willingness to Assume Assets, and Integrated Services to be much more determinant in its third party logistics selection decision than Segment 1.

While there were differences between all but one of the remaining eleven selection variables, they were not as notable as those indicated for the three highly determinant variables. There was no difference between the groups regarding the importance of a provider's International Capabilities. Thus, Segment 2 views Operating Flexibility, Proven Experience and Overall Cost (value) as mandatory requirements but these are not necessarily sufficient to sway the final supplier selection decision. In other words, these three attributes are the minimum criteria for supplier consideration, while the final selection decision for Segment 2 is likely to rely on the three most determinant variables, i.e., EDI Capabilities, the Provision of Integrated Services, and a Willingness to Assume Existing Assets. Segment 2 appears to be seeking a supplier relationship which encompasses synergistic benefits. The buyers in this segment may be more interested in entering into a strategic relationship with a third party logistics supplier than the buyers representing Segment 1.

Benefit based market segmentation helps a marketer understand why buyers as a group choose certain products or suppliers and reject others. If a marketer is aware of the bundle of benefits sought by a given group, a tailored approach may be designed for the segment of interest. The first two segments differ considerably in their evaluation of three of the supplier selection determinants. The purchasers in Segment 1 may be characterized as "traditional buyers" of transportation and logistics services. This group is primarily concerned with efficiency and dependability. Segment 2 also highly values efficiency and dependability; however, the buyers in

this group may be more appropriately be considered "innovative buyers" of logistical support services. They are seeking synergistic benefits from their acquisition of third party logistics services. These buyers are more likely to outsource multiple logistics functions and seek a single source supplier of these services.

Demographic profiles of the two major market segments

Once benefit segments have been determined, the buyers must be identified by easily accessible indices. The next section further develops the behavioral profiles of major segments 1 and 2 to assist third party suppliers in identifying and accessing these buyers. This enhancement is based on the demographic information provided by the third party logistics buyers in Section III of the mail survey (see Appendix C -- Background Information).

Table 4.23. compares the major market segments on a variety of demographic measures, e.g., outsourcing activity, channel membership, annual sales level, scope of business activity, industry type, etc. The column entries represent the percentage of buyers included in each demographic category for each segment. The percentage of respondents, by category, for the entire sample population is also included under the column labeled "Sample Frequency." A review of **Table 4.23.** indicates that many of third party logistics buyers responding to the mail survey represent large manufacturers of finished products conducting business on a global scale. The sample population results also revealed that the majority of firms participating in the research maintain a centralized logistics organizational structure.

A comparison of the buyers included in major segment 1 (traditional buyers) versus those representing major segment 2 (innovative buyers) revealed that segment 2 was more likely to be composed of finished goods manufacturers. The results also indicated that segment 2 buyers were more likely to outsource manufacturing than those included in segment 1. Furthermore, the innovative buyers tend to be involved in international commerce more often than traditional buyers.

Table 4.23. Demographic Comparison of the Two Major Market Segments

Demographic Indices	Sample Frequency (%)	Segment 1 Traditional Buyers Frequency (%)	Segment 2 Innovative Buyers Frequency (%)
Use of Outsourcing			
Manufacturing	43	37	54
Contract Employees	55	56	54
Payroll	29	30	28
Personnel Services	10	10	10
Information Services	27	28	26
Advertising	31	30	32
Product Merchandising	11	10	12
Other	20	25	18
Channel Membership			
Raw Materials Supplier	3	3	2
Component Manufacturer	10	12	7
Finished Product Manu.	63	58	71
Wholesaler	12	14	10
Retailer	10	12	8
Other	2	1	2
Annual Sales ($'s)			
Less than 10 million	0	0	0
10 million to 100 million	11	10	12
100 million to 500 million	22	22	22
500 million to 1 billion	23	20	26
Greater than 1 billion	44	48	40
Scope of Business			
International/Global	56	51	63
North America	21	23	18
U.S. - National	17	19	15
U.S. - Regional	5	6	3
Local	1	1	0

Table 4.23. (continued)

Demographic Indices	Sample Frequency (%)	Segment 1 Traditional Buyers Frequency (%)	Segment 2 Innovative Buyers Frequency (%)
Logistics Function			
Centralized	75	72	76
Logistics Department			
Separate Department	58	57	59
Warehouse Use by Type			
Co. Owned (> 50% of goods)	38	33	42
Co. Leased (> 50% of goods)	12	10	12
Contract (> 50% of goods)	7	5	9
Public (> 50% of goods)	5	2	7
Ship Direct to Customers (> 50% of goods)	18	11	28
Industry Type			
Appliances	1	0	1
Auto	10	10	10
Building Materials	2	2	2
Chemical	11	11	11
Clothing	6	5	6
Computer	8	7	9
Construction Equipment	3	2	3
Department Store	3	3	2
Electronic	11	11	11
Electrical Machinery	3	3	3
Food / Beverage	19	23	17
Hardware	1	2	0
Machine Tools	2	5	0
Metal Products	1	0	1
Office Equipment	3	3	3
Paper	4	3	4
Pharmaceuticals	11	7	14
Rubber	1	2	1
Other	3	1	2

A notable difference between segment 1 and segment 2 concerning methods of finished goods distribution was observed. The mail study participants were polled (Q32) concerning their use of various types of warehousing, e.g., private, contract, public, etc. The results presented in **Table 4.23.** reflect the percent of respondents who indicated that at least fifty percent of their goods were distributed through a particular type of warehouse. Members of the innovative buyer segment were observed to avoid warehouse use and ship products directly to their customers more frequently than members of the traditional buyer segment.

The demographic profiles revealed that five industries accounted for approximately two-thirds of the respondents from both groups. These industries were automotive and transport equipment, chemicals and plastics, electronics, food and beverage and pharmaceuticals. A comparison of respondents across both segments by industry type indicated that the traditional buyer segment contained a higher concentration of food and beverage members than that found in innovative buyer group. Pharmaceutical companies also were found to be more heavily represented by the innovative buyer group.

A comparison of the two segments across the fourteen supplier selection determinants disclosed that innovative buyers were more likely to seek synergistic benefits from their acquisition of third party logistics services. These buyers were also noted to be more innovative in their approach to logistics outsourcing. Further, the demographic comparison between the two segments revealed that the buyers composing the innovative buyers segment were more likely to represent firms that manufacture finished products, outsource manufacturing as well as logistics, and conduct business on a global scale. Finally, the innovative buyers were also noted to represent organizations that ship their products directly to end users more frequently than the traditional buyers of segment 1.

Comparison of the two minor market segments

Application of Ward's minimum-variance clustering algorithm revealed the existence of four groups in the data base. These groups represented four distinct third party logistics market segments. The segments varied in size with two representing major market segments and two designating minor segments. The two minor segments were further noted to be sub-segments of the "innovative buyers" group (major segment 2) examined in the previous section..

The two minor market segments represent buyers fused together in the last two stages of the clustering process immediately preceding the formation of the innovative-buyer major segment. In other words, these respondents were combined with the buyers already included in segment 2 during the final iterations of the fusion process. Each of the two minor segments will be examined below in the reverse order of their cluster formation. The last group fused to major segment 2, i.e., sub-group 2A, will be reviewed first and then the next to last group (sub-group 2B) will be investigated.

The first sub-segment of the larger innovative-buyer group consisted of the respondents beginning with case 32 and ending with case 85 in the dendrogram appearing in **Figure 4.7.** This group represented a very small segment of the total sample population, i.e., 4.4%. It is unlikely a marketer would develop a separate strategy for a segment this small unless it represented an unusually high revenue opportunity. In any event, the segment was investigated to provide insight into its preferences and demographics and to complete this phase of the research.

Tables 4.24. and 4.25. provide a comparison across the revised innovative-buyer segment and sub-segment 2A for each of the fourteen service attributes in the same manner described in the previous section. The statistics for the innovative-buyer segment were revised to eliminate the responses from the buyers forming sub-segment 2A. Thus, revised group means

Table 4.24. Comparison of Group Means Across the Fourteen Service Attributes

Revised Major Segment 2 versus Sub-Segment 2A

Service Attribute	Sample Stack Ranking	Sample Mean 100%	Revised Segment 2 Mean 56.6%	Segment 2A Mean 4.4%	Mean Index Revised Segment 2	Mean Index Segment 2A
Track Record	3	29.4	32.2	37.7	1.10 *	1.28 *
Time in Business	9	22.0	24.1	36.9	1.10	1.68
Experience	4	28.3	29.8	48.0	1.05	1.70
EDI Capabilities	7	24.6	28.7	42.4	1.17	1.72
Integrated Services	8	22.8	25.6	42.3	1.12	1.86
ISO 9000	12	14.9	14.6	38.4	0.98	2.58
Breadth of Services	6 **	24.8	26.5	41.3	1.07	1.67
Int'l. Capabilities	11	20.4	19.1	36.6	0.94	1.79
Assume Assets	13	14.7	16.0	37.7	1.09	2.56
Overall Cost	2	29.6	31.5	45.1	1.06	1.52
Operating Flexibility	1	30.5	34.1	44.0	1.12	1.44
Contract Flexibility	5	25.4	28.4	38.9	1.12	1.53
Low Price	6 **	24.8	26.4	37.3	1.06	1.50
Non-Union	10	20.8	22.2	32.0	1.07	1.54

* Mean Index = Segment mean divided by sample mean.

** Tie

Table 4.25. Comparison of Revised Major Segment 2 and Sub-Segment 2A Indexed to the Same Mean*

Service Attribute	Revised Segment 2	Sub-Segment 2A
Proven Track Record		+ 0.19
Time in Business		+ 0.58
Experience in Buyer's Industry		+ 0.64
EDI Capabilities		+ 0.56
Provision of Integrated Services		+ 0.73
ISO 9000 Certification		+ 1.60
Breadth of Services Offered		+ 0.60
International Capabilities		+ 0.86
Willing to Assume Assets		+ 1.48
Overall Cost of Services		+ 0.46
Operating Flexibility		+ 0.32
Contract Flexibility		+ 0.41
Lowest Price		+ 0.44
Non-Union Operation		+ 0.47

* The mean for each service attribute for both segments was divided by the sample mean to create and index. The entries appearing under each segment represent the positive difference between the two segments.

and indexes were calculated for segment 2 as well as those determined for sub-segment 2A.

The innovative-buyer group originally accounted for 61% of the total sample population and represented the largest market segment. As the buyers in sub-segment 2A represented 4.4% of the total sample, the revised innovative-buyer group now accounted for 56.6% of the total market. This segment remained the largest market group as segment 1 (the "traditional-buyer" group) accounted for 39% of the sample population.

A comparison of the group means for the fourteen determinants across revised segment 2 and sub-segment 2A revealed results similar to those found in the comparison between the two major market segments examined in the previous section. Sub-segment 2A rated each of the fourteen determinants higher than the buyers representing the revised major market segment 2. The most important differences pertained to three of the determinants forming the "Synergy" factor, i.e., ISO 9000 Certification, International Capabilities, and a provider's Willingness to Assume Existing Logistics Assets. Especially large differences were noted for the ISO 9000 and Willingness to Assume Assets determinants, i.e., 1.60 and 1.48 respectively (**see Table 4.25.**).

Differences were also noted in the nominal ranking of the top three supplier selection determinants between the two groups. While both groups consider Overall Cost and Operating Flexibility to be extremely important in the supplier selection decision, sub-segment 2A also highly values Experience in the Buyer's Industry. Undoubtedly, both groups expect efficiency gains from logistics outsourcing, but micro segment 2A is also concerned with selecting a supplier that has experience in its industry.

The most important supplier selection determinants differentiating the buyers representing sub-segment 2A from those of revised segment 2 relate to logistics synergy and capacity. The micro segment buyers require a potential supplier to be efficient and dependable but this is not enough to be selected as their provider. They likely represent firms involved with

products which require a highly predictable transportation and storage process. It also very likely these organizations are involved in international commerce. Further, the firms represented by these industrial buyers are likely to own substantial assets dedicated to logistics support as the final selection decision is heavily influenced by a supplier's willingness to assume proprietary logistical assets. Sub-segment 2A can be characterized as super-critical in its evaluation of and requirements for synergistic benefits from logistics outsourcing. However, this group may be labeled "supplier-oriented" buyers since their final supplier selection decision is likely to be determined by a provider's financial and service capacities and capabilities.

Demographic profile of the first minor market segment

The demographic comparison of the supplier-oriented and revised innovative-buyer segment presented in **Table 4.26.** revealed several notable differences. However, the differences between these two groups should be viewed with substantial caution as the supplier-oriented segment has few members in comparison with the larger segment from which it was derived. Moreover, the observed differences are based on frequencies expressed as percentages and this can lead to faulty perceptions when comparing groups of vastly different size.

The demographic comparison revealed that the supplier-oriented segment tends to be more heavily represented by raw material and finished product manufacturers than the revised innovative-buyer group. Further, there were no wholesalers or retailers included in the micro segment. This small group also maintained an exclusive international or North American focus as none of the members conducted business solely in the U.S. or merely on a local basis. The supplier-oriented segment was also noted to maintain a centralized logistics function and include a separate logistics department more often than the larger segment from which it was derived. Finally, a higher concentration of firms in the computer, food/beverage and paper industries were observed in the micro segment.

Table 4.26. Demographic Comparison of Revised Segment 2 and Sub-Segment 2A

Demographic Indices	Sample Frequency (%)	Revised Segment 2 Innovative-Buyers Frequency (%)	Sub-Segment 2A Supplier-Oriented Frequency (%)
Use of Outsourcing			
Manufacturing	43	38	29
Contract Employees	55	53	57
Payroll	29	29	14
Personnel Services	10	9	14
Information Services	27	27	29
Advertising	31	35	14
Product Merchandising	11	12	0
Other	20	17	23
Channel Membership			
Raw Materials Supplier	3	2	14
Component Manufacturer	10	11	14
Finished Product Manu.	63	57	72
Wholesaler	12	15	0
Retailer	10	12	0
Other	3	3	0
Annual Sales ($'s)			
Less than 10 million	0	0	0
10 million to 100 million	11	12	14
100 million to 500 million	22	22	29
500 million to 1 billion	23	26	14
Greater than 1 billion	44	40	43
Scope of Business			
International/Global	56	52	57
North America	21	20	43
U.S. - National	17	20	0
U.S. - Regional	5	7	0
Local	1	1	0

Table 4.26. (continued)

Demographic Indices	Sample Frequency (%)	Revised Segment 2 Innovative-Buyers Frequency (%)	Sub-Segment 2A Supplier-Oriented Frequency (%)
Logistics Function			
Centralized	75	76	86
Logistics Department			
Separate Department	58	43	61
Warehouse Use by Type			
Co. Owned (> 50% of goods)	38	40	40
Co. Leased (> 50% of goods)	12	12	20
Contract (> 50% of goods)	7	9	0
Public (> 50% of goods)	5	7	20
Ship Direct to Customers (> 50% of goods)	18	11	20
Industry Type			
Appliances	1	1	0
Auto	10	11	0
Building Materials	2	2	0
Chemical	11	11	14
Clothing	6	7	0
Computer	8	9	14
Construction Equipment	3	3	0
Department Store	3	2	0
Electronic	11	10	14
Electrical Machinery	3	3	0
Food / Beverage	19	17	30
Hardware	1	0	0
Machine Tools	2	0	0
Metal Products	1	1	0
Office Equipment	3	3	0
Paper	4	2	14
Pharmaceuticals	11	14	14
Rubber	1	1	0
Other	3	3	0

The fourth group identified by the clustering procedure represented a final partition or sub-grouping of the innovative buyer group. This entity was formed during the next to last iteration of the clustering process resulting in the major segment 2. The innovative-buyer group was modified in the previous section and labeled revised segment 2. It represented 56.6% of the sample population after deducting the buyers forming the supplier-oriented sub-group.

Revised major segment 2 was further reduced by the number of buyers forming the final sub-segment. Modified group means across the fourteen determinants were calculated for the final revision of the innovative-buyer segment and the last sub-group. The final revision of segment 2 resulted in a group representing 44.2% of the total sample population. The final sub-group (2B) accounted for 12.4% of the sample population.

Group means and mean indexes for the final revision of major segment 2 and sub-segment 2B are presented in **Tables 4.27. and 4.28.** Observation of the group means in **Table 4.27.** reveals that sub-segment 2B considers the determinants relating to cost and flexibility to be very important in its supplier selection decision. Whereas the group from which this sub-segment was derived (the revised innovative buyer group) tends to place more importance on determinants composing the Synergy factor. While all of the buyers in both of these segments were lumped together as similar (innovative-buyers) in the comparison of the two major market segments, differences are apparent among the members of the innovative-buyers segment when the analysis is further refined.

Table 4.28. accentuates the differences between group 2B and the final revision of major market segment 2. Segment 2B considers the variables relating to the Efficiency factor, especially a provider's use of a non-union work force, as highly determinant in its supplier selection decision. On the other hand, the buyers representing the revised innovative-buyers group place importance on the determinants composing the Synergy factor, in particular a

Table 4.27. Comparison of Group Means Across the Fourteen Service Attributes

Revised Major Segment 2 versus Sub-Segment 2B

Service Attribute	Stack Ranking	Sample Mean 100%	Revised Segment 2 Mean 44.2 %	Segment 2B Mean 12.4%	Mean Index Revised Segment 2	Mean Index Segment 2B
Track Record	3	29.4	31.8	33.8	1.08 *	1.15 *
Time in Business	9	22.0	23.3	27.3	1.06	1.24
Experience	4	28.3	30.1	28.7	1.06	1.01
EDI Capabilities	7	24.6	30.4	23.0	1.24	0.93
Integrated Services	8	22.8	26.9	21.1	1.18	0.93
ISO 9000	12	14.9	15.9	10.1	1.07	0.68
Breadth of Services	6 **	24.8	27.9	21.4	1.13	0.86
Int'l. Capabilities	11	20.4	20.0	15.9	0.98	0.78
Assume Assets	13	14.7	17.9	9.4	1.22	0.64
Overall Cost	2	29.6	29.1	40.2	0.98	1.36
Operating Flexibility	1	30.5	31.6	42.9	1.04	1.41
Contract Flexibility	5	25.4	26.3	35.7	1.04	1.41
Low Price	6 **	24.8	24.5	33.2	0.99	1.34
Non-Union	10	20.8	19.0	33.5	0.91	1.61

* Mean Index = Segment mean divided by sample mean.

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Table 4.28. Comparison of Revised Major Segment 2 and Sub-Segment 2B Indexed to the Same Mean *

Service Attribute	Revised Segment 2	Sub-Segment 2B
Proven Track Record		+ 0.07
Time in Business		+ 0.18
Experience in Buyer's Industry	+ 0.05	
EDI Capabilities	+ 0.30	
Provision of Integrated Services	+ 0.25	
ISO 9000 Certification	+ 0.39	
Breadth of Services Offered	+ 0.26	
International Capabilities	+ 0.20	
Willing to Assume Assets	+ 0.58	
Overall Cost of Services		+ 0.38
Operating Flexibility		+ 0.37
Contract Flexibility		+ 0.37
Lowest Price		+ 0.35
Non-Union Operation		+ 0.70

* The mean for each service attribute for both segments was divided by the sample mean to create an index. The entries in each column reflect the positive difference between the two segments.

potential supplier's willingness to assume existing assets. This observation is in keeping with the preferences of the innovative-buyers market segment noted in the comparison of the two major market segments. The purchasers in sub-group 2B are also interested in obtaining benefits from the unified management of integrated logistics services. However, their final selection decision is based on efficiency and flexibility objectives, especially those relating to the use of non-union labor. The individuals in this final sub-group may be deemed to be "Cost-Sensitive" buyers. It is also likely that the purchasers in this group are highly adverse to the risk of strikes or unauthorized work stoppages. As indicated above, they represent 12.4% of the total sample population.

Demographic profile of the second minor market segment

A review of the demographic characteristics of the cost sensitive sub-group and the buyers representing the revised innovative-buyers group revealed several differences. However, the same caution noted in the analysis above involving the supplier-oriented sub-segment is applicable here as significant differences in membership size exist between the two groups being compared.

Table 4.29. reveals that the cost-sensitive segment tends to be more firmly committed to outsourcing when is compared with the buyers forming the revised innovative-buyer segment. The smaller segment was also noted to be more heavily represented by retailers and to include a larger percentage of firms earning revenues between 100 to 500 million dollars annually. The demographic comparison also disclosed that firms represented by the Cost-Sensitive buyers are less likely to be involved in international commerce. Further, the use of leased warehouse space was more apparent by the members of this group. Finally, this sub-segment was observed to have a higher concentration of food and beverage companies than that appearing in the revised major segment from which is was derived, i.e., the major innovative-buyer segment.

Table 4.29. Demographic Comparison of Revised Segment 2 and Sub-Segment 2B

Demographic Indices	Sample Frequency (%)	Revised Segment 2 Innovative-Buyers Frequency (%)	Sub-Segment 2B Cost-Sensitive Frequency (%)
Use of Outsourcing			
Manufacturing	43	36	45
Contract Employees	55	49	65
Payroll	29	28	35
Personnel Services	10	7	15
Information Services	27	29	20
Advertising	31	32	45
Product Merchandising	11	12	15
Other	20	15	25
Channel Membership			
Raw Materials Supplier	3	1	5
Component Manufacturer	10	12	10
Finished Product Manu.	63	61	45
Wholesaler	12	16	10
Retailer	10	7	30
Other	3	3	0
Annual Sales ($'s)			
Less than 10 million	0	0	0
10 million to 100 million	11	15	0
100 million to 500 million	22	18	35
500 million to 1 billion	23	28	20
Greater than 1 billion	44	39	45
Scope of Business			
International/Global	56	54	45
North America	21	19	25
U.S. - National	17	20	20
U.S. - Regional	5	7	5
Local	1	0	5

Table 4.29. (continued)

Demographic Indices	Sample Frequency (%)	Revised Segment 2 Innovative-Buyers Frequency (%)	Sub-Segment 2B Cost-Sensitive Frequency (%)
Logistics Function			
Centralized	75	77	75
Logistics Department			
Separate Department	58	63	55
Warehouse Use by Type			
Co. Owned (> 50% of goods)	38	42	37
Co. Leased (> 50% of goods)	12	8	21
Contract (> 50% of goods)	7	12	0
Public (> 50% of goods)	5	4	5
Ship Direct to Customers (> 50% of goods)	18	9	11
Industry Type			
Appliances	1	1	0
Auto	10	13	5
Building Materials	2	3	0
Chemical	11	11	10
Clothing	6	7	5
Computer	8	9	10
Construction Equipment	3	4	0
Department Store	3	3	0
Electronic	11	10	10
Electrical Machinery	3	3	5
Food / Beverage	19	14	25
Hardware	1	0	0
Machine Tools	2	0	0
Metal Products	1	1	0
Office Equipment	3	3	5
Paper	4	3	0
Pharmaceuticals	11	13	20
Rubber	1	1	0
Other	3	1	5

Phase III Implications

The purpose of undertaking Phase III of the research was to determine whether all industrial buyers are seeking similar benefits when they purchase third party logistics services. Current advertising literature from contract logistics providers appears to indicate that sellers perceive buyer needs as homogeneous. In fact, many providers routinely impart a "shotgun" approach to promotion. In essence, these suppliers offer to provide any and all logistics services to every potential customer. If buyers are seeking distinct benefits, the need for customer segmentation will become increasingly important to suppliers. This will occur as the third party logistics market matures.

Analytical analysis of the data obtained from the industrial buyers responding to the mail study revealed three distinct benefits routinely desired in a purchase of third party logistics services. One advantage or benefit factor concerned the need for economy and efficiency from logistics outsourcing. This factor was composed of supplier selection variables associated with initial price, overall cost, and provider flexibility.

A second benefit factor emphasized a preference for service enhancement and cost reduction via the provision of associated logistical services under the management of a single supplier. Variables relating to the supply of integrated services, international capabilities, and a supplier's willingness to assume existing logistical assets composed the second benefit factor.

The final contract logistics benefit desired by industrial buyers was service reliability. This factor was composed of variables associated with a supplier's tenure in servicing a given type of industry, EDI capabilities and overall business longevity. Service reliability was found to be a function of supplier capability, competence and performance.

Four distinct groups of third party logistics buyers were identified from the research data. Two major and two minor market segments were represented by the four customer groups.

The members of both of the major market segments were found to desire benefits related to economy and reliability from their third party logistics supplier selection decision. However, the largest group, composed of almost two-thirds of the buyers, was noted to most prefer the benefit of logistics synergy resulting from the provision of integrated services managed by a single supplier. These buyers expect economy and reliability, but their final selection of a supplier is predicated on the provider's ability add value by effectively merging and managing associated logistical services.

The buyers most preferring synergistic benefits were recognized as "innovative buyers" of third party logistics services. The other major market segment, composed of approximately one-third of the research participants, were deemed to be "traditional purchasers" of distribution related services. These buyers were noted to be most concerned with economy and reliability when they chose a third party logistics supplier.

A demographic comparison of the firms represented by the two major market segments revealed that innovative buyers were more likely to be involved in the manufacture of finished goods, conduct business on an international scale, and ship their products directly to customers. Thus, channel structure, scope of operation and logistics strategy may influence the third party logistics decision making process. These attributes appear to impact the area of benefit deemed most critical in a supplier selection decision.

The two minor market segments were identified as sub-segments of the innovative buyer group. The largest of these two segments represented twelve percent of all the mail survey respondents while the smallest segment accounted for only four percent. The members of the two minor market segments were noted to prefer synergistic benefits from logistics outsourcing. However, they differed in the variables considered most determinant in the final selection of a supplier.

The smallest sub-group was found to differentiate between potential suppliers by concentrating on issues relating to service consistency and financial capacity. Specifically, provider choice was noted to be dependent on ISO 9000 certification of service processes and the ability of a supplier to acquire existing proprietary logistical assets. The purchasing attributes of this group characterize the members as supplier-oriented in their decision process. The implications of this strategy relate to limited supplier search and highly restrictive screening and qualification criteria.

An analysis of the supplier selection data for the largest sub-group of the major market segment revealed these buyers to be highly cost conscious in their purchase of third party logistics services. However, as members of the innovative buyers segment, they are initially seeking benefits from the provision of integrated logistics services. Their preferences do not indicate an extensive focus on economy and reliability to the exclusion of logistics synergy, as displayed by members of the major market segment composed of traditional buyers.

The buyers constituting the large sub-group were found to differentiate among suppliers, during the final stages of selection, on variables associated with flexibility. After identifying suppliers with the ability to provide synergistic benefits from logistics outsourcing, these purchasers are very adamant in their need for the flexibility, stability and cost effectiveness of a non-union operation. Thus, a firm's operational strategy concerning labor issues influences its third party logistics supplier selection process.

The preponderance of evidence from analyses of the research data supports a finding that benefit based customer segmentation is feasible in the third party logistics market. The data indicate that two major and two minor market segments exist. Thus, one may safely reject the null hypothesis raised in chapter three that third party logistics buyers do not differ in the benefits they seek when purchasing third party logistics services.

Third party logistics benefit preferences are apparent among industrial buyers. A number of organizational and operational attributes appear to influence the degree to which decision making units express a desire for the benefits of Economy, Reliability and logistics Synergy. The major difference relates to purchasers primarily concerned with the selection of an economical and reliable supplier versus those who expect economy and reliability and demand additional benefits from the provision of integrated logistical services.

Chapter V.

RESEARCH SUMMARY AND IMPLICATIONS

The measure of any research effort is the theoretical or applied value that is added to a disciple as a result of the study. The purpose of this final chapter is to summarize the research, review the major findings, present conclusions and address future research needs. Initially the scope of the study is revisited to highlight the objectives, data, and methods of the research and limitations on the generalizability of the findings. The second section summarizes the implications of the purchasing process model and the major findings concerning organizational buying behavior and industrial marketing. Next, conclusions are drawn from the findings as they apply to buyers and sellers of third party logistics services. The final section includes recommendations for further study.

Research Summary

This research originated from a desire to understand how organizational buyers proceed in outsourcing their logistical requirements and selecting third party suppliers. The first objective of the study was the formulation of a conceptual model of the third party logistics purchasing process. However, as the study of organizational buyer behavior exists to advance the practice of industrial marketing, the dissertation also addressed a need for buyer segmentation in this new market. A knowledge of buyer behavior is required to develop an effective and efficient marketing strategy. Therefore, the second objective of the research was to determine whether knowledge of the purchasing process could be used to identify benefit based buyer segments in the third party logistics market. Three methods of discovery were used; namely, a focus group, in-depth field case studies and a mail survey. The research was exploratory in design and character.

An in-depth focus group interview involving senior managers from eleven different manufacturing organizations was held to identify constructs and obtain pre-scientific knowledge of the third party logistics market. All the participants were key decision makers in their firms' recent decision to outsource logistics and select a third party supplier for the provision of these vital services. The focus group provided preliminary insight from industrial buyers regarding the concept of third party logistics, current suppliers, and the acquisition process. The interview also helped structure topics and questions that were subsequently used in a series of in-depth field case studies and the development of a mail questionnaire.

In-depth case studies were conducted with the members of third party logistics decision making units from five manufacturing organizations. Each of these teams had recently completed the buying process or was engaged in the evaluation or selection of a third party logistics supplier at the time the case study was completed. Detailed insight of acquisition methods and the third party logistics procurement process were obtained from this phase of the research. Results from the case studies also facilitated the design of the mail questionnaire that was used to gather behavioral data from an important group of industrial buyers. The results of the case studies are generalizable to a conceptual model of the acquisition process.

As no source identifying third party logistics users was available to the researcher, a data base of potential respondents was constructed from three areas. Popular press publications, suppliers' promotional brochures and the membership roster of the Council of Logistics Management, representing manufacturing and merchandising companies, were used to develop a population of potential third party logistics purchasers. Twelve hundred and seventy-nine firms were identified from the three sources. The questionnaires were mailed to managers most likely to be involved in the evaluation or selection of third party logistics suppliers. Two-hundred and sixty-three completed questionnaires were received; forty-four mail surveys were returned

unopened as a result of improper or inadequate addressees. Attitude and descriptive data as well as demographic information were obtained. An overall response rate of 21.3% (263/1235) was realized from the mail survey. This response level falls within previously reported acceptable levels for this research method.

Data was collected on two hundred and thirty-nine variables in the mail questionnaire. The survey included decision variables such as the factors prompting a firm to outsource logistics and specific services obtained in the purchase. Other decision variables measured the degree of integration among the external services provided and strategies regarding the use of third party logistics services. Individual variables, concerning the amount of risk inherent in the purchase decision and the perceived importance and variability of thirty supplier selection attributes, were measured in the mail survey. Further, interpersonal variables relating to the role played by members of the decision making unit and others in the organization were also included in the questionnaire. Finally, company specific demographic variables such as channel member type, geographical scope of operation, annual sales revenue, and the degree of organizational centralization in the logistics function were measured in the questionnaire.

Findings from the Research

One of the objectives of this research was to develop a conceptual framework of the third party logistics procurement process. The model formulated and presented was the result of exploratory research. It was primarily based on findings from the in-depth case studies. Therefore, it represents an initial effort to characterize the purchasing process and related activities between buyers, sellers and other individuals influential in the decision process.

The model revealed that the purchasing process followed by industrial buyers participating in this research consisted of five stages or phases, i.e., need awareness, solution development, supplier selection, service adoption and service assessment. The framework is a

simplified depiction of a complex decision. It was presented in a linear format; however, the process did not always proceed in exactly this manner. The third party logistics supplier selection decision was found to result from an iterative process that requires cycling and recycling through the phases. While the model is a fundamental representation of an intricate decision, it's provides researchers with the basic structure of the buying process.

Industrial buyers were noted to become aware of the need for a third party logistics purchase as a result of problems more often than opportunities. The most common problems concerned the need to reduce cost, improve customer service and alleviate space constraints. An internal or external supporter or "champion" was often required to initiate and promote the idea of third party logistics within an organization. Hired consultants and auditors were found to be instrumental in enhancing need recognition. Also, senior executives, financial officers and logistics managers recognized and defined the problems and opportunities prompting a consideration of logistics outsourcing.

The solution development stage was found to be the most time consuming phase of the third party logistics buying process, especially for those seeking to purchase highly integrated logistics services. Conceptualization of solution alternatives was often limited within decision making units. Buyers were found to rely heavily on potential suppliers for problem diagnosis and solution development. Providers were also noted to be involved in the design and structure of formal proposal packages.

Potential suppliers were identified from a variety of sources; however, the recommendations of trusted business colleagues, hired consultants and firms currently supplying the organization with distribution related services were common sources of reference. Only one tailor made solution was developed by firms seeking to purchase integrated services. Organizational buyers seeking less integrated services defined their needs more narrowly and

relied on an in-house team to devise and seek ready-made solution alternatives. However, potential suppliers often served to broaden the scope of need awareness among firms only seeking to replace an existing proprietary system with an external provider.

The selection of a third party logistics supplier was found to rely on analysis, bargaining and judgment. The process consisted of multiple sub-stages and involved qualitative and quantitative criteria. Supplier capability was often subjectively measured against the qualifying criteria. Analysis was used by members of the third party logistics decision making unit to determine service capabilities and performance levels before considering cost.

Six suppliers, on average, were initially identified as serious candidates and three were formally evaluated. The final selection decision relied most heavily on the judgment of those authorizing the purchase. A number of factors such as politics, power and personality played important roles in the final choice of a supplier. Selection criteria were modified during the screening process to reflect the requests of managers influential in the final authorization of the purchase. The most important sources of information in the decision were internal and external business colleagues of buying team members and references from existing and former customers of providers.

The service adoption phase of the buying process represented the initiation of service or implementation of the logistical alliance between the buyer and supplier. This phase was found to play a key role in customer satisfaction as it offered the first tangible opportunity to measure the selected provider's performance. The time leading to service adoption was noted to vary significantly. When highly integrated services were bought, the shift to full service adoption followed a staggered implementation strategy and extended over an extended time horizon, i.e., up to a year or more. When less integrated services were obtained, full service was implemented

in a relatively short period, e.g., within two weeks after supplier selection. Service contracts usually extended from one to three years.

The final phase of the buying process entailed service assessment. This is an ongoing phase and consists of qualitative and quantitative evaluations. Service performance was found to be measured frequently, even daily on an informal basis. Cost and service levels were noted to be formally measured at monthly or quarterly intervals. The importance of cultural compatibility was important in the assessment stage as much of the service delivery process was found to focus on the relationship between the individuals in the logistical alliance. Benchmarking was noted to be employed to evaluate a suppliers' overall performance at critical points in the agreement, such as the expiration of a contract period.

The second objective of the study was to determine whether industrial buyers could be grouped into market segments based on the benefits sought in the purchase of third party logistics services. This phase of the research utilized respondents' ratings on thirty supplier selection criteria. The criteria were derived from the literature review, focus group and case studies. Factor analysis was used to condense the thirty supplier selection variables and describe the interrelationships among the variables. Ward's minimum-variance agglomerative hierarchical clustering algorithm was used to group the third party logistics buyers based on the factor analysis results.

The principal components model was employed to extract factors. Cattell's[359] scree test was used to identify the number of non-trivial factors. This was followed by a varimax rotation to enhance interpretation and obtain a simpler structure. Three factors, resolving 51.4% of the total variance, resulted from the above procedure. The factors described the relationships among

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[359] Cattell, R., "The Scree Test for the Number of Factors," *Multivariate Behavioral Research*, Vol. 1, No. 2, 1966.

the original supplier selection variables. These variables represented the benefits sought by industrial buyers in their purchase of third party logistics services.

The first factor was found to describe the economy resulting from logistics outsourcing; it was related to cost, price and flexibility. The second factor represented the advantage of synergy derived from the purchase of integrated third party logistics services. The variables "loading" on this factor related to the level and degree of integration among services and the breadth of services offered by a supplier. The last factor was noted to describe the benefit of reliability resulting from a purchase of contract logistics services. It was composed of variables related to supplier competence and longevity.

The results of the factor analysis were used as input to a cluster analysis algorithm to classify the industrial buyers responding to the mail survey. The buyers were grouped according to their ratings on the variables composing the Economy, Synergy, and Reliability factors. Four groups or market segments were identified; two major and two minor segments. The two minor segments were noted to be sub-segments of one of the major segments. The two major segments were found to differ on their ratings of three variables associated with the benefit of synergy. Thus, one of the major segments was found to be seeking more innovative benefits from its purchase of third party logistics services. The other group was noted to be satisfied with the more traditional benefits of economy and reliability. The two minor groups represented sub-segments of the innovative buyer segment. The smallest of the two highly valued financial capabilities and international service attributes in their selection of a third party logistics supplier. The other sub-group was noted seek the most economical supplier, after its need for integrated service provision had been satisfied.

Conclusions from the Research

It is evident from the third party logistics purchasing process that marketers need to develop relationships with individuals influential in promoting logistics outsourcing. Outside consultants and financial auditors were found to be acutely involved in the need awareness stage of the buying process. Corporate purchasing and financial officers were also noted to be instrumental in bringing the subject to the attention of executives.

Proven levels of performance and provider credibility are critical to supplier choice in the third party logistics market. Since tangible "products" do not exist in this type of purchase, the most meaningful measurements take the form of referrals from logistics managers and references from existing or former customers. While non-personal sources of information are sometimes used to initially identify and screen potential suppliers, the advice and recommendations of colleagues and friends represent the most important sources of information in supplier selection. Marketers must strengthen their service offerings by influencing these verification sources or "cues" to gain an advantage in the decision process.

Supplier selection criteria were noted to change during the decision making process. Requirements become more qualitative as the buying procedure progresses from solution development to supplier selection. Members of the decision making unit may not be aware of all the selection criteria, especially when final authorization for the purchase must be obtained from influential individuals not directly involved in the previous stages of the process. Providers must identify and discern the perspectives of these individuals as well as those of the procurement team to be successful in this market. The early identification of the "economic" buyer is critical to success.

This research applied the concept of benefit segmentation first posited by Russell Haley[360] to the third party logistics market and identified two major benefit segments and two minor benefit segments. Thus, the alternate hypothesis, i.e., third party logistics buyers, representing different industries, are seeking distinct benefits in their acquisition of third party logistics services, raised in chapter three is supported by the research results. The market segments were based on a bundle of service attributes desired by third party logistics buyers.

Both of the major segments were found to highly value benefits relating to economy and reliability in their third party logistics supplier selection decisions. However, the largest of the two segments, consisting of sixty percent of the buyers, was noted to differentiate among supplier candidates on synergistic benefits resulting from the provision of integrated logistics services. This customer group was found to include a higher percentage of finished good manufacturers conducting business on a global basis and shipping products directly to their customers. The buyers in this segment are seeking to improve the efficiency and responsiveness of their logistics system. However, final selection relies on a supplier's ability to accomplish these goals via the provision of integrated services that promote synergy across the distribution network.

It is apparent that all the industrial buyers participating in this research were expecting reliable service and stable or reduced costs to result from their logistics outsourcing decision. These were the minimum objectives of buyers and accomplishment of these goals had to be substantiated by all candidates seriously considered for selection. Moreover, verification of supplier competence was noted to be based on referrals and customer references, especially for buyers without first-hand experience with a provider. However, there is a significant customer

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360 Haley, R., "Benefit Segmentation: A Decision Oriented Tool," *Journal of Marketing*, Vol. 32, 1968.

group that demands more than economy and reliability from the supplier they select to provide logistical support services. This group desires ongoing benefits from the cohesive management of the services it outsources. Suppliers attempting to serve these customers must be able to offer more than mere economy and reliability.

This research provides third party logistics marketers with a methodology for identifying customer segments based on benefits rather than arbitrary demographic measures. Two major groups of buyers were identified in this study. The smallest segment, representing approximately one-third of the purchasers, was shown to highly value selection criteria relating to economy and service reliability during the negotiations leading to supplier choice. The largest customer group also valued economy and reliability, but final selection was found to be based on the value added from the provision of highly integrated services managed by a single supplier.

Benefit based segmentation is an effective method of segregating customers as it provides a substantive basis for the existence of customer groups. This type of customer aggregation provides the springboard for successful marketing strategy development and the efficient use of resources. The research results indicate that suppliers cannot consider all third party logistics buyers similar in the benefits they seek from a contract logistics purchase.

A "shakeout" is currently occurring among third party logistics providers; however, competition is likely to be rigorous in the foreseeable future. Third party suppliers must become adept at matching their service offerings to customer needs to gain a competitive advantage in the marketplace. The results of this study provide insight into the purchasing methodology and preferences of industrial buyers regarding the acquisition of third party logistics services.

This dissertation provides industrial buyers with a descriptive, theoretical model for the purchase of contract logistics services. It is a simplified template of the decision making process. The basic framework consists of five stages or phases. The most time consuming and

complex step was found to be solution development. Industrial buyers often do not have a clear conceptualization of solution alternatives and data is routinely lacking to guide preliminary cost and service analyses. Much time is spent attempting to gather the necessary information within the organization. Members of the buying team were also noted to lack critical information (selection criteria) regarding supplier qualification from senior executives charged with final authorization.

Industrial buyer behavior concerning the purchase of strategic operating services was addressed by this study. The research results confirm that the decision process follows a structured path. However, the buying procedure is not necessarily linear and all phases are not completed in every selection decision.

The relative value of information was noted to change as the selection process continued through its various phases. Initially, evidence of service capabilities and performance were highly valued. The financial status of potential providers was also considered very important during the early stages of solution development and supplier selection. Moreover, solution development and supplier selection were commonly noted to occur simultaneously.

Price was not investigated until service performance was validated. However, cost was usually not an overriding issue in the final selection of a provider. This occurred as logistics outsourcing routinely maintained or reduced existing proprietary cost levels.

Once service and cost performance were ascertained, the most salient factors in the final selection of a third party logistics supplier were provider trustworthiness and the degree of cultural compatibility existing between the buying and selling organizations. The most valued information at this critical stage in the process was often the advice solicited by the senior logistics manger of the buying team from business colleagues, external to the firm, and the personal preferences of executives responsible for final authorization.

Future Research Needs

The purchase of third party logistics services involves multiple representatives from buyer and seller organizations. A dyadic or network relationship exists. The perspective of the seller was not evaluated in this research. It is an important to broaden the research to include this viewpoint to more fully characterize the purchasing process.

As reported in the findings from Phase II of this research, the buying process is not linear for all firms. A variety of modifications to the conceptual framework developed herein are possible and probable. This leads to a question regarding the most feasible method of selecting third party logistics providers. A "best practices" study is needed to identify the process most likely to result in successful decisions.

The benefit factors derived from this research resolved approximately one-half of the variance represented by the supplier selection variables. This is not uncommon in an exploratory study; however, future research is needed to substantiate the results. Measurement error may have served to limit the explanatory ability of the factors and additional supplier selection criteria and benefit factors probably exist. The provision of additional benefit factors may also assist in refining the market segments identified in this research.

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Appendices

Appendix A

Focus Group Topical Outline and Interview Excerpts

TOPIC 1 - DEFINITION OF THIRD PARTY / CONTRACT LOGISTICS

1.1 What does the term third party logistics mean to you?

1.2 What activities does third party logistics encompass?

1.3 What types of third party providers exist?

1.4 Who, in your opinion, are the major providers of third party logistics services?

TOPIC 2 - PERCEPTIONS OF THIRD PARTY / CONTRACT LOGISTICS

2.1 What, if any, value does (or could) third party logistics offer to your organization? Please explain.

2.2 What the positive / negative aspects of third party logistics? Please explain.

2.3 What are the risks / rewards of outsourcing logistics activities?

2.4 Do you believe that third party logistics suppliers should be strategically aligned with their customers?

2.5 What type of third party providers are you the most comfortable with? Why?

2.6 What are the strengths / weaknesses of the current third party providers?

a. Transportation based providers
b. Warehouse based providers
c. Management or Information based providers
d. Shipper based providers

2.7 Who are the most innovative third party providers?

2.8 How important are the following third party provider attributes?

a. The ability to manage all logistical activities on an integrated basis
b. The provision of consulting services on system design, re-engineering, etc.
c. The provision of a real-time, integrated information system
d. The ability to offer one stop shopping and invoicing
e. Available capital for future growth needs
f. A well documented track record in your particular industry

TOPIC 3 - THIRD PARTY SERVICES IMPLEMENTATION LEVEL

3.1 Has your organization outsourced any activities / services?

- a. What logistical activities?
- b. What non-logistical activities
- c. Have you done this on a company-wide or a facility-by-facility basis?

3.2 If you have not outsourced, why not?

- a. Have you or are you currently considering outsourcing?

3.3 Has you organization reassumed the provision of services that were previously outsourced? Why?

3.4 Have you expanded the scope of outsourcing since you initial effort?

3.5 Would you consider outsourcing other activities / services based on you results-to-date? Why or Why not?

TOPIC 4 - THIRD PARTY LOGISTICS SERVICES PURCHASING PROCESS

4.1 How would you or did you identify the need to outsource?

- a. Who initiated the effort?
- b. What are or were your needs?
- c. Was there a "trigger event" that led to outsourcing? What was it?
- d. Who was or is involved in the needs determination?
- e. Did you involve outsiders (consultants or third party providers) in the purchasing decision process?

4.2 Who would be or was involved in the decision to outsource?

4.3 Who was the "champion" of your outsourcing strategy?

4.4 What are or were you third party purchasing goals?

- a. Who developed the goals?
- b. What is the basis of your goals, i.e., cost, service, or value driven?

4.5 What are or were your selection criteria for choosing a third party logistics provider?

4.6 How did you find out about the capabilities and performance history of potential third party logistics suppliers?

4.7 What differentiates your current provider(s) from those not chosen?

4.8 What types of process, i.e., competitive bidding, invitation, etc., would you or did you follow to select a provider?

4.9 How long did it take your organization to decide that your firm should outsource?

a. How long did it take your organization to select a third party supplier?
b. How long did it take your organization to implement action once a supplier was chosen?

4.10 What do you consider to be the ideal method of compensation for the provision of third party logistics services? (i.e.) charge per unit, cost plus, management fee, etc.)

4.11 Did you have a plan or strategy for turning over activities to your third party providers?

TOPIC 5 - SATISFACTION / DISSATISFACTION WITH THIRD PARTY LOGISTICS

5.1 What is your experience thus far with logistics outsourcing?

a. Concerning your overall level of satisfaction?
b. Concerning cost savings?
c. Concerning customer service?
d. Concerning control?
e. Concerning value?

5.2 How would you rate your third party providers performance to-date?

5.3 Has third party logistics provided any benefits that you did not anticipate?

5.4 Has there been an unanticipated, negative side-effects to outsourcing?

5.5 What are third party logistics providers not doing that, if changed, would improve their performance?

5.6 What is your profile of the ideal third party logistics provider?

TOPIC 6 - FUTURE STRATEGY / FUTURE OF THIRD PARTY LOGISTICS

6.1 What third party provider characteristics or dimensions would entice you to consider outsourcing or to consider outsourcing additional activities?

6.2 What issues or events would lead your organization toward outsourcing?

6.3 Do you think that third party logistics will grow?

6.4 What issues or events would enhance the growth of third party logistics?

6.5 What type of third party providers will ultimately be the most successful?

a. Asset based vs. Non-asset based
b. Transportation vs. Warehouse based
c. Integrated suppliers vs. Functional suppliers
d. Regional vs. National vs. Global suppliers
e. General capabilities vs. Industry specific capabilities

Focus Group Excerpts

- **What does the term third party logistics mean to you? What kinds of things come to mind?**

"It's a independent party to service a variety of distribution functions you don't want to handle internally. Whether it be storage and handling and a variety of other administrative things to support those functions"

"Invoicing, order-entry, inventory, receiving, assembly, service, set-up"

"Return goods, processing, network consulting, freight audit and payments"

"Contract delivery"

"EDI clearinghouses for order transmissions"

"Marking and labeling and consolidation/de-consolidation"

"Household goods movements"

"Forecasting and inventory management services"

"Driver leasing"

"Temporary management - distribution managers and traffic managers"

"Warehouse design and layout -- network consulting"

"Load tendering" .

- **How many of the following functions are important to you and your company -- either right now or in the near future?**

  -- Shipping, order entry, inventory records, forwarding and brokering?

Eight of eleven participants agreed with the statement

--Assembly and set-up, packaging, return goods processing, network consulting, contract delivery, EDI, marking and labeling, consolidation, household goods movement, forecasting, manpower/hourly/contract employers?

Six of eleven agreed with the statement

- **What companies provide these services? Who are the suppliers that come to mind?**

Group responses: "Caterpillar Logistics, GATX, National Distribution Centers, Trammel Crow, ROLS - Roadway Logistics Services, USCO services, Leaseway, Menlo, TNT, Stokes Nielsen, Schneider Logistics, J. B. Hunt Logistics, LINK (Central Transport), Ryder, Gondrand, Cass Logistics, Williams, Tranzact, Berry and Lloyd, Klein-Schmidt, MTB, Southern Motor Carriers, and National Transportation Payment"

- **How do these companies differ?**

"Some have grown out of transportation companies and others have grown out of warehousing and distribution"

"Some have grown out of manufacturing; they have excess warehouse space and systems capability to sell"

"Some have an information systems/software background"

- **Does the origin of a third party logistics supplier make any difference to you as an industrial buyer.**

"It does to me because I have positive experiences with companies who have been either in the transportation or warehousing and customer delivery business, the rest of them are peripheral support kinds of services. I find very difficult to image that a party logistics provider will grow from an audit/payment company to providing operational services. Fundamentally you must start with the operational expertise"

"I think it's very important to understand the supplier's frame of reference. It's very difficult to use a one stop shop, when you're looking for a particular need/task/function. Generalists cannot get that specific"

- **Which of the previously mentioned companies have origins close to a one stop shop or are highly integrated?**

"GATX, Roadway, Leaseway, Dry Storage and Caterpillar Logistics Services"

"These companies know what's it's like to be out on the line, providing service and what it takes to manage cost-effectively"

- **Functionally, what's the liability of the company that doesn't have an integrated background?**

"Basically, I think it's comforting to know a supplier has the background and the experience that would be appropriate to the goals you are attempting to reach"

"I think a lot of these companies are starting from the relationship they have with a shipper. A shipper will say 'I'd like to have this done,' and they take it a step further and they figure out how they can offer a multitude of operations. The relationship already exists and that is how it expands"

"I would view it as the previous or root company's experience actually servicing a company directly as opposed to being on the periphery and trying to move into that area. I would feel much more comfortable with someone who has been providing the actual service for a customer. They understand what it's like to have to meet those various needs. I would feel comfortable with a company like this expanding back up through the organization by adding supplemental services such as software expertise, order entry or something like. I would not feel comfortable seeing someone coming out of the financial market and trying to run a warehouse"

"For us, it has to do with what their core competencies are and how established their networks are"

- **How about the fact that some of these companies are asset owners and others specialize in the fact that they don't have assets? Do you think it is important?**

"They do, they argue about it and sell on that"

"I think it is central because when I'm in the decision making mode, the only reason I consider third party services is when capital is tight -- too tight for us to purchase the assets. I want somebody who really has operational assets, space and equipment and knows how to operate them and keep the operating costs low. When we start up a contract operation, it is very hard to justify the capital to replace that third party provider -- once it's off the ground"

- "If we're in a capital rationing mode I won't invest in the brick and mortar to surround the inventory. If the third party has good asset management and keeps space costs and labor costs low through volume throughput, I can never justify the capital to replace them"

- **What are the things you look for when you are evaluating a third party logistics supplier?**

"Financial strength"

"Sometimes I'm shopping price, I have a niche, looking for price. Other times I'm looking for an ability to handle capacity"

"Compatibility of computer systems"

"Price"

"Technical competence"

"Verification of existing or previous customer references"

"Flexibility, our business conditions change hourly, we're moving manufacturing from one plant to another at the spur of the moment and we need equipment or warehousing space tomorrow for two or three hours. . . someone who can match our needs"

- **Some of these companies mentioned previously...ROLS, Menlo, etc. are less-than-truckload (LTL) carriers that have third party logistics divisions. Do you automatically associate attributes of the parent company with the contract logistics organization?**

"I think the companies would like you to think that. But in reality, when you sit across the table with them, they really don't have the expertise . . . that was the case with RPS when they started the business 7 years ago. They brought all kinds of LTL people in and the small package business is entirely different"

"If you're talking about an LTL carrier going into dedicated contract carriage I would say the transfer is simple, if you're talking about an LTL carrier setting up a warehouse and saying that they can take orders, process orders, do all the warehousing and distribution functions, I would say no. I would be very skeptical, because there is a big difference between that and cross-docking freight"

"It depends on what their base skill is. From this point it may or may not make a difference who the owner is"

"I see it as a slow evolution, I don't see an USCO or Trammell-Crowe getting into freight payment or selling me consulting services for anything other than site selection. They should expand on what they already do well, provide me with more service. At some point when they've built that competency, then they expand further, maybe into transportation or something. I think it an evolutionary process. I think if they try to make a leap, they lose a lot of creditability as far as trying to transfer competencies across the gap"

- **Would it be better for a transportation company and a warehouse company join forces?**

"To me it would. If you merged a company with a strong history in transportation with an efficient warehousing organization -- that would be a strong partnership. They could combine their core competencies and pull some costs out of the system"

"If somebody walks in off the street selling and tells me "no problem" it scares me - they don't understand our wants or needs. But if someone asks a whole series of questions based on understanding from having done it before - - then that's impressive"

- **Are third party logistics suppliers good at selling their competencies?**

"It seems like they are all hanging shingles out. I keep getting these things with the strangest services being offered by companies, but the credibility just isn't there. It's awfully hard to know"

"I think we all sense that this is an important function, inventory management -- the flow of goods is becoming more and more critical. Everybody is trying to jump on this thing and ride the wave. They try to pawn themselves off as an expert, but you have to be extremely careful"

- **Do you differentiate at all between the suppliers that would come in and offer to do things that you are currently doing for yourself versus the supplier who comes in and wants to be a partner in business process improvement? To be strategically involved?**

"That's what we want. We're about to enter some new areas. We want someone to work with us to achieve that"

"There is a third category. There are some that use this as a front to funnel sales to their core competency, such as an LTL business. These are the guys that come in and say 'No problem, we'll set something up to get it to the hub'

- **We probably listed forty or fifty potential functions a third party logistics supplier might perform. What's really the most important thing that you are really seeking from a potential provider?**

"Core competency"

"It would depend on what service you're shopping for; whatever it is that I'm outsourcing or looking for a third party to handle for me. I would want to select from a list of people who have a reputation and possess verifiable core competencies"

"I have to look at where I'm weak. What is my number one weakness? That's where I need help. I can't take care of a bubble, I don't know where it's going to be -- is it in California, New England, Florida? So I need somebody who's got some trailers or can handle a bubble anywhere in the country. If I had to narrow it down to one, I'd have to go for size. Somebody who can serve as an umbrella, that would be more important than price. If I can't handle something, I'm dead. I'm looking primarily at shipping; warehousing is more of a side issue for me -- finding a third party supplier who can respond to my business"

- **What are the key attributes that a third party logistics supplier must possess to be successful?**

"In my case it would be the breadth of service that they provide. We're not trying to off-load any particular function that we currently perform in-house. Rather we're trying to get into some new markets and do some new things. So we're looking for somebody who can do that -- somebody who sees the big picture"

"Adding on to that, I think financial strength is important. If you're going to marry somebody, you want to make sure they're going to be around for awhile. That's my number two"

"I seek technical competencies"

"I'm going to go ahead and say it . . . PRICE! I think the process that leads you to price is the important thing and we haven't gotten to that yet"

"I think it's the reliability and integrity of the function that you are outsourcing. If they commit to performing the particular service for you, you know that the function will be performed"

"Sometimes it's location"

"Number one is core competency. If they can truly do the pricing and they've developed a reputation, it's no contest"

"I want to pick a partner that I am important to, I don't want to be some little fish down there that they fit in whenever they can. I don't have to be their number one customer, but I want to be one of their top four or five or customers so that I am important."

- **What about an industry like this where you have so many companies trying to make an initial impact? Some of whom have financial strength – but they are willing take a loss to obtain business?**

"All of them do when they first start out, they'll tell you so"

"We've begun to steer clear of that in our organization, especially so in the transportation and warehousing arenas. We spend too much time getting a facility operating the way we want it to operate or a carrier to provide the services that we want them to provide. They're either pricing themselves out of the business or we know that they're going to have to come back and ask for more money later. We have a tendency to steer clear of that. We know that means that they don't know their business well enough or the services are not going to be there"

"It tells me whether they are competent. If they can price the business accurately, it tells me that they understand it, they've asked the right questions and they're prepared to provide the service at a reasonable cost"

- **What are the pros and cons of using third party logistics?**

"Control. When you have it directly under your area and your four walls, sometimes you have sense that you have control over it. There are pros and cons with that. In some of the more definitive areas that we do outsource, I have a comfortable feeling that they have better control over it. In other areas, I would never consider outsourcing"

"They don't adequately represent the image you want to convey -- your attitude, your culture. They really are an extension of you. It could be their interaction with your plants, in particular, their interaction with your customers"

"Allows you to concentrate your capital, your brain power, etc. on other parts of the business that you find more strategic"

"Combined knowledge in something that can be beneficial to both parties"

"There is a price issue. There's no way in our organization that we can have a network of forty plus locations across the country and own them all. The flexibility to move with the market without a significant cost implication"

"Flexibility, especially as you get into the warehousing network, because as your customer base changes or as you grow or diminish in size in a particular segment, your distribution network may need changing. It's an economic question"

"I think it helps you manage the risk while making a capital decision. Where you are weak, rather than tie up your resources, you can solicit a third party. It's less risky than jumping in yourself. You do sacrifice some control, but most of us have to do that"

"I think in-house expertise fades with the use of third party logistics. Eventually you'll get to the point where you don't have the oversight capability that you currently have -- if you don't continue to develop the knowledge base in-house"

"Sometimes our competitors use the fact that we don't perform one of these specific functions any more - that we use a third party - against us. They try to tell customers that they have higher level of control than our company. Sometimes our competitors use this as part of their story. . . we're not as competent, flexible or capable as they are . . . They own the truck fleet, own a warehouse, etc."

- **Is it possible to actually gain control by using a third party logistics supplier?**

"In logistics I think we're all the same. We are very heavily drawn into vendor-managed inventory for our customers. We have to manage the entire pipeline between their plant and our plant. It's hard to put a third party in there and give confidence to your largest customers that you can manage their inventory by giving it to a third party, because you lose creditability. On the other had an advantage is quick global support. Our customers who conduct international commerce are insisting, as a condition of doing business, that we must also be global and sometimes the fastest way to create that presence is with a third party logistics supplier -- and that is precisely what we are doing. We can use them to get the operation going faster than we could develop it ourselves"

- **What is it that causes you to get serious about looking for a third party supplier? Are there any trigger events that cause you to say "it's time to go shopping"?**

"Probably time frame. You don't have the time to develop the resources. If you can find the right capabilities externally, you can do it much more quickly"

"It involves some type of expansion - new product line or markets"

"Cost reduction programs, it doesn't make economic sense to pursue another alternative"

"We find we need more competency than we have or some technical expertise that we don't have and go out to find out what it will cost us to obtain that expertise. When we do that we look what at our in-house cost vs. third party cost as a bench mark and make a determination from there"

"Customer requirements and customer demands. Our customers want their merchandise the next day. In a foreign market that we can't supply with next day service, how else would we get there without brick and mortar and still meet the customer's expectations?"

"I think for us it is to reduce risk. Two examples come to mind. One is in systems development, if we need access to a large expensive system and we don't want to take the risk of tying it up ourselves and somebody's already got it. We did that internationally. We chose a third party who had the system in place that could ship internationally and knew all the requirements without having to develop them. As another example: we were entering a new market and didn't want to take the risk of investment on our own -- in case the thing didn't pan out. We purposely started out

with a third party and later brought it in-house to save the twelve percent profit-margin. We evaluated it, we could do it less expensively, but we didn't want to take the risk until it was a proven market opportunity"

"We have the reverse of that. We had a significant customer buying from us domestically and selling and distributing and redistributing internationally through their internal network, particularly in Europe. They sold off that part of their business, so to retain the market we took the distribution and sales on ourselves but through a third party"

"We're beginning to be driven by our customer needs/customer demands to distribute through the people they want us to distribute through. We've been a direct-supplier for as long as we've been in business and most recently we're getting a lot of requests for us to distribute through the customers preferred channel"

"I used to think that were certain services that you would never trust a third party to perform. You just don't get a third party involved in a relationship that is that very close to your customers. Now, I just realize there isn't a single service that a third party can't perform as well as or better than we perform ourselves. Some of the services that customers are asking for today are new services. In order for us to perform them, we would have to drastically change our own operations. So if there's a third party that's already performing these functions, it's opens you up to the possibility of outsourcing. If it spreads the overhead of funding it and gets us in there faster and cheaper than doing it ourselves -- we ought to consider it"

- **Does higher management act as a "trigger point" for the evaluation or purchase of third party logistics services?**

" That's a very interesting marketing point. Providers always send literature to the CEO and it comes trickling down with the message "what about this?"

"The provider's message always says 'We can do it better than you own people can do it.' So the message that comes down is -- justify your own existence"

"Yes, in order to achieve the end objective, you've got to do whatever is necessary. We're not large enough to have a complement of staff in all of those arenas, so therefore I'll go out and contract a third party for whatever we need. I mentioned we're expanding into Europe. We evaluated "partner-shipping" with some customers who want to get more into our end of the business. We were interested but we thought the price was too high. Therefore we looked at alternatives -- including third party logistics"

- **How about the issue of core competency within your company? Where does a company choose to put it's strategic chips? One of the popular thoughts today is that you can't be strategically impressive in every possible way -- some areas are more important than others. Is that a trigger kind of event or philosophy?**

"You bring up strategy. We don't really have a strategic plan, we have logistics. We act more than we plan ahead and that bothers me. If I look at strengths, one that made this company is basically being responsive to the customers needs by anticipating that customers needs. The company I work for has offered same day shipping within two hours of the item being ordered for twenty-five years.

Now everybody else does essentially that same thing and that strategic advantage is down to a minute difference. We have to find other ways of expanding in other areas that which would allow us to be the number one supplier to our customers. Price is getting to be an issue now, so you have to find ways of doing it just as good, but a little bit better in price"

"We use a number of third parties for different things, I guess we would classify most of our uses to be small in comparison to a large strategic project. However, last year our Board of Directors added a new member who is the CEO of a third party logistics company. About the same time we had a strategic project that came up. A major distribution center expansion and relocation of our central distribution center. The project that evolved was a head-to-head comparison of our services vs. those available from a third party provider. Project teams were put together and every aspect of cost was shared, including their profit and expenses, etc. It was eye-opening. They opened the kimono and so did we. It turned out that because of the location we were choosing, the cost was so low in terms of land acquisition, building and labor, that the only difference between the two companies operating that facility was their profit margin. Had we gone into a higher-cost environment, they would have beaten us. Or if we were coming from a high cost environment of our own, going from a union operation to a non-union, they would have beaten us"

"Coming back to the integrated logistics phenomenon of the last ten or fifteen years -- surveys indicate that in-house integrated logistics has not been successful . Management expectations have not been adequately met, and the trend to third party is catching on"

"Personally I don't think that failures have spawned interest in third party involvement. I think failures came from our own inability to radically change how we do stuff. In the most integrated logistics I've ever seen, the distribution division under the Vice President did all these things. Over the years I've watched it slowly move away . . . disintegrate. Now at my company, a very strong business unit orientation has emerged, and logistics is a patchwork all over the place. So my career has been watching the disintegration of the logistics function. The process still exists, but is just a lot more complicated"

"Our company has a reluctance to add staff. So, anything that involves staff, the first place we're going to look is outside. There's also a reluctance to add capital"

"There isn't a whole lot of return in logistics. When you're competing for expense dollars, head-count dollars, or capital dollars it's either research on a new drug or something else that has a high profit margin that is going to win. I can go in and say we can turn seven percent if we buy a truck. Forget it, we don't have money for that. That's a good business decision. That's technically how the third party guy gets in. And again the advertisement to the CEO or the CFO that says maybe I can find somebody out there that can do more and I can use the resources that I have in my logistics organization, pare those down and use those resources someplace else"

"You either invest in the revenue side of business or the cost side of business"

- **When you identify the need for third party logistics process, who gets involved ? How do you go about it?**

"Usually a cross-functional team is established"

We identify our needs and get the right people involved"

It is a multi-step process that involves various functional areas and levels of management"

"The first thing you do is take a look at your need, find the scope of that. If it's particular, you take a look at the market area, zero in there. Then you take a look at the reputation, the references, and the integrity of potential vendors for that particular discipline"

- **How you evaluate a potential third party logistics provider?**

"I'll look at networking with regard to a particular supplier. My contacts are usually able to provide a list of references. Usually somewhere within the list I'll recognize somebody I know who can walk me through that organization and give me an idea of what their experience has been".

"Once you've done your survey and your reference checking, you walk the space. We want an existing operation, we literally go through their facility. We bring in several different kinds of people, not just an operations guy, a transit guy, but human resources gets involved, quality people go through the facility and make sure that it meets all of our standards, fire code people, technical people. Then we talk to their other customers about the operations. Then we start talking price, service"

"We begin by defining the core competencies that help us maintain a competitive advantage. Then, what functions do we have to perform for the company that aren't core competencies -- that really are not the key things that are keeping us out in front. Those would be game to outsource. In our case, distribution of the product is not on our core competency list. In our case that's a candidate for a third party to work with us. When we start looking, we want someone who can do it better than we can do it today, better than we think we can do it in the future"

- **How can third party logistics providers verify expertise in a given service area?**

"I think the references are rather key and that's why many of these companies, when they go into the business, must understand that it's going to be a loser for a while. R & D costs so to speak. They've got to develop some good clients who can say that they are doing a good job for me. It's a building process"

"They have got to be able to make a professional presentation and explain what their competencies are"

"By customer references to document performance levels"

"It's a gradual process -- consistent good service over an extended period of time"

- **How do you detect potential weaknesses when evaluating third party logistics suppliers?**

"If they send you something in the mail that proclaims this whole list of third party services that you haven't seen as their customer, it's beyond credibility. They're supposedly experts at a long list of things that you don't associate with them but they'll send you a video of it. It just doesn't make me comfortable. I think name recognition and past positive experience is important. You're more

inclined to give them the benefit of the doubt and let them talk about what they've been doing to grow their capabilities and expertise"

"If a company lacks experience in performing an activity for your company, it's a strike against them"

"We purchase very few outside services based on a cold call. Generally, we identify the need, develop a short list of people to consider, we invite them in, or we go to see them at our request. At that point you're evaluating them based on their ability to do all these things and they have to prove that to you"

- **How do you develop your "short list" when evaluating third party logistics providers?**

"It's doing research to see who's doing what. In certain cases, it's word of mouth, in others it's looking into journals, advertising, or making phone calls"

"I usually check with someone with experience in the area to find out who they're using. If I'm leasing a facility, I'll ask the company I'm leasing from. Most of the time they'll offer the services I need"

"Past experience or a recommendation from a trusted colleague"

"By determining how well a potential supplier meets the needs and specifications included our request for proposal"

- **Does the supplier selection decision include a long gestation period? Are suppliers willing to endure it?**

"If they're not willing, I'd be happy to part company with them. After all, we are the potential customer. They should be willing to do whatever it takes"

"If we must present what a third party has to offer to a potential client, the supplier better be very flexible"

"Sometimes these are hostile environments. The provider is not invited because the distribution manager wants to outsource, but because he's been told to evaluate third party services. So it becomes a make or buy analysis where he really wants to keep it in-house and he's out to prove that the outside provider can't do the job. He doesn't want to give up control or take a risk"

"In another situation, a directive has come down from on-high that says we've got to get into this business and get in fast. The provider may only have thirty days to make it happen"

"Another situation might be a long, slow evaluation process where you know you're going to be involved in numerous detailed analyses. The third party supplier may be up against some stiff competition; he may be required to do a lot of research and still lose the business"

"In our case it's been an evolutionary process. We've required extra value-added services and they don't all come at one time. We may ask for something to be done right now and then in a few

months ask for more. A lot of carriers knock themselves out by not being flexible. You find out that the network they have is rigid and they don't want to stray from it. Right away they eliminate themselves"

"It takes a lot of patience because they may have to start out small and convince you that it's okay to outsource more and more"

Appendix B

Case Study Interview Outline and Summaries

1. THE NEED FOR THIRD PARTY / CONTRACT LOGISTICS SERVICES

1.1 Describe the overall nature of your firm's logistical operation

a. Provide relatively extensive detail here to understand the nature and importance of logistics at each of the case study companies.

b. Obtain a logistics network diagram, if possible, plus relative importance of transportation, inventory, warehousing, order processing, etc., in relation to manufacturing and/or customer distribution.

1.2 What factors explain the firm's interest in third party/contract logistics?

1.3 Were there any environmental factors or "trigger" events that led to the firm's decision to use third party logistics services?

2.0 FIRM'S PERCEPTIONS TOWARD THIRD PARTY LOGISTICS SERVICES AND SUPPLIERS

2.1 What value does or will third party logistics offer the firm?

2.2 What are the positive and negative aspects of third party logistics?

2.3 What are the risks and rewards associated with logistics outsourcing?

2.4 Do you believe that third party logistics suppliers should be strategically aligned with their customers? If so, why?

2.5 How does outsourcing affect you "control" of logistics?

2.6 What types of provides are you most comfortable with? Why?

2.7 How would you evaluate the following supplier types:

a. Transportation Based?
b. Warehouse Based?
c. Management or Information Based?
d. Shipper Based?

2.8 How important are the following third party provider attributes?

a. Ability to manage all logistical activities on an integrated basis?
b. Asset base in areas such as warehousing, transportation?
c. Consulting services on system design, re-engineering, etc.?
d. Provision of real-time, integrated information services?
e. Ability to offer one-stop shopping and invoicing?
f. Available capital for future growth needs?
g. A well-documented track record in your industry?

3.0 THIRD PARTY SERVICES IMPLEMENTATION LEVEL

3.1 Firm's experience with outsourcing to-date?

a. Logistics services?
b. Non-logistics services?
c. Product provision?
d. Company-wide vs. facility-by-facility basis?

3.2 Has the firm expanded its use of outsourcing since its initial effort?

3.3 Based on experience to-date, would the firm consider outsourcing other activities or functions? Why or Why not?

4.0 ELEMENTS OF THE BUYING PROCESS FOR THIRD PARTY LOGISTICS

4.1 What event or action brought about the evaluation of outsourcing?

a. Initiated by a "trigger event"?

b. Who was/is involved in the decision? What were/are the relative roles of each person?

c. Were their any outsiders involved in the evaluation or purchasing process?

d. Was there a true "champion" in the process? If so, who?

4.2 What goals or objectives were established from the outsourcing of logistics?

a. Who developed the objectives?
b. What was the basis of the objectives, i.e., cost, service, or value driven?

4.3 What were the steps or phases in the buying process?

a. What were the time frames for each phase?

b. Who was involved in each phase?

c. Was the process linear in nature? If not, how would you describe the sequence of phases in the buying process?

d. What type of evaluation was used, i.e., analytic, judgment, bargaining, to differentiate between potential suppliers?

e. What formal process was used to initiate the supplier selection process, i.e., request for proposals, competitive bid, negotiation, etc.?

4.4 What selection criteria was used to screen potential suppliers?

a. How did the firm identify the most suitable selection criteria? What were the specific elements of the selection criteria utilized?

b. What were the sources of information used to obtain detailed information about potential suppliers of third party logistics services?

4.5 How long did the purchasing process last?

4.6 What was the elapsed time between supplier selection and service implementation?

a. Describe the plan used during the transition period between previous system and adoption of third party logistics services.

5.0 WHAT TYPE OF RELATIONSHIP EXISTS BETWEEN THE FIRM AND THIRD PARTY SUPPLIER?

5.1 Is the relationship governed by a contract? If so, what is the nature of the contract, the time duration, responsibilities of each party, etc.?

5.2 What method of compensation is used for payment for the provision of third party logistics services?

a. What is considered to be the ideal method of compensation?

6.0 THIRD PARTY LOGISTICS COMPETITIVE ENVIRONMENT

6.1 What are the perceived strengths and weaknesses of current providers of third party/contract logistics services?

6.2 Which type of suppliers, i.e., transportation based, warehouse base, etc., are considered the most innovative?

6.3 How are emerging providers viewed?

6.4 What are the differences perceived between suppliers?

a. What is the relative importance of these differences?

7.0 WHAT IS THE EXISTING LEVEL OF OVERALL SATISFACTION WITH THIRD PARTY LOGISTICS SERVICES?

7.1 Satisfaction with cost incurred? customer service levels? value attained?

7.2 Have there been any unexpected benefits resulting from the shift to third party logistics?

7.3 Have there been any unanticipated, negative side-effects to logistics outsourcing?

7.4 What could the existing provider(s) do to improve their performance?

7.5 What is the profile of the "ideal" third party logistics provider?

8.0 WHAT IS THE FUTURE FOR THE USE OF EXTERNALLY-PROVIDED, INTEGRATED LOGISTICS SERVICES?

8.1 What third party characteristics or dimensions would entice the firm toward additional logistics outsourcing?

8.2 Do you think the use of third party/contract logistics will grow?

a. What factors will be influential in this growth?
b. What factors may inhibit or slow down this growth?

8.3 What type(s) of third party providers will ultimately be most successful?

a. Asset vs. Non-asset based
b. Transportation vs. Warehouse Based
c. Integrated services vs. Functional
d. Regional vs. National vs. Global
e. General capabilities vs. Industry-specific capabilities

Case Study Company:	U.S. Manufacturer of Motor Vehicles
Date of Visit:	January 5, 1994
Location:	Corporate Headquarters -- Michigan
Case Study Participants:	Director Material Transportation Assistant Director Material Transportation Director, International Transportation Powertrain Logistics Manager Powertrain Divisional Transportation Manager Chassis Divisional Transportation Manager General Supervisor - Transportation Economics and Planning

The company examined in this case study was a major automobile and truck manufacturer. It is usually described as one of the "big three" based in the United States. The case study involved the firm's North American Operations (NAO) Logistics group. This is a staff organization responsible for process management and policy formulation for the company's domestic transportation needs.

NAO's search for a third party supplier to coordinate and manage its less-than- truckload (LTL) shipments throughout the United States, i.e., between and among suppliers, assembly plants, foundries, etc., was the focal point of this research effort. The case study sought to evaluate the buying process followed by the automaker in its attempt to select a third party supplier to leverage the company's LTL volume for cost reduction and service improvement.

The NAO third party logistics buying process was noted to include:

- A internal "creativity" team composed of functional managers from field locations, the home office and several "sister" companies.

- A multiple step buying process which included:

  Need and potential supplier identification
  Analysis of requirements and potential providers
  Strategic logistics planning and supplier selection
  Service implementation
  An ongoing evaluation of the supplier(s) selected

- A bid package heavily influenced by recommendations from invited suppliers (see Table CS 1.1. for a listing of the suppliers included).

- Qualitative and quantitative selection criteria and methods (see Exhibit CS 1.1.).

- Final supplier selection predicated on a corporate requirement to routinely evaluate price and benchmark service performance. Also, judgment was found to be paramount in the final choice of a supplier.

Table CS 1.1. NAO LTL SHIPMENT MANAGEMENT

POTENTIAL SUPPLIERS	LOCATION
Yellow Logistics Services, Inc.	Overland Park, KS
Customized Transportation, Inc.	Howell, MI
LINC - Central Transport	Warren, MI
Roadway Logistics Systems	Akron, OH
Quest Partners - Leaseway	Birmingham, MI
TNT Logistics Corp.	Flat Rock, MI
Ryder Dedicated Logistics	Miami, FL
Menlo Logistics	Troy, MI

EXHIBIT CS 1.1. Third Party Supplier Bid Evaluation Instrument

LTL 3RD PARTY MANAGER BID EVALUATION

BIDDER _____ **EVALUATOR** _____

LEGEND: 5-EXCELLENT, 4-GOOD, 3-FAIR, 2-POOR, 1-LOUSY

SCOPE OF OPERATION

1. How well does the proposed plan grasp transportation requirements?

5☐ 4☐ 3☐ 2☐ 1☐

These requirements include:

- Establish and publish transit time in hours for both inbound/outbound moves after NAO review.
- Monitor conformance to all routing instructions.
- Pick up and deliver material to scheduled windows.
- Provide dedicated tracking and expediting to ensure all shipments are delivered within published transit time and/or windows.
- On time performance: (responsible party pays the penalty).
- Sort and deliver material by in-plant and/or dock location as required.
- Obtain cube/weight from suppliers to maximize cube utilization of carrier equipment.
- Establish and maintain milk runs/collection routes where applicable.
- Maintain critical shipment diversion capabilities and provide ability to intercept freight .

  For example:
  Accept notification of hot material, locate the material at pick up or intransit and consolidate all hot material on a separate trailer (or tail of trailer) for expedited delivery and unloading.

- Be cognizant of all USA, Canada and Mexico Customs regulations and policies and operate accordingly.
- Insure production material and non product freight are separated prior to border crossings.
- P..form switching and/or "bullpen" operation services where applicable.
- Ide.. ..y and recommend suppliers for specific day(s) of the week shipping to level inbound volume.
- Recommend opportunities to load directly to the destination hubs/terminals for outbound shipments based on volume for SPO.

EXHIBIT CS 1.1. (continued)

2. How well does the proposed plan grasp non-transportation requirements?

5☐ 4☐ 3☐ 2☐ 1☐

These requirements include:

- Receive (via computer link/fax) the supplier ship/requirement schedules/pull signals at the part number level.
- Convert these schedules/pull signals into driver pick-up instructions.
- Drivers to utilize these instructions for part/quantity verification at the point of pick-up and report all under shipment and **REFUSE** all over shipments. (A must to support supplier 100% compliance to schedule.)
- Pick-up terminals are to provide supplier follow-up on driver reported under shipments which may include material expediting as required.
- Notify receiving plant of any material that will arrive after the scheduled delivery window time.
- Update ASN status (or completes phone forwarding when no ASN is issued) and/or receive the parts into ISP/SSP/etc.
- Provide and apply in-plant routing labels (stockman/storage coded) if not applied by the supplier.
- Provide in-transit services such as alternate storage location, sub-assembly, kitting, sequencing and floor loaded material delivery when required.
- Provide country of origin inspection and labeling on shipments from Canada for non-complying suppliers.
- Manage returnable containers to include sorting, cleaning, tracking, and transporting (back to the suppliers).
- Audit packaging for compliance to Specifications Manual and for improvement potential.
- Perform SPC monitoring and reporting to of your corrective actions for supplier compliance to: ship/requirement schedules; ASN issuance; labeling and packaging requirements.

QUALITY ASSURANCE

How appropriately does the proposed plan address the issues of quality assurance?

5☐ 4☐ 3☐ 2☐ 1☐

The plan requirements include:

- Damage free
- No shortages
- Claims processing & payment
- Hazardous material handling certified

EXHIBIT CS 1.1. (continued)

PERFORMANCE MEASUREMENTS

How appropriate is the proposed performance measurement plan?

5☐ 4☐ 3☐ 2☐ 1☐

The plan requirements include:

- Appropriate periodic volume, performance and cost reports; plus comparative analysis summaries on an periodic basis.
- Total order cycle time reporting (outbound dealer/customer delivery), i.e., daily transmission of POD information to net - format is TDCC Standard ... This is specific to SPO.

BILLING & PRICE STRUCTURE

How feasible is the proposed billing & pricing structure?

5☐ 4☐ 3☐ 2☐ 1☐

The structure requirements include:

- Payment of individual freight bills to be handled by the Logistics Service Provider.
- Must be cost specific attributable to individual locations down to the account number level.
- Must be applicable to 3rd party shippers/receivers for shipments paid by

GLOBAL EXPECTATIONS

How well does the proposed plan address realizing desired results?

5☐ 4☐ 3☐ 2☐ 1☐

These results include:

- Maximizing freight efficiency through two-way networking (Backhaul).
- Rationalizing the number of routed carriers currently controlled individually by divisions, plants, local territories, etc.
- Maximizing carrier cube utilization while:
  - Increasing ship frequency and lowering cost through volume leveraging.
  - Managing container return flow.
- Providing consistent supplier communications.
- Re-evaluating the activities of origin (RDC's) and destination (De-Con Centers) distribution centers.
- Supporting the plant requirement of a single contact for LTL.
- Managing the correct balance between current operations and new opportunities.

EXHIBIT CS 1.1. (continued)

- Enabling common NAO business practices relative to LTL shipping activities.
- Providing transportation network expertise for

QUOTE COMPLIANCE

How well did the bid provide all the required information?

5☐ 4☐ 3☐ 2☐ 1☐

These requirements include:

- A detailed description of your planned structure for managing the daily activity (from a service and quality perspective).
- Full implementation strategy and timetable.
- A description of your planned process for: selecting and managing carriers and distribution facility operators, interfacing with our plant, platform/divisions and head-quarters personnel.
- A complete review and explanation of your computer system support, interface plan, and resources.
- A thorough layout of your monitoring process. This should include: (1) the operational monitoring, exceptions communication, corrective action handling and reporting. (2) The method for monitoring the costs of the operation. You must be able to provide cost data on a local level plus other comparative cost analysis reports to NAO Headquarters.
- A remuneration plan.
- A plan for continuous improvement and mutual gains sharing.

SYSTEMS

How well does the proposal address system requirements.

5☐ 4☐ 3☐ 2☐ 1☐

These requirements include:

- Interface with transportation, material and scheduling systems via dedicated NET (hard-line).
- Programming system requirements to satisfy all non-transportation functional requirements.
- Exchange electronic data for ad hoc analysis.

EXPERTISE - EXPERIENCE - BACKGROUND (Based on the total of your personal direct or indirect experiences, not any isolated situation. Leave blank if you haven't had any personal experience with this bidder.)

1. How well does the bidder's overall business philosophy/mission statement fit this Strategy?

5☐ 4☐ 3☐ 2☐ 1☐

EXHIBIT CS 1.1. (continued)

2. How reliable has their performance been, this is to include how well have they handled and permanently corrected former failures?

5☐ 4☐ 3☐ 2☐ 1☐

3. How responsive are they to change, both proactive and reactive?

5☐ 4☐ 3☐ 2☐ 1☐

4. How experienced are they in handling business?

5☐ 4☐ 3☐ 2☐ 1☐

Areas of experience to include:

- Transportation
- Plant Systems Interface & Usage (ISP, PSIC, etc.)
- Material Follow-up (Remote &/or On-site)
- ASN updating, In-plant Routing Label generation & application

FINANCIAL STABILITY

What is their recent Corporate financial performance? _____

Case Study Company: Manufacturer of Recreational Vehicles

Date of Visit: May 17, 1994

Site: Corporate Headquarters -- Midwestern United States

Participant: Manager of Logistics

This case study involved one of the oldest producers of recreational vehicles (RV) in the United States. Annual revenues of 140 million dollars were derived from the worldwide sale of travel trailers, motorcycles, parts/accessories, and clothing, The company also licensed its name for use by many other consumer goods manufacturers.

The buying situation investigated in this case study concerned the corporation's search for a third party logistics provider to distribute its products in Europe. Historically, this company had distributed its products through independent dealers located on the continent. This practice resulted in lengthy order cycle times and increased cost causing the firm's products to increasingly become less competitive.

A study of the RV manufacturer's third party logistics buying process revealed:

- An outside organization (a well known logistics consulting firm) served to initiate an investigation of logistics outsourcing.
- A "logistics reconfiguration team" (which included a member from the consulting company) was established to evaluate the purchase of third party logistics.
- A make vs. buy study conducted by the outside consultants.
- Potential supplier candidates identified from a variety of sources, e.g., the U.S. Chamber of Commerce, a logistics consulting firm, the Netherlands Foreign Investment Agency, the British consulate and a third party logistics brokerage firm.
- A multiple step supplier selection procedure.
- A request for proposal (RFP) drafted from the recommendations of potential suppliers.
- A supplier evaluation methodology consisting of a qualitative and quantitative service review (see Exhibit CS 2.1.) and cost comparisons.
- A subjective evaluation tool consisting of thirteen service categories and assorted weighting factors (see Exhibit CS 2.2).
- An on-site visit to the corporate offices of the finalists and visits to existing customers of the finalists.
- Much judgment in final supplier choice. The team also changed their recommendation late in the process after learning that management would not approve their first choice.

Aspect	Van Ommeren-Intexo	Cleton	Ned Lloyd	Vitesse	Abemy
Sales	Intexo $100 Million (Van Ommeren $922 M)	$10 million	$3.5 - $4 billion	$65 million	N/A
Company Profile	• Services: Warehousing, transport, shipping • Has facilities located in Rotterdam and Amsterdam	• Services: Warehousing, logistics integration management • Experienced 25% growth for past 5 years • Has facilities located in Rotterdam	• Services: Shipping, containers, terminals, trucking, warehousing • Has facilities located in various locations in the Netherlands and throughout Europe	• Services: Warehousing, distribution, containers,trucking • Little or no growth for past 2 - 3 years • Has facilities located in Roadstead and Venlo • Hub locations in major cities throughout Europe	• Services: Holding Company Of Greenib • Total involvement includes , Triumph, Moto-guzzi, and Mitsubishi • Abemy would sub-contract to a third party and act as middle man in any relationship with
Current Customers	• Honeywell •Honeywell is a fairly comparable to in terms of product size and handling (e.g. large computers cabinets, medium sized mechanical pumps, small parts like wire harnesses, fasteners, decals)	•Detroit Diesel, Allison •Both customers are directly comparable to in terms of product size and handling (e.g. large diesel engines, medium size replacement parts, small parts like fasteners, nuts, bolts)	•Various •Ned Lloyd failed to show comparable P&A customers to . They did show a warehouse in poor condition that cross-docked another customer's motorcycles • The parts warehouse shown was not directly applicable to parts handling needs	•Franklin Mint •Vitesse showed the group the Franklin Mint product in storage which is only a fair comparison to . This includes description cards of about 5"x7" size kept in various languages depending on the shipment destination.	• Mitsubishi •Greenib handles and only distributes for the Benelux market

Exhibit CS 2.1. RV Firm's Preliminary Comparative Analysis

Aspect	Van Ommeren-Intexo	Cleton	Ned Lloyd	Vitesse	Abeny
Market Coverage	• Have experience in distributing products to Pan-European countries	• Have experience in distributing products to Pan-European countries	• Have experience in distributing products to Pan-European countries	• Have experience in distributing products to Pan-European countries	• Generally have experience in distributing product in the Benelux and some UK
Info Technology	•Platform: Hewlette Packard(Unix) • Uses software entitled LYRICS • The software focus is on supply chain integration which is the logistics trend of the 1990's • The software is written in Progress which is a 4th generation language with utilization of original MAI Basic 4 software • System has on-line inquiry capabilities •The European Commission has endorsed Van Ommeren's LYRICS software and is subsidizing 35% of its development	•Platform: AS400 •Custom MAI Basic 4 original software written in Business Basic, performs typical business functions • Bus. Basic is an older prgmg language • Third party systems support used is considered respectable by Harley systems staff • System has on-line inquiry and order processing capabilities	Platform: AS400 • Uses software developed in-house called DISYS • Uses in-house systems support which was considered a quality organization when reviewed by a systems person	Platform: HP9000 (Unix) and IBM S/36 •Performs typical business functions •Uses in-house systems support • New software titled DOMS is used in new Venlo DC. Installation of new software was complete 1/94	N/A • Separate systems at each separate company - Greenib, HNG • Greenib has limited warehousing mgmt systems to support picking and packing operation. OK inventory control and order mgmt. Going to electronic OE with dealers • HNG has similar systems but has developed a scheduled delivery system and supporting order processing system
Warehouse Practices	• Practices are generally considered top-notch in the industry • Manual and semi-automatic receiving, picking, packing and shipping • Radio frequency technology employed for communications in the warehouse	• Practices are considered very good when compared to the industry• Manual receiving, picking, packing, and shipping • Use bar coding on a limited basis for picking and packing-Use data logger for uploading to AS400 at a later time	• Practices seemed to be less than adequate when compared to the industry • Warehouses seemed to be dis-organized and cluttered	• Practices are generally considered top-notch in the industry • Manual and semi-automatic receiving, picking, packing and shipping • Radio frequency technology employed for communications in the warehouse	•Practices generally considered to be at a very manual level • Manual receiving, picking, packing and shipping • No bar coding technology employed • Greenib warehouse was very clean while the Mitsubishi whse was somewhat cluttered

Exhibit CS 2.1. (continued)

Aspect	Van Ommeren-Intexo	Cleton	Ned Lloyd	Vitesse	Abemy
Distribution and Transportation	• Third Party Express services, ground services • Owns a road cargo freight line	• Third Party Express services, ground services	• For express services, will use their own division called Van Gend & Loos and other third parties, for ground services will use their own division called Road Cargo and other third parties	• Third party express services • Will use their own cargo trucking company line	•Contract with local trucking companies • Utilize Mitsubishi fleet of vans for scheduled delivery system
Quality ISO 9002	Yes	Yes	Districenters-Yes (most) Road Cargo-No	5/1/1994 (planned)	No
Operations Management	• Uses a Centralized/Acct Mgmt to manage customer inventory and distribution • This approach is deemed most suitable for as it provides one contact	• Uses a Centralized/Acct Mgmt to manage customer inventory and distribution • This approach is deemed most suitable for as it provides one contact	• Uses a decentralized approach to managing the customer's product • This is not conducive to efficient communication between and the third party	• Uses a Centralized/Acct Mgmt to manage customer inventory and distribution • This approach is deemed most suitable for · as it provides one contact	• Do not know at this time

Exhibit 2.1. (continued)

Exhibit 2.2 RV Firm's Key Attribute Evaluation Instrument

Key Attributes of 3rd Party Services

1. Information Systems Capabilities
   A. Customs/VAT - Electronically Communicate directly with Customs office, prepare VAT documents
      Weight = 10
   B. Warehousing Management - Systems that support Picking, Inventory Control, Packing
      Weight = 10
   C. Order Processing/Invoicing - Available systems for Order Processing
      Weight = 6
   D. Freight Management - Systems that support Parcel size Optimization, Outbound Freight Rates
      Weight = 7
   E. Supply Chain Visibility - Ability to view materials in the entire supply chain, including arrival date and time
      Weight = 6
   F. Growth Potential - Ability to expand systems to accommodate increased growth and sophistication
      Weight = 5

2. Assets involved in Outbound Freight Management
   A. Does the company have assets in a Private Fleet or must they utilize Contract Carriers
      Weight = 3

3. Experience - About the 3rd party Company:
   A. Current Customers - do they have current customers like ?
      Weight = 8
   B. Time in Business - Have they been in business longer than 30 years?
      Weight = 2
   C. Pan-European or Other - Do they currently distribute across all of Europe?
      Weight = 8

4. Qualifications and Awards
   A. ISO 9002 or Others - Have they been ISO qualified or received other awards that give them unique qualifications?
      Weight = 6

5. Size of Company
   A. Ranking - In total revenue provided with the business, is in the top 5?
      Weight = 7
   B. Financial Strength - Ability to absorb downturn in business
      Weight = 6

6. Services Provided
   A. Is Warehousing (P&A business) a Core Competency?
      Weight = 10

7. Operations Management Structure
   A. Will they provide a centralized or decentralized operation for all three product lines?
      Weight = 9

8. References
   A. How strong, positive are the references they recommended we visit? How similar to the EDC operation are the visited references?
      Weight = 10
   B. What contract length do they have with the reference, and will they have with ?
      Weight = 10

9. Culture
   A. Corporate Chemistry conducive to will they fit the culture?
      Weight = 10
   B. Know - are they familiar with products? Do they ride?
      Weight = 3

10. Staffing
   A. Customs/VAT - Do they have a company Customs/VAT staff (former Customs officer)?
      Weight = 10
   B. Information Systems - Do they have their own Information systems staff? Do they subcontract?
      Weight = 8
   C. Traffic & Warehouse Management - Did tours show utilization of progressive traffic and warehouse management practices?
      Weight = 7

11. Practices/Process
   A. Warehouse - condition, layout, cleanliness of the warehouse
      Weight = 7

12. Preparedness
   A. Visit - Were they prepared with questions about the RFP for our visit?
      Weight = 8
   B. Proposal Response - Were they able to follow directions, respond as we requested and on time to the RFP?
      Weight = 10

13. Gut Feel
   A. Company - What was our gut reaction to the Company?
      Weight = 7
   B. People - What was our gut reaction to the People in the Company?
      Weight = 5

Case Study Company:	Computer Hardware Manufacturer
Date of Visit:	June 10, 1994
Site:	Corporate Headquarters -- Northern California
Participants:	Director, Distribution Services Group Logistics Planning and Administration Manager. Distribution Operations Manager European Logistics Manager

The computer hardware firm involved in this case study was a self styled global data networking company manufacturing and selling wide area network and connectivity hardware to link together all types of computers, i.e., from personal computers (PC's) to worldwide communications. The organization fabricated and assembled its products at nine company owned sites in North America and Europe. Sub-contractors located in Hong Kong also provided hardware under contractual arrangements. The corporation was founded in 1981 and realized sales of approximately 800 million dollars in 1993.

Numerous marketing channels were employed by the computer manufacturer without overlap or conflict. Many sales were facilitated through large micro computer distributing companies or national re-sellers. Other sales were obtained via systems integrators, or handled directly with original-equipment-manufacturers (OEM's) and the government. The company experienced rapid growth since its inception, much of it resulted from the acquisition of competing or synergistic organizations. The cost of logistics at this firm was noted to be small when viewed as a percentage of product price and senior management was much more service sensitive than cost oriented. However, the company maintained an aggressive posture regarding logistics management and was considered a top performer in the computer industry regarding service provision and cost control.

This case examined the computer manufacturer's search for a single source, third party global logistics provider to replace its current in-house operation and reconfigure its network for continuous and breakthrough improvements. The third party logistics buying process was found to entail:

- Need initiation prompted by outside consultants. The concept of an integrated global distribution network was recommended by a consulting company hired to address several strategic issues including logistical support.
- A multiple stage purchasing process administered by an internal "logistics strategy" team composed of operations, distribution, information systems and human relations management.
- Benchmarking against "best-in-class" organizations during the need assessment stage.
- An RFP designed by an outside consulting firm.
- The development of highly specific preliminary screening criteria including:

An ability to link all logistics channel members for the purpose of global tracking and tracing on a real time basis.

A "cultural" fit between the computer firm's employees and supplier's personnel.

A commitment to a totally integrated, worldwide logistics system with a long-term business "partner."

- Initial supplier screening completed via a telephone interview.
- Supplier selection criteria developed from the suggestions of professional colleagues, with experience in logistics outsourcing, at other manufacturing firms.
- Face-to-face interviews with the three finalists at the computer manufacturer's main origin-destination sites in the U.S. and Europe.
- Final selection predicated on a supplier's ability to convince the third party logistics buying team that it had the resources, commitment and flexibility to develop a totally integrated world class logistics system managed by a single supplier. The main factor influencing supplier selection concerned the ability of the chosen provider to re-engineer the existing system and "tie" the network together with a State-of-the-Art information system.
- A six stage implementation plan which required the selected provider to prove its competence at each stage before the award of additional business. However, the long-term business relationship was noted to depend on the selected supplier's ability to generate year to year improvements in customer service and reduce cost.
- Lofty but nebulous goals from logistics outsourcing. While rigorous service/cost requirements and supplier selection criteria were established for the selected supplier concerning the assumption of existing activities, long-term need specification was not clearly defined.
- The value of supplier reputation and references from existing customers. These, along with sophisticated personal selling, were found to be critical in obtaining the award of this business from the highly knowledgeable buyers representing the computer manufacturing case study company.

Case Study Company:	Manufacturer of Telecommunications Equipment
Date of Visit:	January 31, 1994
Location:	European Corporate Headquarters -- London, England
Participants:	Director, Logistics and Transportation Europe Logistics Advisor, Corporate Logistics Europe Manager/Purchasing S.E. Operations

The subject of this case study was a large telecommunications firm partially (53%) owned by a Canadian company and partially publicly held (47%). The Canadian owner was noted to be a subsidiary of a worldwide manufacturer and distributor of telecommunications equipment. The study firm was also a major manufacturer and distributor of telecommunications equipment with 1993 sales of approximately 1.25 billion dollars. The company employed 11,000 people and was composed of two major areas, i.e., research and development and product merchandising. Five major product groups were supported as follows: switches, transmission products, multi-media communication systems, wireless products, and defense items. Commercial products were marketed globally under various trade names. Manufacturing facilities were located in Ireland, Turkey, France and England. Much product sourcing also originated from the United States and Canada. Exhibit CS 4.1., appearing at the end of the case study summary, depicts the logistics network existing within the telecommunications firm at the time the case study was conducted.

Each of the five product groups has traditionally maintained responsibility for its own manufacturing, product sourcing and distribution. Recently the company sought to bring about a commonality of business processes and systems through re-engineering. This effort lead the telecommunications company to standardize its logistics technology and centralize its direction.

This case study concentrated on the telecommunication company's decision to restructure its logistics operations in Holland by sub-contracting physical distribution. An examination of the buying process for this decision provided insight into the reasons for change, purchasing methodology, and supplier evaluation and selection criteria. The purchasing procedure consisted of:

- An outsourcing decision which resulted from inventory management and customer service problems, especially those related to product returns and repairs.

- Internal "champions" in the form of an operations and finance manager. A third party logistics buying team composed of functional managers, e.g., logistics, operations, planning and finance.

- Supplier identification limited to twelve firms known by the Director of Logistics and Transportation, Europe. This manager contacted professional colleagues for recommendations on "best-in-class" suppliers for the needs faced by the telecommunications company in Holland.

- A multiple stage buying process which included the following three levels of supplier filtering:

  Elimination after written proposals were received from invited suppliers.
  Elimination after service and costs analysis accompanied by site visits
  Elimination after final negotiations.

- A tender document structured from the recommendations of the twelve suppliers initially considered. A formal request for proposal (RFP) was prepared with assistance from the marketing department responsible for logistics in Holland.

- Six criteria were used to initially screen the nine suppliers responding to the formal RRP. These included:

  Financial status (Dunn and Bradstreet)
  Preliminary discussions with each supplier
  Proven experience in related industries and tasks
  Physical proximity to Amsterdam
  The range of relevant services offered
  ISO 9001 certification

- Alleged experience validated via contact with supplier provided customer references.

- A formal presentation by each of the suppliers and a tour of their facilities.

- A detailed service and cost analysis based on a one month profile of the business to be assumed. The final stage of the selection process included a comparison with existing proprietary cost and service levels.

- Final selection between two finalists predicated on the judgment of the Director of Logistics and Transportation. The most important criterion was noted to be the degree to which a provider's representatives were able to substantiate competence and trustworthiness during the final negotiation meetings.

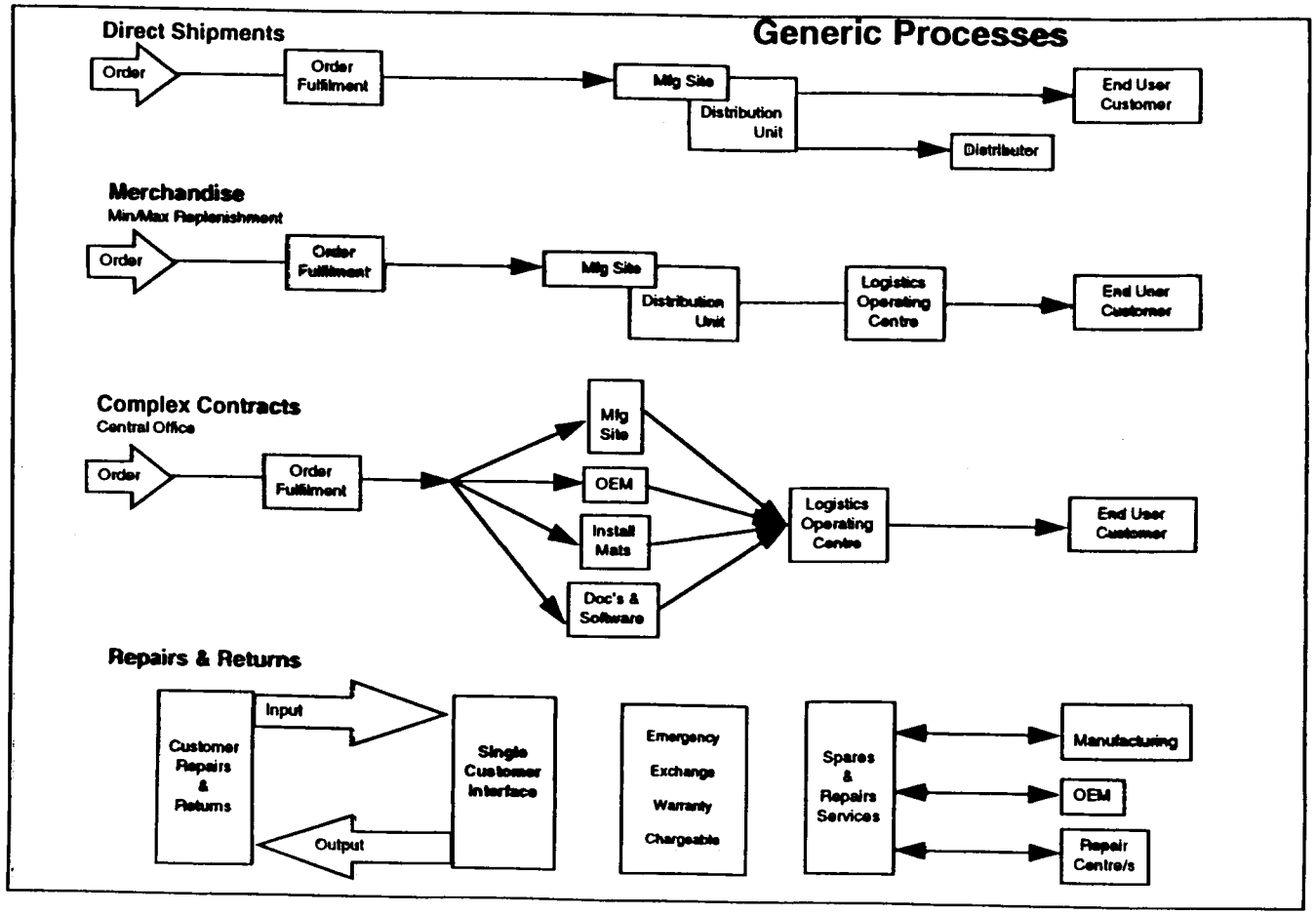


Exhibit CS 4.1. **Telecommunication Company's Logistics Network**

Case Study Company:	European Manufacturer of Motor Vehicles
Date of Visit:	February 4. 1994
Location:	Regional European Logistics Center -- Southern Germany
Participants:	Director, Distribution and Logistics Inventory Control Manager Information Systems Manager Warehousing Manager Logistics Planning Manager

The firm involved in this case study was a division of a large motor vehicle manufacturer based in Germany. The location visited was a combination production and spare parts distribution site. This facility was the largest of its type in the company and was considered the central depot for European operations; thirty distribution centers and approximately five thousand dealers were serviced from this central location. The company maintained a customer service level which guaranteed that its dealers, located no more than two hundred and fifty kilometers from a distribution center, would receive ninety-seven percent of their orders complete within twenty-four hours after order placement. The division also serviced the parent company's locations in the United States and other non-European customers.

Three logistics outsourcing decisions recently completed by the division and the organization's long term strategy for spare parts distribution in Europe were studied. The third party logistics buying method was found to include:

- A very limited assessment of third party logistics needs driven by cost constraints and warehouse space limitations. The terms of union labor agreements prohibited large scale changes in the logistics system as it pertained to personnel.

- Supplier identification limited to transportation based firms currently serving the automaker.

- A multiple buying step process administered by an internal team composed of managers from information systems, inventory management, and transportation.

- Supplier selection criteria which emphasized the ability of invited suppliers to duplicate existing services at a reduced cost.

- A high level of risk aversion in supplier choice. Consideration was limited to suppliers with whom the automaker had a long standing relationship built on trust and confidence.

Appendix C

Mail Study Cover Letter and Questionnaire
(Including Aggregate Responses from Participants)

COVER LETTER ACCOMPANYING THE MAIL SURVEY QUESTIONNAIRE

Logistics services traditionally provided "in-house" are increasingly being purchased from third party/contract providers. While there is no universally accepted definition of third party/contract logistics, the term frequently implies the medium to long term contractual provision of multiple logistical services by a supplier holding no inventory ownership position at any point during the business transaction. Many companies known for their provision of individual functional services such as transportation, warehousing and freight forwarding are now creating new organizations offering third party logistics services.

- As a doctoral candidate in Business Administration at The University of Tennessee, Knoxville, I am conducting a research project entitled "An Empirical Analysis of Industrial Buyer Behavior and Benefit Based Segmentation in the Third Party Logistics Market."

- The attached questionnaire seeks to gain insight into the methods used by firms to acquire third party logistics services and whether homogeneous groups of buyers are present in the third party logistics market.

Your opinions are critical to the success of this study as I am seeking input from individuals with knowledge of their firm's logistical needs and preferences. Although you are not expected to benefit directly from completion of this questionnaire, your input will assist in expanding the base of knowledge concerning the purchase of strategic services. There are no known risks from participating in this research.

Your identify will be kept confidential. There are no identifying marks or codes on the questionnaire to identify you as a respondent. As the sole investigator, I am the only person with access to questionnaires. All completed survey forms will be maintained in a locked file cabinet except during data entry. The questionnaire mailing list will housed in secure location when it is not being used to facilitate distribution of the questionnaires. All questionnaires and the mailing list the will be destroyed at the conclusion of the research project. All results will be tabulated, analyzed and reported only in an aggregate form, so anonymity is assured.

You may direct any questions about the research, either now or later, to the sole investigator: Mr. Harry L. Sink, Doctoral Candidate, 223 Merrick Hall, North Carolina A&T State University, Greensboro, NC 27411 or call 910-334-7744.

Thank you for your participation. Please feel free to call if you have any questions about the study or questionnaire.

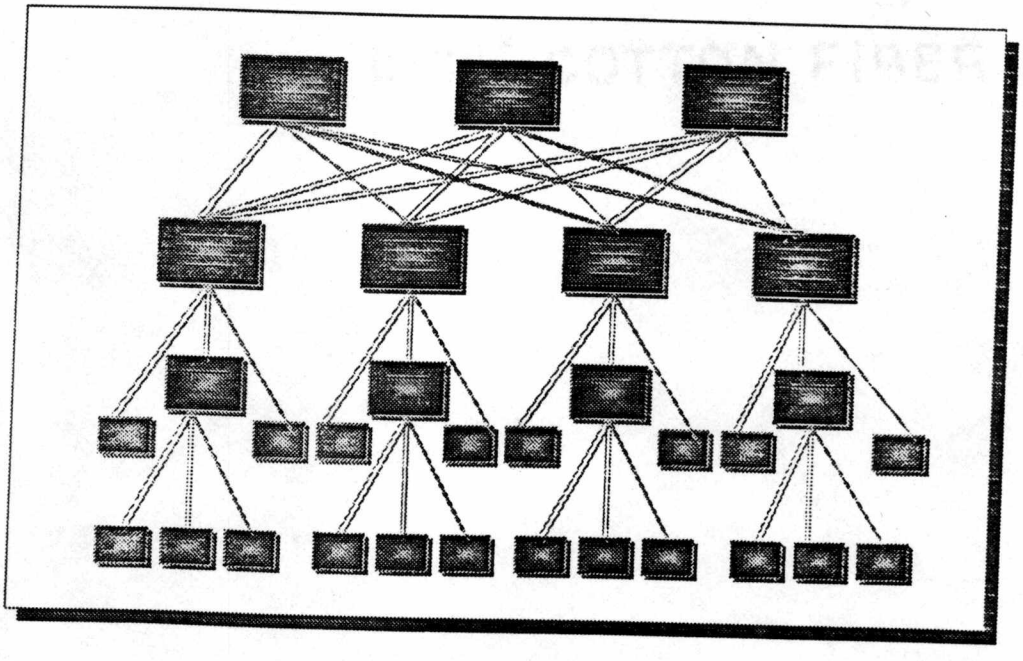
Your return of the questionnaire in the attached self-addressed, stamped envelope will constitute informed consent to participate in this study.

Sincerely,

Harry L. Sink
Doctoral Candidate

University of Tennessee

Third-Party Logistics Market Study



Section I: Evaluation of Third Party/Contract Logistics Services

1. In general, do you feel that there is a trend toward the use of third party/contract logistics services in today's business environment?

	USERS *	NON-USERS
NO	5.0%	11.8%
YES	95.0%	88.2%

* Users refers to respondents currently using or evaluating third party logistics services

2. If your organizational unit needed to purchase third party/contract logistics services, would you prefer to buy integrated services, i.e. activities bundled or "tied" together as a package, from a single supplier?

	USERS	NON-USERS
NO	27.6%	30.5%
YES **	72.4%	69.5%

** If YES, which of the following specific services should be offered in the package?

	USERS	NON-USERS
Outbound transportation	72.8	68.3
Selected manufacturing activities	11.2	3.2
Inbound transportation	51.2	48.3
Product marking, labeling, packaging	40.8	39.2
Inventory management	38.4	39.6
Traffic management/fleet operations	35.2	39.1
Information systems	43.2	38.5
Product assembly/installation	10.4	6.1
Product returns & repair	28.0	30.1
Freight bill auditing/payment	44.0	43.2
Cross-docking	52.8	37.1
Order entry/order processing	16.8	10.4
Warehousing	71.2	64.3
Freight consolidation/distribution	64.0	60.5
Customer service	19.2	3.4
Other:	3.2	6.1

3. Does your organizational unit presently use, or are you considering the use of a third party/contract provider of logistics services?

NO 39.2% -- SKIP TO QUESTION NUMBER 20
YES 60.8%

4. Has your organizational unit ever outsourced logistics and then later brought the activities back "in-house" or awarded the business to another third party logistics supplier?

NO 51.9%
YES 48.1%

5. Which of the following best describes your current strategy regarding the use of third party/contract logistics services? *(Check the single, most appropriate response)*

34.2% We are expanding our use of third party services
3.2% We are seeking to replace an existing third party supplier
34.8% We will maintain the use of our current third party suppliers
7.6% We recently decided to use a particular supplier
6.3% We are currently searching for a third party supplier
13.9% We are currently considering the purchase of third party/contract logistics

6. What factor(s) "triggered", or had a significant influence on your organizational unit's decision to use a third party supplier of logistics services. *(Indicate one to three factors, the most important by writing a "1" and the second by writing a "2", etc.)*

Responses represent percent of total times each factor was indicated in the top three

10.1% Capacity (space) limitations
2.0% More effective supplier relationships
3.7% Lack of logistical expertise
3.9% Outdated computer/information system
3.7% Organizational change
10.1% Reduce employee base
3.1% Supply chain restructure
7.3% Flexibility
2.2% Labor issues
0.0% Proposal by provider or consultant
0.3% Merger/acquisition
9.6% Improve logistics customer service
2.5% New products/markets
7.3% Concentrate on core business
0.0% Initiation of quality process
5.6% Reduce logistics assets
3.3% Changing customer needs
0.0% Followed actions of a competitor
20.6% Search for cost-reduction
4.7% Other:

7. Please indicate the logistics services that your organizational unit currently outsources, and those which you are likely to also outsource in the future. *(Check all that apply)*

	Current	Future	N/A
Outbound transportation	66.7%	27.5%	5.8%
Inbound transportation	56.0%	28.6%	15.4%
Freight bill auditing/payment	77.2%	18.1%	4.7%
Information systems	42.5%	34.2%	23.3%
Freight consolidation/distribution	49.1%	38.7%	12.2%
Cross-docking	37.3%	41.0%	21.7%
Product assembly/installation	39.3%	19.7%	41.0%
Warehousing	77.3%	16.7%	6.0%
Selected manufacturing activities	53.4%	11.0%	35.6%
Product marking, labeling, packaging	53.4%	23.3%	23.3%
Traffic management/fleet operations	38.7%	38.7%	22.6%
Product returns and repair	32.4%	35.1%	32.5%
Inventory management	32.1%	28.3%	39.6%
Order entry/order processing	24.5%	17.0%	58.5%
Network design/consulting	33.9%	25.4%	40.7%
Other:	7.5%	1.9%	90.6%

8. To what extent are the services in question seven currently "tied together" or integrated by your supplier(s) of third party/contract logistics services?

20.9 % Significant
36.6 % Somewhat
42.5 % Very little

9. How much time elapsed between the identification of the need to outsource logistics and the selection of a third party logistics supplier?

7.84 Number of months (range of responses 1 to 36; most common response was 6)

10. In what year did you complete your most recent third party logistics supplier selection decision process?

1993 (range of responses 1988-1994; most common 1994 at 42.6%)

11. For your most recent third party selection decision, indicate the number of supplier firms in each of the following categories:

6.66 Initially identified
3.44 Formally evaluated

12. In the first three columns below, indicate (by a check mark) the role that executives from the specified corporate areas may have played in your organizational unit's third party logistics decision. In the fourth column, indicate (by another check mark) whether this person could be considered a "champion", or key supporter of the decision to outsource logistics.

Corporate Area/Position	(1) Recognize Need to Outsource	(2) Evaluated Suppliers	(3) Supplier Selection	(4) Champion or Key Supporter?
President/CEO	37.8%	1.9%	6.4%	17.3%
Finance	39.1%	20.5%	12.8%	28.8%
Logistics/Transportation	78.8%	83.3%	80.8%	78.8%
Manufacturing	25.0%	15.4%	13.5%	16.7%
Marketing	17.3%	9.6%	5.8%	12.8%
Other:	10.3%	9.6%	8.3%	10.3%

13. Compared to other corporate decisions with which you are normally involved, how much more internal controversy do you feel was involved with the decision to use a third party supplier of logistics services?

31.4% Much more
52.2% About the same
16.4% Much less

14. What benefits have resulted from your outsourcing efforts? *(Check all that apply)*

58.1% Costs for the outsourced functions have been reduced
49.7% Service levels for the outsourced functions have been improved
38.7% Firm is better able to focus on core competencies
51.6% Employee base has been reduced
40.6% Capital expenditures for logistics have been reduced
31.0% Availability of greater/more specialized logistics expertise
60.0% Increased flexibility
29.0% Improved use of information technology
8.4% Other:

15. What problems have you experienced in your outsourcing efforts? *(Check all that apply)*

29.8% Control over the outsourced function(s) has diminished
22.5% Service level commitments have not been realized
29.1% Quality of third party employees has not meet our expectations
30.5% Time and effort spent on logistics has not decreased
9.9% Customer complaints have increased
20.5% Cost reductions have not been realized
17.2% Unsatisfactory transition occurred during implementation stage
9.3% Other:

16. Overall, have your outsourcing activities been successful?
(Check the single most appropriate answer)

29.9% Yes, they have been extremely successful
56.6% Yes, they have been somewhat successful
11.0% They are neither successful or unsuccessful
1.9% No, they have been somewhat unsuccessful
0.6% No, they have been extremely unsuccessful

17. How many third party logistics suppliers were under serious consideration or on your "short list" during the final selection decision?

2.70 Number of finalists (range of responses from 1 to 10)

18. Please rate the importance of each of the following selection criteria to you during the time you were making your most recent third party logistics acquisition decision. Also, please indicate your opinion of how much difference there is among suppliers in the industry on each of the selection criteria.

Importance Rating Scale Not Important 1 2 3 4 5 6 7 Very Important

Difference Rating Scale All About the Same 1 2 3 4 5 6 7 Differ Widely

	Importance Ratings		Difference Ratings	
	Mean	Std. Dev.	Mean	Std. Dev.
Provision of integrated logistics services	4.60	1.77	4.95	1.44
Single contact point	5.48	1.26	4.35	1.44
Continuous improvement	5.86	1.14	4.53	1.32
Direct control of all services provided	4.96	1.48	4.54	1.33
International capabilities	3.96	2.24	5.16	1.47
Breadth of services	4.86	1.52	5.11	1.27
Required services at lowest price	5.04	1.38	4.92	1.23
Quality of service	6.62	0.61	5.06	1.40
EDI capabilities	5.11	1.69	4.82	1.43
Confidentiality during negotiations	5.21	1.70	3.55	1.61
Warehouse mgmt. system	4.41	1.92	4.64	1.39
Software/systems capability	5.21	1.58	5.06	1.39
Proven track record of experience	5.92	0.92	4.97	1.37
Financial strength	5.84	1.05	4.97	1.30
Asset ownership	4.07	1.65	4.75	1.37
Depth of management expertise	5.84	0.93	5.22	1.37
Experience in your industry	5.43	1.40	5.21	1.59
Time in business	4.81	1.26	4.58	1.46
References from current customers	5.01	1.53	4.08	1.37
Strategic partner potential	5.05	1.66	4.84	1.35
ISO 9000 certification	3.17	1.76	4.71	1.72
Gain sharing from productivity improvements	4.84	1.63	4.78	1.31
Compatible culture	5.08	1.43	5.03	1.40
Skill level of workers	5.23	1.00	4.74	1.33
Quick response to customer requests	6.28	0.89	4.71	1.43
Non-union work force	4.50	1.90	4.63	1.36
Contractual/pricing flexibility	5.57	1.04	4.56	1.33
Willingness to assume ownership of existing assets	3.26	1.78	4.50	1.40
Overall cost of service	5.91	0.98	5.01	1.15
Operational flexibility	6.10	0.80	4.99	1.29

19. Please indicate the extent to which you agree or disagree with each of the following statements.
Agreement Rating Scale: Strongly Agree 1 2 3 4 5 6 7 Strongly Disagree

	Agreement Ratings	
	Mean	Std. Dev.
Our industry is highly competitive	1.76	1.23
Our company's products are perishable or otherwise non-durable	5.01	2.30
Our industry is experiencing significant growth	3.97	1.74
Our company's purchasing philosophies support the concept of outsourcing	3.47	1.43
Our strategic intent is to make greater use of third parties	3.50	1.47
Logistics is a "core competency" at our firm	3.85	1.84
Our customers are placing a greater interest on customer service	2.48	1.41
Our customers place a higher priority on price, rather than on service	3.92	1.59
Our company welcomes new and innovative ways to improve logistics	2.53	1.47
Control over logistics can be improved through the use of third parties	3.54	1.46
Our company uses centralized purchasing for the acquisition of logistics services	3.88	2.18
Our firm is "easy to do business with"	3.99	1.64
Our company is much more receptive to the use of third party providers than we were five years ago	2.75	1.55
Third party providers are generally capable/competent	3.41	1.26
Third party providers have a long-term commitment to their business	3.41	1.31
The more experienced third party providers will have greater "staying power"	2.97	1.36
Third party suppliers should provide a broad, comprehensive set of service offerings	2.85	1.45
Third party suppliers should focus on their own areas of core competency, and use other suppliers to broaden their service offerings	3.12	1.37

Section II is designed solely for two types of respondents: 1) those who are not currently using third party/contract logistics services and 2) those without any prior experience with third party/contract logistics.

Section II: Companies Not Currently Using Third Party/Contract Logistics Services

20. Which of the following help to explain why you do not currently use a third party supplier of logistics services? (Check all that apply)

6.4% We have not been approached by third party providers
38.9% We have not yet considered the possibility of using a third party
33.7% Other: (most common response: not enough volume to warrant outsourcing now and suppliers do not offer the services we need)

21. What are your organizational unit's plans for outsourcing logistics activities? (Check one)

9.8% We plan to outsource certain logistics activities in the near future
33.6% We are studying opportunities to outsource logistics activities
56.6% We have no plans to outsource logistics activities

22. How familiar do you feel you are with third party logistics suppliers and the services which they offer?

30.1% Very familiar
67.6% Somewhat familiar
2.3% Not familiar at all

23. Would you say that your company's purchasing philosophy generally supports the use of third party suppliers for logistics services?

71.4% NO
28.6% YES

24. Please indicate the extent to which you agree or disagree with the following statements.
Agreement Rating Scale: Strongly Agree 1 2 3 4 5 6 7 Strongly Disagree

	Agreement Ratings	
	Mean	Std. Dev.
We would experience a loss of control by outsourcing logistics	3.65	1.34
Logistics is a core competency of our firm	3.44	1.22
Third party suppliers cannot supply an adequate level of service	1.57	1.43
We do not have enough volume to warrant outsourcing logistics	5.23	1.65
Third party logistics suppliers do not offer the services that we need	5.29	1.43
Our logistics costs could be reduced by outsourcing logistics	4.88	1.54
Our logistics service levels could be improved by outsourcing logistics	4.64	1.43
Our firm would be better able to focus on its core competencies by outsourcing logistics	4.78	1.56
Our employee base could be reduced by outsourcing logistics	2.88	1.78
Our capital expenditures for logistics could be reduced outsourcing logistics	3.68	2.11
We would obtain greater or more logistics expertise by outsourcing logistics	4.23	1.78
We could improve flexibility by outsourcing logistics	4.27	1.91
We could attain improved use of information technology by outsourcing logistics	3.89	1.67
If we outsource logistics, the performance of third party employees may not meet our quality expectations	3.76	1.45
Time and expense spent on logistics may not decrease by outsourcing logistics	3.33	1.40
Customer complaints may increase as a result of outsourcing logistics	3.55	1.29

Section III: Important Background Information

This last section provides important baseline information necessary for statistical purposes only, so that your answers may be compared to others like yourself. It is applicable to all survey participants. Responses should reflect the organizational unit, i.e., corporate, division, business unit, department etc., most likely to be involved in a decision to purchase third party/contract logistics services.

25. Please indicate any of the following activities which are currently being outsourced by your organizational unit. *(Check all that apply)*

	USERS	NON-USERS
Manufacturing	43.3%	22.9%
Use of contract employees	54.8%	42.9%
Payroll services	28.7%	28.6%
Personnel services	9.6%	8.9%
Information systems	26.8%	15.8%
Advertising	31.2%	28.6%
Product merchandising	10.8%	5.1%
Other:	20.4%	11.6%

26. Which of the following most closely describes your organizational unit?

	USERS	NON-USERS
Raw materials supplier	2.5%	1.3%
Manufacturer (component)	9.6%	12.3%
Manufacturer (finished product)	63.1%	71.7%
Wholesaler	12.1%	6.8%
Retailer	10.2%	7.9%
Other:	2.5%	0.0%

27. Please estimate your organizational unit's total sales for 1994.

	USERS	NON-USERS
less than $10 million	0.0%	2.6%
$10 million to $100 million	11.0%	19.1%
$100 million to $500 million	22.1%	30.3%
$500 million to $1 billion	23.4%	19.2%
Greater than $1 billion	43.5%	28.8%

28. What is the geographical scope of your organizational unit's operations?

	USERS	NON-USERS
International/global	55.8%	50.1%
North America (U.S./Canada/Mexico)	21.2%	18.9%
U.S. - national	17.3%	22.9%
U.S. - regional	5.1%	8.1%
Local	0.6%	0.0%

29. Would you say the structure of your organizational unit's logistics system is:

	USERS	NON-USERS
Centralized	74.5%	71.3%
Decentralized	25.5%	28.7%

30. What is the principal type of product manufactured or distributed by your organizational unit?

(Please see **Table 4.3.** in chapter four for responses to question 31)

31. Does your organizational unit have a separate logistics or distribution division?

	USERS	NON-USERS
NO	42.2%	49.9%
YES	57.8%	50.1%

32. Please estimate the percentage of your organizational unit's finished goods that are handled by each of the following types of facilities.

	USERS	NON-USERS
Company-owned warehouses	39.5	42.3
Company-leased warehouses	15.5	20.1
Contract warehouses	13.2	4.1
Public warehouses	9.3	10.7
Shipped directly to customers	22.5	22.8

33. Which of the following factors is having a significant impact on the industry in which your organizational unit competes? *(Check all that apply)*

	USERS	NON-USERS
Globalization	50.3%	53.1%
Development of new technologies	45.9%	39.5%
Rapidly-accelerating product development	47.1%	33.4%
New markets	38.9%	30.2%
Intensifying government/regulatory policies	41.0%	35.4%
Significant pressures to reduce cost	85.4%	82.3%

34. Please rank the following factors to characterize how your organizational unit views the importance of logistics. (*Ranking scale is "1" most important, "2" second most important, etc.)*

	USERS	NON-USERS
Cost minimization	277	265
Profit center	260	235
Customer-service driven	253	210
Source of strategic, competitive advantage	207	203

Note: responses reflect a weighted ranking score based on the frequency of rankings and weighting factors.

Is there anything else you would like to tell us about the third party/contract logistics market? If so, please use this space for that purpose.

THANK YOU FOR YOUR TIME AND EFFORT IN COMPLETING THIS SURVEY!

(Please include your business card to receive a summary of the research findings)

MAIL SURVEY TO:

The University of Tennessee
Department of Marketing, Logistics and Transportation
Third Party Logistics Research Team
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Knoxville, Tennessee 37996

VITA

Harry Lee Sink was born in Roanoke, Virginia on March 5, 1949. He attended public schools in and around Roanoke until his father, a lifelong long-haul truck driver, was transferred to Martinsville, Virginia. Harry graduated from Martinsville High School in 1967 and immediately began work as a nitroglycerin operator with Hercules Incorporated at Radford Army Ammunition Plant in Radford, Virginia. He married Sarah Ann Ussery of Martinsville, VA in 1968. She completed college in 1969 and encouraged her husband to pursue a college education. Harry and Sarah were blessed with the birth of a son, Kevin Lee Sink, in 1968.

Harry graduated Cum Laude from Dabney S. Lancaster Community College, Clifton Forge, VA with an Associate in Arts degree in May 1971. He also completed a tractor-trailer training course conducted by the continuing education division of North Carolina State University, Raleigh, NC in September 1971. He was employed for the next four years as an over-the-road tractor-trailer driver by a contract trucking company and two Class I less-than-truckload motor carriers.

A career in transportation management interested Harry and he decided to return to college and obtain formal education in the field. He began his studies at The University of Tennessee, Knoxville (UTK) in 1975. Harry "majored" in transportation and graduated "With Highest Honors" from UTK in 1977. He received numerous scholarships while completing his undergraduate studies and was named Delta Nu Alpha's National Outstanding Transportation Student of the Year during the 1977-78 academic year. Harry was also awarded a Hilton A. Smith graduate fellowship at UTK and began work toward a Master of Business Administration

degree with a concentration in logistics and transportation. He earned the MBA degree in August 1978.

Harry accepted a position in transportation management with a Fortune 500 chemical company upon graduation. He was promoted four times during the next twelve years as he "rose through the ranks" with the chemical company. He was also awarded incentive stock options and bonuses during his tenure for superior management performance. Moreover, he was promoted to the highest "field" distribution management position in the company before acting on a long-term desire to earn a doctoral degree with a concentration in logistics and transportation.

Kevin graduated from college in 1990 and Harry decided to resign his management position and begin full-time doctoral study in 1991. In 1993, Harry passed his logistics and transportation comprehensive examinations "With Distinction." In 1994, he accepted a position as adjunct professor with North Carolina Agricultural and Technical State University (NC A&T SU), Greensboro NC. Harry received the Ph. D. degree in 1995 and currently teaches logistics, transportation, purchasing and business management courses at NC A&T SU. He also serves as an advisor to industry and government on matters of logistics strategy and transportation management.