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The Ohio State University, Ph.D., 1977
Marketing

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1976
CUSTOMER SERVICE AS AN ELEMENT OF THE MARKETING MIX:
THE EVALUATION OF A DESCRIPTIVE MODEL OF
CUSTOMER SERVICE

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

By

Paul Harvey Zinszer, B.S.C.E., M.C.R.P., M.B.A.

The Ohio State University
1976

Reading Committee:
Dr. Bernard J. La Londe
Dr. John R. Grabner
Dr. Robert G. House

Approved by

Adviser
Department of Marketing
ACKNOWLEDGMENTS

Thomas Edison has been quoted as saying that invention consists of:

"one percent inspiration and ninety-nine percent perspiration"

As this research project reflects this process I believe Mr. Edison slighted the second component. In that this document reflects both the culmination of the first phase of my research in the areas of customer service and the completion of my degree requirements, I would like to acknowledge the contribution made by others, who have facilitated the attainment of these goals.

My family has provided the support and encouragement which I find necessary in my life. For this love and affection I thank Dianne, Glenn and Matt. Of special consideration is the gratitude I wish to express to Professor Bernard J. LaLonde, who is both a scholar and gentleman in the truest sense of the words. His influence on my life during the six years which I have known him has been substantial. As a masters student he initially aroused my interest in the area of physical distribution. Three years later as an entering Ph.D. candidate he created the environment which has challenged, supported and provided guidance through the pursuit of this degree and this project. For this leadership, I am grateful.
Two years of consulting with Professor Donald J. Bowersox provided the opportunity to evaluate in considerable detail the interaction of cost/service components of distribution systems. It is from this experience that my initial ideas concerning customer service were developed. This in turn prompted my return to Ohio State to pursue this work. I am thankful for this opportunity.

My committee has been most helpful during this research project, both in terms of their excessive expectations and commitment. Professor Bernard J. LaLonde provided both the stimulus and the collaborative opportunity to develop relationships which this research explores. Professor Robert G. House who I admire both professionally and personally brought a certain rigor to the research design. Professor John R. Grabner contributed perspective by always bringing the project back to reality by relating to the "known" world. I thank the committee for their commitment and dedication to this work.

The data used in this research was collected for a research project conducted for The National Council of Physical Distribution Management and—presented in a book, Customer Service: Meaning and Measurement by B.J. LaLonde and P.H. Zinszer. I am particularly grateful for NCPDM's interest in this area of distribution, and in particular I am grateful for their selection of the research proposal which I prepared.

During the Ph.D. program fellow students have mutually assisted in our collective development. Fran Tucker taught us how to question, Jim Stock showed us how to work, Doug Lambert rationalized the most complex of problems and Saeed Samiee continually tested the system. I thank them for the comradery of those days.
This report would not be in its present legible condition were it not for the contributions made by Ms. Katie Kiefer, Ms. Cindy Coykendale, Ms. Chris Durtschi and Mrs. Jane Burrows who accepted my commitments as their own.
VITA

May 2, 1945. . . . . . Born - Berkley, California

1969 . . . . . . . B.S.C.E., The Ohio State University, Columbus, Ohio

1970 . . . . . . . M.C.R.P., The Ohio State University, Columbus, Ohio

1970 . . . . . . . M.B.A., The Ohio State University, Columbus, Ohio


1973-1975. . . . . Research Associate, College of Administrative Science, The Ohio State University, Columbus, Ohio

1976-1977. . . . . Visiting Assistant Professor, College of Administrative Science, The Ohio State University, Columbus, Ohio

FIELDS OF STUDY

Major Field: Logistics

Minor Field: Marketing
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CHAPTER I
INTRODUCTION

Background

Recent changes in the business environment have led many firms to reevaluate their product offerings. In particular, those characteristics associated with product delivery have come under increased scrutiny. Business generally describes these characteristics of product delivery as customer service.\(^1\) This study was designed to develop a general definition of customer service based on usage of the term by business, to identify and evaluate the relative importance of the component elements of customer service, and to determine whether the importance of the elements varies by industry.

Three major factors which have aroused business interest about customer service levels and policies were the rapid increase in cost of capital during the early 1970's, the business recession of 1974-75, and the impact of product shortages, particularly the 1973-74 petroleum shortage, all affected the firm's operating environment. The prime interest rate reached 12 percent in 1974 and remained at

\(^{1}\)As defined by NCPDM Comment, August 1974, "Customer service is defined as the sum of interfaces between the firm and its customer, as it relates to product movement."
historical high levels into 1976. This had the direct impact of causing many firms to reduce inventory levels. This recession forced many firms to reconsider their service standards in light of reduced sales volumes. Product shortages, whether due to high prices or controlled market conditions, affected the normal operation of many firms through the reduction in availability of raw materials, the curtailment of energy supplies for manufacturing use, or the scarcity of petroleum to meet the firms' transportation needs.

The effect of each of these environmental changes on the firm was often a reduction in the level of customer service and its importance as a variable of the product offering. However, the recent economic uncertainties have forced many firms to adjust operations affecting service without the benefit of research to provide guidance for decision-making in this area.

Statement of the Problem

This study has two purposes. The first is to provide managers with information concerning customer service so they might be better able to make operating decisions concerning the relative importance of customer service as a variable of the marketing mix and to determine the relative importance of specific elements of customer service. The second purpose of the study is to establish a comprehensive examination of customer service from a marketing perspective, generalizable across industries as a basis for further research in this area. The major goals of the research are to:
1. Develop a generic definition of customer service based upon use of the term by distribution management.

2. Evaluate the importance of customer service relative to other marketing variables and determine how perceptions of relative importance vary by functional area of responsibility within the firm.

3. Determine if the relative importance placed on the component elements of customer service differs by industry.

4. Evaluate whether a functional relationship exists between the relative importance of the component elements of customer service and the characteristics of product flow and distribution system configuration.

Scope

Members of the National Council of Physical Distribution Management (NCPDM) served as the study base. Respondents for both questionnaires and personal interviews were selected based on their understanding of customer service. This understanding is reflective of "state-of-the-art" knowledge among firms sensitive to the importance of customer service. Fourteen standard industry classifications adopted by NCPDM were used in the study to categorize responses. Respondents also categorized their firms as primarily a manufacturer or merchandiser.

Individual respondents were selected by title; only persons with managerial titles indicating authority within the physical distribution function were chosen as prospective respondents. Data collected from other functional areas within the firm (top management, production, purchasing and marketing) also reflect the perspective of the management level within each area.
The development of the topic presented in this study is from the perspective of the marketing/distribution activity of the firm. The study also compares perceptions of customer service from the perspective of the firm's customers (these are wholesalers, retailers, etc. not ultimate consumers) and relates these perceptions to perceptions from within the firm about customer service.

**Hypotheses**

The research issues developed in the problem statement led to the subsequent development of several hypotheses. The first research issue concerned the development of a generic definition of customer service based upon use of the term by distribution management. Two important questions emerge in defining customer service. The first concerns the extent to which companies perceive customer service activities as part of the sales function; the second determines whether firms perceive customer service as an activity in its own right or simply as evaluative measure of how well an activity is performed.

Two hypotheses evaluate these research questions:

**Hypothesis 1A.** Physical distribution management does not perceive sales activities as distinct from customer service activities.

**Hypothesis 1B.** Physical distribution management does not perceive customer service as an evaluative measure of performance of an activity.

The second research issue addresses the relative importance of customer service as a marketing mix variable. Because the establishment of customer service standards can occur through the interaction of the major functional areas within the firm, this research question
compares the customer's perceptions with the perceptions of five functional areas of responsibility within the firm. The statement of the hypothesis is:

Hypothesis 2. There is no difference in the relative importance of the marketing variables as perceived by executives in various functional areas of the firm and its customers.

The third research question concerns the relative importance placed on the component elements of customer service by different industries. The statement of the hypothesis is:

Hypothesis 3. There are no significant differences in the ranking of the major component elements of customer service by industry classification.

The fourth research question identifies variables which influence the importance of the elements of customer service. The hypothesis which assesses this relationship is:

Hypothesis 4. There is no functional relationship between the relative importance of the elements of customer service and variables which are characteristics of product flow and the distribution system configuration.

Methodology

The study data were collected with a series of three mail questionnaires. The respondents were selected from the mailing list of the National Council of Physical Distribution Management. An addressed,

2 The five functional areas compared were: purchasing, top management, marketing, production, and physical distribution.
stamped envelope accompanied all questionnaires to motivate response by reducing encumbrances on the respondent and assuring privacy of response.

The first questionnaire collected data describing the distribution system and elements of customer service and established a mechanism for distributing questionnaires to the other corporate functions. The second series of questionnaires inquired about respondents' perceptions of the effect of change in level of service. The third questionnaire prompted the response of previous questionnaires and gathered data on characteristics of product flow.

A variety of parametric and non-parametric statistical techniques were used to test the study hypotheses. The first hypothesis was evaluated using chi-square analysis. The second and third hypotheses were evaluated using the Kolmogorov-Smirnov two-sample test. The fourth hypothesis was evaluated by factor analyzing the variables of product flow and distribution system configuration. Responses were then grouped based upon the characteristics of customer service by multidimensional scaling techniques and hierarchical clustering. These clusters were compared to those derived through factor scores by employing discriminate analysis to compare predicted and actual assignment of respondents to groups.

Limitations

Study participants were selected from the NCPDM membership list based upon criteria of (1) perceived knowledge in the area of physical distribution and customer service and (2) the necessity of a management
title. Thus, a knowledgeable segment of American industry rather than a representative sample provided the data. Selection was dependent upon the researcher's perception of the respondent's understanding of physical distribution. The respondents to the study were primarily distribution executives, although an attempt was made to evaluate the perceptions of other functional areas within the firm.

The theoretical development of this research is from the marketing/distribution literature. Literature pertaining to purchasing/consuming has not been developed in this research because of the difference in perspective concerning distribution activities.

Extensive questionnaire pretesting and the provision of an instruction sheet with the questionnaire minimized data distortion. The research is vulnerable to other limitations of the methodology, such as the small sample size, the inability to control for delegation of response to subordinates and non-response bias.

**Possible Contributions of the Study**

This research contributes to marketing/distribution theory by developing a generic definition of customer service, identifying and evaluating the existence of multiple elements of customer service, and determining the relative importance of customer service as a marketing variable.

The impact of this research on physical distribution practice may be substantial. Many firms in recent years have reduced customer service levels. This research provides an expanded understanding of
not only the critical elements of customer service but also their relative importance. Another result is an appreciation of how these elements vary by industry. The net result of this knowledge when applied to the market is to increase marketing efficiency.

The results from this exploratory research are expected to provide substantive contributions to theory ultimately affecting practice in marketing distribution. Increased understanding of the phenomenon of customer service contributes to theory by (1) providing a descriptive model of customer service, (2) demonstrating that the relative importance of customer service differs by industry, and (3) determining that a relationship exists between the importance of the elements of customer service and characteristics of product flow and distribution system design. For the manager the service elements and their relative importance are criteria to use in judging what is service to the consumer.

Organization

The purpose of the first chapter is to identify the topic of customer service and demonstrate the need for this research. The problems addressed in this research are identified and the outline of the research procedure is developed.

In Chapter II the literature considered relevant to this study is presented. The material presented falls into five different areas so that each may apply more directly to a specific research question.
In Chapter III the research design is developed, consisting of an overview of the research, the development of the questionnaire design, and an examination of the analytic techniques. Included in the discussion of analytic techniques is a development and discussion of the particular research issue tested. This chapter, along with the associated appendices, includes the complete procedure followed in the study.

In Chapter IV the analysis and findings of the research questions are reviewed. Each research question is examined as are the hypotheses, the testing procedures, and the results.

In Chapter V the conclusions are developed, their implications are evaluated, and future research is identified. This material is developed around each specific research question which serves as a focal point for the evaluation.
CHAPTER II
REVIEW OF LITERATURE

Introduction

This chapter presents a review of that part of the marketing literature that provides a substantive contribution to the development of thought concerning customer service. The material is organized and presented to develop particular concepts relevant to the research undertaken in this study. The first section outlines the development of the concepts of customer service from the marketing literature. In the second section definitions of customer service are presented. Chapter III uses these definitions to identify critical component variables evaluated in this research. Presented in the third section of this chapter is research which evaluates specific elements of customer service. This material contributes to the development of the descriptive model of customer service. The fourth section presents research which compares the perceptions of customer service by customers and firms. The fifth section of this chapter evaluates research which examines the effect of differing levels of service on product sales. The final section contains the conceptual model used in this study. The model is based on a synthesis of existing literature; it has been expanded to include areas which have not previously been reviewed in the literature.
Historical Overview of Customer Service

One of the earliest authors in the area of general marketing was A. W. Shaw, who described the flow of agricultural products through distribution channels. He defined the marketing process as "Demand creation and physical supply."¹

Not only did he associate the word "distribution" with physical supply, but he recognized this process as "matter in motion" concerned with changing both place and ownership.

The distinction made between changing place and ownership implies that product movement alone is insufficient; rather, product movement which culminates in consumer ownership is the goal of distribution. This differentiation establishes an evaluative criteria of distribution; that is, having the right product at the right place at the right time. As Shaw explains, this is necessary to accomplish the ultimate result of this process--product ownership by the customer.

Another author exhibiting considerable insight into product distribution and customer service was Fred Clark. Clark recognized the importance of customer service both from the effect which this element of the marketing mix has on a product's sales, as well as from the effect that customer service has on physical distribution costs. In his 1922 Principles of Marketing, in a section on the "Components of Marketing Efficiency," Clark recognized that, "First among these must

be considered the effectiveness with which the distribution service is rendered, then the cost at which this service is performed."² He goes on to elaborate that, "it is evident that the first two elements of marketing efficiency, service and cost, must be studied as composing the problem."³ "In any criticism which may be made, the investigator must be careful to balance properly the service rendered against the cost. Too often the former is forgotten. If the buyer demands service, he must pay."⁴ Clark was one of the earliest authors to recognize the dichotomy presented in the creation of time and place utility. He recognized that increased levels of service demanded by the customer must be borne by the customer in the form of increased product costs.

Beckman, Davidson and Talarzyk addressed the fact that buyers' demands for services are indistinguishable from the satisfactions provided by the product itself. They state, "Because such services are invariably supplied to the consumer in marketing, their cost is necessarily tied to the cost of distribution goods. It is often overlooked, however, that such service results in satisfactions just as real as those yielded by the physical products."⁵

³Ibid., p. 496.
⁴Ibid., p. 501.
Another contemporary author, Philip Kotler, defines the marketing process as "Customer orientation backed by integrated marketing aimed at generating customer satisfaction as the key to satisfying organizational goals."6

This definition emphasizes the importance to the organization in "generating customer satisfaction." Therefore it is the customer's, rather than the seller's, desire and perception of services provided to him which are of paramount importance. This is a critical concept, for regardless of the specific services and their actual level, it is the customer's perception of them which is important in "satisfying organizational goals."

These concepts summarize the philosophies which encompass the material developed in this research. That is, a high degree of interrelationship exists between the activities of marketing and physical distribution. The physical distribution activity concerns itself with more than just moving product; the total cost and service levels achieved are of inseparable concern.

Contemporary Definitions of Customer Service

The phrase "customer service" presently seems to lack generic definition, apparently because of the highly situational use of the term. Customer service is a "catch all" term used by industry for all critical activities necessary for satisfying customers with respect to the firm's present methods of operation. That is, the specific

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element of customer service which is most significant to the firm defines customer service. For example, customer service is often defined by the activities of the position such as handling customer complaints, maintaining inventory availability and inventory status reports, or accepting orders and maintaining even work flow at an order processing area.

An examination of several definitions of customer service will serve as an illustration of these points. Ballou and Kalwani in a study specifically examining transit time stated that "customer service can be defined without a great loss in generality as consistency in order cycle times." In this case the authors used a very constrained definition of customer service to serve the purpose of the specific research. Willett and Stephenson examined order cycle time and order cycle consistency and, like Ballou and Kalwani, defined customer service very narrowly.

A definition of customer service in the Logistics Newsletter, a publication of Japan Air Lines, provides an example of an activity-related definition. They defined customer service as "organizing the order-fulfillment activity so that customer orders will be delivered within the time-frame required, complete, accurate, free from damage and


in the units of handling and shipping required, and at minimum cost."  

One purpose of this publication was to sell air freight capacity, therefore emphasis on these activities is understandable. This definition of customer service was presumably conducive to meeting that goal by explicitly defining the activities and final condition of the shipment.

Morrison, in his monograph "Customer Service", defines customer service as "services over and above the assembly and sale of merchandise." This definition alludes to activities "above the assembly and sales of merchandise" but it appears to exclude sales activities as a component of customer service.

One definition of customer service which is probably used more frequently than any other is the one developed and used by The National Council of Physical Distribution Management: "The sum of all interfaces between the customer and the corporation." This definition does not itemize corporate activities such as the JAL definition; however, it appears to include sales as well as credit promotion activities within its context. It is not evaluative of activities at the interface between customer and the corporation; that is, the per-

---


formance of these activities is not necessarily sales enhancing based on how they are performed. Rather their existence is customer service.

A definition which is evaluative of the performance is that provided by *Sales Management* magazine. This publication defines customer service as "those activities that enhance or facilitate the sale and use of one's products or services." This definition appears to exclude direct sales activities in those activities included as customer service.

Several definitions of customer service were presented in this section to show the range and variety of definitions being used in the literature. These definitions vary with respect to three specific characteristics:

1. The degree of specificity of those activities which constitute customer service;
2. The level of involvement of customer service as a sales activity;
3. The determination of whether customer service is evaluative of the activity being performed or whether customer service is itself an activity.

These criteria are applied to specific definitions in the development of the first research question in Chapter III.

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Research Evaluating Component Elements of Customer Service

Like the definitions of customer service, research examining the component elements of customer service is largely situation specific. Attempts at generalizing customer service elements to all purchase situations appear to meet with limited success.

The definition of customer service provided by Ballou and Kalwani and also Willett and Stephenson identifies elements of customer service, of order cycle time, and consistency of the order cycle time. This focus results more from the particular research they present than from the completeness of the list of those elements of customer service which they feel are relevant to all purchase decisions.

Bowersox defines customer service as consisting of three component elements:13

1. product availability;
2. order cycle time;
3. consistency of order cycle time.

It is interesting to note that a current publication by an author as widely read as Bowersox views customer service as consisting only of these three elements.

Hutchison and Stolle14 identify six specific elements of customer service. These elements and their respective definitions are:

1. Order processing time - time from receipt of order until ready for assembly;
2. Order assembly time - time to prepare order for shipment;
3. Delivery time - time in transit to customer;
4. Inventory reliability - stock-outs, back orders, percent of demand filled, omission rate, percent of orders shipped complete;
5. Order-size constraint - minimum order size and minimum frequency allowed;
6. Consistency - range of variation in each of the preceding elements.

The first three elements in this list could be combined into one element—order cycle time. Inventory reliability is a proxy measure for product in-stock availability. The authors contribute the element of order size constraints to the three elements previously identified. They recognize that frequent and/or small size orders may realize less profit per unit than other orders.

Stephenson and Willett\(^\text{15}\) hypothesize relationships between customer service and company profits. In doing so, they identify eleven component elements of customer service:

1. Order cycle length
2. Consistency of order cycle length
3. Order preparation (includes medium of transmittal from customer to supplier).
4. Order accuracy

\(^{15}\text{Ronald Stephenson and Ronald P. Willett. "Selling with Physical Distribution." Business Horizons (December, 1968), pp. 75-85.}\)
5. Order condition when received
6. Order size
7. Order frequency
8. Bill accuracy
9. Billing efficiency - supplier facilitating customer's handling of accounts payable
10. Back orders
11. Claims

The authors discuss only the first three elements of service. They justify the analysis of only three elements by stating that "they are extremely important to the physical distribution manager and have general importance across industries." Their research indicates that customers can accurately perceive differences in alternate supplier order cycle times.16

Bender17 brought together many of the interactive organizational components relative to customer service in his text Design and Operation of Customer Service Systems. He presents theories concerning the impact of service on sales, inventory levels on product availability, and he examines the impact of organizational structure and forecasting techniques on customer service.


This section of the chapter reviewed the development of the component elements of customer service. The three major elements of product availability, order cycle time, and consistency of order cycle time are the focal points of this development. Hutchinson and Stolle add an element of order-size constraints and subdivide order cycle time into three components of order processing time, order assembly time, and delivery time. Stephenson and Willett identify eleven elements of customer service but analyze only three and state that "they are extremely important to the physical distribution manager and have general importance across industries." Bender examines the operational impact of customer service policies on organizational structure, inventory levels, and forecasting abilities of the firm.

The following section presents research which attempts to evaluate customers' perceptions of the service with which they have been provided.

Research Evaluating Customers' Perceptions of Service Levels

Researchers have become increasingly aware of the importance of examining customer service from the perspective of the customer. Several researchers have shown that the customer's perception of the service levels provided is more important than the actual levels achieved. Presented in this section of the report are several studies which evaluated the customers' perceptions of the service levels provided.
William Perreault, Jr. examined the relation of customer service to the purchase decision in the industrial purchase of six specific products. The purchasing agents responded to a mail questionnaire based upon the purchase criteria of one of these products. Perreault found that although customer service is an important purchasing determinant, the specific elements of customer service elements vary in importance in different purchasing situations. However, he concluded that "purchasing managers do not appear to be evaluating customer service as they should." He based this statement on the inordinately high level of defective product which the purchasers perceive relative to the actual situation as he evaluates it. The purchasing agents in this situation base purchase decisions on the perceived level of defective product rather than the actual level.

Willett and Stephenson evaluated order cycle time relative to the distance from the supplier and the means of order communication. Their findings rest on a survey of 480 retailers of dry and drug sundries. The retailers reconstructed the means of order communication and distance from the supplier for the last order they had placed. The retailers made a comparison of these two conditions and the resulting order cycle time for each of six suppliers. Willett and Stephenson


concluded that buyers can discriminate among even small differences in physical distribution service time and that their ratings of satisfaction with service times are a linear function of service times.

M. K. Wilson\textsuperscript{20} examined the salient attributes of customer service in the plumbing fixtures and supplies industry. Distributor-wholesale-salers evaluated the nine largest manufacturing firms in the industry. The distributors furnished subjective estimates of the similarities and differences in the customer service offering using nine customer service elements to evaluate each of the nine manufacturers. These data were analyzed using a nonmetric multidimensional scaling algorithm. This analysis resulted in the recovery of two clusters of groups of distributors. This indicated to Wilson that there were two specific market segments, each segment evaluating both the importance of the customer service elements and the specific manufacturers which provided them in a comparable manner.

This rather recent research indicates an increased awareness of the importance of evaluating the customer's perception of the services with which they are provided. In the specific situations examined it was found that customers tend to exaggerate the importance of relatively poor service which may be provided them. However, customers appear to be extremely perceptive in evaluating alternate levels of service provided by different suppliers. The perceptive ability of the customer

to differentiate among suppliers based upon the service levels provided can result in customers' segmenting suppliers into distinct categories of acceptable and unacceptable levels of service.

Research Evaluating the Effect of Customer Service on Sales

The evaluation of the effect of different customer service levels on sales has generally focused attention on the effects of product stockouts on sales, thus relying heavily on inventory control theory. While it is apparent that product availability is a significant element of customer service, it is not the only significant variable.

Shycon analyzed the effects of the number of product days stock-out on retail grocery sales in the Boston area. He found that for the typical shipment consisting of 1,000 cases with a gross profit of $1,500, the effects of product stockout days were as follows:

- 2-day stock-out: gross profit lost - $130.00
- 4-day stock-out: gross profit lost - $185.00
- 7-day stock-out: gross profit lost - $687.00

The results of the study indicate that lost profits increase exponentially as stock-out days increase. In the short run, a trade off made between profits lost due to customer service standards and the additional cost of making these improvements is appropriate.21

In a study by the A. C. Nielsen Company for the National Association of Food Chains, stock conditions in grocery stores were measured

and customer surveys were taken to evaluate their response to the stock-outs. The results showed that:

1. An average of 42 percent are "shoppers refusing to buy substitute brand when favorite brand is out of stock."

2. An average of nearly 20 percent, ranging from 13 to 24 percent, are "shoppers refusing to buy substitute size for the size "out of stock." Based on these two figures, the report concluded that "about half of 'loyal' customers will accept another size."

Ingram, Brown and Earle compared stock-outs of supermarkets and their warehouses. Based on four weeks of observations of 95 dry grocery products, the percentage of out-of-stocks in retail supermarkets was 5.9 and in warehouses 7.6. In contrast to the Progressive Grocer findings, the Cornell group found that private label stockout rates exceeded the rates for national brands. Both studies provided quantitative measures of the severity of stockouts, although neither attempted to define it in monetary terms. The Cornell study concluded:

It is difficult to determine the actual dollars and cents cost of stockouts in lost sales and profits. Income lost as a result of stockouts depends upon the percentage of

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stockouts and the willingness of customers to buy substitute brands and sizes.\textsuperscript{24}

Swartz criticized conventional treatments of stock-out penalties because "the question of loss of goodwill has been considered amenable only to inexact or subjective treatment."\textsuperscript{25} Furthermore, the penalty cost was often based on the number of units backordered or cancelled at the time of the stock-out. Swartz claimed: "It is the demand experienced in the future, not the expense incurred in the present, that is affected by goodwill."\textsuperscript{26} He developed his "perturbed demand" model to measure the reduction in future demand that reflects customers' loss of goodwill towards the supplier.

Other quantitative studies related lost sales to stock-outs. Burgin describes a quantitative relationship between the number of days out-of-stock and lost sales because of the stock-out.\textsuperscript{27} He assumed that a monetary value could be placed on these lost sales; his method calculated the units of lost sales.

In his model for stock rationing, Kaplan applied two levels of penalty costs, for low and high priority users, to backorders. The model calculates that at some point the supplier incurs a lower

\textsuperscript{24}Ibid., p. 4.


total expected penalty cost by serving only high priority users.\textsuperscript{28}

Christopher and Wills\textsuperscript{29} addressed customer service, specifically developing an ordering system of cross classifying both customers and products. This procedure, much like ABC inventory control, identified both critical customers and products to be controlled in order to achieve desired levels of customer service.

Walter studied the effects of product stock-outs in state liquor stores. He found that rather than substitute an alternate product or size, 14.1 percent of the customers would go to another source while 2.5 percent would return at a later date. Customers were willing to substitute an alternative size of the same brand 19.3 percent of the time; when customers were willing to switch brands, they purchased products at the same price range 59.1 percent of the time while moving up and down in price range 2.5 percent of the time for both alternatives.\textsuperscript{30}

Walter and La Londe\textsuperscript{31} extend this original model to consider the

\begin{itemize}
\end{itemize}
situation of two sequential product stockouts. It should be noted that of those customers experiencing the first stock-out, 14.1 percent switched stores. However, upon experiencing a second stock-out, 39.9 percent were willing to switch stores. The implications of these results are that the consumer becomes increasingly resistant to dealing with merchants who experience repeated stockouts. It would appear that the manufacturer is initially penalized when a single stock-out is experienced, with 64 percent of the customers willing to switch brands. However, upon experiencing a second stock-out, only 24.6 percent of the remaining customers switch brands.

Chang and Niland's model examined the probabilities of the effect of varying lead times on product sales. Lead times are those initially accepted or specified by the customers. If a customer approved an extension of his lead time, the action was termed "postponement." If the supplier judged that he could meet the lead time requirements specified by the customer, including any postponement, he would accept the order. Then the buyer would confirm the order, thus halting his search for another source of supply. The particular order was then filled, incurring some added costs for expediting which were paid at the "compensation" step.

The more involved portion of the model was that component of orders with short lead times that were not postponed. In this case, the supplier could either accept the order or "withdraw from contention" for this particular order. If the supplier chose the "withdrawal," the
customer was forced to search elsewhere for the desired items.  

This research indicated both the poor level of customer service achieved in some industry segments and the significant effect which long order cycle times have on product sales. The modeled results of this research lead to the conclusion that customer service is a major determinant in product selection.

Helferich and Mitchell, using a distribution system simulation computer program, demonstrated the effect of total distribution system cost on achieving various levels of product instock availability. The authors develop through simulation a cost service curve which compares the total cost of physical distribution to varying levels of product instock availability. They found that changing from 89 percent instock to 98 instock incurred a 14.8 percent increase in total cost of product distribution.  

These research findings indicate that customer service, specifically product stock-outs, can have a significant impact on sales. The results are difficult to generalize to all situations since the findings are product- and situation-specific. The response rate of customers surveyed is not known; however, the nature of their

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responses is known. First, a sale of the product which the customer desires will be lost, resulting in lost goodwill of the customer and potential lost revenue to the merchandiser and manufacturer. Upon experiencing a stock-out, a customer will either purchase a different size of the same brand, switch brands, postpone the purchase, or evaluate an alternate source of products. The last two alternatives affect the merchandiser's revenue; hence he tends to respond by initially reducing shelf space, then delisting the product.

Summary and Conclusions

Recent adverse environmental changes in the business climate have refocused attention on customer service. These factors include product shortages resulting from the Mid-East oil boycott, the general business recession in 1974 and 1975, and increased competition to maintain market share. While businesses generally reduced levels of customer service during these periods, they continued to realize relatively sustained market share. Thus, business began to question what levels of customer service were necessary to achieve corporate goals.

The literature which identifies elements of customer service was presented. Extant research has tended to address a limited number of elements of customer service. The elements of customer service which have been identified relate to the transactional stage of purchase generation. Research evaluating the impact of customer service elements has focused exclusively on product availability and order cycle time.
The available literature has focused almost exclusively on the aspects of customer service directly involved in a completed transaction between a buyer and seller. However, few, if any, attempts have been made to deal with those aspects of customer service that arise both prior and subsequent to the transaction. This study is based on a more extensive model of customer service that includes pre- and post-transaction variables as well as those involved in the transaction itself.34

Pre-Transaction Elements of Customer Service relate more to policy than they do to performance. These activities are non-routine in nature and generally require management level decisions for resolution. They include:

1. A written statement of customer service policy delineating the performance standards to be met by transactional and post-transactional activities.

2. Communication of the customer service policy to customers. This acquaints customers with the level of performance customers can expect and with the way in which customers can interact with the supplier. Without communication about system capability, customers may establish their own expectations which may be unrelated to the actual performance capability of the system.

3. An organizational structure facilitating adequate interaction of corporate functions affecting customer service and assuring specific authority and responsibility for the achievement of customer service standards.

Transaction Elements of Customer Service include those activities most commonly associated with customer service:

1. Product stock availability levels; that is the proportion of ordered items (or complete orders) that will normally be filled from stock upon order receipt.
2. Back order procedures.
3. Order cycle time; that is the total time required to deliver a product measured from the time an order is placed until goods are received.
4. Expediting capabilities and procedures to reduce order cycle times in emergency situations.
5. Transshipment policy and procedures governing whether goods will be shipped from a system node other than the one the rest of the order is shipped from if the ordered item is out of stock at the primary node.
6. Order filling and billing accuracy levels.
7. Order placement methods available to customers.
8. Product substitution procedures governing whether or not a closely similar product will be substituted when the ordered item is out of stock.
Post-Transaction Elements of Customer Service are those activities that follow the sale and are supportive of the product while in use by the consumer. They include:

1. Product installation, warranty, repair parts and/or item repair services provided.
2. Product tracking for products which may be potentially harmful if product defects appear after manufacture.
3. Customer claims, and return procedures.
5. Provision of equipment while customer's equipment is undergoing repair.
6. Technical assistance in the areas of order preparation, inventory control and product application.

These elements of customer service are summarized in Figure 4. The model shown in Figure 4 will be used and modified as needed in order to evaluate differences in the importance of customer service by industry. The model is developed further for these purposes in Chapter III.
CUSTOMER SERVICE

PRE-TRANSACTION ELEMENTS
1. Written Statement of Policy
2. Customer Receives Policy Statement
3. Organizational Structure

 TRANSACTION ELEMENTS
1. Stockout Level
2. Ability to Backorder
3. Elements of Order Cycle ($T_1, T_2, T_3, T_4$)
4. Expedite Shipments
5. Transship
6. System Accuracy
7. Order Convenience
8. Product Substitution

 POST-TRANSACTION ELEMENTS
1. Installation, Warrantee, Alterations, Repairs, Parts
2. Product Tracking
3. Customer Claims, Complaints, Returns
4. Product Packaging
5. Temporary Replacement of Product
6. Technical Services

FIGURE 1
DESCRIPTIVE MODEL OF CUSTOMER SERVICE
CHAPTER III
RESEARCH DESIGN

Overview of Methodology

In the preceding chapters a discussion of the forces which focused attention on customer service was presented. These chapters have also covered the relevant literature that has contributed to the development of thought and research in the field of customer service. This chapter details the research design. First, certain hypotheses are developed from the relevant literature. Then the survey design, which consists of pretest considerations, the waves of questionnaires, and an analysis of the response rates, are developed. Finally presented in the last section is an analysis of the procedures used for evaluating the data and for selecting specific analytic techniques.

Questionnaire Design

Development of Questions

This section describes the hypotheses and a summary of the literature as it pertains to the development of each topic. The section also presents specific questions used to collect data and to test the hypotheses.

FIRST HYPOTHESIS: Chapter II outlines a variety of definitions of customer service which can be compared by their component parts. These
definitions exhibit three major distinctions. These distinctions are:

1. Is customer service distinct from or inclusive of direct sales activities?
2. Is customer service evaluative or non-evaluative of performance?
3. Is customer service best described as a corporate philosophy, as an overall activity, or as a set of the specific activities areas?

A summary of the definitions presented in Chapter II relative to these three criteria is presented in Figure 2.

Figure 2 summarizes the definitions presented in Chapter II with respect to these three criteria. This comparison of definitions indicates that: (1) customer service is distinct from direct sales activity, (2) it tends to be characterized as an evaluative measure of performance, and (3) customer service is not seen as an identifiable set of specific activities. However, these generalizations are subject to several qualifications. First, many activities, functions, or end results involve customer service. Second, the definition of customer service must apply to multiple industries and modes of operation. Therefore, any attempt to generate an exhaustive list of all activities is very difficult because of the extensive list of activities or the inappropriate identification of an activity in a particular situation. Third, a corporate philosophy, when expressed, may lack operational applicability because of its vagueness.
<table>
<thead>
<tr>
<th></th>
<th>Customer Service Distinct from Direct Sales</th>
<th>Customer Service Is Evaluative in Nature</th>
<th>Specific Activities Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ballou and Kalwani: &quot;Customer Service can be defined without a great loss in generality as consistency in order cycle times.&quot;</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>JAL: &quot;Organizing the order-fulfillment activity so that customer orders will be delivered within the time-frame required, complete, accurate, free from damage and in the units of handling and shipping required at minimum cost.&quot;</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Morrison: &quot;Services over and above the assembly and sale of merchandise.&quot;</td>
<td>YES</td>
<td>Not Necessarily</td>
<td>NO</td>
</tr>
<tr>
<td>J. Davis: &quot;The sum of all interfaces between the customer and the corporation.&quot;</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td>Sales Management: &quot;Those activities that enhance or facilitate the sale and use of one's products or services.&quot;</td>
<td>YES</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>H. Davis: &quot;The Chain of events that is in the business of keeping customers.&quot;</td>
<td>NO</td>
<td>Possibly</td>
<td>NO</td>
</tr>
</tbody>
</table>

Figure 2
Comparisons Among Definitions of Customer Service
This research question concerns the development of a general definition of customer service based upon usage of the term. Two characteristics of the definition evaluated by distribution management are the determination whether (1) the perception of customer service includes or excludes the selling function of the organization and (2) whether the perception of customer service is an evaluative or non-evaluative measure of the activity being performed.

The hypotheses formulated to evaluate these research questions are as follows:

1A. Physical distribution management does not perceive sales activities as distinct from customer service activities.

1B. Physical distribution management does not perceive customer service as an evaluative measure of performance of an activity.

The specific questions used to collect this data are: "3c. Check the most appropriate completion of the statement, 'Customer service service is: The (contact, performance, interface, efficiency) with which the firm provides customer satisfaction.'" "3d. Customer service is distinct from a firm's sales efforts (e.g., advertising, personal selling, promotions). ___yes, ___no). (Second Questionnaire, Question 3c and 3d. (Appendix E)).

SECOND HYPOTHESIS: The second hypothesis addresses the relative importance of customer service as a variable of marketing. A review of the literature indicates that few studies have attempted to determine
the relative importance of marketing variables including customer service. Perreault and Russ\(^1\) found distribution service to be second in importance to product quality. However, in the allocation of 100 points, distribution service only received 17. However, the variable set under study by Perreault and Russ included the variables of size of business and reciprocity as well as price and quality but excluded promotion or advertising. It seems that these results do not necessarily evaluate the relative importance of customer service as a marketing variable. Previous studies have also failed to obtain the comparative perceptions of the various groups affected by marketing variables.

This study provides an opportunity to compare the perceptions of customers with other corporate members in the functional areas of purchasing, top management, production, marketing, and physical distribution.

The specific statement of the second hypothesis is:

2. There is no difference in the perception of the relative importance of the marketing variables by corporate members (purchasing, top management, production, marketing, and physical distribution) and the firms' customers.

The specific question asked of the respondents reads as follows:

"Indicate the importance of the following variables in achieving sales for your firm (greater points indicate greater importance in achieving sales).

THIRD HYPOTHESIS: This hypothesis evaluates the importance of different elements of customer service based on industry classifications. The components of the La Londe and Zinszer descriptive model of customer service described in Chapter II are evaluated. It is these elements which were compared across industries in order to determine if differences in importance of the elements of customer service exist by industry.

The pretest of the questionnaire used in this study revealed that data on pre-transaction elements of customer service could not be gathered with the instrument used in the study (mail questionnaire). Therefore the study focused on only transactional and post-transactional elements of customer service.

Specifically, the hypothesis evaluated is:

3. There is no statistical difference in the ranking of the major component elements of customer service by industry classification.
The specific question asked the respondents was as follows:

"(1) Provide relative ranking of those measures of customer service (major headings lettered at the left) which are important to your business in generating sales by distributing 100 points among them in Column 1 (more points indicate greater importance)."

<table>
<thead>
<tr>
<th>A. PRODUCT AVAILABILITY</th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. ORDER CYCLE TIME</td>
<td></td>
</tr>
<tr>
<td>1. Order Entry</td>
<td></td>
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<tr>
<td>2. Order Processing</td>
<td></td>
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<tr>
<td>3. Order Picking &amp; Shipping</td>
<td></td>
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<tr>
<td>4. Transit Time</td>
<td></td>
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<tr>
<td>C. DISTRIBUTION SYSTEM FLEXIBILITY</td>
<td></td>
</tr>
<tr>
<td>1. Expedite Order</td>
<td></td>
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<tr>
<td>2. Backorder Product</td>
<td></td>
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<tr>
<td>3. Substitute Product</td>
<td></td>
</tr>
<tr>
<td>4. Faster Transportation</td>
<td></td>
</tr>
<tr>
<td>5. Other:</td>
<td></td>
</tr>
<tr>
<td>D. DISTRIBUTION SYSTEM INFORMATION</td>
<td></td>
</tr>
<tr>
<td>1. Inventory Status</td>
<td></td>
</tr>
<tr>
<td>2. Order Status</td>
<td></td>
</tr>
<tr>
<td>3. Data Base for Forecasting</td>
<td></td>
</tr>
<tr>
<td>4. Other:</td>
<td></td>
</tr>
<tr>
<td>E. DISTRIBUTION SYSTEM MALFUNCTION</td>
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</tr>
<tr>
<td>1. Administrative Errors (inc. credit)</td>
<td></td>
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<tr>
<td>2. Picking Errors</td>
<td></td>
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<tr>
<td>3. Shipping Errors</td>
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<tr>
<td>4. Warehouse Damage</td>
<td></td>
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<tr>
<td>5. Company-Shipping Damage</td>
<td></td>
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<tr>
<td>6. Carrier-Shipping Damage</td>
<td></td>
</tr>
<tr>
<td>7. Other:</td>
<td></td>
</tr>
<tr>
<td>F. POST SALE PRODUCT SUPPORT</td>
<td></td>
</tr>
<tr>
<td>1. Repair Parts Availability</td>
<td></td>
</tr>
<tr>
<td>2. Repair Service</td>
<td></td>
</tr>
<tr>
<td>3. Technical Advice</td>
<td></td>
</tr>
<tr>
<td>4. Other</td>
<td></td>
</tr>
<tr>
<td>G. Other:</td>
<td></td>
</tr>
<tr>
<td>100 points</td>
<td></td>
</tr>
</tbody>
</table>

(First Questionnaire, Appendix C, #4)
FOURTH HYPOTHESIS: The purpose of the fourth hypothesis is to determine if a relationship exists between the perceived importance of the elements of customer service and characteristics of product flow and the distribution system configuration of each firm. Characteristics of product flow and of the distribution system configuration may be independent variables which dictate the relative importance of the component elements of customer service.

Product value and product-usage rates are two variables which affect product flow. Product value serves as a measure of both the customers' and distribution systems' cost of capital associated with holding inventory. As product value increases, the increased costs associated with carrying inventory will move a distribution-system design toward faster modes of transportation and order communications to compensate for reduced inventory. The characteristics of this type of a product resemble those of durable goods: high cost, infrequent purchase. The important characteristics of customer service in this relationship may be product availability, information on inventory, support of the product once in use, and distribution system flexibility in assuring product delivery.

Another critical variable of product flow is volume or the number of shipments made to a customer. As the number of shipments increases, the risks associated with misallocated inventory decreases, consequently, the distribution system achieves a consistency of response to customer orders. This consistency results from increasing the number of stocking locations, using faster transportation modes, increasing
the speed of order communication, or regionalizing the order-filling decision process.

As both the dollar value per shipment decreases and the frequency of orders increases, the distribution-system design criteria tend towards service consistency and cost reduction. This type of a system is characterized by unitized product handling, slower transportation, and captive carriers such as assigned rail cars or a private motor fleet. The warehouse system tends to become a dual system with field stock or in-transit locations for quick response, while the majority of shipments are made from national service centers. The interaction of product flow characteristics and distribution system design should produce groups of firms with similar characteristics. It is expected that these groups can also be identified by their customer service policies. The fourth hypothesis will examine the nature of the relationship between the perceived importance of the customer service elements and the characteristics of product flow and physical distribution systems configuration. The steps in the analysis are:

1. Individual firms were grouped based upon the similarity of perceived importance of the elements of customer service. The grouping procedures used were (a) multidimensional scaling (MDS) using the distance measure directly from the questionnaire; (b) multidimensional scaling using rank order correlation developed from the data; and (c) cluster analysis. Euclidean distance measures were used as the metric in the MDS, while the diameter method of clustering was used in the clustering procedure.
It is expected that the composition of the groups should be invariant with respect to grouping procedures if true groups do exist.

2. Variables which characterized product flow and distribution system configurations were factor analyzed to eliminate intercorrelated attributes which would bias grouping procedures based on assumptions of linearly independent measures (e.g., discriminant analysis). The factor analysis would also reveal the primary dimensions which characterize product flow from an analytic rather than a conceptual viewpoint.

3. The groupings identified in step 2 were employed in a confusion matrix analysis where one set of groupings was developed from a discriminant analysis of the factor scores on the distribution system and product flow attributes. The second set of groupings was developed from the scaling and cluster analysis.

4. This step tests the hypothesis that customer service characteristics can be predicted as a function of product flow characteristics and distribution system design.

The specific variables of product flow to be considered are:
1. Number of points shipped to
2. Average dollars per order
3. Average pounds per order
4. Average time between shipments to each customer
5. Truck load freight class
6. Less than truck load freight class
7. Average freight class used
8. Dollar value per pound of product
9. Number of stockkeeping units
10. Number of ship from locations
11. Relative degree of competition
12. Percent sales response to a 5 percent reduction in customer service levels
13. Value of customer service as a marketing variable

The specific variables of distribution system configuration to be considered are:

1. Percent of manufacturing capacity for product to go into stock
2. Percent of inventory stored at warehouses
3. Number of plants
4. Number of warehouses
5. Inventory turns at plant
6. Inventory turns at warehouses
7. Percent production shipped directly to customers
8. Percent of number of shipments by TL made to customer
9. Percent of number of shipments by LTL made to customer
10. Percent of freight moved by company-controlled freight
11. Percent of inventory stored at customers
12. Percent of shipments using pallets
13. Percent of shipments using slip sheets
14. Percent of orders entered by telephone
15. Percent of orders entered by mail
16. Percent of orders entered electronically
The specific hypothesis tested reads:

4. A relationship does not exist between the perceived importance of the elements of customer service and characteristics of product flow and of physical distribution-system configuration

The First and Third Questionnaires (Appendices C and I) contain the specific questions for this data. The customer service data comes from the First Questionnaire (Appendix C), question 4, while the information concerning the distribution system appears in the First Questionnaire (Appendix C) questions 2, 3, 5a and 5c. The Third Questionnaire (Appendix I), questions 1, 2, 3, 4, and 5, yields the product flow information.

Pretest of Instrument

Personal contact, such as personal interviews and telephone contact, pretested the formal data collection procedure. The pretest sample consisted of fourteen personal interviews and fourteen telephone contacts. In total, this pretest amounts to 4 percent of the original sample and 20 percent of the expected returns (because of the questionnaire length and requested participation by other corporate members and customers, the response in this study was expected to be about 20 percent). The pretest sample drew on industries in proportion to NCPDM industry membership, selecting firms with demonstrated knowledge in customer-service relations and physical distribution and expressing a willingness to cooperate with the study. The pretest sample does not appear in the final data set.
Letters of Introduction

A letter of introduction accompanied all questionnaires which described NCPDM sponsorship of the study, identified the need for more knowledge in this area, and promised to keep all correspondence and data confidential. A promise to return a summary industry response to the participants provided an inducement to participate in the study. The first questionnaire, because it requested highly-detailed information, included an explanation of all questions which might require any elaboration. This elaboration gave instructions, defined terms, described the interpretation of responses, and provided sample responses.

In order to facilitate returns from all corporate members and customers, a pre-addressed postage-paid envelope accompanied all questionnaires. This procedure allowed each respondent to return his response individually without concern that his particular response could be examined by other corporate members.

Series of Questionnaires

Three series of questionnaires elicited specific types of data as shown in Figure 3. The physical distribution manager received all the questionnaires. He responded or forwarded them to other corporate functions for their response.

The first questionnaire measured the use and configuration of the firm's distribution system. It also retrieved information concerning the relative importance of component elements of customer service. The questionnaire evaluated a single product group which has uniform
FIGURE 3

QUESTIONNAIRE DISTRIBUTION

FIRST QUESTIONNAIRE
- Only responded to by physical distribution

SECOND QUESTIONNAIRE
- Mailed to physical distribution and distributed to proper corporate areas

THIRD QUESTIONNAIRE
- Only responded to by physical distribution
customer service standards and distribution practices, therefore respondents were asked to describe the customer service characteristics of one specific product group.

The second questionnaire collected opinion data concerning customer service. The third questionnaire developed data concerning product flow characteristics. A second purpose of the third questionnaire was to communicate to the respondents that all previous questionnaires should be promptly returned in order to contribute to the study.

The physical distribution function distributed two unique types of questionnaires. One questionnaire related to customer service attributes and the purchase decision. These questionnaires went to the purchasing function and customers of the firm. The other questionnaire reached the corporate functions of top management, production and marketing. This questionnaire collected data reflecting both the impact of customer service on the firm's success and also evaluated responsibility for developing a customer service program.

Each questionnaire had an identifying number which indicated both the corporation to which it was sent and the functional area which was expected to complete the questionnaire. In addition there was a label on all questionnaires to aid in identifying the recipient. An explanatory letter describing the purpose and need for the study, as well as a pledge to maintain the confidentiality of each response, accompanied each questionnaire. This letter, without an introduction or salutation, allowed physical distribution or other functional areas to provide these components of the letter. An addressed, pre-stamped
envelope accompanied these questionnaires.

Questionnaires and questionnaire support material are in the following appendices:

Appendix A - Letter of Introduction to Physical Distribution - First Questionnaire

Appendix B - Explanation of Customer Service Questionnaire

Appendix C - First Questionnaire - Physical Distribution

Appendix D - Letter of Introduction to Physical Distribution - Second Questionnaire

Appendix E - Second Questionnaire - Physical Distribution

Appendix F - Introductory Letter to Customers and Other Corporate Areas

Appendix G - Questionnaire for Customers and Purchasing

Appendix H - Questionnaire for Top Management, Production and Marketing

Appendix I - Third Questionnaire - Physical Distribution

Response Data

Three series of questionnaires collected the data. The first questionnaire was mailed January 26, 1976 with a cutoff date for responses two months later. The second series of questionnaires was mailed March 22, again with a two-month cutoff date. The third questionnaire was mailed May 22; the cutoff date for responses was June 30. Figure 4 shows the number of questionnaires mailed for each series and the response rate.

The rate of response to different questionnaires ranged from a low of 20 percent for physical distribution and customer response on
<table>
<thead>
<tr>
<th>Department</th>
<th>Questionnaires</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>525</td>
<td>20%</td>
</tr>
<tr>
<td>Merchandising</td>
<td>117</td>
<td>26%</td>
</tr>
<tr>
<td>PURCHASING</td>
<td>36</td>
<td>39%</td>
</tr>
<tr>
<td>TOP MANAGEMENT</td>
<td>41</td>
<td>49%</td>
</tr>
<tr>
<td>PRODUCTION</td>
<td>35</td>
<td>71%</td>
</tr>
<tr>
<td>MARKETING</td>
<td>48</td>
<td>46%</td>
</tr>
<tr>
<td>PHYSICAL DISTRIBUTION</td>
<td>63</td>
<td>92%</td>
</tr>
<tr>
<td>CUSTOMERS</td>
<td>90</td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Number preceding "questionnaires" indicates total number of questionnaires mailed.

FIGURE 4

DATA COLLECTION* - MAIL QUESTIONNAIRE -
the first questionnaire to 92 percent by physical distribution on the
second one. The overall rate of response for usable questionnaires
was 25 percent.

Analytical Design

Data Preparation

Upon receipt of the data it was edited for errors, omissions,
and comments concerning the ambiguity or difficulty of particular
questions. The only questions to which a number of respondents
provided obviously erroneous responses requested average shipment
size in hundredweight (cwt.). When this response did not correspond
to mode selection shipment size, the response was corrected to the
corresponding cwt. The rate of omitted questions was low and apparently
random. 3

Data validity was checked by having two respondents complete the
same questionnaires twice. One respondent was a random selection,
while the second respondent was a member of the pretest group. These
respondents answered the questions after a two-week interval. The
responses to all questions were consistent.

3 Two questionnaires were returned incompletely. One of the ques-
tionnaires indicated that company policy would not allow the completion
of the questionnaire. The second questionnaire indicated that "the
questions do not seem to apply to my industry." Eight other responses
from the same industry indicated no apparent problems.
The non-participating respondents of the original sample were examined by size of firm, geographic location, and industry group. No characteristics which distinguish respondents from non-respondents were found in this analysis.

Selection of Analytic Techniques

This section reviews the characteristics of the data collected and statistical techniques appropriate to analyze the data. General parameters for evaluation of the fourth research question are established to focus the analysis of the data from a managerial, as well as a statistical, perspective.

The first research question investigated the characteristics of a general definition of customer service. Nominally scaled data was obtained from the respondents in developing an answer to this question. The chi-square test of the equality of distribution of responses was the appropriate analytic technique to employ in light of the quality of the data and the desired information from the test. The significance level of $\alpha = 0.05$ was established.

The second and third hypotheses were tested using the Kolmogorov-Smirnov two-sample test. Data compiled using a 100-point scale, determined the relative importance of the marketing variables and elements of customer service. This test was appropriate because of ranked characteristics of the data, small sample sizes, and power of the test. The level of significance of $\alpha = 0.05$ was established.

The fourth hypothesis was evaluated using three basic steps. The first step consisted of grouping firms based upon their perceptions
of the relative importance of the elements of customer service. Three sets of groups were generated, one for each of the grouping techniques employed. The grouping techniques used in the analysis were (1) multidimensional scaling with rank order data, (2) multidimensional scaling with distance data, and (3) cluster analysis.

Groups are selected based upon maximizing intergroup distances, locating elbows in the stress curve and comparing stress levels with Klahr numbers. Stress is a measure of goodness of fit between the actual and calculated distances of the location of points. A Klahr number for stress indicates the average stress level for randomly generated numbers while considering the number of stimuli and dimensions.4

The second step consisted of performing a factor analysis on the twenty-nine variables classified as characteristics of product flow and distribution system configurations. This procedure generated a set of orthogonal vectors which were used to generate factor scores for each respondent on each "dimension."

In the third step discriminant analysis was applied to the factor scores from step 2. The application of discriminate analysis resulted in the identification of groups of firms based upon the factor scores.

These groups were then compared with the groups developed in step 1 (scaling procedures). The evaluation of the hypothesis rested upon comparative group assignments.

**Summary**

The research design has been presented in the chapter. The hypotheses were developed based upon the literature and the research questions. Specific questions were developed from the hypotheses. Finally, the testing procedures were described in light of the data collected and the hypotheses under consideration. The data are presented, the test results are computed, and the hypotheses are evaluated in Chapter IV.
CHAPTER IV
RESEARCH FINDINGS

Introduction

This chapter presents the findings for each research question. The chapter also identifies the specific issues to be evaluated with respect to each research question. The hypotheses tested for each research issue are evaluated, both from a statistical and a managerial perspective. The treatment of each research question concludes with relationships between the test results for the specific hypotheses and the original question.

First Research Question

"Develop a generic definition of customer service based upon the use of the term by distribution executives."

This question considers two issues: 1. Is customer service distinct from, or part of the sales efforts of the firm?

2. Is customer service an evaluative measure of performance of an activity or is customer service the activity itself?

The following hypotheses evaluate the first question:

$H_0^{1A}$: Physical distribution management does not perceive sales activities as distinct from customer service activities.

$H_0^{1B}$: Physical distribution management does not perceive customer service as an evaluative measure of performance of an activity.
Hypothesis 1A. was tested using a chi-square one-sample test.\(^1\) Table 1 presents the data from this test. The two categories include those respondents who felt that customer service was distinct from sales, and those who felt that customer service is not distinct from sales.

The application of the chi-square one-sample test yields a statistic of \(x^2=0.68\), which is less than the critical values of 3.84 (\(\alpha = .05\)).\(^2\) Therefore this hypothesis (H\(_0\)1A) cannot be rejected.

The respondents identified the most appropriate description of customer service. They chose from four options: two are non-evaluative in nature (customer service is 1. contact, and 2. interface), while two alternatives are evaluative of the activity (customer service is 1. performance and 2. efficiency). For testing purposes, the non-evaluative and evaluative samples were analyzed jointly. Table 2 and Table 3 present the data collected from the respondents. The data shows that 73% of the sample indicated that customer service is evaluative in nature, while 27% indicated that customer service is passive in nature.

The application of the chi-square one-sample test\(^3\) yields a statistic of \(x^2=7.81\), which is greater than the critical value of 3.84 (\(\alpha = .05\)).\(^4\) Therefore this hypothesis is rejected. It can be


\(^{2}\text{Ibid, p. 249.}\)

\(^{3}\text{Ibid, p. 42.}\)

\(^{4}\text{Ibid, p. 249.}\)
### TABLE 1

**A COMPARISON OF RESPONDENTS' VIEWS OF CUSTOMER SERVICE'S RELATIONSHIP TO SALES**

<table>
<thead>
<tr>
<th>Yes, customer service is distinct from sales</th>
<th>No, customer service is not distinct from sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of responses</td>
<td>16</td>
</tr>
<tr>
<td>Percent of total response</td>
<td>44%</td>
</tr>
<tr>
<td></td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>56%</td>
</tr>
</tbody>
</table>

\[ x^2 = 0.68 \text{ calculated from data} \]

\[ x^2 = 3.84 \text{ at } \alpha = 0.05 \]

samples are not statistically different
### TABLE 2
A COMPARISON OF PERCEPTIONS OF CUSTOMER SERVICE

<table>
<thead>
<tr>
<th></th>
<th>Customer Service is Contact</th>
<th>Customer Service is Interface</th>
<th>Customer Service is Performance</th>
<th>Customer Service is Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Responses</td>
<td>0</td>
<td>10</td>
<td>16</td>
<td>11</td>
</tr>
<tr>
<td>Percent of Total Responses</td>
<td>0%</td>
<td>27%</td>
<td>43%</td>
<td>30%</td>
</tr>
</tbody>
</table>

### TABLE 3
A SUMMARY OF THE EVALUATIVE VERSUS PASSIVE NATURE OF CUSTOMER SERVICE

<table>
<thead>
<tr>
<th></th>
<th>Customer Service is Evaluative</th>
<th>Customer Service is Passive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Responses</td>
<td>27</td>
<td>10</td>
</tr>
<tr>
<td>Percent of Total Responses</td>
<td>73%</td>
<td>27%</td>
</tr>
</tbody>
</table>

\[X^2 = 7.81\] calculated from data

\[X^2 = 3.84\] at \( \alpha = 0.05 \)

Samples are statistically different
concluded that at the 95% confidence level, there is a difference between distribution managements' perceptions of customer service. The data indicate that customer service is seen as an evaluative function within the corporation.

The test results of these hypotheses indicate: 1. That there is no significant difference between those respondents that perceive sales activities as distinct from customer service and those who do not; 2. a majority (73%) of the respondents perceive customer service as an evaluative measure of the performance of an activity.

Second Research Question

"Evaluate the importance of customer service with respect to other marketing variables and determine how perceptions of relative importance vary by functional area of responsibility within the firm."

This question considers two issues: 1. Determining the importance of customer service with respect to the other marketing variables, and 2. Ascertaining whether perceptions of the relative importance of customer service vary by functional area of responsibility within the firm and determining how these functional areas perceive the importance of the marketing variables compared with customers of the firm.

The following hypothesis evaluates the second research question:

$H_0$: There is no difference in the perception of the relative importance of the marketing variables by corporate members (purchasing, top management, production, marketing and physical distribution) and the firm's customers.

These data were collected from the respondents from their allocation of a total of 100 points to the four marketing variables. The questionnaire instructed the respondents to indicate the relative
importance of each variable in achieving sales for the firm. Table 4 presents these data. The data were analyzed using the Kolmogorov-Smirnov two-tailed test.\textsuperscript{5} Table 5 shows the results of this analysis.

The results of the evaluation compare each functional area to all other functional areas. The maximum difference in the cumulative ranking of the variables is \( d \). This value is then evaluated for significance, to determine if both samples were drawn from the same populations.\textsuperscript{6} When significant differences do exist in the data they are represented by an *. (An * indicates that at \( \alpha = .05 \) there is a significant difference in the distributions of the two samples.)

As Table 4 shows, the firms' customers perceive customer service as the second most important market variable. Customers feel that product quality is the most important variable (34 points), followed closely by customer service as the second most important variable (28 points). Physical distribution and top management are the only corporate functions which rank customer service as the second most important marketing variable (with 23 and 22 points respectively).

Table 6 summarizes Table 5 and compares those industries which exhibit a significant difference in the evaluation of the relative importance of the marketing variables of product, customer service, price, and advertising. Table 6 shows that the physical distribution function has similar perceptions of the marketing variables relative to all other functional areas evaluated. At the other extreme, the marketing function exhibits a significant difference in perception of

\textsuperscript{5}Siegel, \textit{op. cit.}, p. 127.

\textsuperscript{6}Ibid, p. 278.
TABLE 4

PERCEIVED IMPORTANCE OF MARKETING VARIABLES BY FUNCTIONAL AREA

<table>
<thead>
<tr>
<th>MARKETING VARIABLES</th>
<th>PURCHASING</th>
<th>TOP MANAGEMENT</th>
<th>PRODUCTION</th>
<th>MARKETING</th>
<th>PHYSICAL DISTRIBUTION</th>
<th>CUSTOMER</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCT</td>
<td>42</td>
<td>37</td>
<td>42</td>
<td>27</td>
<td>36</td>
<td>34</td>
</tr>
<tr>
<td>CUSTOMER SERVICE</td>
<td>20</td>
<td>22</td>
<td>18</td>
<td>24</td>
<td>23</td>
<td>28</td>
</tr>
<tr>
<td>PRICE</td>
<td>28</td>
<td>21</td>
<td>23</td>
<td>27</td>
<td>23</td>
<td>20</td>
</tr>
<tr>
<td>ADVERTISING/SALES</td>
<td>10</td>
<td>20</td>
<td>17</td>
<td>22</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SAMPLE SIZE</td>
<td>14</td>
<td>20</td>
<td>25</td>
<td>22</td>
<td>36</td>
<td>18</td>
</tr>
</tbody>
</table>
TABLE 5

KOLMOGOROV-SMIRNOV TEST FOR SIGNIFICANT DIFFERENCES BETWEEN FUNCTIONAL AREAS

Allocation of points to marketing variables - d values

<table>
<thead>
<tr>
<th></th>
<th>Purchasing</th>
<th>Top Management</th>
<th>Production</th>
<th>Marketing</th>
<th>Physical Distribution</th>
<th>Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchasing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top Management</td>
<td></td>
<td>10*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production</td>
<td>7</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>15*</td>
<td>10</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Distribution</td>
<td>8</td>
<td>1</td>
<td>6</td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td>8*</td>
<td>3</td>
<td>8</td>
<td>9*</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Sample Size</td>
<td>14</td>
<td>20</td>
<td>25</td>
<td>22</td>
<td>36</td>
<td>18</td>
</tr>
</tbody>
</table>

* indicates a significant difference at \( \alpha = .05 \)

\( d \) is calculated by determining the maximum difference between two cumulative rankings.
TABLE 6
A COMPARISON BY FUNCTIONAL AREA OF SIGNIFICANT DIFFERENCE* IN IMPORTANCE OF MARKETING VARIABLES

<table>
<thead>
<tr>
<th>Functional Area</th>
<th>Frequency of Significant Differences 2</th>
<th>Functional Areas Experiencing Significant Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Physical Distribution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Production</td>
<td>1</td>
<td>Marketing</td>
</tr>
<tr>
<td>3. Customer</td>
<td>2</td>
<td>Marketing, Purchasing</td>
</tr>
<tr>
<td>4. Top Management</td>
<td>2</td>
<td>Marketing, Top Management</td>
</tr>
<tr>
<td>5. Purchasing</td>
<td>3</td>
<td>Marketing, Top Management, Customer</td>
</tr>
<tr>
<td>6. Marketing</td>
<td>4</td>
<td>Production, Customer</td>
</tr>
</tbody>
</table>

1 Significant difference at *α* = .05
2 The expected frequency of differences results in a .75 probability of 1, and .19 probability of 4 significant differences.
the importance of the marketing variable with all other functional areas except physical distribution. The analysis of these data indicates that of the fifteen total possible comparisons, seven demonstrate significant difference concerning the relative importance of the marketing variables in realizing a sale of the firm's products; therefore Hypothesis Two is rejected.

Third Research Question

"Determine if the relative importance placed on the component elements of customer service differ by industry."

This question concerns two issues: 1. Determining the relative importance of the elements of customer service, and 2. Ascertaining whether the importance of the customer service elements varies by industry.

The following hypothesis evaluates the third question:

$H_0^3$: There are no significant differences in the ranking of the major component elements of customer service.

The respondents were asked to indicate the relative importance of the customer service elements in the descriptive model of customer service. They allocated 100 points to those elements which were important in their business. Table 7 shows the distribution of points by industry.

The data were analyzed for significance using the Komogorov-Smirnov two-tailed test. Siegel, op. cit., p. 127.
difference (d value). The test for significance was performed at the .05 level; an asterisk (*) indicates significant differences.

Table 9 summarizes the significant findings from Table 8. This data in Table 9 shows that the industries of food manufacturing and chemical and plastic manufacturing are significantly different from only two other industries. The machine tool manufacturing industry is significantly different from all other industries.

Product availability is uniformly considered, across all industries, to be the most important element of customer service, with approximately 40% of the relative importance of customer service attributable to a sale. In general, the importance of elements of customer service following product availability are, order cycle time (20%), distribution system flexibility (15%), distribution system information (12%), distribution system malfunctions (7%), post sales product support (4%) and other characteristics of customer service (1%).

The analysis indicates that significant differences do exist concerning the relative importance of elements of customer service across industries. Sixteen of the twenty-eight comparisons made indicate a significant difference. Therefore, the third hypothesis is rejected.

Fourth Research Question

"Evaluate the existence of a functional relationship in the firm between the relative importance of the component elements of customer service and the characteristics of product flow and distribution-system configuration."

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8Siegel, op. cit., p. 278.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Product Availability</td>
<td>44.5</td>
<td>37.1</td>
<td>39.7</td>
<td>32.7</td>
<td>41.3</td>
<td>56.3</td>
<td>40.5</td>
<td>43.9</td>
</tr>
<tr>
<td>2. Order Cycle Time</td>
<td>17.4</td>
<td>21.4</td>
<td>28.0</td>
<td>17.4</td>
<td>12.3</td>
<td>10.7</td>
<td>26.2</td>
<td>20.2</td>
</tr>
<tr>
<td>3. Distribution System Flexibility</td>
<td>10.6</td>
<td>12.9</td>
<td>10.6</td>
<td>12.9</td>
<td>18.5</td>
<td>17.3</td>
<td>9.0</td>
<td>12.9</td>
</tr>
<tr>
<td>4. Distribution System Information</td>
<td>11.7</td>
<td>14.8</td>
<td>9.0</td>
<td>16.7</td>
<td>20.1</td>
<td>1.0</td>
<td>14.0</td>
<td>8.0</td>
</tr>
<tr>
<td>5. Distribution System Malfunction</td>
<td>9.1</td>
<td>10.3</td>
<td>7.8</td>
<td>7.9</td>
<td>4.5</td>
<td>4.0</td>
<td>8.2</td>
<td>10.0</td>
</tr>
<tr>
<td>6. Post Sale Product Support</td>
<td>6.2</td>
<td>2.3</td>
<td>2.9</td>
<td>11.7</td>
<td>1.8</td>
<td>10.0</td>
<td>2.1</td>
<td>5.0</td>
</tr>
<tr>
<td>7. Other Characteristics</td>
<td>0.5</td>
<td>1.2</td>
<td>2.0</td>
<td>0.7</td>
<td>1.5</td>
<td>0.7</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SAMPLE SIZE</td>
<td>32</td>
<td>26</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>3</td>
<td>22</td>
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</tr>
<tr>
<td>----------------</td>
<td>--------------</td>
<td>-------------</td>
<td>---------------</td>
<td>---------------</td>
<td>--------------</td>
<td>-------------------</td>
<td>------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Chemical Manuf.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food Manuf.</td>
<td>7.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pharm. Manuf.</td>
<td>5.8</td>
<td>9.3*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Manuf.</td>
<td>11.3*</td>
<td>8.3</td>
<td>15.3*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper Manuf.</td>
<td>8.3</td>
<td>6.9</td>
<td>14.1*</td>
<td>12.5*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Machine Tool Manuf.</td>
<td>11.8*</td>
<td>19.2*</td>
<td>16.6</td>
<td>23.6*</td>
<td>15.0*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consumer Merch.</td>
<td>5.5</td>
<td>8.3</td>
<td>2.6</td>
<td>16.6*</td>
<td>13.1*</td>
<td>15.8*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Merch.</td>
<td>4.5</td>
<td>6.8</td>
<td>4.2</td>
<td>14.0*</td>
<td>10.5*</td>
<td>12.4*</td>
<td>4.7</td>
<td></td>
</tr>
</tbody>
</table>
## TABLE 9

A COMPARISON BY INDUSTRY OF SIGNIFICANT DIFFERENCES\(^1\) IN PERCEPTION OF THE RELATIVE IMPORTANCE OF THE ELEMENTS OF CUSTOMER SERVICE

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>FREQUENCY (^2)</th>
<th>INDUSTRIES WHERE SIGNIFICANT DIFFERENCES EXISTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Chemical and Plastic</td>
<td>2</td>
<td>Electronic, Machine Tool</td>
</tr>
<tr>
<td>2. Food</td>
<td>2</td>
<td>Pharmaceutical, Machine Tool</td>
</tr>
<tr>
<td>3. Consumer Merchandising</td>
<td>3</td>
<td>Electronic, Paper, Machine Tool</td>
</tr>
<tr>
<td>4. Industrial Merchandising</td>
<td>3</td>
<td>Electronic, Paper, Machine Tool</td>
</tr>
<tr>
<td>5. Pharmaceutical</td>
<td>4</td>
<td>Electronic, Paper, Machine Tool, Food</td>
</tr>
<tr>
<td>6. Paper</td>
<td>5</td>
<td>Electronic, Machine Tool, Pharm, Consumer Merchandising, Industrial Merchandising</td>
</tr>
<tr>
<td>8. Machine Tools</td>
<td>7</td>
<td>All Industry Classifications</td>
</tr>
</tbody>
</table>

\(^1\)Significant difference at \(\alpha = .05\)

\(^2\)The expected frequency of differences results in a .70 probability of 2 significant differences and .20 probability of 7 significant differences.
Research question three evaluates differences in the importance of customer service across industries. Research question four determines if characteristics of product flow and distribution system configuration relate to differences in the relative importance of the elements of customer service.

The data for the third research question shows that there is a significant difference among many industries concerning the importance of the elements of customer service. The fourth hypothesis looks at variables of product flow and distribution system design as explanatory variables of difference in customer service, rather than industry classifications.

The specific hypothesis to be evaluated is:

\( H_0^4: \) A functional relationship does not exist between the relative importance of the elements of customer service and characteristics of product flow and the distribution system configuration.

The research design consists of the activities presented in Figure 5. The first step is to group respondents, based upon their similarity of perception of the relative importance of the elements of customer service. The specific elements of customer service are:

1. Product Availability
2. Order Cycle Time
3. Distribution System Flexibility
4. Distribution System Information
5. Distribution System Malfunctions
6. Post Sales Product Support
7. Other Characteristics of Customer Service

Three alternate methods were used to group respondents: 1. multidimensional scaling using distance measures; 2. multidimensional
Step 1.
Group Respondents
(multidimensional scaling,
and cluster analysis)
Based upon Similarity
of Perception of
Customer Service

Step 2.
Eliminate covariance
and develop factor
scores (factor analysis)
Based on variables
of product flow and
distribution system

Step 3.
Compare Group Assignments
(discriminate analysis) To
Determine If Relationship
Exists Between Customer Service
and Product Flow Distribution
System Characteristics

FIGURE 5
RESEARCH DESIGN FOR FOURTH RESEARCH QUESTION
scaling using rankings and 3. hieratical clustering. Figure 6 shows group membership by respondent number. Two dimensions identify group membership resulting from multidimensional scaling because of the low number of stimuli, identifiable groups assignment, and low levels of stress.

The groups shown in Figure 7 indicate that industry classifications do not discriminate between the relative importance of elements of customer service. For example, the food industry divides so that there are no more than 50% of the firms in each group. Other industries exhibit similar characteristics.

The second step of the research design consists of reducing co-variance by factor analyzing characteristics of product flow and distribution system configurations. The specific characteristics examined were:

<table>
<thead>
<tr>
<th>Product Flow</th>
<th>Distribution System Design</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Ship to Points</td>
<td>1. TL Shipment Direct to Customer</td>
</tr>
<tr>
<td>2. Average $ per Order</td>
<td>2. LTL Shipments Direct to Customer</td>
</tr>
<tr>
<td>3. Average lbs. per Order</td>
<td>3. % of Freight Moved by Co. Transportation</td>
</tr>
<tr>
<td>4. TL Freight Class</td>
<td>4. % of Inventory at Customers</td>
</tr>
<tr>
<td>5. LTL Freight Class</td>
<td>5. % Use of Pallets</td>
</tr>
<tr>
<td>6. Average Time Between Shipments</td>
<td>6. % Use of Slip Sheets</td>
</tr>
<tr>
<td>7. Lbs. per Cubic Foot</td>
<td>7. % Orders Entered by Phone</td>
</tr>
<tr>
<td>8. Number of Stock keeping Units</td>
<td>8. % of Manufacture for Stock</td>
</tr>
<tr>
<td>9. Average Freight Class</td>
<td>9. % of Inventory Stored at Warehouse</td>
</tr>
<tr>
<td>10. Number of Ship from Points</td>
<td>10. Number of Plants</td>
</tr>
<tr>
<td>11. Degree of Competition</td>
<td>11. Number of Warehouses</td>
</tr>
<tr>
<td>12. Sales Response to Customer Service</td>
<td>12. Inventory Turns - Plant</td>
</tr>
<tr>
<td>13. Value of Customer Service</td>
<td></td>
</tr>
</tbody>
</table>

---


10Ibid. p. 64.
Factor analysis of these characteristics reduced the number of variables under consideration by removing characteristics which covaried. The resulting factor set was used to more efficiently describe alternative product flow and distribution system design characteristics of the data set. Seven factors were found which explain 86.5% of the variation, as is shown in the data in Table 10.\textsuperscript{11}

The first three factors explain 51% of the variation. These factors can be described as:

**Factor 1. Firms with high degree of inventory management.**
- high number of plants
- high number of warehouses
- high degree of inventory turnover at plants
- high degree of inventory turns at warehouses
- low degree of perceived competition

**Factor 2. Firms which ship TL direct to customers**
- high level of TL shipments to customers
- low % of inventory stored at warehouses
- high % of production shipped direct to customers

**Factor 3. Firms with large dollar orders, automated order entry**
- high average $ per order
- high level of electronic order entry
- low level of mail order entry

The third step compares firms by applying discriminate analysis to the factor scores for each respondent developed from the factors found in

\textsuperscript{11}The factor names are derived from the component factor loads, only factor loads $\pm 0.5$ were considered.
step 2. Then the assignment of the respondents based on the discriminant analysis was compared with the assignment to groups from the first step of the analysis. Table 11 presents the comparison of the results of grouping of the respondents by the three methods in step one and the discriminant analysis in step three.

A similar assignment occurs when a firm is assigned to the same group by the grouping techniques (step 1) and the discriminant analysis (step 3). Hieratical clustering results in the generation of groups which have the similar assignment 34% of the time; this contrasts with chance assignment. The group assignment of multidimensional scaling of distance data results in similar assignment of 80% of the respondents to groups, versus a chance assignment of 50%.

The results indicate a relationship does exist between the elements of customer service and the characteristics of product flow and distribution system configuration. The analytic procedure confirms this relationship since the assignment of a firm to a group based upon the importance of customer service elements is the same as the assignment of that firm to a group when based upon characteristics of product flow and distribution system configurations. Based upon the results in Table 11, the assignment of firms to groups based upon these two criteria is always better than chance assignment. This assignment process performed a similar assignment in 80% of the cases. Therefore the hypothesis that no relationship exists between the importance of customer service elements and characteristics of product flow and distribution system configuration is rejected.
<table>
<thead>
<tr>
<th>PROCEDURE</th>
<th>GROUP MEMBERS</th>
<th>STRESS LEVEL KLAHR NUMBER*</th>
</tr>
</thead>
</table>
| 1. Hierarchical Clustering  
Diameter Method | A) 1, 26, 27, 28, 32  
35, 43, 44 | Not Applicable |
| | B) 3, 4, 5, 8, 21, 24 | |
| | C) 2, 6, 16, 37, 42 | |
| | D) 7, 12, 19, 38 | |
| | E) 14, 17, 22, 30 | |
| | F) 9, 10, 11, 15, 18,  
23, 29, 33, 41 | |
| | G) 13, 20, 25, 31, 34  
36, 39, 40 | |
| 2. Multidimensional Scaling  
Ranked Data  
Euclidean Metric  
2 Dimensions | A) 1, 3, 11, 13, 20, 24  
25, 29, 32, 33, 35, 37,  
38, 40, 42, 43, 44 | 0.0976 0.212 |
| | B) 2, 4, 5, 6, 7, 8, 9,  
10, 12, 14, 15, 16,  
17, 18, 19, 21, 22,  
23, 26, 27, 28, 30,  
31, 34, 36, 39, 41 | |
| 3. Multidimensional Scaling  
Distance Data  
Euclidean Metric  
2 Dimensions | A) 1, 3, 5, 7, 8, 12, 13,  
15, 17, 21, 24, 25, 26,  
28, 30, 31, 33, 40, 41,  
42, 43 | 0.021 0.212 |
| | B) 2, 4, 6, 9, 10, 11, 18,  
16, 18, 19, 20, 22, 23,  
27, 29, 32, 34, 35, 36,  
37, 38, 39, 44 | |

*Klahr numbers represent the minimum stress level to be achieved by clustering data which is randomly generated. See: "A Monte Carlo Investigation of the Statistical Significance of Kruskal's Nonmetric Scaling Procedure," *Psychometrica*, September, 1969, pp. 319-330.

FIGURE 6  
GENERATION OF GROUPS
1. Hierarchical Clustering

Group A. -low order frequency
   -low $/lb.
   2 Food
   2 Machine Tools
   1 Chemical and Plastic
   1 Electronics
   2 Other

Group B. -high $/lb.
   -high order $
   1 Food
   1 Electronics
   1 Automotive
   1 Metals & Metal Working
   1 Pharmaceutical
   1 Building Materials

Group C. -high $/lb.
   -low order $
   1 Chemical and Plastic
   1 Minerals and Mining
   1 Food
   1 Pharmaceutical
   1 Appliance

Group D. -low number of ship to locations
   -high shipment weight
   1 Metals and Metal Working
   1 Pharmaceutical
   1 Appliance
   1 Food

Group E. -high number of ship to locations
   1 Food
   2 Chemical and Plastic
   1 Pharmaceutical

Group G. -low order
   frequency
   -mail order entry
   2 Food
   2 Paper
   2 Chemical and Plastic
   1 Furniture
   1 Appliance

FIGURE 7
GROUP MEMBERSHIP BY INDUSTRY
2. Multidimensional Scaling
   Ranked Data

   Group A. - low number of ship to locations
       - high weight/shipment
       -mail order entry

   4 Food
   2 Chemical and Plastic
   3 Other
   2 Appliance
   2 Pharmaceutical
   1 Furniture
   1 Building Materials
   1 Machine Tools
   1 Metals and Metal Working

   Group B. - high number of SKU
       - high number of ship from locations
       - electronic order entry
       -low order weight

   8 Chemical and Plastic
   4 Food
   3 Electronics
   2 Paper
   2 Metals and Metal Working
   1 Automotive
   1 Building Materials
   1 Machine Tools
   1 Other
   2 Pharmaceutical
   1 Minerals and Mining
   1 Appliance

3. Multidimensional Scaling
   Distance Data

   Group A. - low number of ship to locations
       - high $/order
       -high degree of competition
       -electronic order entry

   4 Food
   4 Chemical and Plastic
   2 Appliance
   2 Pharmaceutical
   2 Other
   2 Metal and Metal Working
   1 Automotive
   1 Electronic
   1 Paper
   1 Building Materials
   1 Machine Tools

   Figure 7 - continued
Group B. - high number of ship to locations
- low $/order
- mail order entry
- low degree of competition

6 Chemical and Plastic
4 Food
2 Other
2 Pharmaceutical
1 Mining and Minerals
1 Building Materials
1 Machine Tools
1 Paper
1 Appliance
1 Furniture
1 Metal and Metal Working
2 Electronics

Figure 7 - Continued
### TABLE 10

FACTOR SCORES OF PRODUCT FLOW AND DISTRIBUTION SYSTEM CONFIGURATION DATA

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>FACTORS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 2 3</td>
</tr>
<tr>
<td>No. Ship To Loc.</td>
<td></td>
</tr>
<tr>
<td>Avg. $ Per Order</td>
<td>0.619</td>
</tr>
<tr>
<td>Frt. Class LTL</td>
<td>0.854</td>
</tr>
<tr>
<td>No. SKU</td>
<td>0.739</td>
</tr>
<tr>
<td>Deg. Competition</td>
<td>-0.638</td>
</tr>
<tr>
<td>Sales Response C.S.</td>
<td>0.532</td>
</tr>
<tr>
<td>% TL Customer</td>
<td>0.610</td>
</tr>
<tr>
<td>% Freight Co. Trans.</td>
<td>0.554</td>
</tr>
<tr>
<td>% Invent. Cust.</td>
<td>0.674</td>
</tr>
<tr>
<td>% Orders Telephone</td>
<td>0.898</td>
</tr>
<tr>
<td>% Invent. Whse.</td>
<td>-0.633</td>
</tr>
<tr>
<td>No. Plants</td>
<td>0.702</td>
</tr>
<tr>
<td>No. Whses.</td>
<td>0.606</td>
</tr>
<tr>
<td>Turns Plant</td>
<td>0.970</td>
</tr>
<tr>
<td>Turns Whse.</td>
<td>0.700</td>
</tr>
<tr>
<td>% Shipped Direct</td>
<td>0.666</td>
</tr>
<tr>
<td>% Orders Mail</td>
<td>-0.518</td>
</tr>
<tr>
<td>% Orders Elec.</td>
<td>0.844</td>
</tr>
</tbody>
</table>

**Factor Description**
- Invent. Mgmt.
- Dir. TL
- Lrg. # Elec. Ordrs.
- High # SKU's
- LTL

**Eigenvalues**

- **a. % Var. Expl.**
  - 20.3
  - 16.3
  - 14.5
  - 12.0
  - 9.7
  - 7.9
  - 5.8

- **b. Cum. % Var. Expl.**
  - 20.3
  - 36.6
  - 51.1
  - 63.2
  - 72.8
  - 80.7
  - 86.5
TABLE 11

DISCRIMINATE ANALYSIS COMPARISON OF PREDICTED
VERSUS ACTUAL ASSIGNMENT TO GROUPS

<table>
<thead>
<tr>
<th>GROUPING PROCEDURE</th>
<th>% CORRECT ASSIGNMENT</th>
<th>CHANCE ASSIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Hierarchical Clustering</td>
<td>34.1%</td>
<td>20%</td>
</tr>
<tr>
<td>2) Multidimensional Scaling, Ranked Data</td>
<td>56.8%</td>
<td>50%</td>
</tr>
<tr>
<td>3) Multidimensional Scaling, Distance Data</td>
<td>79.6%</td>
<td>50%</td>
</tr>
</tbody>
</table>
Summary

This chapter analyzes the research results by examining the research question, the specific hypothesis employed to evaluate the research question, and the results of the data analysis as they pertain to the evaluation of the hypothesis.

The first research question concerns the attributes of customer service activities; customer service is an evaluative measure of performance, which may or may not be part of direct sales efforts.

The second research question addresses the relative importance of customer service as a marketing variable and evaluates differences in perception by functional area within the firm. The analysis indicates that customer service is the second most important marketing variable; however, the perceptions of various corporate members are significantly different.

The third research question evaluates the relative importance of the component elements by industry. Product availability is universally considered the most important element of customer service; however, the relative importance of the other customer service elements varies by industry. It follows, therefore, that there are significant differences across industries in the relative importance place on the elements of customer service.

The last research question postulates a relationship between the relative importance of the elements of customer service and characteristics of product flow and distribution system design. The analysis indicates that a relationship does exist between these variables.
CHAPTER V
RESEARCH SUMMARY

Introduction

This chapter consists of seven components. Each of the first four sections addresses a research objective. The first section "Defining Customer Service," develops a generic definition of customer service. The second section, "Customer Service as a Marketing Variable" evaluates the importance of this variable of the marketing mix. The third section examines "Industry Differences in Customer Service" as it relates to the specific elements of customer service. The fourth section, entitled "The Impact of Customer Service on Distribution" evaluates the relationship between differences in customer service and the corresponding effect on characteristics of product flow and distribution system configuration. These four sections are followed by a "Summary of Conclusions" section. The section, "Implications of Research" evaluates the results of this analysis in light of concept and management. The last section, "Summary of Future Research" examines alternate research procedures and topic areas where research might fruitfully be conducted.
Defining Customer Service

The first research objective concerns the "development of a generic definition of customer service based upon use of the term by distribution management." Based, also on a review of the literature, the issues which were determined to be significant are: 1. Is customer service part of the sales effort of the firm? and 2. Is customer service an evaluative measure of performance of an activity?

The research findings indicate that 1. customer service is not distinct from the firm's sales activities; 2. customer service is an evaluative measure of performance of an activity.

Following from this analysis is a general definition of customer service which incorporates these results. In this context, customer service may be defined as "a corporate philosophy which integrates and manages those activities that occur at the interface between the corporation and its customers which enhance or facilitate the sale and use of the corporation's products or services."

Customer Service As A Marketing Variable

The second research objective concerned the "evaluation of the importance of customer service with respect to other marketing variables and the determination of how perceptions of the relative importance of customer service varies by functional area of responsibility within the firm."

This research objective considers two issues: 1. What is the relative importance of customer service as a marketing variable? 2. Do perceptions of the relative importance differ by
functional area within the firm or by the firm's customers?

In a relative evaluation of product, price, advertising/sales and customer service; customer service ranked second in importance to product quality. Findings on the second research issue indicate that some significant differences do exist in the perception of the relative importance of the marketing mix variables. These differences in perceived importance of customer service exist at a significant level both between companies and within the functional areas of the individual companies.

**Industry Differences in Customer Service**

The third research objective is "Determine if the relative importance placed on the component elements of customer service differs by industry." This research objective concerns two issues: 1. Determine the relative importance placed on the elements of customer service by industry, 2. Ascertain whether the relative importance of the customer service elements varies by industry.

The results of the analysis of these research issues indicate that product availability is considered by all industries to be the single most important element of customer service, with approximately 40% of the relative importance. In general, the importance of elements of customer service following product availability are, order cycle time (20%), distribution system flexibility (15%), distribution system information (12%), distribution system malfunctions (7%) and post-transaction product support (4%).
Addressing the second research issue, this analysis indicates that significant differences do exist concerning the relative importance of elements of customer service across industries. Sixteen of twenty-eight company comparisons indicate significant differences.

The results of this analysis indicate that there are a considerable array of elements of customer service which are important to the realization of a sale. The single most important element of customer service is product availability. This element is approximately twice as important as the order cycle time. The analysis also indicates that the relative importance of the elements of customer service differ significantly among industries.

The Impact of Customer Service on Distribution

The fourth research objective concerns the "Evaluation of the existence of a functional relationship in the firm between the relative importance of the component elements of customer service and the characteristics of product flow and distribution system configuration."

Research objective three evaluates differences in the importance of customer service across industries; research objective four determines if characteristics of product flow and distribution system configuration relate to differences in the relative importance of the elements of customer service.
Analysis of the third research objective shows that there is a significant difference among many industries concerning the importance of the elements of customer service. The fourth research objective examines variables of product flow and distribution system design rather than industry classifications as explanatory variables of differences in customer service. The fourth research objective evaluates this relationship by forming groups of respondents with similar perceptions of the relative importance of customer service and comparing these groups by analyzing characteristics of product flow and distribution system configuration.

The results of this analysis indicate that there is considerable overlap between the two sets of independently formed groups. The similarity of group assignment varies upon techniques employed, ranging from 50% to 80% similar assignment of firms to groups (80% equals 1.6 times the probability of chance assignment). These results indicate a strong direct relationship between the perceived relative importance of the elements of customer service and the characteristics of product flow and distribution system design.

The purpose of this research objective is to uncover the underlying structure of variables which assist in explaining why differences exist in the relative importance of the elements of customer service by industry. The marketing concept might suggest that customer service standards are established to fulfill the customers' needs. These results confirm the relationship that patterns of customer demand establishes characteristics of product flow.
The target structure of product flow determines the characteristics of the distribution system which must meet customers' customer service needs. Thus the research shows that a relationship exists between customer service and characteristics of product flow and distribution system configurations.

The major variables of product flow and distribution system design which were analyzed as having a functional relationship with elements of customer service are:

1. Inventory turnover at plants
2. Percent of orders entered by telephone
3. Freight class of LTL shipments
4. Percent of orders entered by electronic means
5. Number of SKU's (stockkeeping units)
6. Number of plants
7. Inventory turnover at warehouses
8. Percent of inventory stored with customer
9. Percent of production shipped direct to customer
10. Degree of competition
11. Percent of inventory stored at warehouses
12. Average dollars per order
13. Percent of TL shipments to customer
14. Number of warehouses
15. Percent of freight moved by company-owned transportation
16. Response of sales to customer service
17. Number of ship to locations
18. Percent of orders entered by mail.

These are the variables which provide the greatest differentiation among groups. Therefore they are also the variables which distinguish among alternative distribution systems exhibiting differing relative importance of the elements of customer service.

**Summary of Conclusions**

Based on the preceding analysis, the following conclusions are made:
1. Customer service is defined as "a corporate philosophy which integrates and manages those activities that occur at the interface between the corporation and its customers which enhance or facilitate the sale and use of the corporation's products or services.

2. Customer service is ranked as the second most important variable of the marketing mix.

3. The physical distribution function is the only area within the firm that does not have significantly different perceptions from other areas in the firm or the firm's customers concerning the relative importance of the variables of the marketing mix.

4. The relative importance of the elements of customer service differ significantly by industry. Therefore there is neither a consistent ranking or weighing of the elements of customer service across industries.

5. There is a direct relationship between the relative importance placed on the elements of customer service and variables of product flow and the configuration of the distribution system.

Implications of the Research

The research leads to conclusions which have implications in the conceptual and managerial areas. The impact of this research in each area is as follows:

Conceptual Implications of this study include the development of a definition of customer service both in terms of a general definition and in terms of an identification of the component elements of customer service. Both definitions rely upon the perceptions of distribution management for their development. The generic
definition of customer service presented as the first point in the preceding section "Summary of Conclusions" meets the criteria established following a review of the literature and as such this definition should find generalizability across both industries and research. The Descriptive Model of Customer Service was used to evaluate differences in the relative importance of the elements of customer service. The model has added the new dimensions of pre- and post-transaction activities to those transactional elements formerly recognized. Respondents were able to respond to the model and it serves as a means of differentiating among firms based on service. As such, it contributes to the conceptual range of activities of the firm which can be considered customer service.

The study results indicate that there are significant differences among industries in the relative importance of the elements of customer service. Previous research has not suggested that differences in the ranking of the elements of customer service among firms exist. A major conceptual contribution of this research is the explanation that firms differ in the relative ranking of elements of customer service based upon characteristics of product flow and distribution configuration.

This finding supports an application of the marketing concept of fulfilling customer needs as they relate to customer service. These results indicate that there is a direct relationship between the relative importance of elements of customer service and the characteristics of product flow and distribution system design. The marketing concept implies that consumer demand is a function of the marketing
variables of product, price, promotion and customer service. In turn, consumer demand establishes characteristics of product flow. This leads to the requirement of specific distribution system configurations to meet customer service standards and to handle the levels of product flow. In this respect, these results provide supportive evidence of the validity of the marketing concept as it relates to the configuration of the distribution system for the firm.

Managerial Implications of this research are that this study demonstrates the importance of customer service. Customer service is shown to be the second most important variable of the marketing mix. It can be argued from these results that substantial effort should be placed by the firm on those marketing activities that occur during and after the sale of the product (customer service), as opposed to only assuming commitment to the pre-sales marketing activities (product, price and promotion).

The study findings indicate that the distribution function has a similar perception of the relative importance of customer service to that of both the firm's customers and all other functional areas within the firm. These results suggest that the distribution function should be significantly involved in the establishment of levels of customer service as they relate total market planning. The ability of accurately perceiving the customers' needs, if incorporated into the market planning process can alleviate some of the need for emergency actions which tend to be both disruptive and counter-productive to the efforts of the firm.
in realizing the full sales potential. The analysis of the relative importance of the elements of customer service indicated that product availability and order cycle time account for from 50% to 70% of the total importance of customer service. To date, most research has focused solely on the last two elements. These study results indicate that the remaining elements of customer service can be as important (from 50% to 30%) in realizing a sale as those elements of customer service which have previously received attention.

These results indicate the need in distribution system design to consider addressing the activities of distribution system; information, malfunctions, flexibility and post-transaction product support as important design specifications. Since these activities rival product availability and order cycle time in importance in realizing sales, this means that the distribution function should be organized or coordinated to interface with those other corporate areas which are important in meeting customers' needs as they relate to these activities of product distribution.

**Suggestions for Future Research**

This research examines customer service as it relates to the distribution of a product within a channel. The research is exploratory in nature. The results of the study are promising relative to the research goals; however, further research is warranted.

The descriptive model of customer service is able to differentiate firms based upon the relative importance of the elements of customer service. However, as the range of firms is extended to which it is applied (with respect to characteristics of product flow
and distribution system configuration), new elements of customer service may be found to be of considerable importance and the elements presently in the model may lose applicability. For example, it is expected that product availability is very low in importance in a job shop situation and, conversely, of substantial importance with a product such as electrical power. An extension of the model to these situations would either confirm its generality or facilitate a modification to a more generalizable model.

This research indicates a direct relationship between the relative importance of the elements of customer service and characteristics of product flow and distribution system configuration. This research design focused attention on expanding an understanding of customer service elements. Additional research concerning the variables of product flow and distribution system configuration is also necessary. This research should have a dual emphasis first on capturing all relevant variables and, secondly, on determining the best measurement techniques. For example, this research examines the total number of SKU's; perhaps a better measure would be the total number of product groups. Most of the significant variables in this study can be modified in a similar manner.

The research would then consist of repeating this study as it relates to the fourth research question comparing an expanded list of variables of product flow and distribution system configuration with customer service elements. The result of this research would be a predictive model of the relative importance of the elements of customer service. The model would be based upon product flow characteristics
and distribution system configurations. This analysis would result in identifying the best measures of the variables of product flow and distribution configuration. The relationship between each variable or combination of variables and the corresponding impact upon each element of customer service would result. The applicability of this model would be in the design or evaluation of distribution systems. This model would provide the means to evaluate alternate distribution systems—their performance levels in balance with a set of customer service standards established by the model. This adjunct to the evaluation of distribution system performance could bring considerable marketing efficiency to the distribution of a firm's product. In so doing, the potential rewards to the firm that realizes the increased efficiency in marketing its products could be of considerable strategic value.

Henry Ford is quoted as saying that, "Customer service is the foundation of all business." This research confirms the importance of customer service as an element of the marketing mix and provides a greater understanding of the functions of these variables in the market. It would appear that substantial rewards await those firms that realize the potential benefits inherent in the more efficient serving of consumers' needs.
Dear NCPDM Member:

In late summer 1975, the National Council of Physical Distribution Management commissioned The Ohio State University to continue and complete a study of Customer Service. Since that time we have been visiting with a number of companies and pretesting our data collection methods.

Attached is a questionnaire on customer service. We know you get a lot of questionnaires and it is a burden to fill all of them out. But this questionnaire is of special importance and the collective results will be shared with all of the membership through NCPDM. We hope you will participate in the study by filling out the questionnaire.

In our preliminary study we have found that there is a great deal of variety in what customer service means to different industries and companies. For this reason we have attached some instructions (blue sheet) which attempt to clarify the information we seek. Second, we recognize that some of the data we ask for will not be readily available. In these cases, your best estimates are perfectly appropriate for purposes of this questionnaire.

It is not the purpose of this study to evaluate "good" or "bad" distribution systems or customer service policies, and as with all data collected, under no circumstances will individual firms be identified, or will data be presented so that individual firms can be identified. We guarantee the confidentiality of your responses.

In partial repayment for your assistance, we will send you a summary of your industry response by major category. Fill out the last page of the questionnaire if you want this summary. The complete study will be available through the National Council of Physical Distribution Management in the Fall of 1976.

Thank you in advance for your prompt participation.

Sincerely,

Bernard J. La Londe

 BJL/cle

Attachments
EXPLANATION OF CUSTOMER SERVICE QUESTIONNAIRE
— PHYSICAL DISTRIBUTION

As you are aware, there is a great need for a better understanding of customer service in industry today. This questionnaire is the first of several which will greatly assist in providing this needed information — YOUR PARTICIPATION IS NEEDED in order to get an accurate picture of current practices.

All responses will be kept in strictest confidence—we guarantee the confidentiality of your response. The data you provide will only be used in aggregate with other members of your industry group.

Use approximate figures if necessary. It is expected that all questionnaires can be answered using data which is close at hand and your knowledge of your distribution system. It is not expected that you would search for any of the required data. Of course, if you do not know an approximate answer to a question, leave it blank.

**Question 1a.** The first question is meant to focus responses for this questionnaire on a product or product group that has uniform standards of customer service. For example, identical products may be sold by your firm to retailers and wholesalers, however, because of various circumstances the service provided to each of these market segments may be different. Therefore, select a product group with uniform service standards and use it as your point of reference for Questions 1 through 5 in this questionnaire.

**Question 1b.** Manufacturing as used in this context implies the modification of an initial product, while merchandising refers to the sale of the product to a user who would consume or deplete it. If your firm has activities in both areas, indicate relative percent activity (sales) for each.

**Question 1c.** Include in the corporate title any divisional distinctions which your company may make, e.g., Manager of Physical Distribution-Chemicals; Director of Distribution-Corporate.

**Question 1d.** Annual revenue for the product group which you selected to describe in Question 1a. Use approximate figures if necessary.

**Question 1e.** This question determines whether the distribution system which you are about to describe is reflective of national (continental) or regional sales.

**Question 1f.** Does your company have a written (formal) statement of policy concerning customer service whether very general in scope or specific in nature.

**Question 1g.** This question is meant to distinguish between salesmen's "promises" to a customer and the corporation's expected performance criteria.

**Question 1h.** As with all data received, this material will be kept in strictest confidence.

**Question 2** This question is making reference to the specific product which you have identified above. Product manufactured for customers means the pre-designation of a production run for a specific customer "to order," regardless of whether it is warehoused by you or not. All production not predetermined to a specific customer is to be included in the inventory category—"for stock"—even if the product is shipped directly from the production line to the customer.

The second part of the question refers to all inventory whether produced specifically to customer order or for inventory—that is, all product which is stored. "Plant(s)" refers to in-plant storage, plant warehouses etc., while "Field Warehouse" refers to all storage locations removed from the plant. Included under "Other" might be product stored at a customer's location for which he has not taken title.
Question 3 “Plant” refers to sources of product whether subcontracted, sub-assembled or totally assembled. “Company Operated Warehouses” includes all locations where employees are directly controlled by your firm, regardless of the ownership of the facility. “Public Warehouses” are those facilities whose employees are not directly under your firm’s control.

The “Average Annual Turnover of Inventory at Location” is meant to determine inventory turnover by level in the distribution system. This is calculated by dividing the cost of goods sold for the total system for the year (not yearly sales unless inventory on hand figures include net profit margin) by the average inventory by level. Algebraically, this is expressed as:

\[
\text{Average Annual Inventory Turnover} = \frac{\text{Cost of Goods Sold/Year}}{\text{Average Inventory by Level}}
\]

Calculate this for the levels of plant, company operated warehouses and public warehouses.

“% of Annual Volume Shipped Directly to Customers” includes all shipments whether manufactured for inventory or for customers which are shipped directly from the plant(s) to the customers. The units of measurement is percent of volume (units) shipped for the year.

Question 4 This question is meant to be approached in stages. First, examining just the descriptions of major categories of customer service which are: A. PRODUCT AVAILABILITY; B. ORDER CYCLE TIME; C. DISTRIBUTION SYSTEM FLEXIBILITY; D. DISTRIBUTION SYSTEM INFORMATION; E. DISTRIBUTION SYSTEM MALFUNCTION; and F. POST-SALE PRODUCT SUPPORT (and, of course, being aware of the sub-categories) grade (rank) each category relative to each other in importance in contributing to the generation of sales by distributing 100 points among the major categories in Column 1. Second, within the major categories re-distribute the points allocated to the major measures in Column 1 to the submeasures in Column 2. For example, if the major category of “D. DISTRIBUTION SYSTEM INFORMATION” has received 20 of the 100 points allocated to the major headings, now the 20 points are to be distributed among “1. Inventory Status; 2. Order Status; 3. Data Base for Forecasting; and 4. Other—any other category identified.” Of course, a reverse procedure would be to distribute 100 points to the subcategories then total the points within subcategories to determine the major category point allocations. Feel free to add categories of measures of customer service under categories of “Other” as needed.

Third, put a check mark beside those customer service measures which you do not measure at present in your firm, yet indicated were of importance in Column 1 and 2.

The fourth task is to identify those measures which you presently use to evaluate customer service. Identify the present numeric level of customer service and most importantly the units used to calculate or measure it. For example, “PRODUCT AVAILABILITY” may be measured by line items, or orders, or cases either as stockout or instock levels; “Expedite Order” might be % of orders; or units or excess labor or excess freight costs incurred; “Back-order Product” might be measured by orders, lines, cases, dollars, or % of orders; “Substitute Product” might be measured by the number of substitutions, or % of orders or net costs to company; “Inventory and Order Status” might be the number of queries per month, etc. If direct measures are not used, a description of the activity levels would be appreciated—explicitly describe all units used. Write on a separate page if necessary.

Question 5a. Use approximate figures if necessary to answer this question. “Warehouse” as used here stands for all intermediate points between the plant and the customer.

Question 5b. This question is meant to evaluate changes in product demand which might impact upon production and distribution policy to the extent that variations in customer service policy would result.
Question 5c. "Company-Operated Transportation" refers to transportation where your company directly controls the employees.

Question 6a. This question is requesting the total cost of distribution for all product groups which your distribution system handles.

Question 6b. This question is made with reference to all product movement in your distribution system. This question in effect asks you to break distribution costs down into their component parts. First, indicate which cost categories are included in the calculation of distribution costs with a check mark. Second provide these costs as a % of Sales. It is realized that some of these cost figures may be aggregated in the firm, e.g., order processing included in the cost of warehouse operation. However, we ask that if a cost category is included for budgetary purposes in this area of distribution, you provide a comparable percent of sales figure here. Use approximate figures if necessary.

Question 7 This question asks for a verbal description of customer service as it applies to physical distribution.

Question 8 The question requests that you distinguish between the physical product, the market price for the product, customer service and the effect of the sales effort (advertising, promotions, personal calls, etc.) in realizing the sale of the product.

Please feel free to add any additional comments (on a separate page) about customer service at your company which need elaboration or were not asked.

It is important that additional points of view and detail be determined about your distribution system. Therefore, we request that you take the time and effort to answer a second questionnaire and, having explained the importance of the study and received assurances of cooperation, route short questionnaires to the corporate functions of production, marketing/sales, purchasing and top management, as well as a questionnaire for five customers (we recommend selection in conjunction with the marketing/sales function and prior agreement by the customer to cooperate) and five suppliers (we recommend selection in conjunction with the purchasing department and prior agreement to cooperate). As you can anticipate, the perspective on customer service of these individuals may be considerably different, and therefore a necessary component for this study. It is also necessary to have you complete a second questionnaire. While the questionnaires sent to these other individuals will be purposefully
brief (requiring approximately 10 minutes to complete), this second questionnaire for you may require up to one hour to complete—really not that much time for the potential benefits. We ask that you do what you can.

Your name and company identification are used only for purposes of forwarding the second questionnaire and the summary results of your industry. No evaluation of a specific distribution system as being "good" or "bad" will ever be made, nor will data ever be released or presented in such a manner that your firm would be recognized—rather only industry aggregate figures will ever be used.

THANK YOU IN ADVANCE FOR YOUR PROMPT PARTICIPATION
APPENDIX C

CUSTOMER SERVICE QUESTIONNAIRE — PHYSICAL DISTRIBUTION

Use approximate figures if better figures are not immediately at hand. Refer to the “Explanation of the Questionnaire” if you do not understand the question.

1a. Identify your industry from the list below. If your company has multiple, dissimilar divisions indicate for this questionnaire the one with which you are most familiar, or your largest division (if the division has products with multiple customer service criteria, use as your point of reference the product group with which you are the most familiar. Do not include consideration of products for international shipment).

- Appliance
- Automotive
- Building Materials/Lumber
- Chemicals & Plastics
- Electronics
- Food
- Furniture
- Other, specify

- Machine Tools & Machinery
- Metals & Metal Working
- Mining & Minerals
- Paper
- Petroleum
- Pharmaceutical
- Textiles

1b. Are you primarily a Manufacturing Firm ________ or a Merchandising Firm ------------?

1c. Your corporate title ---------

1d. Approximate annual sales for those products $_________

1e. Are these products marketed throughout the continental U.S.? _____Yes _______No

1f. Do you have a written customer service policy? ______Yes _______No

1g. Do customers receive a copy of this policy? ______Yes _______No

1h. May we receive a copy of any formal statements which you have pertaining to customer service?

If YES, Please forward it to us with this questionnaire.

2. With reference to the product group which was identified above, indicate the characteristics of product movement through your distribution system using as measurement units percentage of dollars sold. Use approximate figures if necessary.

<table>
<thead>
<tr>
<th>% of Dollar Production Manufactured for:</th>
<th>Of All Products Going into Inventory Indicate the % Dollar Value Stored At:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory (for stock)</td>
<td>Plant(s)</td>
</tr>
<tr>
<td>Customers (to order)</td>
<td>Field Warehouse(s)</td>
</tr>
<tr>
<td></td>
<td>Other (write in)</td>
</tr>
</tbody>
</table>

3. Indicate how inventory moves through your distribution system for the products which you are describing. Use approximate figures if necessary.

<table>
<thead>
<tr>
<th>Location</th>
<th>Number of Facilities</th>
<th>Average Annual Turnover of Inventory at Location</th>
<th>% of Annual Volume Shipped Directly to Customer</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLANT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company Operated Warehouse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public Warehouse</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Do the parts of this question in sequence, (1), then (2), then (3), then (4).

(1) Provide relative ranking of those measures of customer service (major headings lettered at the left) which are important to your business in generating sales by distributing 100 points among them in Column 1 (more points indicate greater importance).

(2) In Column 2 distribute the points allocated to the major headings among the numbered subcategories.

(3) Indicate with a check mark those activities not presently measured.

(4) Numerically describe your present level of service and describe the units used to measure it. E.G., Product Availability: Service Level = 92% instock; Units = % of units sold.

<table>
<thead>
<tr>
<th>MEASURES</th>
<th>COLUMN 1 (1)</th>
<th>COLUMN 2 (2)</th>
<th>(3) SERVICE LEVEL</th>
<th>(4) UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. PRODUCT AVAILABILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. ORDER CYCLE TIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Order Entry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Order Processing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Order Picking &amp; Shipping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Transit Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. DISTRIBUTION SYSTEM FLEXIBILITY</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Expedite Order</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Backorder Product</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3. Substitute Product</td>
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<tr>
<td>4. Faster Transportation</td>
<td></td>
<td></td>
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<tr>
<td>5. Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. DISTRIBUTION SYSTEM INFORMATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Inventory Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Order Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Data Base for Forecasting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. DISTRIBUTION SYSTEM MALFUNCTION</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Administrative Errors (Inc. credit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Picking Errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Shipping Errors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Warehouse Damage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Company — Shipping Damage</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>6. Carrier — Shipping Damage</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7. Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. POST SALE PRODUCT SUPPORT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Repair Parts Availability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Repair Service</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Technical Advice</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. OTHER:</td>
<td>100 pts.</td>
<td>100 pts.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5a. Provide the following information concerning product movement in your distribution system. Use approximate figures if necessary.

<table>
<thead>
<tr>
<th>Freight Movement</th>
<th>% of Freight Bill</th>
<th>% of Number of Shipments</th>
<th>% of Weight Shipped by Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant to Customer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant to Warehouse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warehouse to Customer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>100%</td>
<td>=100%</td>
</tr>
</tbody>
</table>

5b. Is there enough seasonal variation in demand for this product that the shipping characteristics would change throughout the year?  
Yes  No  
Do your customer service standards change?  Yes  No

5c. ___ % of freight moved (cwt.) by company-operated transportation.

6a. Total cost of distribution last year for all products moved in your company's distribution system $.  
Distribution costs as a % of Sales are ___ %.

6b. For the following distribution cost categories first check if a cost category is considered part of distribution costs in your company, then for the relevant cost categories provide cost figures as a percent of sales for the total distribution system (all products). Use approximate figures if necessary.

<table>
<thead>
<tr>
<th>Cost Categories</th>
<th>Check if Included in Distribution Costs</th>
<th>Cost As a % of Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inbound Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outbound Transportation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Common Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Carrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Administration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receiving &amp; Shipping</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packaging</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Order Processing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Warehousing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In Plant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field-Private</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Field-Public</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inventory Carrying Cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taxes, Insurance, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Distribution Costs</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Define Customer Service as it applies to physical distribution in your company:

_________________________________________________________________________
_________________________________________________________________________
_________________________________________________________________________

8. Distribute 100 points among the following marketing variables. (The greater number of points indicating greater importance in achieving sales for your firm).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td></td>
</tr>
<tr>
<td>Customer Service</td>
<td></td>
</tr>
<tr>
<td>Advertising, Sales Effort</td>
<td>100</td>
</tr>
</tbody>
</table>

100 points

For questions requiring elaboration of answers or any additional comments, please include these on a separate page.

Thank you for participating in this section of the study on Customer Service which is designed to provide a detailed description of your distribution system and general detail concerning customer service. The next section of the study will evaluate customer service in greater detail. It is expected that this questionnaire may require approximately one hour to complete. We would also like to send shorter questionnaires to you to be distributed to the corporate functions of production, marketing, purchasing and top management, as well as five customers and five suppliers selected by you. These short questionnaires will require approximately ten minutes to complete. All questionnaires will be accompanied by a self-addressed, stamped envelope and all responses will be kept in strictest confidence.

If you are willing to participate further in the study, please indicate below those areas where you think you can help us and return this form along with the questionnaire in the attached prepaid envelope.

PLEASE SEND THE FOLLOWING:

________ Second Questionnaire for me.

I will discuss participation and distribute questionnaires to the following areas:

_____ Purchasing   _____ Production   _____ Five Customers
_____ Marketing/Sales   _____ Top Management   _____ Five Suppliers

PLEASE SEND THESE QUESTIONNAIRES AND THE SUMMARY RESULTS FOR MY INDUSTRY TO:

Name __________________________
Title __________________________
Company _________________________
Address _________________________

THANK YOU FOR YOUR PARTICIPATION
Dear NCPDM Member:

Thank you for indicating your willingness to participate in the second half of the Customer Service Study. The information derived from the first half of the Study is impressive as you will see from your industry summary statistics to be mailed to you in June.

Enclosed you will find a questionnaire for yourself and any of the additional functional areas which you indicated could assist in the Study. As you will notice, they have been grouped and identified to facilitate handling by you. We recommend contacting the suppliers through the purchasing department and contacting the customers through the sales department. An accompanying letter is also enclosed for you to sign and send to these individuals. Please reinforce the fact that no individuals or firms will be identified and an evaluation will not be made pertaining to functioning of the various areas surveyed.

Please distribute the questionnaires which you have requested and follow up in about one week to ensure that they have been returned. We thank you in advance for your contribution to this Study.

Sincerely,

Bernard J. La Londe

BJL/clc

Enclosures
The National Council of Physical Distribution
Management Survey on Customer Service - Physical Distribution

You have been assigned number__________ as a means to identify your industry and allow us to add the data from this response to the previous questionnaire. Under no circumstances will you or your firm be identified in any way.

1. The following are provided as general definitions of customer service. Select the definition which you feel is most appropriate (indicating it with a check mark). Add any comments which will improve any of the individual definitions below or develop your own definition.

<table>
<thead>
<tr>
<th>Check Best Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>_____ Distribution system performance</td>
</tr>
<tr>
<td>_____ The sum of all interfaces between the corporation and its customers</td>
</tr>
<tr>
<td>_____ Distribution activities which enhance or facilitate the sale and use of a corporation's product(s)</td>
</tr>
<tr>
<td>_____ The efficiency with which a corporation satisfies its customers</td>
</tr>
<tr>
<td>_____ Other (write in) __________________________________________</td>
</tr>
</tbody>
</table>

__________________________________________________
2a. Indicate the degree of responsibility for the following customer service activities within your organization by distributing 100 points among the job functions.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution Management</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Sales Management</td>
<td></td>
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</tr>
<tr>
<td>Other (Specify)</td>
<td></td>
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<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
</tr>
</tbody>
</table>

2b. For the following customer service activities indicate the degree of responsibility within your organization by distributing 100 points among the activities.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Top Management</th>
<th>Distribution Management</th>
<th>Sales Management</th>
<th>Other (specify)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop Customer Service Objectives</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement Customer Service Plans</td>
<td></td>
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<tr>
<td>Manage Customer Service Activities</td>
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<tr>
<td>Evaluate Customer Service Performance</td>
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<td>100 points</td>
<td>100 points</td>
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<td>100 points</td>
</tr>
</tbody>
</table>
3. In defining the term "customer service," indicate the following:

a) Rank the three corporate departments which have the greatest impact on customer service (1=most important, 2=second most important, etc.).

- Engineering
- Top Management
- Finance
- Product Distribution
- Public Relations
- Production
- Sales Efforts
- Other (write in)

b) Rank the top three corporate activities which have the greatest impact on customer service (1=most impact, 2=second most impact, etc.).

- order invoicing
- technical services
- transportation
- information about inventory/delivery status
- warehousing
- ordering/order department
- expediting, handling emergency orders
- marketing/sales
- complaints, warranty, repair parts & service
- all corporate activities
- other (write in)
c) Check the most appropriate completion of the statement:

"Customer service is: The (contact, performance, interface, efficiency) with which the firm provides customer satisfaction.

d) Customer service is distinct from a firm's sales efforts (e.g., advertising, personal selling, promotions). ___yes; ___ no.

4a. Diagram your company's organizational chart (or provide a photocopy).
Show the functions of Physical Distribution, Marketing, Production, Purchasing, Top Management or their equivalents. Include any function which your company presently defines as customer service (or customer relations, distribution services, etc.). If your company subdivides the physical distribution activities show where they report. Show staff responsibility with a dashed line and line responsibility with a solid line. If appropriate, you may describe only a division or subsidiary of your company if most of the corporate functional areas described above are included within it.
b) If your company designates a particular area as customer service
(or customer relations, distribution services, etc)...

b.1. How many people are assigned to the area: exempt employees ______
      non-exempt employees ______

b.2. Describe the major responsibilities of these individuals:

b.3. To what department does this area report?__________________________

b.4. If possible, please provide us with all job descriptions which
      include customer service/customer relations in the title.

5a. Relative to your company's order cycle time...

1. How frequently do you monitor the order cycle (check one)
   ______ every order ______ routinely sample ______ never ______ other (specify)

2. Indicate (using letters from the diagram below, e.g. B to C) which
   components are part of your measurement. ______ to ______.

   CUSTOMER PLACES ORDER
   ORDER RECEIPT
   ORDER PROCESSED
   ORDER SHIPPED
   ORDER RECEIVED

   A     B     C     D     E
3. If measured indicate the average time in days or hours (specify which) taken by your system between

\[ \begin{align*}
A \text{ and } B &= \underline{\text{hrs/days}} \\
B \text{ and } C &= \underline{\text{hrs/days}} \\
C \text{ and } D &= \underline{\text{hrs/days}} \\
D \text{ and } E &= \underline{\text{hrs/days}}
\end{align*} \]

4. Your estimate of the average total order cycle A to E is \underline{\text{hrs/days}}

5b. Indicate the importance of each of the following variables by distributing 100 points among them (more points indicate greater importance).

<table>
<thead>
<tr>
<th>Influenced the setting of present customer service standards</th>
<th>Which of these functions are most important in providing feedback of complaints on any failure in service objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historically determined</td>
<td>x x x</td>
</tr>
<tr>
<td>Production</td>
<td></td>
</tr>
<tr>
<td>Marketing/Sales</td>
<td></td>
</tr>
<tr>
<td>Physical Distribution</td>
<td></td>
</tr>
<tr>
<td>Competition</td>
<td></td>
</tr>
<tr>
<td>Top Management</td>
<td></td>
</tr>
<tr>
<td>Customers</td>
<td></td>
</tr>
<tr>
<td>Other (specify)</td>
<td></td>
</tr>
</tbody>
</table>

100 points 100 points
6. Listed below are a series of statements. Indicate your agreement or disagreement with these statements by circling the appropriate response.

SA = Strongly Agree; A = Agree; N = No Opinion; D = Disagree; and SD = Strongly Disagree.

1. Customer service levels are improved as the number of field warehouses are increased.  
SA A N D SD

2. A field force of customer service representatives assists in making the customers aware of actual customer service standards.  
SA A N D SD

3. Central order processing improves customer service levels.  
SA A N D SD

4. A customer service function should report to the top distribution executive.  
SA A N D SD

5. Independent middlemen (brokers, public warehousemen, wholesalers, etc.) tend to reduce customer service levels by delaying information from final customers.  
SA A N D SD

6. Government regulation will have greater impact on setting minimum levels of customer service in the future.  
SA A N D SD

7. Freight terms (F.O.B. plant or customer) have no impact on the level of service provided.  
SA A N D SD

8. Competitive pressure is the most important factor in setting the level of customer service.  
SA A N D SD

9. A motor carrier private fleet will generally improve the level of customer service.  
SA A N D SD

10. A centralized customer service function within the corporation tends to improve service levels provided to customers.  
SA A N D SD

11. Customer service standards tend to constrain the operation of the physical distribution function, thus reducing the operating efficiency of the corporation.  
SA A N D SD
12. A decentralized customer service function tends to increase the level of customer service which is provided.

13. Independent middlemen (brokers, public warehousemen, wholesalers, etc.) tend to reduce customer service levels by filtering information from final customers.

14. The customer function should report to the top sales/marketing executive.

15. Customer service should be a company philosophy rather than a set of specific activities.

16. Competition determines the level of customer service we must provide.

17. Most firms really do not understand what their customers really want in customer service.

18. Most firms do not specifically measure the cost implications of changes in customer service levels.

19. Most firms do not specifically measure the sales impact of changes in customer service levels.

20. Customer service levels in most firms are set at a higher service level than necessary to provide customer satisfaction.

21. The use of assigned rail cars improves customer service over the use of the carriers' available cars.

22. As customer service standards improve, customers tend to order more frequently in smaller quantities.

23. In my business, consistency in order cycle times is more important than having all products in stock.

24. Customers tend to discredit the service which they are actually receiving by remembering only the problem orders.
7. If your products are out of stock, indicate how your "average" customer would respond by ranking the alternatives according to his sequence of actions (1 = first response; 2 = second response, etc.).

- backorder product
- reorder with next order
- contact sales personnel
- order from competition
- contact top management
- check inventory status reports to determine expected future delivery date
- postpone purchase
- drop product
- other (specify) ________________________________

8a. In selecting a public warehouse, indicate the importance of each of the following variables in making this decision by distributing 100 points among the variables (more points indicate greater importance).

Sales Effort, Advertising
Prices (Rates/Cost)
Services Provided
Number and Location of Warehouses

100 pts.
8b. Evaluate the importance of the following elements of customer service in selecting a public warehouse. Rank the elements by distributing 100 points among the elements (more points mean greater importance).

<table>
<thead>
<tr>
<th>Facilities and Equipment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of space</td>
<td></td>
</tr>
<tr>
<td>Quality of space</td>
<td></td>
</tr>
<tr>
<td>Special order entry equipment</td>
<td></td>
</tr>
<tr>
<td>Availability of materials handling equipment</td>
<td></td>
</tr>
<tr>
<td>Availability of special storage/handling equipment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consistency (Reliability)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>In shipment receiving</td>
<td></td>
</tr>
<tr>
<td>In order processing</td>
<td></td>
</tr>
<tr>
<td>In providing transit time</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Administration</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory management</td>
<td></td>
</tr>
<tr>
<td>Shipment tracing</td>
<td></td>
</tr>
<tr>
<td>Housekeeping (Sanitation)</td>
<td></td>
</tr>
<tr>
<td>Product security</td>
<td></td>
</tr>
<tr>
<td>Claims administration</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>

100 points
8c. Listed below are some factors which might be used to describe the responsiveness of the public warehouses you use to meet your distribution system needs. Indicate the relative importance of each factor by distributing 100 points among the factors (more points indicate greater importance).

**Flexibility**

- In handling emergency shipments  
- In handling special shipments  
- In rerouting/rescheduling  
- In special pick up or delivery situations

**Responsiveness**

- Speed of response to inquiry  
- Accuracy of response to inquiry  
- Adequate detail in response to inquiry  
- To manufacturer recall procedures

**Supplementary Services**

- Order consolidation  
- Local delivery service  
- Repackaging & recooperage

**Other factors**

- Quality of management  
- Quality of workforce  
- Other

---

9a. In selecting a common carrier, indicate the importance of the following variables in the selection process by distributing 100 points among the variables (the greater the number of points the greater the importance in your selection).

- Sales effort, advertising  
- Prices (Rates)  
- Services provided  
- Number and location of terminals

---

100 points
9b. Evaluate the importance of the following elements of customer service in selecting a carrier. Rank the following elements by distributing 100 points among them (more points mean greater importance).

Equipment
- Equipment availability
- Availability of specialized equipment
- Condition of equipment

Consistency (Reliability)
- Of pick up
- Of delivery
- Of total transit time

Administration
- Shipment tracing
- Claims administration
- Paper work accuracy

Speed (Of Transit Time)

Other

Other

100 points
9c. Listed below are some factors which might be used to evaluate the carriers you are using. Indicate the relative importance of these factors by distributing 100 points among them (more points indicate greater importance).

Flexibility
- In handling emergency shipments
- In handling special shipments
- In rerouting/rescheduling
- In special pick up or delivery situations

Responsiveness
- Speed of response to inquiry
- Accuracy of response to inquiry
- Adequate detail of response to inquiry

Other Factors
- Shipment security
- Housekeeping (Sanitation)
- Quality of management
- Quality of workforce

Other ________________________
Other ________________________ 100 points

10a. The average $/lbs. of shipping carton = ______$/lbs.

b. The average lbs./cu. ft. of shipping carton = ______lbs./cu.ft.

c. The average order size = $ ________.

d. The average time between orders = ______ weeks.

e. The most common freight class for outbound shipments to customers is ______.

f. The approximate number of stock keeping units in your product line offering = ______/____ S.K.U.'s.

g. The approximate number of shipping points used last year: ________.

h. Indicate the number of independent channel members which your firm presently uses.
   ______ public warehouse  ______ wholesalers
   ______ brokers  ______ others (specify)
10i. Indicate the present level of unitization as a % of outbound shipments to customers which are:

- palletized _______%
- shrink wrap _______
- slip sheets _______
- other (specify) _______

j. Indicate your present relative level of automated materials handling equipment on a scale of 1 to 7. (1=very little automation; 7=highly automated for industry). Level of automation = _______.

k. Indicate how customer orders enter your order processing function (as a % of all orders received).

- Salesmen _______
- Telephone _______
- Mail _______
- Electronic (C.R.T./Telex, etc.) _______
- Other (specify) _______

l. Indicate the relative degree of competition which your products experience in the marketplace. (1=little competition; 7=intensive competition). Degree of competition = _______.

m. If the average level of customer service for your products were reduced by 5% (holding all other market variables constant), the approximate corresponding impact on sales as a percent of sales would be _______

THANK YOU FOR YOUR PARTICIPATION IN THIS STUDY. Please forward the (1) Customer Service Job Descriptions; and (2) Any formal customer service policy statement which your company may have.

PLEASE follow up with the other people to whom you gave the other questionnaires in about one week to assist in assuring a response.

-- THANK YOU --
The enclosed questionnaire addresses the area of customer service in American industry today. As you know, this is a critical topic concerning all segments of the economy.

This study is being sponsored by the National Council of Physical Distribution Management and is being conducted by a research team at The Ohio State University. Under no circumstances will individuals or firms be identified, however it is necessary to distinguish types of industry and therefore you have been assigned a number which appears at the top of the questionnaire to distinguish your industry.

Please return the completed questionnaire directly to The Ohio State University in the accompanying self-addressed envelope.

Thank you for your valuable insights on this topic.
APPENDIX G

The National Council of Physical Distribution Management Survey on Customer Service-Customers

This survey is meant to evaluate customer service in American Industry today. No individual or firm will be identified. To identify your industry you have been assigned number________. Thank you for your response to these questions.

1. The following are provided as general definitions of customer service. Select the definition which you feel is most appropriate (indicating it with a check mark). Add any comments which will improve any of the individual definitions below or develop your own definition.

Check Best Definition

______ Distribution system performance

______ The sum of all interfaces between the corporation and its customers

______ Distribution activities which enhance or facilitate the sale and use of a corporation’s product(s)

______ The efficiency with which a corporation satisfies its customers

______ Other (write in) ___________________________________________________

2. Indicate the importance of the following variables in your product purchase decision by distributing 100 points among the variables (more points indicate greater importance).

Product
Customer Service
Price
Advertising, Sales Effort

100 points

3. Indicate the relative degree of competition for the products which you purchase (1=little competition, 7=intensive competition) The degree of competition = ________.

[Please turn questionnaire over and respond on the other side]
4. If the average level of customer service for the products which you purchase was reduced by 5% (holding all other market variables constant) your approximate corresponding response as a percent of present sales would be ________%.

5. The following items can generally be considered measures of customer service. First indicate the importance of each of the items in the purchase decision by distributing 100 points among the items (more points indicate greater importance). Second, identify the present level of service which you presently receive and describe the approximate present service provided (e.g. product availability=90% in stock, order cycle time=14 days, administrative errors=1% of sales etc.)

<table>
<thead>
<tr>
<th>Measures</th>
<th>(1) Importance</th>
<th>(2) Service Level Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Product Availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Order Cycle Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Distribution System Flexibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Expedite Orders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Back Order Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Substitute Products</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Distribution System Information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Order/delivery status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Inventory status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Distribution System Malfunction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Administrative Errors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Distribution Errors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Product Damage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Post Sale Product Support</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Repair parts/service availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Warranty</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Technical advice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Tracing product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Other (Specify)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

100 points

Thank you for this response. Please return this questionnaire in the accompanying self-addressed envelope.
APPENDIX H

THE NATIONAL COUNCIL OF PHYSICAL DISTRIBUTION MANAGEMENT SURVEY ON CUSTOMER SERVICE.

This survey is meant to evaluate customer services in American Industry today. No individual or firm will be identified. To identify your industry you have been assigned number ________. Thank you for your response to these questions.

1. Indicate the importance of the following variables in achieving sales for your firm (greater points indicate greater importance in achieving sales.)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product</td>
<td></td>
</tr>
<tr>
<td>Customer Service</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td></td>
</tr>
<tr>
<td>Advertising, Sales Effort</td>
<td></td>
</tr>
</tbody>
</table>

100 points

2. The following are provided as general definitions of customer service. Select the definition which you feel is most appropriate (indicating it with a check mark). Add any comments which will improve any of the individual definitions below or develop your own definition.

Check Best Definition

- Distribution system performance
- The sum of all interfaces between the corporation and its customers
- Distribution activities which enhance or facilitate the sale and use of a corporation's product(s)
- The efficiency with which a corporation satisfies its customers
- Other (write in)__________________________

3. Indicate the relative degree of competition which your products experience in the market place (1= little competition, 7= intensive competition).

Degree of competition = ________.

4. If the average level of customer service for your products were reduced by 5% (holding all other market variables constant) the approximate corresponding impact on sales as a percent of present sales would be ________%.

Please turn questionnaire over and respond on the other side.
5a. Indicate responsibility for the following customer service activities within your organization by distributing 100 points among the titles.

<table>
<thead>
<tr>
<th></th>
<th>Develop Customer Service Objectives</th>
<th>Implement Customer Service Plans</th>
<th>Manage Customer Service Activities</th>
<th>Evaluate Customer Service Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distribution</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sales Management</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purchasing</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Production</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Specify)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
</tr>
</tbody>
</table>

5b. For the following customer service activities indicate responsibility within your organization by distributing 100 points among the activities.

<table>
<thead>
<tr>
<th></th>
<th>Top Management</th>
<th>Distribution Management</th>
<th>Purchasing</th>
<th>Production</th>
<th>Sales Management</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop Customer</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Service Objectives</td>
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<td></td>
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<tr>
<td>Implement Customer</td>
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<td></td>
</tr>
<tr>
<td>Service Plans</td>
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<td></td>
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<tr>
<td>Manage Customer</td>
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<tr>
<td>Service Activities</td>
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<td></td>
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<tr>
<td>Evaluate Customer</td>
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<tr>
<td>Service Performance</td>
<td></td>
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<tr>
<td>Total</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
<td>100 points</td>
<td>100 pts</td>
</tr>
</tbody>
</table>

Please return this questionnaire in the accompanying self-addressed envelope.
Dear NCPDM Member:

The industry summaries of the Customer Service Study are nearing completion and will be mailed to you within a month. The study results to date indicate the critical nature of some operational areas to the performance of the customer service function. The following questions examine these areas more closely.

Please complete the following questions and return this sheet in the accompanying envelope. Thank you.

Regard,

Bernard J. La Londe

P.S.: If you participated in the second series of questions, please prompt a response.

1. Approximately how many points did you ship to last year? _______ points.
2. Average shipment size = _______ dollars.
3. Average shipment weight = _______ lbs.
4. Average time between shipments to a customer = _______ weeks.
5. Average freight class = _______ TL; _______ LTL.
6. Average cubic feet of shipping container = _______ cu.ft.
7. Please indicate the following

<table>
<thead>
<tr>
<th></th>
<th>Check if Yes</th>
<th>Check if No</th>
<th>If Yes, indicate mail, phone person, CRT, etc.</th>
<th>Time required to perform function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers submit orders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salesmen submit orders</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orders are collected (batched) at field locations</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orders are transmitted immediately to an order processing system</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customers receive an order acknowledgement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salesmen receive an order acknowledgement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>How are shipping instructions transmitted to warehouse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have an automated order status inquiry available for:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Customers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Salesmen/sales office</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3) Warehouse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do you have automated invoicing to customers</td>
<td></td>
<td></td>
<td>(follows shipment by ______ days)</td>
<td></td>
</tr>
</tbody>
</table>

8. 

<table>
<thead>
<tr>
<th></th>
<th>Telephone</th>
<th>Mail</th>
<th>On line</th>
<th>Electronic</th>
<th>Telex</th>
<th>In person</th>
<th>Other Specify:</th>
</tr>
</thead>
<tbody>
<tr>
<td>If customer submits order indicate % of orders handled by.................................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 100%</td>
</tr>
<tr>
<td>If salesmen enter orders indicate % of orders handled by.................................</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>= 100%</td>
</tr>
</tbody>
</table>

9. Would you characterize the customer service function in your firm (or division, if distinct) as centralized _____ or as decentralized _____?

You have been assigned number ______ in order to match this response with the first questionnaire.
BIBLIOGRAPHY

Books


**Articles**


Sweers, John F. "A Standard to Beat the Carrier's Clock." Handling and Shipping, October, 1973, pp. 54-57.


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