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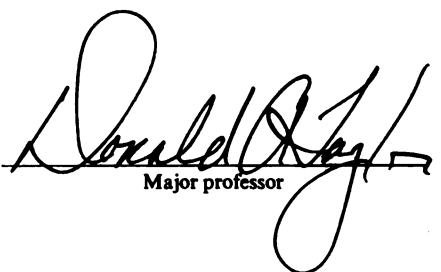dissertation entitled

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Fernando Bins Luce

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PHYSICAL DISTRIBUTION SERVICE:

A COMPARATIVE STUDY

By

Fernando Bins Luce

A DISSERTATION

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ABSTRACT

PHYSICAL DISTRIBUTION SERVICE:
A COMPARATIVE STUDY

By

Fernando Bins Luce

This dissertation presents a report of research about physical
distribution service in Brazil. The major thrust of this study was to
make a comparative analysis of the findings of this research with those
reported by Perreault and Russ (1976a) in the United States. Also, the
investigator sought to examine relationships not reported in the
Perreault and Russ study so as to provide additional understanding of
physical distribution service in the Brazilian environment.

The population of the study comprised purchasing managers of
companies with more than 50 employees, located in either the metro-
politan area of Porto Alegre or in the city of Caxias do Sul, both in
the State of Rio Grande do Sul, and within a certain group of indus-
tries (metallurgical, mechanical, electrical, transportation equipment,
furniture, plastic, and shoe). Because it was feasible and desirable,
all firms within the population were invited to participate in the
study; thus, no sampling was necessary.

The data were gathered by a questionnaire in which the respond-
ents were asked to answer questions on product-specific situations.
The questionnaire was administered to 418 subjects. The return rate

was 43% (180 questionnaires). To minimize nonrespondent error, a sample was drawn from this population, and personal interviews were conducted with 24 nonrespondents. Then tests for differences in responses were performed. No relevant differences were found.

The major variables of the study were divided into two groups. The independent variables included supplier (type, number), company (size, industry category), and situational variables (deliveries, backorders, order cycle time). The dependent variables were satisfaction (physical distribution service and its components), importance (physical distribution service components), and purchasing factors variables.

The major differences between the two studies centered on the following aspects: (1) the importance of price and physical distribution service as factors in selecting suppliers and (2) the relationships between number of deliveries and satisfaction with physical distribution service with its importance in selecting suppliers. The relevant similarities included the identical pattern concerning satisfaction with service and feedback about service needs, the highest importance ranking of product quality as a factor in selecting suppliers, and the unobserved relationships between number of suppliers and backorders with importance of physical distribution service in selecting suppliers.

ACKNOWLEDGMENTS

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CHAPTER I

INTRODUCTION

This dissertation reports research that was conducted to
examine different aspects of physical distribution service in the
Brazilian business environment and to compare them with a study done
by Perreault and Russ (1976a) in the United States. This chapter
includes an overview of the purpose and the importance of the study,
followed by a brief analysis of the conceptual framework of the
research. The research objectives are introduced, and the major limi-
tations of the methodological procedures are examined.

Purpose of the Study

This study was conducted to enable further acquisition of
knowledge in the area of physical distribution by reporting a compara-
tive analysis of perceptions of purchasers concerning the physical
distribution service provided by their suppliers in two different
business environments: Brazil and the United States.

Physical distribution service was selected for study because
it is the overall objective of a physical distribution system. The
Perreault and Russ study was selected for comparative purposes because
it lends itself to replication in another environment.

Repeating a similar trend that has occurred in the United
States in the last three decades (Bowersox, 1978, pp. 4-12), the

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concept of physical distribution is evolving in Brazil. In conduct-
ing this research, the investigator was concerned with the generali-
zation and application, to the Brazilian situation, of the findings
reported by Perreault and Russ (1976a) about physical distribution
service in the United States because there are considerable dif-
ferences between the two countries. There is a substantial gap
in the countries' economic development, which is certainly reflected
in their business practices. The higher inflation rates in Brazil
have a direct effect on interest rates, which in turn affects the
supply and demand of credit that influences the management of
funds within a single business enterprise. The not-so-legally pro-
tective competitive system in Brazil permits the development of
monopolistic and oligopolistic market structures that affect the busi-
ness environment. All of the aforementioned environmental character-
istics directly influence physical distribution service from the
point of view of both suppliers and customers.

The investigator also sought to examine relationships not
reported in the Perreault and Russ study so as to provide additional
understanding of physical distribution service in the Brazilian envi-
ronment. This was done with the intention of augmenting the limited
body of knowledge about business in Brazil, in the hope of contribut-
ing to the development of a unique theoretical framework to deal with
specific problems of physical distribution service in Brazil.

Importance of the Study

The Brazilian economy is experiencing a host of economic prob-
lems that have a direct effect on the area of physical distribution.

These problems include high interest rates, inflation, high costs of energy, and tight monetary policies. The interest rates and the high inflation pose extreme restrictions on inventory policies concerning availability, which in turn influences the level of physical distribution service that can be offered to customers. The high costs of energy are posing threats to the stability of Brazil's transportation system. Physical distribution service levels will certainly have to be revised. Also, the tight monetary policies are bringing about a reduction in consumer demand, resulting in a profit squeeze that reduces the funds available for providing adequate physical distribution service. At the same time, the knowledge of physical distribution is growing within the Brazilian business environment. Therefore, the need for insights regarding physical distribution service practices and perceptions arises.

The findings of this research can foster an improvement in business practices in Brazil by providing elements to further managerial competence through new insights about physical distribution service as perceived by the recipients of such services.

Conceptual Framework

In spite of extensive research in the area of physical distribution service, it seems that the authors have not yet reached consensus about what is meant by physical distribution service and what constitutes its components. The problem may have originated in the confusion that exists in differentiating customer service from physical distribution service. The former should be viewed as a set

of activities or elements that constitute the interface between a company and its customers, whereas the latter is one of the elements of that interface--that is, physical distribution. Therefore, in this dissertation physical distribution service was viewed as one element of customer service, which was defined as "those activities that occur at the interface between the customer and the corporation which enhance or facilitate the sale and use of the corporation's products and services" (La Londe & Zinszer, 1976, p. 2).

Definitions of physical distribution service range from one extreme, which emphasizes the time-and-place utilities provided, to another, in which emphasis is placed on either highlighting the components or elements of physical distribution service or establishing performance standards to be attained by physical distribution service.

For the purpose of this research, physical distribution service was defined as "the interrelated package of activities provided by a supplier which creates utility of time and place for a buyer and increases form utility" (Perreault & Russ, 1976a, p. 3). This definition was operationalized by a number of components that constitute the physical distribution service package, which is the same as the one described by Perreault and Russ (1976a, p. 8). Therefore, in this dissertation the components of physical distribution service included billing procedures, average delivery time, delivery time variability, rush service, returns policy, order status information, accuracy in filling orders, action on complaints, and order methods. Throughout the remainder of the dissertation, the abbreviation PDS is used and refers to physical distribution service as defined above.

The basic framework of this research stemmed from the work done by Perreault and Russ (1976a) so as to provide the means for a comparative analysis. Therefore, the categories of variables and some of the hypotheses are similar in both studies. Additional variables and hypotheses were introduced in the present work to allow for the fulfillment of the other major purpose of this research. The categories of variables are outlined at the end of Chapter II, and the hypotheses are presented later in this chapter.

Research Objectives

The operationalization of this research undertaking was accomplished by a certain number of objectives and hypotheses. The first objective concerned satisfaction with the overall PDS and its components. The second was intended to rank the PDS components in order of importance. The third objective sought to compare PDS with other factors in patronage decisions. The fourth explored relationships of particular variables to the importance of PDS in selecting suppliers. For this objective, a series of six substantive hypotheses were stated. The fifth objective was to compare the findings of this study with those presented by Perreault and Russ (1976a).

The specific research objectives were as follows:

1. To investigate the perceived satisfaction of buyers with overall PDS and with each of its components.

2. To rank, in order of importance, different components of PDS as perceived by purchasers.

3. To compare the importance of PDS with other factors influencing patronage decisions.

4. To explore relationships between situational variables of the buying process, supplier variables, company variables, and satisfaction variables with the perceived importance of PDS in selecting suppliers.

5. To present a comparative analysis of the findings of this study with those reported by Perreault and Russ (1976a). This analysis compares the findings in the Brazilian and American environments on the following aspects: (a) satisfaction with overall PDS and each of its components, (b) the importance of PDS as a factor influencing patronage decisions, and (c) relationships involving the perceived importance of PDS in selecting suppliers.

Hypotheses

The hypotheses derived from the fourth objective are presented below:

1. The greater the number of deliveries, the greater the importance of PDS in selecting suppliers.

2. The higher the proportion of backorders, the greater the importance of PDS in selecting suppliers.

3. The greater the average order cycle time, the greater the importance of PDS in selecting suppliers.

4. The greater the number of alternative suppliers available, the lower the importance of PDS in selecting suppliers.

5. The larger the company, either in terms of number of employees or in sales volume, the greater the importance of PDS as a factor in selecting suppliers.

6. The greater the satisfaction with PDS, the lower its importance as a purchasing factor.

Limitations

The limitations of this research stemmed from three basic sources: the instrument, the population, and the analyses. Each is discussed below.

The Instrument

The data-collection instrument was relatively long and fairly complicated. Most of the questions were product and supplier specific, and some of them related to different time frames. The responses were based on self-support, with the exception of a sample of nonrespondents who were personally contacted. A number of questions required perceived responses, as opposed to specific data-based answers. The products chosen for the questionnaire were all standardized industrial products with a sizable number of alternative suppliers. The conceptual background used in developing the instrument was, in itself, a limitation. Since the Perreault and Russ (1976a) study was used as a starting point for this research undertaking, the present effort was in a sense limited to their framework.

The Population

The criteria used to define the population (see Chapter III for details) were fairly restrictive. First of all, a defined geographical area prevented the inclusion of a large number of industries in the population. The available roster of members of the

Federação das Indústrias do Rio Grande do Sul, from which the respond-
ents were selected, had data on the companies for the year 1979; some
subjects might have been excluded from the population because of out-
dated information in the roster. And finally, only a selected group
of industries (see Table 3.1) was included in the population.

The Analyses

Most of the analyses were either descriptive or relational and
were based heavily on a correlational model. Therefore, causality
may not be inferred from this type of analysis.

Overview of the Dissertation

The core of this research undertaking is presented in the
next four chapters. In Chapter II the literature on customer service
is examined, with emphasis on PDS. A discussion of the various
definitions of customer service and PDS is presented, as well as a
review of the recent research findings in the area of PDS. In
Chapter III the methodology developed for this research is discussed.
The population of the study is described, and the data-collection
instrument and procedures are presented. The statistical tools used
for testing the hypotheses and exploring relationships are introduced.
Chapter IV contains a summary of the substantial findings of the study,
and Chapter V outlines the major conclusions and implications of this
investigation and explores further research that could be derived
from this endeavor.

CHAPTER II

LITERATURE SEARCH

Introduction

This study on the role of physical distribution service

(PDS) explores buyers' perceptions of satisfaction with and impor-

tance of certain PDS components and the importance of PDS as a

factor in selecting suppliers. The study stems from previous work

done by Perreault (1973) and by Perreault and Russ (1974, 1976a)

but includes a broader theoretical background that examines more

recent research developments in the field of PDS.

In this chapter, the investigator reviews major concepts and

research approaches and findings that provide a background for the

study. The literature examined in this chapter directly influenced

the selection of research variables, the design of the data-collection

instrument, and the final interpretations of the study's findings,

conclusions, and recommendations.

Customer Service

Since Perreault's investigation, a host of different research

studies have addressed the area of customer service, with emphasis on

the demand-obtaining aspect of customer service. In spite of the exten-

sive work in this area, it seems that some of the original difficulties

in determining what is meant by customer service still persist. In this

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respect, Daniel and Jones (1969) emphasized that "anyone who has attempted to struggle with a definition of customer service realizes that it is a paradoxical concept" (p. 344). The major problems appear to be in defining the scope of customer service and also in assigning responsibilities for managing customer service within the organizational structure. La Londe and Zinszer (1976) summarized this situation by highlighting three different corporate approaches to dealing with customer service. The first considers customer service as a set of activities within the firm. Examples are organizing and implementing billing procedures, customer complaints, and so on. The second approach views customer service in terms of performance levels, which could be related to availability of product, returns due to damages in transit, order cycle time, etc. The third approach regards customer service as "an element of total corporate philosophy" (Rose, 1979, p. 280). This approach considers customer service as a new area of managerial concern and could be viewed as similar to the idea of the marketing concept. Regardless of the approach one uses to view customer service, it is undoubtedly an area that permeates almost all of the managerial functions within an organization.

Definitions of customer service range from the most diffuse and general to statements that comprise specific indicators of customer service performance. Among the broader definitions, it is appropriate to mention the following:

> Customer service is a chain of events that is in the business
> of keeping customers. (Davis, 1971, p. 51)

Customer service constitutes those activities that occur at the interface between the customer and the corporation which enhance or facilitate the sale and use of the corporation's products and services. (La Londe & Zinszer, 1976, p. 2)

Customer service is a complete collection of demand-related factors under the control of the firm, but whose importance in determining supplier patronage is ultimately evaluated by the customer receiving the service. (Ballou, 1973, p. 96)

Customer service is a function which is concerned with all of the operating interfaces, except selling, between the company and its customers. (NCPDM, 1978, p. 188)

Toward more specific definitions of customer service, one may consider those that state the economic utilities fulfilled by customer service. They are:

Technical product services are those activities which the manu-facturer engages in besides sale of the product, to produce for the purchaser of his product the expected utility or end values in terms of product performance for which the product is obtained. (Simon, 1965, p. 32) [This definition deals with form utility.]

Customer service is the quality with which the flow of goods and services is managed. (Ballou, 1978, p. 62) [Temporal and spatial utilities are implicit in this definition.]

Customer service is the interrelated package of activities pro-vided by a supplier which creates utility of time and place for a buyer, and insures form utility. (Perreault, 1973, p. 15)

These last two definitions address the concept of physical distribution service (PDS), which is the major topic of the present study.

The literature has not developed a definition of customer service that deals only with possession utility. However, several authors have included dimensions that are related solely to possession utility as being part of either product service or physical distribution service. Examples are visitation services (Simon, 1965, p. 33), terms of sale and ease of ordering (Levy, 1981, p. 91), and salesmen's visits (Perreault & Russ, 1974, p. 40; Gilmour, 1979, p. 87). There

is room for the development of a customer-service definition that would consider only possession utility.

Components of Customer Service

La Londe and Zinszer (1976, pp. 272-82) presented the most comprehensive description of the customer service components, which grouped the elements of customer service into three distinct categories: the pretransaction elements, which provide the organizational posture for customer service; the transaction elements, which fulfill the delivery function; and the posttransaction elements, which support the product while in use. Perreault and Russ (1974, p. 40), Cunningham and Roberts (1974, p. 22), and Gilmour (1979, p. 87) also provided lists of customer service components.

Cunningham and Hardy (n.d., p. 125) conducted research on the components of service. They investigated the elements of service as perceived by retailers in experimental studies in Great Britain. The findings showed the following elements of service to be important: reliability of delivery, call frequency, delivery frequency, availability of stock, personal relationship with salesman, and provision of advice and information. The findings were situation specific, and the authors did not mention the reasons for including the elements listed above as part of customer service.

La Londe and Zinszer (1976, pp. 23-24) conducted an extensive research project sponsored by the NCPDM to gather information on the elements of customer service. The categories of service were the

following: product availability, order cycle time, distribution-system flexibility, distribution-system information, distribution-system malfunctions, and postsale product support. The categories were obtained by personal interviews with physical distribution executives in U.S. industries. A second phase of the research was a survey that centered on the importance of the customer service elements, costs, definition of customer service, marketing variables, and other situational questions. Even though the title of the study was Customer Service, it is evident that the research aimed at PDS. Again, the problem of correctly defining customer service persisted throughout the study. The definition provided in the introduction to the research report was very broad and encompassed the activities involved in the customer-corporation interface for the purpose of facilitating and enhancing the sale and use of a product. After examining the findings of the research, it seems possible that the respondents had a different perception concerning the definitions of customer service (see pp. 203-17). At the end of the study, the authors acknowledged this possibility.

Physical Distribution Service

In the last decade, the field of logistics has become established as an area of managerial concern. The climate of the times, with the shortages of raw materials and of reliable energy sources and the economic problems of increasing inflation rates and rising unemployment, has paved the way for the growing importance of logistics in the management of organizations.

According to Bowersox (1978), logistics is "the process of strategically managing the movement and storage of materials, parts and finished inventory from suppliers, between enterprise facilities and to customers" (p. 3). From this definition, it is clear that logistics deals with movement and storage of goods; hence the performance of logistical operations results in fulfillment of time-and-place utilities.

One of the areas of logistics is physical distribution, which "deals with the movement, storage and processing of orders for a firm's output" (Ballou, 1978, p. 26).

In providing time-and-place utilities, physical distribution is confronted by two conflicting objectives: (1) to maximize customer service (i.e., time-and-place utilities) and (2) to do so at the least total cost of offering the service. Management is dealing with a trade-off situation because "no physical distribution system can simultaneously maximize customer service and minimize distribution cost" (Kotler, 1967, p. 420).

The idea of maximizing customer service is subordinated to the posssibility of establishing a demand-obtaining function related to customer service. Since customer service involves a host of different components, the development of demand functions has proven to be cumbersome. Thus, until the early 1970s, the majority of the writings and research concentrated on the minimization problem of physical distribution (Perreault, 1973, pp. 13-15), i.e., how to provide a certain level of service at the lowest cost. Nevertheless, scholars and researchers have acknowledged the effect of customer service on

generating sales (Hutchinson & Stolle, 1968; Johnson & Parker, 1961; Magee, 1960; Stephenson & Willett, 1968; Stolle, 1967). Recently, the increasing use of quantitative techniques, with the aid of improved computer technology in management investigation, has allowed researchers to shift emphasis toward the demand-obtaining aspect of customer service.

Before reviewing the most recent research undertakings in PDS, the definition of PDS should be discussed, as well as the major components or elements of PDS and the service level.

Definition of PDS

The same problems encountered in attempting to define customer service occur in defining PDS. At one extreme, one could find general definitions that emphasize the time-and-place utilities provided by PDS, and at the other, definitions that either highlight the components or elements of PDS or establish performance standards to be attained by PDS. Another category of definitions can also be identified, which stresses a supplier orientation or a customer orientation.

The most general definition of PDS is the one that is closely related to the objective of PDS, i.e., creation of time-and-place utilities. Perreault and Russ (1976a) defined PDS as "the interrelated package of activities provided by a supplier which creates utility of time and place for a buyer and increases form utility" (p. 3).

Heskett (1971) presented a list of definitions of PDS and ranked them in order of popularity. The definitions ranged from "the

elapsed time between the receipt of an order at the supplier's ware-house and the shipment of the order from the warehouse" to "the ease and flexibility with which a customer can place his order." The least-popular definitions are the customer-oriented ones, such as the latter above, in contrast to the supplier-oriented definitions, which seem to be more popular. The reason for this apparent paradox is the difficulties encountered by management in either controlling or measuring the customer-oriented performance levels.

Customers are directly affected by the performance of customer service. Thus, a definition of customer service should account for the customer's needs, and PDS provides "the availability (at the right time and place) of a needed product" (Perreault & Russ, 1974, p. 39).

La Londe and Zinszer (1976, p. 271) summarized the three key ingredients associated with customer service definitions: (1) customer service is an activity that occurs at the customer-corporation inter-face; (2) customer service should involve only postsale activities; and (3) customer service is an evaluative measure, thus the perform-ance of customer service functions constitutes customer service. Since customer service is an evaluative measure, one can talk about service level, which constitutes performance standards for customer service functions. Thus, certain authors have presented the elements of PDS in terms of their performance measurements.

PDS Elements

It has been clear for some time that the major objective of physical distribution is to deliver finished products in the right

place, at the right time, in the right quantities and specifications, and in a usable condition. The elements or components of PDS should, theoretically, encompass all the functions and activities necessary to attain that overall physical distribution objective. In other words, they should comprise the functions or activities responsible for providing time-and-place utilities with assurance of form utility.

An examination of the literature in the area of physical distribution showed some deviations from this theoretical framework when identifying the major components of PDS. Some authors have tended to include elements not related to the temporal-spatial utility-satisfaction objective. Appendix A contains a list of the major set of elements of PDS as perceived by various authors.

Research in the Area of PDS

After reviewing research in the area of PDS, it was concluded that a major category of components involves activities that influence the perspective of the buyer or have an effect on sales revenues:

- PDS components and satisfaction with PDS components

- PDS and the selection of suppliers

- Causes of the importance of PDS in selecting suppliers

Each of these topics is examined in detail in the following pages.

PDS Components

The majority of the research in this area is heavily concentrated on order cycle time. The reasons for this emphasis seem to

be twofold: (1) the ease of measurement of order cycle time and
(2) the availability of data on order cycle time.

Ballou and DeHayes (1967) postulated that order cycle time
variability was more important than average order cycle time in choos-
ing transportation services. They conducted a simulation using speed
of delivery, dependability (variations in delivery schedules), and
the cost of service as variables for selecting service. The final
outcome showed that dependability had an effect on inventory costs,
whereas speed of delivery had little or no effect on the same costs,
provided that the level of demand was kept constant. Aside from this
stringent assumption, one cannot guarantee that the buyers will con-
sider inventory costs when comparing average order cycle time and its
variability.

Hutchinson and Stolle (1968) conducted a survey of 500
customers of a firm to determine buyers' perceptions of the services
provided. Among other results, it was found that delivery consistency
was preferable to delivery time, and supplier inventory reliability
was considered just as important as delivery time. The major short-
coming of this survey rested in the sample used: It did not allow
generalizations beyond the universe of the firm from which data were
obtained.

In a survey conducted by Ballou (1973), 2,000 members of the
National Association of Purchasing Agents were selected to indicate
change in supplier patronage if (1) average order cycle time were
reduced, (2) order cycle time variability were reduced, or (3) if both
were reduced. He concluded that "reliability may be less important

than we think" because buyers apparently cannot discriminate the effects of variability from the average order cycle time. The major problems of this research centered on methodological aspects (low response rates; nonrespondent bias) and also on the few aspects of PDS that were evaluated (Ballou also acknowledged this problem).

In another simulation study, Speh and Wagenheim (1978) found that consistency in physical distribution performance was more important than "speed." Moreover, "inconsistent lead-times resulted in both higher system costs and lower customer service" (p. 106). The limitations of this study rested on the assumption that buyers would perceive the differences between consistency and "speed."

Levy (1981) conducted an experiment with 30 drug wholesalers to define standards of customer service. From previous research, he determined the importance of components of customer service and found the following to be most significant: free order-placement policy (WATS line), terms of sale, consistent delivery, lead time, and fill rate. (It should be mentioned that terms of sale is not a component of PDS according to the definition used in this study.) Levy contacted the subjects by telephone and asked them to rank nine different pairings of service levels contained in five trade-off matrices of nine cells each. He examined the data using a conjoint analysis approach. The findings showed that the perceived dollar values of changes in lead time were greater than those of changes in consistent delivery. Generalizations from this study should be made with caution. The data-collection procedure was questionable, and

the rankings were made considering only three levels of customer service for each component.

Uhr, Houck, and Rogers (1981) undertook a 4^3 factorial experiment to investigate the profit potential of certain customer service variables (order cycle time, variability of delivery time, and communication time). In their model, profit was considered a linear function of the customer service variables. The final outcome was that both order cycle time and variability of delivery time were significant, whereas communication time was not significant. However, any generalizations drawn from the study are questionable because some methodological problems could not be overcome, especially the nonresponse bias.

The aggregate outcome of the above-mentioned studies is intriguing. From a theoretical standpoint, order cycle time variability should be more important than average order cycle time, but the studies just reviewed showed evidence that contradicted the theoretical interpretations.

Concerning the importance of the PDS components, the La Londe and Zinszer study (1976) found the following order: product availability (42.4), order cycle (20.7), distribution-system information (12.6), distribution-system flexibility (11.5), distribution-system malfunction (7.7), and postsale product support (4.5) (p. 117).[1] These findings, however, are not representative of buyers' opinions because the number of respondents in this category (18) was too small

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[1]The numbers in parentheses show the distribution out of 100 points given to that particular PDS element, indicating its importance.

to allow generalizations. Despite this shortcoming, it is worth mentioning that the rankings of importance varied widely by different industries. The researchers did not test for the significance of these differences.

In a study conducted to evaluate the perceptions of the service supplied (order cycle time), Willett and Stephenson (1969) surveyed 480 drug and drug-sundry retailers. The researchers found that "buyers could discriminate among even small differences in physical distribution service times, and their ratings of satisfaction with service received were a linear function of service time" (p. 283). A major shortcoming of this study was that a recognition of a difference in service did not mean that the difference was significant.

Concerning the perceived satisfaction of buyers with the service provided by their suppliers, Perreault and Russ (1976a) investigated 216 purchasing managers from rosters of the National Association of Purchasing Management. Respondents were asked to indicate on a seven-point rating scale their satisfaction with nine aspects of PDS. The findings showed a greater level of satisfaction with the aspects of PDS that dealt with communication (i.e., billing procedures, order methods, accuracy in filling orders). However, the elements that directly affected profits (delivery time variability, and average delivery time) showed lower satisfaction levels. The problem with these findings was that satisfaction levels were only buyers' perceptions concerning the service provided.

Having examined the research studies on PDS components, a review of the importance of PDS in the patronage decision follows.

PDS and the Selection of Suppliers

This section contains a discussion of the research on the importance of PDS and the patronage decision. PDS and some of its components are contrasted with other factors that might affect the selection of suppliers from the point of view of the buyer.

Klass (1961) interviewed 300 executives in 208 industrial companies to define what factors affect purchasing decisions. In order of importance, the most significant factors were:

- maintenance of product quality consistent with specifications

- on-time delivery performance

- an honest and sincere attitude on the part of salesmen

- price

Note that a PDS component (delivery performance) was second only to product quality.

In the Hutchinson and Stolle study (1968), delivery service was tied with product quality as suppliers' choice of the most important element.

Lehmann and O'Shaughnessy (1974) undertook at investigation to determine "how the choice criteria used by purchasing agents to select suppliers vary with the type of problem likely to arise in adopting the particular product." The choice criteria were defined as the factors used to evaluate competitive offerings. The product categories were as follows: routine-order products (I), procedural-problem products (II), performance-problem products (III), and

political-problem products (IV). Table 2.1 summarizes some of their findings. It is worth mentioning that a PDS component (reliability of delivery) was an important factor in selecting suppliers.

Table 2.1.--Rankings of selected factors by product type.

Factors	Product Type			
	I	II	III	IV
Reputation	4	7	5	2
Flexibility	3	5	2	5
Technical service	12	1	3	7
Product reliability	11	11	4	3
Price	2	8	8	1
Reliability of delivery	1	4	1	4

Source: Lehmann and O'Shaughnessy (1974).

Key: I = Routine-order products
     II = Procedural-problem products
    III = Performance-problem products
     IV = Political-problem products

The major shortcomings of the study were of a methodological nature (Semon, 1975). The degree of influence of purchasing agents was not uniform among product classes or among different suppliers. Also, the ranking criteria were questionable; some of the differences between ranks may not have been significant. The sample size (45) was too small to allow further generalizations.

In a study aimed at identifying the determinants of choice of supplier for capital goods in Great Britain, Cunningham and White (1973/1974) identified nine variables that influence the decision

process: price, delivery, reputation, past experience, technical specification, whether the machine was UK manufactured or imported, credit, trade-ins, and reciprocity. Only the first five variables had an effect in causing the buyer to discriminate between alternative offers. Price and delivery were extremely important for determining patronage decisions, provided that the technical specifications were met and that the reputation of the supplier for delivery reliability was not unfavorable.

Cunningham and Roberts (1974) investigated the role of customer service in industrial marketing and concluded that "customer service can be a significant determinant of the buyer's attitude to his suppliers and on his eventual purchase decision" (p. 15). Personal interviews were conducted with 25 buyers of steel castings and forgings among valve and pump manufacturers. The respondents were asked to rank 13 different customer service factors that could influence supplier selection. They considered delivery reliability to be the most important factor. Some of the limitations of Cunningham and Roberts' findings should be mentioned. The sample size was very small, and thus no relevant statistical tests could have been made. Since only customer service factors were considered, other important factors for selecting suppliers were omitted.

Banting (1976) replicated the preceding study in Canada. The sample size was larger (343 subjects), but the response rate was very low (73 usable responses), which imposed restrictions on the generalizability of the findings. In spite of the limitations,

delivery reliability was found to be the most important service factor in the purchase decision.

Perreault and Russ (1976a) also explored the importance of certain supplier characteristics in the purchase decision. The various supplier attributes were measured using seven-point rating scales (ranging from "not important" to "very important"). The findings showed that product quality was perceived as the most important attribute, followed by distribution service and price.

In the same study, Perreault and Russ explored some relationships that could exist between the importance of PDS and some situational variables. For this purpose they formulated the following hypotheses (pp. 7-8):

1. "The greater the number of deliveries, the greater the importance of PDS. Problems with slow or inconsistent service could multiply with the number of deliveries." The findings confirmed the hypothesis. It is interesting to mention that the level of satisfaction with average delivery time and delivery-time variability were the lowest of all the PDS components.

2. "The greater the number of alternative suppliers available, the lower the importance of PDS. Competition presumably increases efficiency, leading to a higher level of service and less need to pay attention to it in choosing suppliers." The findings were contrary to the hypothesis.

3. "The higher the proportion of cancelled orders, the greater the importance of PDS. Problems with PDS lead purchasers

to pay greater attention to it in choosing suppliers." The findings contradicted the original hypothesis.

4. "The greater the satisfaction with PDS, the lower its importance in the evaluation. If the PDS the buyer is currently receiving is satisfactory, then he is less likely to consider it seriously in his decision process." The findings were consistent with the hypothesis, and the authors postulated that "the more important the service level, the more likely the purchaser is to seek out and patronize a supplier who meets his needs."

5. "The greater the average delivery time, the greater the importance of PDS." The findings did not show any apparent relationship that could confirm the statement.

A closer examination of these hypotheses and the findings presented by the authors led to the following conclusion: Other variables or factors affect the importance of PDS.

Factors Affecting PDS

Because customer service is measured by the performance of its components, there are certainly different levels of performance that should be adequate to meet specific service requirements. The paucity of research in this area makes it difficult to develop a concise frame of reference for analysis.

La Londe and Zinszer (1976) concluded that "customer service is indeed situational to an industry and perhaps to the specific distribution policies of a company" (p. 113). This statement considerably limits generalizations across industries in the area of PDS.

In line with this idea, Christopher et al. (1977) emphasized that service is more "critical for some companies than for others" (p. 42). The major thrust is to determine if service is an important factor in influencing demand. Some factors are relevant to this undertaking: (1) product substitutability, which relates to brand loyalty and availability of close substitutes; (2) product criticality, which refers to the cost of a stockout; (3) complementary products; and (4) the cost of customer inquiries (p. 42).

Heskett (1971) suggested observing the following factors in establishing service levels: (1) economics; (2) nature of the environment; (3) nature of the product, which includes substitutability and physical characteristics; and (4) pattern of demand.

From the previous citations, one can infer that service levels will differ for every product and for each major market. Shycon and Sprague (1975) presented a host of factors to be considered when defining a certain service level. These included market share, frequency of purchase, customer's inventory policies, value of the product, profit margins, and degree of competition (p. 77).

Framework of This Research

As mentioned earlier, this research stemmed from the work done by Perreault and Russ (1976a). The hypotheses were spelled out in Chapter I and were very similar to the ones presented by Perreault and Russ (see page 6 of this dissertation), except for Hypothesis 2, in which backorders was used instead of cancelled orders, and Hypothesis 6 (company size and importance of PDS), for which Perreault and

Russ did not test. The content of the questionnaire resembled the one used by Perreault (1973) to generate the data base for the study he presented with Russ (1976a).

The categories of variables were the following:

- Situational variables
    - number of deliveries*[1]
    - percentage of backorders*
    - percentage of backorders cancelled*
    - average order cycle time*

- Supplier variables
    - category of supplier
    - number of suppliers utilized
    - number of other suppliers
    - number of alternative suppliers*

- Company variables
    - size by number of employees
    - size by sales volume
    - type of industry

- Satisfaction variables
    - PDS components*
        - billing procedures
        - average delivery time
        - delivery time variability
        - rush service
        - returns policy
        - order status information
        - accuracy in filling orders
        - action on complaints
        - order methods
    - overall PDS*

- Importance variables
    - PDS components[2]

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[1]The variables marked with an * were the same as those presented by Perreault and Russ (1976a).

[2]The components are identical to those presented for the satisfaction variables.

- Purchasing factors variables
    - product quality*
    - PDS*
    - price*
    - supplier management*
    - distance to supplier*
    - required order size*
    - reciprocity*

- Respondent variables
    - purchasing function
    - other functions or activities
        - general management
        - finance
        - production
        - personnel
        - marketing
        - materials management

- Product variable*

- General variables
    - attitudes toward possible stockouts
    - changes in suppliers
    - reasons for changing suppliers
    - feedback on PDS*

The situational, supplier, company, and satisfaction variables were treated as independent variables in the hypotheses in which the purchasing-factor PDS was considered a dependent variable. For the other relational analyses, the situational, supplier, and company variables were the independent variables and the satisfaction, importance, and purchasing-factor variables were the dependent variables.

This chapter presented a review of the literature on customer service, with emphasis on PDS, and concluded with an outline of the basic framework of the research. In the next chapter, the basic procedures used in this research are discussed.

CHAPTER III

RESEARCH METHODOLOGY

Empirical data for this investigation were gathered by a
survey of purchasing managers' opinions about the physical distribu-
tion service (PDS) of industries located in two large industrial areas
of the state of Rio Grande do Sul, Brazil. The data were collected in
1981, but respondents were asked to refer to their business activi-
ties of 1980.

In this chapter, a detailed description of the population
surveyed, the data-collection procedures and instrument, the hypothe-
ses, and the statistical tests is presented.

Population

Since purchasing managers play an influential role in the
buying decision-making process, particularly on routine order products
(Lehmann & O'Shaughnessy, 1974; Weigand, 1966), these managers were
selected to be the source of information for this research.

A preliminary contact was made with the newly established
regional chapter (State of Rio Grande do Sul) of the Brazilian Asso-
ciation of Purchasing Managers. Despite their interest in partici-
pating in the study, two major problems arose: First, the membership
roster had only 76 managers, and second, of these 76 members, only
12 could actually participate in the study.

Another alternative for reaching the purchasing managers was to obtain a list of all industries in the state of Rio Grande do Sul. This list was available in the Anuário das Indústrias--1980, published by the Federação das Indústrias do Rio Grande do Sul. Because this list contained a very large number of industries, several criteria were established so that the number of industries surveyed could be reduced. These criteria were: (1) size of the company (more than 50 employees); (2) geographical location of the company (either in the metropolitan area of Porto Alegre or in the city of Caxias do Sul--these two regions are the most industrialized areas of the state); and (3) type of industry (metallurgical, mechanical, electrical, transportation equipment, furniture, plastic, and shoes). The number of companies that met the above criteria was 418. A breakdown of the study population by industry and by region is presented in Table 3.1.

Table 3.1.--The study population, by industry and region.

Industry	Porto Alegre	Caxias do Sul	Total
Metallurgy	144	28	172
Mechanical	30	12	42
Electrical	15	3	18
Transportation	7	5	12
Furniture	18	8	26
Plastic	23	5	28
Shoes	118	2	120
Total	355	63	418

Because it was feasible and desirable, all firms within the population were invited to participate in the study; thus, no sampling was necessary.

In summary, the population of the study comprised purchasing managers of companies with more than 50 employees, located in either the metropolitan area of Porto Alegre or in the city of Caxias do Sul, both in the state of Rio Grande do Sul, and within a certain group of industries.

Response Problems

To avoid undesirable response rates that could lead to non-response errors, some precautionary actions were taken. These actions are briefly discussed below.

Sponsorship of the Research

There is evidence that if the person or organization sponsoring a particular research effort is made known to potential participants, this tends to increase the response rate (Scott, 1961; Vocino, 1977). Moreover, sponsorship by a university results in higher response rates than business-corporation sponsorship (Brunner & Carroll, 1969). Therefore, it was made clear to the respondents in the prenotification phone call and in the cover letter to the questionnaire that this investigation was sponsored by the Universidade Federal do Rio Grande do Sul.

Prenotification

Research has shown that prenotification, either by mail or by telephone, increases the response rate (Myers & Haug, 1969;

Waisenen, 1954). Two-thirds of the respondents in this investigation were contacted by phone before they received the questionnaire.

Other measures that could improve the response rate were also followed. They were: including a pre-stamped return envelope (Ferris, 1951), assuring confidentiality, and setting a predetermined deadline for returning the questionnaire (Ferriss, 1951; Scott, 1961).

Data-Collection Instrument

The instrument used for collecting the data was a question-naire.[1] The first page of the questionnaire gives general instructions. The remainder of the instrument contains questions in the following areas:

--selected product (Question 1)

--suppliers (Questions 2-4): category, number

--company (Questions 5-7): size and type

--respondent's activities in his/her company (Questions 8-9)

--purchasing situations (Questions 10-13): deliveries, back-orders, and order cycle time

--evaluation of suppliers' PDS (Questions 14-23): satisfaction levels

--importance of PDS components (Question 24)

--factors influencing purchasing decisions (Question 25)

--attitudes about specific purchasing situations (Questions 26-29)

--general observations or comments (Question 30)

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[1]The instrument was administered in Portuguese. The original questionnaire, including the cover letter and the English translation, is included in Appendix B.

Types of Products

To assure more uniformity with respect to responses, the subjects were asked to answer questions in a product-specific situation. That is, the respondents answered all the questions in reference to a specific product, chosen from a list provided in the general-instructions section of the questionnaire. The products included in that list met the following criteria: (1) routine order products, (2) repeated purchases, (3) various suppliers, and (4) high usage among different industries. The investigator chose the following products for inclusion in the list: fasteners, bearings, lubricants, abrasives, electrodes, and acids.

Test of the Instrument

The preliminary version of the questionnaire was tested with a group of purchasing managers of eight different companies. The major problems with the questionnaire centered on its format and length, the difficulties of coding (in the first version, the respondents were supposed to do the coding themselves), and the understanding of the term "logistics," with which the managers were not familiar. Appropriate adjustments were made to accommodate the suggestions provided by the respondents. The format and length were reduced and the cover letter included in the body of the question-naire. Some questions were condensed and others eliminated. The coding was omitted from the questionnaire, and the term "logistical services" was substituted for "distribution services."

Data-Collection Procedures

The data collection followed five distinct phases, which are summarized below:

1. Selection of industries and then companies from the
Anuário das Indústrias--1980.

2. Telephone contact with each company, to confirm the address and to obtain the name of the purchasing manager or the person responsible for the purchasing function.

3. Telephone conversations with the purchasing managers to explain the research theme and to obtain from them a commitment to complete the questionnaire to be sent the following week. It was emphasized that the research was sponsored by the Universidade Federal do Rio Grande do Sul and that all data would be kept confidential.

Even though the researcher had intended to contact all the respondents by telephone, two problems jeopardized this objective: first, some managers could not be reached; second, cost restrictions prevented telephone contacts with the respondents from the Caxias do Sul area. Thus, of the 355 subjects in Porto Alegre, 276 were contacted (78%). The response rates were as follows:

Porto Alergre (telephone contact with purchasing manager)	-- 46.0%
Porto Alegre (telephone contact with company)	-- 38.0%
Caxias do Sul (no telephone contact)	-- 36.5%

4. Mailing of the questionnaire with a pre-stamped return envelope.

5. Personal contact with 22 nonrespondents to obtain their response to the questionnaire. Despite efforts to reduce the non-response rate, 238 individuals failed to return the questionnaire (see Table 3.2 for details). To minimize nonresponse error, a standard procedure was used. A random sample was drawn from the nonrespondent population (10%). The researcher contacted each of these nonrespondents (i.e., the purchasing manager) by telephone, emphasizing the theme of the study and the importance of his/her participation. Also, a personal appointment was scheduled with the nonrespondent for the purpose of completing the questionnaire. During this appointment, the investigator was careful to avoid influencing the responses the subject might give. A total of 22 questionnaires were obtained using this procedure (2 of the sample of 24 nonrespondents failed to complete the questionnaire).

6. Test for nonresponse error. To allow the research findings to be generalized to the entire population, tests were conducted to compare differences between the subjects who responded to phase-four stimuli and those who responded to phase five stimuli. For statistical purposes, the respondents were divided into two groups: (1) mail group and (2) personal-contact group. Also, the responses were classified in three categories: (1) dichotomies (variables 8-14 and 46); (2) nominal or ordinal responses (variables 1, 2, 5-7, 19-45, and 47-49); and (3) interval or ratio-scaled responses (variables 3, 4, and 15-18). (See Appendix C for the list of variables.)

Table 3.2.--Questionnaire responses, by industry and location.

Industry	Questionnaires				
	Returned	Usable	Not Returned	Personal Contact	Total Usable
Porto Alegre					
Metallurgy	66	64	78	7	71
Mechanical	13	13	17	2	15
Electrical	6	6	9	-	6
Transportation	2	2	5	-	2
Furniture	11	9	7	1	10
Plastic	12	9	11	1	10
Shoe	47	43	71	7	50
Total	157	147	198	18	165
Caxias do Sul					
Metallurgy	10	9	18	1	10
Mechanical	5	5	7	1	6
Electrical	1	1	2	-	1
Transportation	2	2	3	-	2
Furniture	2	2	6	1	3
Plastic	2	2	3	1	3
Shoe	1	1	1	-	1
Total	23	22	40	4	26
Grand total	180	169	238	22	191

The dichotomies were tested using a standard chi-square procedure. The differences between the two groups were not statistically significant at $\alpha = .05$. But at $\alpha = .10$, the two groups were different with respect to responses on variable 10 (financial activities).

A t-test was used to examine the differences between the two groups for the interval or ratio-scaled responses. None of the differences was statistically significant at $\alpha = .05$, nor at $\alpha = .10$.

For the nominal or ordinal responses, a test of differences of proportions, recommended by Fisher (Guilford, 1965), was used. Since in both groups the sample size was not small (<10), the sampling distribution of the difference in the proportion approached normality. Therefore, the test of significance was made through use of a $\overline{Z}$ ratio. Three differences were significant: importance of delivery time variability (rank 1), importance of accuracy in filling orders (ranks 1, 4, and 6), and importance of PDS (ranks 3 and 5).

Therefore, there appeared to be no statistical differences (with the exceptions mentioned) between the mail group and the personal-contact group of respondents. That is, it was not necessary to account for nonresponse error.

Research Objectives and Methodology

The objectives of this research undertaking were discussed in Chapter I. In this chapter the research objectives are examined from a methodological perspective. That is, every objective is related to the questionnaire design. The statistical hypotheses and the tests used to verify them are also presented.

Objective 1: Satisfaction

>   To investigate the perceived satisfaction of
>   buyers with overall PDS and with each of its
>   components.

Questions 14-22 in the questionnaire deal with respondents' satisfaction with PDS components, and Question 23 is a rating of their overall satisfaction with PDS. As can be seen on page 4 of the questionnaire, the respondents were asked to rate their satisfaction with PDS and its components on a five-point scale, ranging from totally dissatisfied to totally satisfied.

For purposes of measurement, the ratings were scaled from 1 (totally dissatisfied) to 5 (totally satisfied). Therefore, the data were measured on an ordinal scale. Scales of this type might have some limitations concerning the statistical tests that can be performed. The basic limitation stems from the failure to meet the equal-interval postulate of measurement. However, as Kerlinger (1973) pointed out, "yet most [behavioral] scales are basically ordinal, [and] we can with considerable assurance often assume equality of interval" (p. 440).

Satisfaction ratings were averaged to permit ranking of the perceived satisfaction with the various PDS components. To test for the statistical differences of the mean ratings between the variables, the Wilcoxon matched-pairs signed test was used. This test allows the researcher "to tell which member of a pair is greater" (Siegel, 1956, p. 75). Thus, 36 signed tests were performed. One word of caution should be given concerning the level of significance in this type of test. The α values are used for every pair comparison,

but they are not additive. That is, there is no significance level for the overall ranking of the mean ratings.

Satisfaction with the overall PDS was measured in two different ways. The first was identical to the one used for the PDS components (ratings ranging from totally dissatisfied to totally satisfied). The second was a weighted average of the components ratings. The weights were determined by the importance ranking of every PDS component given in Question 24. Parametric correlations were run between every rating of satisfaction and the corresponding ranking of importance to test for independence. In only two cases was the correlation coefficient significant: for "rush services" and for "order status information." However, both coefficients were very small (.25 and .12, respectively) but negative, indicating the following pattern: the higher the satisfaction, the higher the importance of the component.

Objective 2: Importance

> To rank, in order of importance, different
> components of PDS as perceived by purchasers.

Question 24 was included to find out about the importance ranking of the PDS components. To allow for better discrimination, the respondents were asked to rank the different components of PDS in order of importance, rather than using a Likert-type scale, which would have rated each component in terms of its importance (i.e., from not very important to very important).

For measurement purposes, the rankings were scaled from 1 to 5, in descending order of importance, producing an ordinal-type scale. Some coding adjustments were made to deal with ties and with nonresponses. To compare every pair of rankings, a Wilcoxon signed test was again used. The same comments mentioned in the previous section applied to the tests conducted here.

Objective 3: Importance

> To compare the importance of PDS with other factors influencing patronage decisions.

To evaluate the importance of different factors affecting the purchasing decision, Question 25 was included in the questionnaire. Respondents were asked to rank, in order of importance, the various factors that could influence their purchasing decisions.

The responses were measured on an ordinal scale, with 1 for the most important factor and 7 for the least important. Again, this measurement was preferred to the Likert-type scale because it allows better discrimination of responses.

To test for ranking differences between the various factors, the same Wilcoxon paired-comparison test was performed. The rankings were only an indication of the perceived importance of any one of the factors. In no way were they manifestations of or surrogates for actual purchasing behavior.

Objective 4: Relationships

To explore relationships between situational variables of the buying process, supplier variables, company variables, and satisfaction variables with the perceived importance of PDS in selecting suppliers.

This objective, as presented in Chapter I, was operationalized in the form of hypotheses. In this section, each hypothesis is examined and discussed from a methodological perspective. Moreover, additional relationships explored in the research are also discussed here.

Situational variables.--The situational variables[1] were defined as follows:

--number of deliveries (Question 10, variable 15)

--percentage of backorders (Question 11, variable 16)

--percentage of backorders cancelled (Question 12, variable 17)

--average order cycle time (Question 13, variable 18)

Hypothesis 1: The greater the number of deliveries, the greater the importance of PDS in selecting suppliers.

To test this hypothesis, the Pearson correlation coefficient between number of deliveries (Question 10, variable 15) and the importance of PDS (Question 25, variable 39) was employed. The statistical and the null hypotheses that resulted from the substantive hypothesis were, respectively:

H_0: $r \geq 0$ where r = correlation coefficient between number of deliveries
H_1: $r < 0$ and importance of PDS

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[1]Refer to Appendix C for a complete list of variables

Thus, if the Pearson correlation coefficient was significantly different from zero and negative, the null hypothesis should be rejected and the alternative (or statistical) hypothesis accepted.

Additional tests concerning the hypothesized relationship were performed using univariate analysis of variance. The variable number of deliveries was divided into three groups according to the frequency of deliveries per month. The importance of PDS was the dependent variable. This procedure enabled the researcher to examine whether the three groups were different in terms of their responses to the ranking of PDS importance. If the F-value was not statistically significant, the null hypothesis of no difference could not be rejected.

> Hypothesis 2: The higher the proportion of backorders, the greater the importance of PDS in selecting suppliers.

Again the Pearson correlation coefficient was used to test this hypothesis about the relationship between proportion of back-orders (Question 11, variable 16) and the importance of PDS.[1] The testable hypotheses were:

$$H_o: \quad r \geq 0 \qquad \text{where } r = \text{correlation coefficient}$$
$$\text{between proportion of back-}$$
$$H_1: \quad r < 0 \qquad \text{orders and importance of PDS}$$

The acceptance conditions were identical to the ones presented above for Hypothesis 1.

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[1]The proportion of backorders cancelled could also have been tested with respect to the importance of PDS, but response problems on Question 17 prevented the tests from being conducted.

Because a considerable number of respondents reported no backorders, this variable was divided into two groups, one with no cancelled backorders and the other with one or more cancelled backorders. An analysis of variance, in this case the standard t-test since only two groups existed, was performed to examine differences with respect to responses to importance of PDS.

> Hypothesis 3: The greater the average order cycle time, the greater the importance of PDS in selecting suppliers.

This hypothesis involved two variables: average order cycle time (Question 13, variable 18) and importance of PDS. The statistical tests were similar to the ones presented for both Hypotheses 1 and 2. That is,

$$H_o: \quad r \geq 0 \qquad \text{where } r = \text{correlation coefficient}$$
$$H_1: \quad r < 0 \qquad \text{between order cycle time and importance of PDS}$$

Supplier variables.--The supplier variables were defined as follows:

--category of supplier (Question 2, variable 2)

--number of suppliers utilized (Question 3, variable 3)

--number of other suppliers (Question 4, variable 4)

--number of alternative suppliers (variable 50 = V3 + V4)

> Hypothesis 4: The greater the number of alternative suppliers available, the lower the importance of PDS in selecting suppliers.

The variables that were dealt with in examining this hypothesis were number of alternative suppliers and importance of PDS. The testable hypotheses were:

$$H_0: \quad r \leq 0 \qquad \text{where } r = \text{correlation coefficient}$$
$$\text{between number of alterna-}$$
$$H_1: \quad r > 0 \qquad \qquad \text{tive suppliers and impor-}$$
$$\text{tance of PDS}$$

The null hypothesis was rejected if the Pearson correlation coefficient was significantly different from zero and positive.

Company variables.--This group of variables was defined as:

--company size, in terms of number of employees (Question 5, variable 5)

--company size, in terms of sales volume (Question 6, variable 6)

--company's industry (Question 7, variable 7)

Hypothesis 5: The larger the company, either in terms of number of employees or in sales volume, the greater the importance of PDS as a factor in selecting suppliers.

Because three variables were involved in this hypothesis (size in terms of employees and sales volume and importance of PDS), one could have two sets of testable hypotheses:

$$H_0: \quad r \geq 0 \qquad \text{where } r = \text{correlation coefficient}$$
$$\text{between size (number of}$$
$$H_1: \quad r < 0 \qquad \qquad \text{employees) and importance}$$
$$\text{of PDS}$$

$$H_0': \quad r' \geq 0 \qquad \text{where } r' = \text{correlation coefficient}$$
$$\text{between size (sales volume)}$$
$$H_1': \quad r' < 0 \qquad \qquad \text{and importance of PDS}$$

Satisfaction variables.--These variables were defined as follows:

--components of PDS (Questions 14-22, variables 19-27)

--overall PDS (Question 23, variable 28 or weighted average of PDS components, variable 51)

Hypothesis 6: The greater the satisfaction with PDS, the lower its importance as a purchasing factor.

This hypothesis also was tested using the Pearson correlation coefficient for the following:

H_o: $r \geq 0$ where r = correlation coefficient between satisfaction with overall PDS and importance of PDS

H_1: $r < 0$

Objective 5: Comparative Analysis

To present a comparative analysis of the findings of this study with those reported by Perreault and Russ (1976a). This analysis compares the findings in the Brazilian and American environments on the following aspects: (a) satisfaction with overall PDS and each of its components, (b) the importance of PDS as a factor influencing patronage decisions, and (c) relationships involving the perceived importance of PDS in selecting suppliers.

The procedures used in making the comparisons were straightforward, but before each one is discussed, a word of caution is suggested concerning the measurements. The satisfaction ratings were obtained on different scales: for this research, on a five-point scale ranging from totally satisfied to totally dissatisfied; and for the Perreault and Russ study, on a seven-point scale ranging from satisfactory to unsatisfactory. Ratings of the importance of factors in selecting suppliers were also gathered in different ways: for this research, on a ranking of importance from the most important to the least important; and in the Perreault and Russ study, from not important to very important. Thus, comparisons cannot be made in an absolute manner, but only on a relative basis.

Satisfaction.--The comparisons were made on three different levels. The first examined the order of satisfaction ratings of the PDS components. The second compared the correlations of each of the components with overall PDS. And the third discussed the findings with respect to feedback of service (Question 29 of the questionnaire: "Do your suppliers of this product check with you to see if the services they are providing are adequate in meeting your needs?").

Importance.--In this comparative aspect, the findings of the two studies were contrasted on the basis of the rank order of importance of factors in selecting suppliers.

Relationships.--The comparisons were made using the hypotheses outlined in the last section, which dealt with situational variables of the buying process (number of deliveries and order cycle time), a supplier variable (number of alternative suppliers), and satisfaction with overall PDS. To allow for more meaningful analyses, all the means of each of the above variables were broken down by every rank of importance of PDS in selecting suppliers.

Other Tests

To provide a sharper picture of the findings, other relationships, associated with the objectives, involving supplier variables, situational variables, and company-size variables were examined.

Supplier variables.--The Pearson correlation coefficient was used to determine the existence of relationships between the number of alternative suppliers and satisfaction with overall PDS (measured either by Question 23 or by the weighted average of PDS components). The hypotheses were of the following type:

H_0: $r = 0$ where r = correlation coefficient
                 between number of alternative
H_1: $r \neq 0$ suppliers and satisfaction
                 with overall PDS

Situational variables.--An examination of the relationships

between number of deliveries, percentage of backorders, and order

cycle time and the level of satisfaction with overall PDS (measured

either by Question 23 or by the weighted average of the PDS components)

was performed. The hypotheses to be tested were of the following

type:

H_0: $r = 0$ where r = correlation coefficients
                 between situational variables
H_1: $r \neq 0$ and satisfaction with overall
                 PDS

A t-test was conducted to explore further the relationships

between situational variables and satisfaction with PDS (in this case,

measured by the weighted average of PDS components). Specifically,

the variable percentage of backorders was divided into two groups:

one had no backorders and the other had one or more. The tested

hypothesis was straightforward: no difference in responses to PDS

satisfaction between the two groups.

Company variables.--Several additional relationships were

explored using the two company-size variables. First, they were

related to overall satisfaction with PDS (measured either by Question

23 or by the weighted average of PDS components). The hypotheses

examined were of the following pattern:

H_0: $r = 0$ where r = correlation coefficients
                 between company size and
H_1: $r \neq 0$ overall satisfaction with
                 PDS

Second, the importance of every PDS component was correlated with both company-size variables. These relationships were tested with the following types of hypotheses:

H_0: $r = 0$ where r = correlation coefficients between company size (employees and sales) and the importance of every PDS component

H_1: $r \neq 0$

Third, univariate analyses of variance were used to test the difference between the various company-size groups, given by number of employees and sales volume, with respect to their rankings of importance of PDS components and of factors for selecting suppliers. Given the two independent variables (company size), there were 18 ANOVAs for the PDS components (2 x 9) and 14 ANOVAs for the factors for selecting suppliers (2 x 7). The 32 different hypotheses had the following format:

H_0: $\mu_1 = \mu_2 = \ldots = \mu_k = \mu$ where μ's = means for the different groups

H_1: $\mu_1 \neq \mu_2 \neq \ldots \neq \mu_k \neq \mu$

Fourth, multivariate analyses of variance were used to examine the differences among diverse company sizes and the aggregate responses for the following sets of variables: satisfaction with PDS components, importance of PDS components, and factors in selecting suppliers. Therefore, six different MANOVAs were performed, as shown below:

MANOVA	GROUPS	DEPENDENT VARIABLES
A	size--employees	satisfaction
B	size--employees	importance
C	size--employees	factors in selecting suppliers
D	size--sales	satisfaction
E	size--sales	importance
F	size--sales	factors in selecting suppliers

The multivariate F-statistic was used to test the significance
of the differences among the various groups on all the MANOVAs.
If the differences among groups were significant, one could compute
the univariate F-statistics to determine which variable or variables
were relevant in explaining the differences.

Fifth, standard ANOVAs were used to explore further the
relationship between company size and overall satisfaction with PDS.
Groups were defined for both measurements of company size. Four
ANOVAs were instrumental for testing four hypotheses of this sort:

$$H_o: \quad \mu_1 = \mu_2 = \ldots = \mu_k = \mu \qquad \text{where } \mu\text{'s} = \text{means for the different groups}$$

$$H_1: \quad \mu_1 \neq \mu_2 \neq \ldots \neq \mu_k \neq \mu$$

The procedures described in this chapter created the data-
file source from which the relational analyses and findings of the
study were developed. The next chapter contains a discussion of
these findings.

CHAPTER IV

RESEARCH FINDINGS

This chapter contains major findings and analyses that should
lead to the fulfillment of the purpose and objectives of this investi-
gation. In the first section, the general descriptive findings are
presented to provide a frame of reference for the relational findings.
Following are sections that center on satisfaction with PDS, importance
of PDS components, factors affecting the patronage decision, and PDS
and the patronage decision. These sections provide the background for
the comparative analysis that follows. A summary of the findings that
most directly relate to the research objectives and hypotheses is given
in the last section.

General Descriptive Findings

In this section, data on the respondents, the suppliers, the
chosen product, and the purchasing situation are presented to provide
a general overview of the descriptive findings of this research. These
data consist mainly of frequency distributions, percentages, and cumu-
lative percentages.

Respondents

The findings about the respondents may be grouped in two cate-
gories. The first deals with the respondents' activities within the
firm and the second with some characteristics of their companies.

Respondents' activities.--Even though the subjects of this
research were purchasing managers within a certain group of indus-
tries, not all respondents dealt solely with purchasing in their
companies. As can be seen in Table 4.1, almost half (46.6%) of the
respondents had other activities besides purchasing.

Table 4.1.--Activities of the respondents.

Activity	N	%
Only purchasing	102	53.4
Purchasing and other activities	89	46.6
Total	191	100.0

Table 4.2 shows that the "other" activities encompassed almost all of
the managerial functions. Production and materials management rep-
resented 53.5% of the other activities. Mentions of personnel,
finance, and marketing could have been a result of the small size of
some of the companies.

Table 4.2.--Distribution of "other" activities[a] of the respondents.

Activity	N	%
General management	12	10.5
Finance	20	17.5
Production	27	23.7
Personnel	4	3.5
Marketing	17	14.9
Materials management	34	29.8
Total	114[b]	100.0

[a]Corresponds to the "purchasing and other" category from Table 4.1.

[b]Total greater than 89 because of multiple responses.

Characteristics of the respondents' companies.--This investigator did not intend to evaluate or to present a host of different characteristics of the companies researched. However, some characteristics relating to size and also to the type of industry were identified. This was done, first, to give a clearer picture of the companies and, second, to permit further analyses of relationships of company size to satisfaction with and importance of PDS components and to purchasing factors.

In Table 4.3, company size is measured by number of employees. Almost 80% of the companies had fewer than 500 employees. Only 1% of the companies had more than 5,000 employees.

Table 4.3.--Distribution of respondents by company size (# of employees).

Number of Employees	N	%	Cumulative %
Less than 50	8	4.2	4.2
50 to 99	51	26.7	30.9
100 to 499	92	48.2	79.1
500 to 999	16	8.4	87.5
1,000 to 4,999	22	11.5	99.0
5,000 or more	2	1.0	100.0
Total	191	100.0	--

When company size was measured in terms of sales volume (see Table 4.4), about three-quarters (73.4%) of the companies showed sales volume figures below 500 million cruzeiros.

The industry categories of the respondents' companies are shown in Table 4.5. The majority of the companies were either metallurgical (23.8%), mechanical (23.8%), or shoe industries (27.6%).

Although all of the companies were officially classified within the industry groups selected for this study, 17 respondents (9.2%) classified their firms as belonging to other industries.

Table 4.4.--Distribution of respondents by company size (sales volume).

Sales Volume[a]	N	%	Cumulative %
Less than 49	27	14.7	14.7
50 to 99	31	16.8	31.5
100 to 499	77	41.8	73.4
500 to 999	20	10.9	84.2
1,000 or more	29	15.8	100.0
No response	7	--	--
Total	191	100.0	--

[a]Values in millions of cruzeiros in 1980.

Table 4.5.--Distribution of respondents by type of industry.

Type of Industry	N	%
Metallurgy	44	23.8
Mechanical	44	23.8
Electrical	9	4.9
Transportation equipment	4	2.2
Furniture	7	3.8
Plastic	9	4.9
Shoes	51	27.6
Other	17	9.2
No response	6	--
Total	191	100.0

Suppliers

Four major variables were analyzed with respect to suppliers. They included: number of suppliers utilized, number of other suppliers, number of alternative suppliers (that is, suppliers utilized plus other suppliers), and supplier category. Each variable is discussed below.

Number of suppliers utilized.--A distribution of the number of suppliers utilized by the purchasers' companies is shown in Table 4.6. These were the suppliers with whom the respondents' companies actually did business in 1980 with respect to the chosen product. From the table, it can be seen that close to 90% of the companies used fewer than five suppliers. Only 2.7% had more than 10 active suppliers for the chosen product.

Table 4.6.--Distribution of number of suppliers utilized.

Number of Suppliers	N	%	Cumulative %
1	31	16.9	16.9
2	46	25.1	42.0
3	53	29.0	71.0
4	23	12.6	83.6
5	11	6.0	89.6
6 to 10	14	7.7	97.3
11 to 34	5	2.7	100.0
Missing	8	--	--
Total	191	100.0	--

Number of other suppliers.--To determine the total number of suppliers available to their companies, the respondents were asked to mention the number of other suppliers with whom they could have done business. The summary of the responses is presented in Table 4.7.

Table 4.7.--Distribution of number of other suppliers available.

Number of Suppliers	N	%	Cumulative %
0	4	2.4	2.4
1	11	6.7	9.1
2	16	9.8	18.9
3	23	14.0	32.9
4	25	15.3	48.2
5	20	12.2	60.4
6 to 10	43	26.2	86.6
11 to 50	22	13.4	100.0
Missing	27	--	--
Total	191	100.0	--

Number of alternative suppliers.--The number of suppliers uti-
lized and the number of other suppliers were added to give the total
number of alternative suppliers. The distribution of these suppliers
is shown in Table 4.8. Note that almost three-quarters (73.4%) of the
respondents' companies could have used from 1 to 10 suppliers.

Table 4.8.--Distribution of number of alternative suppliers.

Number of Suppliers	N	%	Cumulative %
1	4	2.2	2.2
2	8	4.3	6.5
3	18	9.8	16.3
4	19	10.3	26.6
5	15	8.2	34.8
6	15	8.2	43.0
7	19	10.3	53.3
8	17	9.2	62.5
9	15	8.2	70.7
10	5	2.7	73.4
11 to 20	39	21.2	94.6
21 to 64	10	5.4	100.0
Missing	7	--	--
Total	191	100.0	--

Supplier category.--The most important suppliers for the
respondents' companies were classified in three categories: manu-
facturer, wholesaler, or distributor. The majority of the suppliers
(65.3%) were classified as manufacturers. Table 4.9 presents the
breakdown.

Table 4.9.--Supplier categories.

Category	N	%
Manufacturer	124	65.3
Wholesaler	37	19.5
Distributor	29	15.2
No response	1	--
Total	191	100.0

Purchasing Situation

The purchasing situation involved four different variables.
They were: number of deliveries, backorders, backorders cancelled,[1]
and average order cycle time. All the responses concerned transac-
tions conducted in 1980 and were product and supplier specific. The
descriptive findings for each variable are presented below.

Number of deliveries.--To provide a better picture of the
number of deliveries, the data were grouped in four categories, as
shown in Table 4.10. More than two-thirds (68.3%) of the respondents
had, on the average, three or less deliveries per month in 1980, and

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[1]Because of response problems for question 17, which dealt
with proportion of backorders cancelled, no findings are reported
concerning this variable.

close to 30% had 12 or less deliveries in 1980, representing one or less deliveries, on the average, per month.

Table 4.10.--Distribution of number of deliveries in 1980.

Number of Deliveries		N	%	Cumulative %
Per Year	Per Month[a]			
3 to 12	1 or less	43	29.7	29.7
13 to 24	1 to 2	38	26.2	55.9
25 to 36	2 to 3	18	12.4	68.3
37 to 120	3 to 10	46	31.7	100.0
Missing		46	--	--
Total		191	100.0	--

[a]Per month equals per year divided by 12.

Backorders.--The data in Table 4.11 show a distribution of the percentages of backorders in 1980 for the chosen product. The majority of respondents (54.3%) did not have backorders; 78% of them had 5% or fewer of their orders backordered.

Table 4.11.--Distribution of percentage of backorders.

Percentage of Backorders	N	%	Cumulative %
0	96	54.3	54.3
1	8	4.5	58.8
2	3	1.7	60.5
3	10	5.7	66.2
4	2	1.1	67.3
5	19	10.7	78.0
From 6 to 20	28	15.8	93.8
From 21 to 70	11	6.2	100.0
Missing	14	--	--
Total	191	100.0	--

Average order cycle time.--The data on the average order cycle
time were arranged in various intervals to provide a more concise pic-
ture of the distribution of the responses. As can be seen in Table
4.12, the majority of the respondents had average order cycle times of
30 days or less, and only 5.4% had average order cycle times of more
than 60 days.

Table 4.12.--Distribution of the average order cycle time.

Average Order Cycle Time (in days)	N	%	Cumulative %
1 to 5	44	26.2	26.2
6 to 10	31	18.4	44.6
11 to 20	32	19.0	63.6
21 to 30	25	14.9	78.5
31 to 45	8	4.8	83.3
46 to 60	19	11.3	94.6
61 to 90	9	5.4	100.0
Missing	23	--	--
Total	191	100.0	--

The Chosen Product

In the methodology chapter, it was emphasized that the ques-
tionnaire responses were product specific. That is, from a list of
six products, the respondents were asked to choose one product and
to answer the questions considering transactions in relation to that
product. In Table 4.13 the distribution of the chosen products is
presented. Fewer than 10% of the respondents did not select a product
from the list provided in the questionnaire.

Since the questions were product specific, one might wonder
about differences in responses of the subjects who chose different
products. But in conducting a series of statistical tests (ANOVAs

for the ordinal or interval-scaled responses and crosstabs for
the dichotomies), no major differences were found.

Table 4.13.--Distribution of the chosen products.

Product	N	%
Fasteners	36	18.9
Bearings	44	23.2
Lubricants	21	11.1
Abrasives	40	21.1
Electrodes	18	9.5
Acids	14	7.4
Others	13	6.8
Several	4	2.1
No response	1	--
Total	191	100.0

Other General Descriptive Findings

Three more general descriptive groups of findings were derived
from the questionnaire. The first involved the supplier obtaining
feedback from the purchaser about the PDS provided. The second out-
lined respondents' possible actions in a stockout situation. The
third concerned the reasons for changing suppliers.

Feedback about services. Figure 4.1 is a representation of
the responses given by the purchasers about the feedback that suppliers
seek concerning the services provided. The majority of the respondents
(142--81%) said that their suppliers contacted them to check on the
adequacy of the services. Of these 142 subjects, 68% (103 cases)
recognized the need for improvement; in fact, in 89% of the cases the
services did improve.

Yes
N=92
89%

Yes--Did services
N=103 improve?
68%

No
N=11
11%

Yes--Improvements
N=152 necessary?
81%

No
N=49
32%

Supplier Seeking
Feedback About
Services
N=188

Yes
N=24
67%

No--Would like
N=36 them to
19% do it?

No
N=12
33%
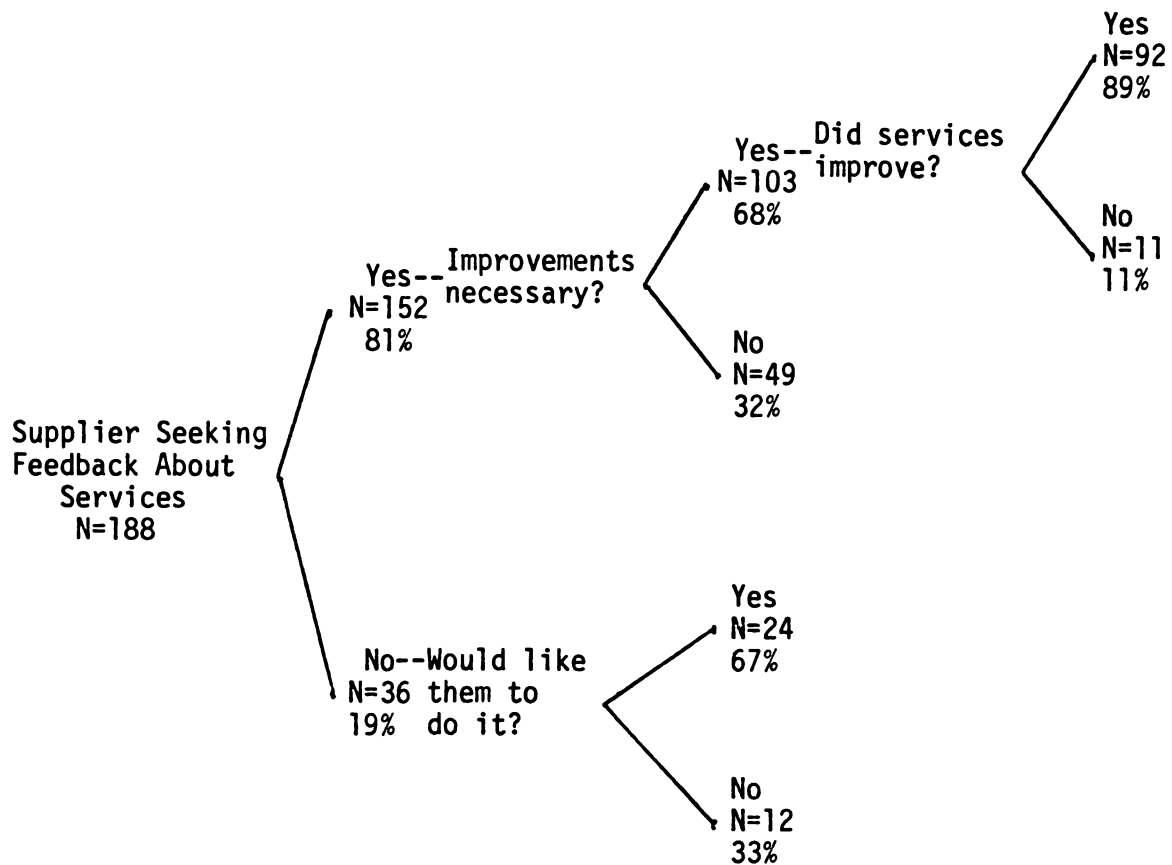
Figure 4.1.--Suppliers seeking feedback about physical distribution
services.

Actions in a stockout situation.--The respondents were asked
to mention their possible action in a stockout situation by their most
important supplier of the chosen product. A large number of the sub-
jects would change suppliers (142--83%), but 54% (77) of them just
for that specific order; only 4% (6) would change suppliers perma-
nently. Figure 4.2 is a diagram of the various responses given by
the subjects.

Permanently
N=6 (4%)

For this order
N=77 (54%)

Only if order
is urgent
N=11 (8%)

Only if no
other arrangements
can be made
N=48 (34%)

Change supplier
N=142 (83%)

STOCKOUT
N=172

Can wait
N=10 (6%)

Supplier takes
appropriate action
N=11 (6%)

Other
N=9 (5%)
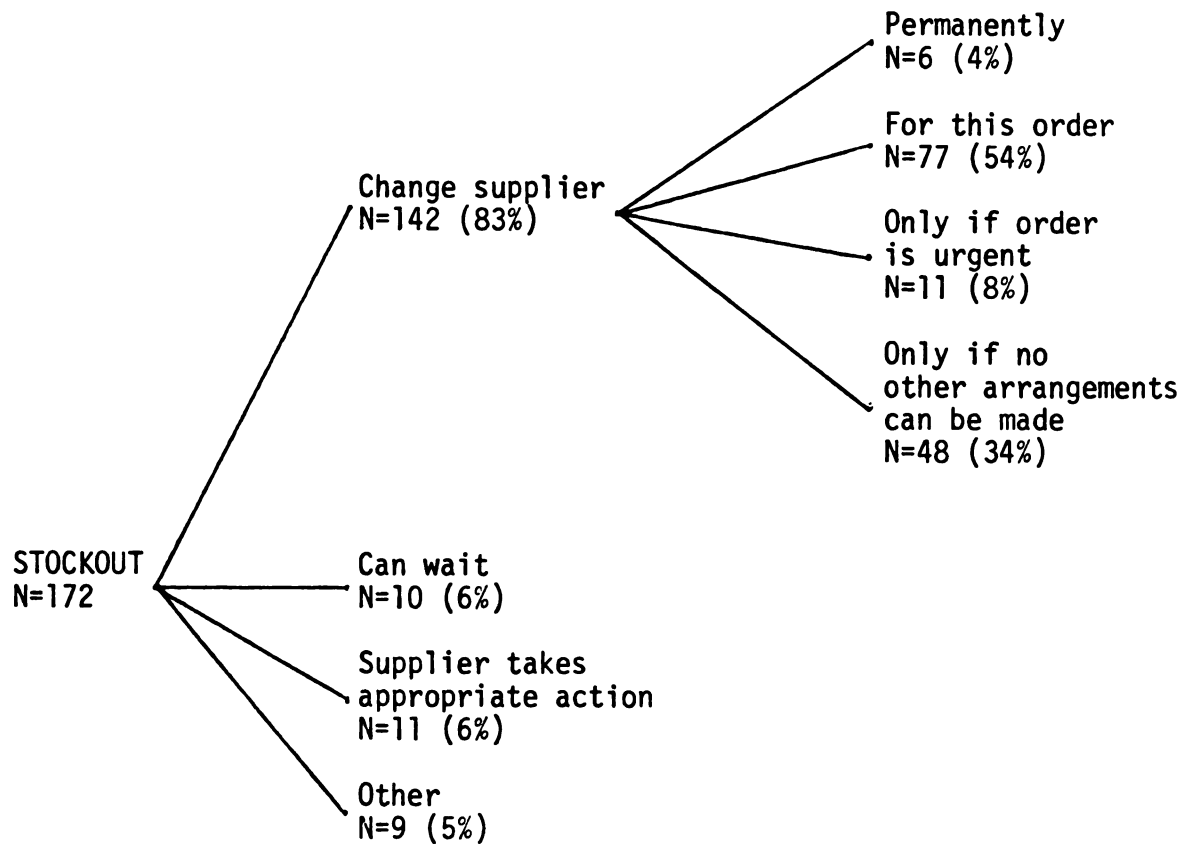
Figure 4.2.--Actions concerning a stockout possibility.

Changing suppliers.--Table 4.14 is a summary of the responses
to a question concerning changes in suppliers for the chosen product
in the last two years. Nearly 44% of the respondents had changed
suppliers; 56.5% had not.

Responses to a question concerning the reasons for changing
suppliers are summarized in Table 4.15. The major reason for change
was related to price (35.2%), followed by problems with PDS (23.2%)
and then problems with product quality (24.0%).

Table 4.14.--Changes of suppliers in the last two years.

	N	%
Yes	81	43.5
No	108	56.5
No response	2	--
Total	191	100.0

Table 4.15.--Distribution of major reasons for changing suppliers.

Reason	N	%
Price	44	35.2
Product quality	29	23.2
PDS	30	24.0
Other	22	17.6
Total	125[a]	100.0

[a]Total greater than 81 because of multiple responses.

Satisfaction With PDS and Its Components

In this section, findings concerning the satisfaction with PDS components are analyzed in two ways. The first deals with purely descriptive aspects of the findings. The second explores relationships among the PDS components to provide some insights in attempting to explain the descriptive findings.

Descriptive Findings

The respondents rated their satisfaction with each PDS component and with the overall PDS on a five-point scale ranging from totally dissatisfied (1) to totally satisfied (5). In Table 4.16

the means of these ratings are presented, as well as the corresponding standard deviations.

Table 4.16.--Satisfaction ratings for PDS components.

PDS Components	Mean Satisfaction Rating	Standard Deviation
Billing procedures	3.842	.877
Average delivery time	4.021	.831
Delivery time variability	3.807	.858
Rush services	3.856	1.092
Returns policy	3.896	.911
Order status information	3.978	.878
Accuracy in filling orders	4.058	.849
Actions on complaints	4.124	.758
Order methods	4.134	.646

Examining the deviations in Table 4.16 and relating them to the means, one might question the possibility of ranking the PDS components according to their respective satisfaction rating. Nevertheless, a Wilcoxon matched-pairs signed test was performed for every difference between two means of satisfaction ratings. In Table 4.17, each of the tests is presented along with the z-values, which are approximately normally distributed with zero mean and unit variance (Siegel, 1956, p. 79), and the p-values associated with each z-value. Examining the mean ratings given in Table 4.16 and the various pair-comparisons presented in Table 4.17, the PDS components can be ranked according to their satisfaction ratings, as follows (at a p value < .10 for every pair comparison):

Table 4.17.--Summary of the Wilcoxon test for mean ratings of satis-
faction for PDS components.

Pair of Variables	z-value[a]	p-value
Billing procedures/average delivery time	1.970	.024
Billing procedures/delivery time variability	-.367	.357
Billing procedures/rush services	.065	.474
Billing procedures/returns policy	.916	.180
Billing procedures/order status information	1.762	.039
Billing procedures/accuracy in filling orders	2.590	.005
Billing procedures/actions on complaints	3.852	.000
Billing procedures/order methods	4.113	.000
Average delivery time/delivery time variability	-3.909	.000
Average delivery time/rush services	-2.453	.007
Average delivery time/returns policy	-1.682	.046
Average delivery time/order status information	-.463	.322
Average delivery time/accuracy in filling orders	.528	.299
Average delivery time/actions on complaints	1.817	.035
Average delivery time/order methods	1.816	.035
Delivery time variability/rush services	.398	.345
Delivery time variability/returns policy	1.013	.155
Delivery time variability/order status information	2.407	.008
Delivery time variability/accuracy in filling orders	3.505	.000
Delivery time variability/actions on complaints	4.755	.000
Delivery time variability/order methods	4.670	.000
Rush services/returns policy	.526	.299
Rush services/order status information	1.408	.080
Rush services/accuracy in filling orders	2.453	.007
Rush services/actions on complaints	3.487	.000
Rush services/order methods	3.257	.001
Returns policy/order status information	.869	.192
Returns policy/accuracy in filling orders	2.084	.019
Returns policy/actions on complaints	3.518	.000
Returns policy/order methods	3.333	.000
Order status information/accuracy in filling orders	1.012	.156
Order status information/actions on complaints	2.431	.008
Order status information/order methods	2.517	.006
Accuracy in filling orders/actions on complaints	1.483	.069
Accuracy in filling orders/order methods	1.386	.083
Actions on complaints/order methods	.103	.459

[a] $z = \dfrac{T - \mu_T}{\sigma_T}$ where T = the smaller sum of like-signed ranked.

--Group 1 (higher satisfaction rating): order methods and action on complaints. At an α value of .10, the means of these components were significantly larger than the mean of any other component. However, the difference between the means of order methods and actions on complaints was not significant (p = .459).

--Group 2: accuracy in filling orders and average delivery time. At an α level of .10, their means were smaller than the means of order methods and actions on complaints and larger than the means of returns policy, rush services, billing procedures, and delivery time variability. However, they were not different from the mean of order status information, nor were they different among themselves. Since the means of returns policy and order status information were not significantly different and because the mean of returns policy was significantly different from the means of both accuracy in filling orders and average delivery time, the component order status information was omitted from group 2 and constituted group 3.

--Group 3: order status information. At an α level of .10, the mean of this component was smaller than the means of accuracy in filling orders and average delivery time and was larger than the means of rush services, billing procedures, and delivery time variability. Because of these differences and the fact that the mean of returns policy was not different from the means of rush services, billing procedures, and delivery time variability, the component returns policy constituted group 4 and the components rush services, billing procedures, and delivery time variability formed group 5.

--Group 4: returns policy.

--Group 5 (lower satisfaction rating): rush services, bill-
ing procedures, and delivery time variability.

The mean rating for satisfaction with the overall PDS was
3.958, with a standard deviation of .778. The distribution of the
ratings for the overall PDS is presented in Table 4.18. As can be
seen in this table, the majority of respondents (85.7%) said they were
either satisfied or totally satisfied with the overall PDS.

Table 4.18.--Distribution of satisfaction ratings for the overall PDS.

Rating	Score	N	%
Totally dissatisfied	1	0	0.0
Dissatisfied	2	17	9.0
Indifferent	3	10	5.3
Satisfied	4	126	66.7
Totally satisfied	5	36	19.0
Missing	-	2	--

Relational Findings

In this section, the descriptive findings are examined in a
relational perspective. That is, satisfaction with overall PDS and
each of its components are treated as dependent variables in a series
of statistical tests conducted with the supplier variables, the com-
pany variables, and the situational variables.

Supplier variables.--The variable category of supplier
was used as an independent variable in a t-test in which two groups
were formed: manufacturers and nonmanufacturers. Table 4.19 sum-
marizes the various t-tests performed. In all of the tests for which
the t-value was significant at an α level of .10, the respondents were

more satisfied with the services provided by the wholesalers or dis-
tributors as compared to the manufacturers. One explanation for this
finding could be related to the geographical location of the suppliers
with respect to their customers: middlemen usually are closer to
their customers than are manufacturers.

Table 4.19.--Summary of t-tests with supplier category.

| Dependent Variable | Means[a] | | t-value[b] | p-value |
	Manufac-turers	Middle-men		
Billing procedures	2.16	2.04	1.04	.298
Average delivery time	1.99	1.86	1.00	.318
Delivery time variability	2.26	1.94	2.33	.021
Rush services	2.27	1.79	2.88	.004
Returns policy	2.07	1.91	1.09	.279
Order status information	1.98	1.92	.36	.719
Accuracy in filling orders	1.99	1.82	1.33	.186
Actions on complaints	1.91	1.65	2.30	.022
Order methods	1.90	1.68	2.11	.036
Overall PDS (Question 23)	3.90	4.09	-1.62	.106
Overall PDS (weighted ave.)	8.95	8.46	1.26	.211

[a]Variables billing procedures through order methods were
recoded so that the lower the mean, the higher the satisfaction.

[b]Degrees of freedom = 188 except for overall PDS (Question 23) =
186 and for overall PDS (weighted average) = 187.

In Table 4.20, a series of Pearson correlation coefficients
between the number of supplier variables and satisfaction with overall
PDS were calculated. All of the correlation coefficients were very
small, but an explanation can be made from the signs of the coefficients

that were significant.[1] It is apparent that the higher the number

of suppliers, the lower the satisfaction with overall PDS.

Table 4.20.--Correlations between supplier variables and overall PDS.

Supplier Variable	Overall PDS			
	Question 23		Weighted Average	
	r	p-value	r	p-value
Number of suppliers used	-.02	.401	.06	.223
Number of other suppliers	-.15	.030	.14	.038
Number of alternative suppliers	-.12	.050	.11	.069

Company variables.--These variables were used to determine if

company size had any effect on the satisfaction ratings of the PDS com-

ponents and overall PDS. Parametric correlations were run between

these variables and overall PDS. None was significantly different

from zero. Despite these findings, a further exploration of the rela-

tionships between company size and satisfaction with PDS and its com-

ponents was conducted via a series of analyses of variance. These

ANOVAs were univariate for the overall PDS and multivariate for the

PDS components. When the independent variable was company size,

measured by sales volume, all the ANOVAs showed no significant differ-

ences in the mean satisfaction ratings between the various groups of

companies. However, when company size was measured by the number of

employees, some significant findings were determined.

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[1]Because of recoding procedures, the two measures of overall
PDS should have opposite readings; that is, a lower rating for the
weighted average measure means higher satisfaction, and a lower rating
for the Question 23 measure means lower satisfaction.

For the purpose of this analysis, the variable company size was divided into three groups, according to the number of employees: group 1--less than 100, group 2--between 100 and 499, and group 3--500 or more. In the MANOVA, in which the PDS components were the dependent variables, the following hypotheses were tested:

$$H_0: \quad \mu_1 = \mu_{2,3}$$
$$H_1: \quad \mu_1 \neq \mu_{2,3}$$

that is, the mean of group 1 is different from the mean of the other two groups

$$H'_0: \quad \mu_2 = \mu_3$$
$$H_2: \quad \mu_2 \neq \mu_3$$

that is, the mean of group 2 is different from the mean of group 3

Table 4.21 presents a summary of the MANOVA performed with company size as the independent variables and the PDS components as dependent variables. Examining the table, one can see that there was no difference between the mean ratings of group 1 and the other two groups combined. But the mean ratings between group 2 and group 3 were significantly different. The variables that were more important in accounting for the differences were returns policy and accuracy in filling orders (at $\alpha = .05$).

For the overall PDS, two ANOVAs were performed to test the same hypotheses detailed above. For the measure of PDS given by the weighted average of PDS components, the groups were not significantly different. However, for the measure of PDS given by Question 23 on the questionnaire, groups 2 and 3 were different but group 1 was not different from the rest. It is interesting that the mean satisfaction ratings for group 2 (medium-size companies) were higher than the mean for group 3 (large companies), indicating that respondents from the

larger companies were less satisfied with the overall PDS provided

than were respondents from the medium-size companies. Table 4.22

shows a summary of this ANOVA.

Table 4.21.--MANOVA: Satisfaction with PDS components by company size (employees).

Hypothesis	F-value[a]	p-value
H_1 (group 1 and groups 2,3)	.8938	.5324
H_2 (group 2 and group 3)	3.4612	.0007

[a]The degrees of freedom were 9 for the numerator and 154 for the denominator in both hypotheses.

Table 4.22.--ANOVA: Satisfaction with overall PDS (Question 23) by company size (employees).

Hypothesis	F-value[a]	p-value
H_1 (group 1 and groups 2,3)	.5299	.4678
H_2 (group 2 and group 3)	4.7845	.0302

[a]The degrees of freedom were 1 and 162.

Situational variables.--The relationships between the situa-

tional variables (number of deliveries, backorders, and average order

cycle time) and the satisfaction variables are presented in this

section.

In Table 4.23, parametric correlation coefficients between

the situational variables and overall PDS are shown. The interpreta-

tions are straightforward: The higher the percentage of backorders,

the lower the satisfaction with overall PDS because higher percentages of backorders indicate poor service. Also, the longer the average order cycle time, the lower the satisfaction with overall PDS. Shorter order cycle times indicate better service.

Table 4.23.—Correlations between situational variables and overall PDS.

| Situational Variable | Overall PDS[a] | | | |
| | Question 23 | | Weighted Average | |
	r	p-value	r	p-value
Number of deliveries	-.09	.154	-.02	.400
Percentage of backorders	-.40	.001	.39	.001
Average order cycle time	-.28	.001	.15	.023

[a]Because of recoding procedures, a lower rating for the weighted average measure means higher satisfaction, and for the Question 23 measure a lower rating means lower satisfaction.

Since a considerable number of respondents did not have any backorders (see Table 4.10), the variable backorders was divided into two groups (one with no backorders and the other with backorders). A number of t-tests, summarized in Table 4.24, were conducted with the ratings of satisfaction with PDS and its components. To confirm the findings, the t-tests demonstrated that the groups with no backorders had significantly higher satisfaction ratings than did the group with backorders for all the variables except billing procedures.

Table 4.24.--Summary of t-tests with variable percentage backorders.

Dependent Variable[a]	Means		t-value[b]	p-value
	No Backorders	Other		
Billing procedures	2.09	2.22	- .99	.325
Average delivery time	1.67	2.29	-5.36	.000
Delivery time variability	1.82	2.51	-5.68	.000
Rush services	1.78	2.55	-4.91	.000
Returns policy	1.89	2.23	-2.30	.023
Order status information	1.74	2.23	-3.59	.000
Accuracy in filling orders	1.65	2.30	-5.74	.000
Actions on complaints	1.66	2.08	-3.70	.000
Order methods	1.75	1.94	-1.80	.074
Overall PDS (Question 23)	4.19	3.69	3.45	.001
Overall PDS (weighted ave.)	7.99	9.78	-4.85	.000

[a]PDS components variables were recoded so that the lower the mean, the higher the satisfaction.

[b]Degrees of freedom = 174 except for overall PDS (Question 23) = 170.

Importance of PDS Components

The findings concerning the importance of PDS components are presented in the same manner as the satisfaction findings; that is, the descriptive findings are discussed first, followed by the relational findings.

Descriptive Findings

The mean ratings of the importance of the PDS components, as perceived by the respondents, are presented in Table 4.25. To allow for a rank-ordering of the importance of the PDS components, a Wilcoxon matched-pairs signed test was conducted for every difference between mean rankings (see Table 4.26). Using the data shown in Table 4.25

and the results of the various Wilcoxon tests, the following rank-order of the importance of PDS components was obtained:

1. Accuracy in filling orders--regarded as the most important PDS component

2. Average delivery time

3. Rush services and billing procedures

4. Actions on complaints

5. Order status information

6. Delivery time variability

7. Returns policy and order methods--considered the least important PDS components

Table 4.25.--Importance ratings for PDS components.

PDS Components	Mean	Standard Deviation
Billing procedures	3.932	1.917
Average delivery time	3.126	1.802
Delivery time variability	5.262	1.499
Rush services	3.864	1.813
Returns policy	5.623	1.083
Order status information	4.822	1.497
Accuracy in filling orders	2.267	1.672
Actions on complaints	4.576	1.550
Order methods	5.686	1.375

Relational Findings

The importance rankings of the PDS components were treated as dependent variables to permit the drawing of possible relationships with the supplier variables and the company variables.

Table 4.26.--Summary of the Wilcoxon test for mean ratings of impor-
tance for PDS components.

Pair of Variables	z-value[a]	p-value
Billing procedures/average delivery time	-3.981	.000
Billing procedures/delivery time variability	6.102	.000
Billing procedures/rush services	-0.311	.377
Billing procedures/returns policy	8.729	.000
Billing procedures/order status information	4.530	.000
Billing procedures/accuracy in filling orders	-6.970	.000
Billing procedures/actions on complaints	3.446	.000
Billing procedures/order methods	8.414	.000
Average delivery time/delivery time variability	9.181	.000
Average delivery time/rush services	3.862	.000
Average delivery time/returns policy	10.269	.000
Average delivery time/order status information	7.795	.000
Average delivery time/accuracy in filling orders	-4.064	.000
Average delivery time/actions on complaints	6.577	.000
Average delivery time/order methods	10.196	.000
Delivery time variability/rush services	-6.897	.000
Delivery time variability/returns policy	2.932	.001
Delivery time variability/order status information	-2.903	.001
Delivery time variability/accuracy in filling orders	-10.775	.000
Delivery time variability/actions on complaints	-3.836	.000
Delivery time variability/order methods	2.724	.003
Rush services/returns policy	8.704	.000
Rush services/order status information	4.840	.000
Rush services/accuracy in filling orders	-7.341	.000
Rush services/actions on complaints	3.934	.000
Rush services/order methods	8.381	.000
Returns policy/order status information	-5.803	.000
Returns policy/accuracy in filling orders	-10.901	.000
Returns policy/actions on complaints	-7.108	.000
Returns policy/order methods	0.669	.251
Order status information/accuracy in filling orders	-10.399	.000
Order status information/actions on complaints	1.648	.049
Order status information/order methods	5.579	.000
Accuracy in filling orders/actions on complaints	10.188	.000
Accuracy in filling orders/order methods	10.964	.000
Actions on complaints/order methods	6.924	.000

[a]$z = \dfrac{T - \mu_T}{\sigma_T}$ where T = the smaller sum of the like-signed ranked.

Supplier variables.--The variable category of supplier

was used as an independent variable in a t-test with two groups:

manufacturer and nonmanufacturer. Table 4.27 gives a summary of the

t-tests performed. At an α level of .05, only two differences were

significant: order status information and actions on complaints. The

respondents for whom the supplier was a manufacturer ranked both com-

ponents as more important than did the respondents with middlemen as

suppliers. But at an α level of .10, two more differences were signifi-

cant: billing procedures and rush services. However, the respondents

for whom the supplier was a manufacturer ranked both of these

components as less important than did the respondents with middlemen

as suppliers.

Table 4.27.--Summary of t-tests with supplier category.

Dependent Variable	Means of Categories		t-value[a]	p-value
	Manufac- turers	Middle- men		
Billing procedures	4.13	3.64	1.69	.093
Average delivery time	3.04	3.27	-.84	.401
Delivery time variability	5.23	5.27	-.17	.866
Rush services	4.01	3.56	1.63	.105
Returns policy	5.67	5.53	.84	.402
Order status information	4.50	5.27	-3.38	.001
Accuracy in filling orders	2.15	2.42	-1.11	.270
Actions on complaints	4.40	4.94	-2.32	.022
Order methods	5.80	5.62	.87	.384

[a]Degrees of freedom = 188.

Company variables.--Of this group of variables, the ones related to company size were selected for exploring relationships with the importance of PDS components. A series of parametric Pearson correlation coefficients between company-size variables and the importance of PDS components is presented in Table 4.28. All of the coefficients were very small, indicating a low degree of association. However, the sign of the coefficient, provided it was significant, gave some insights into the direction of the relationship. Therefore, statements like the following can be made (at an α level of .10):

1. The larger the company (in terms of number of employees), the higher the importance of delivery time variability, rush services, accuracy in filling orders, and actions on complaints; and the lower the importance of billing procedures and order methods.

2. The larger the company (in terms of sales volume), the higher the importance of delivery time variability, rush services, and accuracy in filling orders; and the lower the importance of billing procedures.

Note that some relationships (delivery time variability, rush services, accuracy in filling orders, and billing procedures) occurred in both company-size variables.

To explore further the relationships between company variables and the importance rankings of the PDS components, two sets of ANOVAs were performed: one univariate with each component of PDS as dependent variable and one multivariate with the PDS components as dependent variables.

Table 4.28.--Correlations between company variables and importance of
PDS components.

Dependent Variable	Company Size			
	# of Employees		Sales Volume	
	r	p-value	r	p-value
Billing procedures	.26	.001	.25	.001
Average delivery time	.01	.471	-.08	.141
Delivery time variability	-.13	.035	-.15	.025
Rush services	-.14	.031	-.10	.081
Returns policy	.02	.366	.02	.413
Order status information	-.01	.433	-.04	.291
Accuracy in filling orders	-.18	.007	-.15	.021
Actions on complaints	-.12	.052	.06	.213
Order methods	.16	.014	.01	.469

In Table 4.29 the univariate ANOVA between company size,
measured in terms of number of employees, and the importance of PDS
components is shown. The significant differences (at α = .10) among
the groups occurred in the variables billing procedures, delivery
time variability, and accuracy in filling orders. For the billing
procedures, group 4 (companies with 1,000 or more employees) had the
lowest importance ranking. For delivery time variability, the group
of large companies (group 4) had the highest importance ranking.
However, for accuracy in filling orders, the group of smaller companies
(group 1, with less than 100 employees) had the lowest importance rank-
ing. Table 4.30 shows a summary of the preceding interpretations.
Note that a significant F-value assures that at least two groups were
different.

Table 4.29.--Summary of ANOVAs between company size[a] and importance of PDS components.

Dependent variable	MS Between	MSE	F-value[b]	p-value
Billing procedures	18.130	3.508	5.168	.002
Average delivery time	2.543	3.283	.775	.510
Delivery time variability	4.824	2.211	2.182	.092
Rush services	4.993	3.259	1.532	.208
Returns policy	.026	1.191	.022	.996
Order status information	1.219	2.386	.511	.675
Accuracy in filling orders	12.816	2.644	4.847	.003
Action on complaints	3.599	2.405	1.497	.217
Order methods	3.057	1.781	1.716	.165

[a]The variable company size was divided into four groups with respect to number of employees: 1--less than 100, 2--100 to 499, 3--500 to 999, and 4--more than 1,000.

[b]The degrees of freedom were 3 and 187.

Table 4.30.--Summary of the mean rankings of importance for different groups of company size (in terms of number of employees).

Groups of Company Size	Mean Ranking of Importance		
	Billing Procedures	Delivery Time Variability	Accuracy in Filling Orders
1--Less than 100	3.27	5.25	2.90
2--100 to 499	4.06	5.45	1.91
3--500 to 999	4.12	5.12	2.44
4--1,000 or more	4.96	4.60	1.92

The univariate ANOVAs between company size, measured in terms of sales volume, and importance of PDS components are presented in Table 4.31. The company-size variable was divided into five groups, with the same intervals as in the original data-collection instrument. That is, group 1--20 to 49, group 2--50 to 99, group 3--100 to 499, group 4--500 to 999, and group 5--1,000 or more (values in millions of

cruzeiros). As can be seen from the table, the groups were signifi-
cantly different (at α = .10) on the following components: billing
procedures, delivery time variability, accuracy in filling orders,
and actions on complaints.

Table 4.31.--Summary of ANOVAs between company size[a] and importance
of PDS components.

Dependent Variable	MS Between	MSE	F-value[b]	p-value
Billing procedures	12.525	3.668	3.414	.010
Average delivery time	2.969	3.247	.915	.457
Delivery time variability	4.659	2.264	2.058	.088
Rush services	3.271	3.329	.982	.418
Returns policy	1.406	1.207	1.165	.328
Order status information	1.976	2.375	.832	.506
Accuracy in filling orders	7.963	2.753	2.893	.024
Action on complaints	7.099	2.339	3.053	.019
Order methods	.378	1.818	.208	.934

[a]Company size measured in terms of sales volume.

[b]Degrees of freedom were 4 and 179.

To allow for further interpretations of these findings, the
means of the importance rankings of PDS components by each one of the
company-size groups are presented in Table 4.32. One pattern that
can be observed is that the larger the company, the lower the impor-
tance of billing procedures. For delivery time variability, the group
of larger companies (1,000 or more millions of cruzeiros) had the
highest importance rating. For the other two components, accuracy in
filling orders and actions on complaints, even though at least two
groups were different, there seemed not to be an apparent relationship

pattern. However, for both components, group 4 (500 to 999 millions of cruzeiros) showed the highest mean importance rankings.

Table 4.32.--Summary of the mean rankings of importance for different company-size groups (in terms of sales volume).

Company-Size Groups[a]	Mean Ranking of Importance			
	Billing Procedures	Delivery Time Variability	Accuracy in Filling Orders	Actions on Complaints
1-- 20 to 49	3.11	5.26	2.63	4.44
2-- 50 to 99	3.32	5.38	3.03	4.68
3--100 to 499	4.17	5.43	2.08	4.58
4--500 to 999	4.45	5.15	1.65	3.65
5--1,000 or more	4.53	4.53	2.23	5.17

[a]Values are in millions of cruzeiros.

In conclusion, two MANOVAs were conducted with company size as independent variable and the importance ranking of PDS components as dependent variables. In the first MANOVA, which is presented in Table 4.33, the company-size variable was divided into three groups according to the number of employees: group 1--less than 100, group 2--between 100 and 499, and group 3--500 or more. The following hypotheses were tested:

H_0: $\mu_1 = \mu_{2,3}$

H_1: $\mu_1 \neq \mu_{2,3}$

that is, the mean of group 1 is different from the mean of the other two groups

H'_0: $\mu_2 = \mu_3$

H_2: $\mu_2 \neq \mu_3$

that is, the mean of group 2 is different from the mean of group 3

Table 4.33.--MANOVA: Importance of PDS components by company size (employees).

Hypothesis	F-value[a]	p-value
H_1 (group 1 and groups 2,3)	2.3143	.0181
H_2 (group 2 and group 3)	1.9735	.0459

[a]Degrees of freedom were 9 and 154.

The two null hypotheses were rejected; in fact, there were differences among the three groups with respect to their ratings of the importance of PDS components. In the case of H_1, the components billing procedures and accuracy in filling orders were the most important in accounting for the differences in the means (at α = .05). For H_2, the variables billing procedures and average delivery time were the most important, also at α = .05.

For the second MANOVA, the variable company size, measured in terms of sales volume (given in millions of cruzeiros), was grouped in the following manner: 1--less than 100, 2--100 to 499, and 3--500 or more. The hypotheses to be tested were the same as the ones outlined for the company-size variable measured in terms of number of employees. The summary of this MANOVA is given in Table 4.34. The difference between group 1 and the other groups was significant, and the variables billing procedures and accuracy in filling orders were the most important in determining the difference. However, groups 2 and 3 were not statistically different, and therefore the null hypothesis could not be rejected.

Table 4.34.--MANOVA: Importance of PDS components by company size (sales).

Hypothesis	F-value[a]	p-value
H_1 (group 1 and groups 2,3)	2.2745	.0204
H_2 (group 2 and group 3)	1.1780	.3132

[a]The degrees of freedom were 9 and 154.

PDS and Other Factors Affecting the Patronage Decision

In this section, the findings related to the factors affecting the patronage decision are discussed. As in the previous sections, the analysis is divided into two parts: the first, descriptive, and the second, relational.

Descriptive Findings

The mean ratings of the importance of a group of factors in selecting suppliers, as perceived by the respondents, are given in Table 4.35. The same procedure for comparing the mean rankings (Wilcoxon signed test) used earlier for ranking the importance of PDS components was used with the purchasing factors. As can be seen in Table 4.36, all of the differences were significant, enabling the presentation of the following rank of factors, in descending order of importance, affecting the selection of suppliers:

1. Product quality

2. Price

3. PDS

4. Geographical location of the supplier

5. Required minimum order size

6. Supplier management

7. Reciprocity

Table 4.35.--Importance ratings of purchasing factors.

Purchasing Factors	Mean	Standard Deviation
Product quality	1.379	.956
PDS	3.421	1.265
Price	2.116	.877
Supplier management	5.354	1.409
Geographical location of supplier	4.484	1.483
Required minimum order size	5.100	1.371
Reciprocity	5.751	1.375

Relational Findings

In this section, the rankings of the importance of the pur-chasing factors are examined in a relational perspective. These rankings were dependent variables in a series of statistical tests in which supplier and company variables were treated as independent variables.

Supplier variable.--The supplier-variable category was con-sidered as an independent variable in a series of t-tests with two groups: manufacturers and nonmanufacturers. Table 4.37 presents a summary of all the tests that were conducted. The differences were significant (at α = .10) for the first four factors listed in the table. The respondents for whom the suppliers were manufacturers

Table 4.36.--Summary of the Wilcoxon test for mean ratings of the importance of the purchasing factors.

Pair of Variables	z-value[a]	p-value
Product quality/PDS	10.410	.000
Product quality/price	6.966	.000
Product quality/supplier management	11.533	.000
Product quality/geographical location of supplier	11.322	.000
Product quality/required minimum order size	11.551	.000
Product quality/reciprocity	11.491	.000
PDS/price	-8.629	.000
PDS/supplier management	9.884	.000
PDS/geographical location of supplier	5.835	.000
PDS/required minimum order size	8.734	.000
PDS/reciprocity	10.329	.000
Price/supplier management	11.249	.000
Price/geographical location of supplier	11.129	.000
Price/required minimum order size	11.497	.000
Price/reciprocity	11.538	.000
Supplier management/geographical location of supplier	-5.057	.000
Supplier management/required minimum order size	-1.644	.050
Supplier management/reciprocity	2.733	.003
Geographical location of supplier/required minimum order size	3.640	.000
Geographical location of supplier/reciprocity	6.732	.000
Required minimum order size/reciprocity	4.565	.000

$$^a z = \frac{T - \mu_T}{\sigma_T}$$ where T = the smaller sum of the like-signed ranked.

ranked both product quality and PDS lower (that is, more important) than did the respondents who used middlemen as their suppliers. An inverse relationship (that is, less important) was observed for the factors price and supplier management.

Table 4.37.--Summary of t-tests with supplier category.

| Dependent Variable | Means of Categories | | t-value[a] | p-value |
	Manufac-turers	Middle-men		
Product quality	1.26	1.61	-2.42	.016
PDS	3.31	3.65	-1.81	.072
Price	2.20	1.94	1.98	.049
Supplier management	5.49	5.11	1.79	.076
Geographical location of supplier	4.52	4.41	.51	.612
Required minimum order size	5.10	5.06	.17	.863
Reciprocity	5.85	5.53	1.44	.150

[a]The degrees of freedom were 188.

Company variables.--The company-size variables, measured in terms of sales volume and number of employees, were correlated with each of the factors in selecting suppliers to explore the degree of association between them. Table 4.38 presents a summary of the parametric Pearson correlation coefficients. Even though the coefficients were small, the signs of the significant associations (at α = .05) were relevant, and the following statements can be made: The larger the company, measured either by sales volume or by number of employees, the higher the importance of product quality and the lower the importance of price as factors in selecting suppliers;

and the larger the company, measured in terms of number of employees, the higher the importance of PDS in selecting suppliers.

Table 4.38.--Correlations between company variables and factors in selecting suppliers.

| Factors in Selecting Suppliers | Company Size | | | |
| | # of Employees | | Sales Volume | |
	r	p-value	r	p-value
Product quality	-.25	.001	-.21	.003
PDS	-.12	.047	-.08	.151
Price	.12	.050	.21	.002
Supplier management	.10	.091	.03	.340
Geographical location of supplier	.08	.145	-.04	.306
Required minimum order size	.03	.366	.08	.135
Reciprocity	.11	.067	.02	.387

Two MANOVAs were used to examine further the differences in the ranking of importance of factors in selecting suppliers with respect to company size. In the first MANOVA, presented in Table 4.39, the company-size variable was divided into three groups according to the number of employees: group 1--less than 100, group 2--between 100 and 499, and group 3--500 or more. The following hypotheses were tested:

H_o: $\mu_1 = \mu_{2,3}$ that is, the mean of group 1 is
                             different from the mean of the
H_1: $\mu_1 = \mu_{2,3}$ other two groups

H'_o: $\mu_2 = \mu_3$ that is, the mean of group 2 is
                             different from the mean of group 3
H_2: $\mu_2 \neq \mu_3$

At an α value of .10, the two null hypotheses were rejected; there were differences among the groups with respect to the rankings in the set of dependent variables. For the difference between group 1 and the other two groups, product quality was the most important determinant of the difference. And for the difference between group 2 and group 3, PDS was the most important factor in accounting for the difference.

Table 4.39.--MANOVA: Importance of purchasing factors by company size (employees).

Hypothesis	F-value[a]	p-value
H_1 (1 and 2,3)	1.7663	.0978
H_2 (2 and 3)	1.7541	.1004

[a]The degrees of freedom were 7 and 156.

For the second MANOVA, the variable company size, measured in terms of sales volume (given in millions of cruzeiros), was grouped as follows: 1--less than 100, 2--100 to 499, and 3--500 or more. The hypotheses tested were the same ones as cited previously for the company-size variable measured in terms of number of employees. From Table 4.40, it can be seen that only the difference between group 1 and the other two groups was significant at an α value of .10. For this difference, price was the major determinant.

Table 4.40.--MANOVA: Importance of purchasing factors by company size (sales).

Hypothesis	F-value[a]	p-value
H_1 (group 1 and groups 2,3)	1.7481	.1020
H_2 (group 2 and group 3)	1.4599	.1858

[a]The degrees of freedom were 7 and 156.

PDS and the Patronage Decision

In this section, the data are analyzed to provide insights for examining the hypotheses that were instrumental in fulfilling one of the objectives of this research--that is, to explore relationships between situational variables of the buying process, supplier variables, company variables, and satisfaction variables with the perceived importance of PDS in selecting suppliers.

Situational Variables

Hypothesis 1: The greater the number of deliveries, the greater the importance of PDS in selecting suppliers.

The statistical hypotheses derived from this substantive hypothesis are:

H_0: $r \geq 0$ where r = Pearson correlation coefficient between number of deliveries
H_1: $r < 0$ and importance of PDS

The correlation coefficient between the two variables was -.06 with a p-value of .252. Thus, the null hypothesis could not be rejected.

To examine further the relationship formulated in the hypothesis, the variable number of deliveries was divided into three groups according to the frequency of deliveries per month: group 1--1 or less, group 2--more than 1 and 3 or less, and group 3--more than 3. A univariate ANOVA with number of deliveries as the independent variable and importance of PDS as the dependent variable was performed. The F-value was .540 with df = 2, 142 and p-value of .584. Therefore, there seemed to be no difference among the three groups.

Hypothesis 2: The higher the proportion of backorders, the greater the importance of PDS in selecting suppliers.

The testable hypotheses were similar to the preceding ones; that is:

H_0: $r \geq 0$ where r = Pearson correlation coefficient between percentage of backorders
H_1: $r < 0$ and importance of PDS

The coefficient was zero with a p-value of .481. Therefore, the null hypothesis could not be rejected.

Since the number of respondents who had no backorders was fairly large (96--see Table 4.11), this variable was divided into two groups (no backorders and backorders) to allow for a t-test to examine the differences between these groups. The t-value was .35 with a p-value of .474. Thus the hypothesis of no difference could not be rejected.

Hypothesis 3: The greater the average order cycle time, the greater the importance of PDS in selecting suppliers.

The following hypotheses were tested:

$$H_o: \quad r \geq 0 \qquad \text{where } r = \text{Pearson correlation coefficient}$$
$$\text{between average order cycle time}$$
$$H_1: \quad r < 0 \qquad \text{and importance of PDS}$$

The coefficient of correlation was -.13 with a p-value of .041. Even though the absolute value of the coefficient was fairly small, the sign of the coefficient implied that the direction of the association was negative; therefore, the null hypothesis was rejected.

To examine this relationship further, a breakdown of the means of the average order cycle time by every rank of importance of PDS is presented in Table 4.41. The figures in the table suggest that the respondents with low ranks of importance (6 and 7) did, in fact, have lower average order cycle times than did the respondents with high ranks of importance (1 and 2), but the middle groups (3, 4, and 5) were not very different from the high-importance groups. Therefore, it seems that only substantial changes in order cycle time would affect the importance ranking of PDS.

Table 4.41.--Breakdown of average order cycle time by importance of PDS.

Rank of Importance	Mean of Average Order Cycle Time	N
1	26.0	6
2	30.2	26
3	22.3	72
4	25.1	32
5	21.6	18
6	13.8	12
7	10.5	2

Supplier Variables

Hypothesis 4: The greater the number of alternative suppliers available, the lower the importance of PDS in selecting suppliers.

The statistical hypotheses derived from the substantive

hypotheses are the following:

H_0: $r \leq 0$ where r = Pearson correlation coefficient
                    between the number of alternative
H_1: $r > 0$ suppliers and importance of PDS

The coefficient of correlation was .06 with a p-value of

.222. Therefore, the null hypothesis could not be rejected.

The association between the importance of PDS as a factor in

selecting suppliers and the other two supplier variables (specifically,

number of suppliers utilized and the number of other suppliers)

was also explored. The Pearson correlation coefficients are pre-

sented in Table 4.42. Interpreting the data in this table, the fol-

lowing statement can be made (at α = .10): The higher the number of

suppliers utilized, the lower the importance of PDS in selecting suppliers.

Table 4.42.--Spearman correlation coefficients.

Variable Pair	r	p-value
Suppliers utilized/importance of PDS	.12	.060
Other suppliers/importance of PDS	.01	.475

Company Variables

Hypothesis 5: The larger the company, either in terms of
                number of employees or in sales volume, the
                greater the importance of PDS as a factor in
                selecting suppliers.

From this hypothesis, two sets of testable hypotheses can be

derived:

H_0: $r \geq 0$ where r = Pearson correlation coefficient between company size, measured in terms of number of employees, and importance of PDS

H_1: $r < 0$

H'_0: $r' \geq 0$ where r = Pearson correlation coefficient between company size, measured in terms of sales volume, and importance of PDS

H'_1: $r' < 0$

The correlation coefficients were the following: for company size (number of employees) and importance of PDS, -.12 with p-value of .047; for company size (sales volume) and importance of PDS, -.08 with p-value of .151. Therefore, the null hypothesis H_0 was rejected, and the null hypothesis H'_0 could not be rejected.

Two ANOVAs were performed with the company-size variables as independent variables and the importance of PDS in selecting suppliers as the dependent variable. Each ANOVA is discussed and analyzed separately.

In the first ANOVA, the company-size variable was divided into four groups according to the number of employees: 1--less than 100, 2--100 to 499, 3--500 to 999, and 4--more than 1,000. In the second, the company-size variable, measured by sales volume (given in millions of cruzeiros), was divided into the following groups: 1--from 20 to 49, 2--from 50 to 99, 3--from 100 to 499, 4--from 500 to 999, and 5--1,000 or more. A summary of the two ANOVAs is presented in Table 4.43. At an α level of .10, both ANOVAs were significant, meaning that at least two of the groups were different.

Table 4.43.--Summary of ANOVAs between company size and importance of PDS.

Group	MS Between	df	MSE	df	F-value	p-value
Number of employees	3.810	3	1.569	184	2.429	.067
Sales volume	3.411	4	1.573	176	2.168	.074

To examine further the differences in mean rankings of importance of PDS in selecting suppliers within the two company-size groups, Tables 4.44 and 4.45 are presented. As shown in the first table, respondents from the two groups of larger companies (groups 3 and 4) tended to rank importance of PDS higher than did those from the groups of smaller companies (groups 1 and 2). In fact, the major difference seemed to occur between groups 2 and 3. In the second table, groups 2, 4, and 5 were probably different than groups 1 and 3. In fact, groups 3 and 5 were different, with respondents from the larger-companies group (group 5) ranking importance of PDS higher than did respondents from smaller companies (group 3).

Table 4.44.--Mean rankings of importance of PDS by company size (number of employees).

Group (number of employees)	Mean
1--less than 100	3.33
2--100 to 499	3.57
3--500 to 999	2.75
4--1,000 or more	3.16

Table 4.45.--Mean rankings of importance of PDS by company size (sales volume).

Group (sales volume[a])	Mean
1-- 20 to 49	3.56
2-- 50 to 99	3.14
3--100 to 499	3.71
4--500 to 999	3.25
5--1,000 or more	3.07

[a]Given in millions of cruzeiros.

Satisfaction Variables

Hypothesis 6: The greater the satisfaction with PDS, the lower its importance as a purchasing factor.

Since there were two measures of satisfaction with PDS (one given by the respondents [Question 23] and the other computed by the researcher [weighted average of PDS components]), two sets of testable hypotheses could be derived from the substantive hypothesis:

H_0: $r \geq 0$ where r = Pearson correlation coefficient between satisfaction with PDS
H_1: $r < 0$ (Question 23) and importance of PDS

H'_0: $r' \leq 0$ where r = Pearson correlation coefficient between satisfaction with PDS
H'_1: $r' > 0$ (weighted average) and importance of PDS

The coefficients of correlation were r = .03 with p-value of .338 and r' = -.02 with p-value of .372. Therefore, neither null hypothesis could be rejected.

Every one of the satisfaction ratings of PDS components was correlated with the importance of PDS in selecting suppliers. Only

the Pearson correlation coefficient between billing procedures and importance of PDS was significant at α = .10: r = -.13 with p-value = .036. Thus it can be said that the higher the satisfaction with billing procedures, the lower the importance of PDS.

Comparative Analysis

In this section a comparative analysis of the findings of this research and those reported by Perreault and Russ (1976a) is presented. The analysis is divided into three major areas. The first deals with satisfaction with PDS and its components. The second concerns the importance of particular factors in selecting suppliers. The last examines the relationships between situational variables (deliveries, backorders, and order cycle time), a supplier variable (alternative suppliers), and a satisfaction variable (overall PDS) with the importance of PDS in selecting suppliers. The emphasis of the analysis is descriptive because the conclusions and implications of the comparative findings are explored in Chapter V.

Satifaction With PDS and Its Components

In Table 4.46, the satisfaction ratings of PDS components are outlined with respect to the rank order of satisfaction and the mean ratings of satisfaction.[1] The following are some highlights of that table:

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[1]See Chapter III, p. 46, for an explanation of the scaling and measurement procedures of both studies.

--in both studies, delivery time variability was the component with which the respondents were least satisfied; however, in this research, for average delivery time, the respondents were not as dissatisfied as were the respondents in the Perreault and Russ study;

--accuracy in filling orders and order methods were components with which respondents were highly satisfied;

--respondents in the Perreault and Russ study were most satisfied with the component billing procedures, but respondents in the present study were next-to-least satisfied with that component.

Table 4.46.--Satisfaction ratings of PDS components.

PDS Component	This Research		Perreault & Russ Study[a]	
	Rank	Mean	Rank	Mean
Billing procedures	8	3.84	1	1.99
Average delivery time	4	4.02	8	2.94
Delivery time variability	9	3.81	9	3.15
Rush services	7	3.86	6	2.68
Returns policy	6	3.90	3	2.21
Order status information	5	3.98	7	2.90
Accuracy in filling orders	3	4.06	2	2.00
Actions on complaints	2	4.12	5	2.35
Order methods	1	4.13	3	2.21

[a]Source: Perreault and Russ (1976a, p. 8).

To determine what components of PDS are most likely to increase customer satisfaction, a series of correlations between satisfaction ratings of every component and satisfaction with overall PDS are presented in Table 4.47. In both studies, returns policy had the lowest correlation with satisfaction with overall PDS. Billing

procedures also had low correlations, whereas delivery time varia-

bility presented high correlation coefficients. The only discrepancy

between the two studies seemed to be with respect to accuracy in

filling orders: in this research it showed the highest correlation

with satisfaction with overall PDS, whereas in the Perreault and Russ

study it had one of the lowest correlations.

Table 4.47.--Correlations between components and overall PDS.

Component	Overall PDS	
	This Research	Perreault & Russ Study
Billing procedures	.48	.39
Average delivery time	.59	.76
Delivery time variability	.63	.72
Rush services	.61	.59
Returns policy	.34	.44
Order status information	.53	.67
Accuracy in filling orders	.63	.46
Actions on complaints	.56	.56
Order methods	.37	.56

[a]Source: Perreault and Russ (1976a, p. 8).

Another comparison was made regarding the satisfaction with

PDS and the expectations raised by suppliers with their customers by

seeking feedback about the services provided. Table 4.48 summarizes

the findings concerning such feedback; this information was obtained

by asking the following question (number 29 on the questionnaire):

"Do your suppliers of this product check with you to see if the ser-

vices they are providing are adequate in meeting your needs?" These

findings were identical, in degree, to the ones presented by Perreault

and Russ (1976a, p. 9). Examining the data in the table, one can affirm that the respondents who checked response 3 to this question were the least satisfied with the services provided. Also, the respondents who were not contacted by their suppliers and did not see any need for such a contact (response 5) were highly satisfied with the services they were receiving.

Table 4.48.--Supplier sensitivity to purchasers' service needs and purchaser satisfaction with PDS.[a]

Response	Percent Responding		Mean Rating of Overall PDS[b]	
	This Study	Perreault and Russ	This Study	Perreault and Russ
1. Yes, but there are no needed improvements	.26	.18	4.21	1.62
2. Yes, and they have made improvements	.49	.50	4.08	2.21
3. Yes, but the services did not improve	.06	.14	2.63	3.31
4. No, but I would like them to do so	.13	.14	3.43	2.87
5. No, and it is not necessary	.06	.04	4.41	1.33

[a]Title taken from Perreault and Russ (1976a, p. 9).

[b]In this study a high mean rating means highly satisfied, whereas in the Perreault and Russ study it is the opposite.

Importance of Factors in Selecting Suppliers

In Table 4.49, a comparison of the rankings of the importance of different factors in selecting suppliers is exhibited. The findings

of both studies were similar, and some relevant comments are mentioned below:

--product quality had the highest ranking (that is, most important) in both studies;

--in the Perreault and Russ study, PDS was second only to product quality, but in this research price was regarded as more important than PDS; a possible explanation for this difference is the prevailing situation in the Brazilian economy during 1980. The real interest rates were negative; thus companies were hedging against inflation by building up inventories.[1] Therefore, price was an important factor;

--reciprocity was the least important factor in both studies.

Table 4.49.--Ranks of importance of purchasing factors.

Factor	Importance Rankings	
	This Research	Perreault & Russ Study[a]
Product quality	1	1
PDS	3	2
Price	2	3
Supplier management	6	4
Distance to supplier	4	5
Required order size	5	6
Minority/small business	n.a.	7
Reciprocity	7	8

[a]Source: Perreault and Russ (1976a, p. 5).

[1]In a forthcoming research report by Luce et al., that situation was found to be true; the average price of raw materials for both mechanical and metallurgical industries rose 130% during 1980, whereas the average interest rate prevailing in the market for the same period was between 80% and 85% a year, with the inflation rate for 1980 at about 110%.

Relationships

The framework for this part of the comparative analysis was an examination of the common hypotheses involving the importance of PDS as a factor in selecting suppliers. Before proceeding to the analysis, a note on the comparability of the relationships is presented. The data obtained in the two studies with respect to the situational variables of the buying process (deliveries, backorders, and order cycle time) were different: In this research the responses were product and supplier specific (that is, the respondents considered only the most important supplier of the chosen product), whereas in the Perreault and Russ study they were only product specific. Thus, some of the comparisons should be made only in terms of degree.

According to what was reported by Perreault (1973), no statistical significance was found in any of the hypothesized relationships between situational variables (for Perreault they included number of deliveries, backorders cancelled,[1] order cycle time, number of alternative suppliers, and satisfaction with overall PDS) and importance of PDS in selecting suppliers. In this research, only one of the comparable hypothesized relationships[2] was significant: order cycle time and importance of PDS; that is, the greater the order cycle time, the greater the importance of PDS in selecting suppliers. Therefore, the

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[1]See footnote on page 43, Chapter III.

[2]Another relationship was significant (company size [by number of employees] and importance of PDS) but could not be compared with the U.S. findings because it was not researched.

outcomes of both studies were very similar with respect to the
hypothesized relationships.

To examine further these relationships, Perreault and Russ
grouped the respondents "according to their views on the importance
of physical distribution service and the average response on each
situational variable was computed for each group" (1976a, p. 7).
Groups with a low number of respondents (n < 6) were not considered.
In this research the same procedure was followed so that comparisons
between the two studies could be made. Table 4.50 summarizes this
procedure, and an analysis of the findings follows.

Relationship 1: The greater the number of deliveries,
the greater the importance of PDS.

The findings were consistent with the relationship hypothesized
in the Perreault and Russ study: "the importance category . . . of PDS
increases monotonically with the number of deliveries" (1976a, p. 7).
However, in the present research, this pattern was not observed. The
only difference seemed to exist between the lowest importance category
and the others (recall that an ANOVA was performed with different
groups of frequencies of deliveries per month and the importance of
PDS, and it was not significant[1]).

Relationship 2: The greater the number of alternative
suppliers available, the lower the
importance of PDS.

In both studies the relationship was not observed, but two
major differences were found: (1) in the Perreault and Russ study,
the number of "suppliers differs substantially by importance category"

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[1]See page 90, Chapter IV.

(1976a, p. 7), and in this study only one group seemed to be different; and (2) the lowest importance group in this research had the highest number of alternative suppliers, whereas in the Perreault and Russ study the lowest importance group had the lowest number of suppliers.

Table 4.50.--Mean responses on variables by importance of PDS.

Variables	Importance Levels of PDS[a]					
	(Less Important)					(More Important)
Number of deliveries						
Perreault and Russ[b]	n.a.	n.a.	52.3	107.4	174.0	414.0
This study	23.1	33.9	39.0	34.0	35.9	32.3
Number of alternative suppliers						
Perreault and Russ	n.a.	n.a.	11.8	29.5	21.6	17.6
This study	13.7	7.3	8.0	9.7	7.5	9.0
Percentage of backorders						
Perreault and Russ	n.a.	n.a.	21.4	19.2	22.6	18.0
This study	5.5	6.9	4.6	5.4	6.7	2.7
Satisfaction with PDS						
Perreault and Russ	n.a.	n.a.	3.3	2.6	2.5	2.1
This study	4.1	4.0	3.9	4.0	3.9	3.8
Average order cycle time						
Perreault and Russ	n.a.	n.a.	39.6	24.9	40.5	32.9
This study	13.8	21.6	25.1	22.3	30.2	26.0

[a]Some response categories had too few respondents to provide meaningful averages and are identified by the "n.a." entry.

[b]All data on the Perreault and Russ study were taken from Perreault and Russ (1976a, p. 7).

Relationship 3:   The greater the satisfaction with PDS, the lower its importance in the evaluation.

In the Perreault and Russ study, "as the importance of physical distribution service increases, satisfaction increases" (1976a, p. 8). On the other hand, in this study satisfaction with PDS did not affect the ranking of its importance.

Relationship 4: The greater the average delivery time, the greater the importance of PDS.

"No apparent relationship is observed between the importance of physical distribution service and average delivery time" in the Perreault and Russ study (1976a, p. 8). In this research, the relationship was found to be significant, but it seems that only considerable reductions in order cycle time could lower the perceived importance of PDS.

Relationship 5: The higher the proportion of back-orders, the greater the importance of PDS.[1]

In neither study was the relationship observed, and the percentage of backorders was "approximately the same across the importance levels" in the Perreault and Russ study (1976a, p. 7).

Two other meaningful comparisons can be made by further examining the data presented in Table 4.50. The respondents in this study had, for every importance category, a smaller number of alternative suppliers than did the respondents in the Perreault and Russ study. But they had, in every importance category, a shorter average order cycle time than did the subjects in the Perreault and Russ research.

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[1]This relationship was not hypothesized by Perreault and Russ, but since the data were available the comparisons were made possible.

Summary of Findings

The research objectives and hypotheses, with the findings related to each one, are summarized in this final section of Chapter IV.

Objective 1: Satisfaction

To investigate the perceived satisfaction of buyers with overall PDS and with each of its components.

The mean satisfaction rating of the overall PDS (measured on a five-point scale ranging from totally dissatisfied to totally satisfied) was 3.96. The majority of the respondents (85.7%) were either "satisfied" or "totally satisfied" with the service they were receiving from their suppliers. With respect to the specific PDS components, the respondents were most satisfied with order methods (mean: 4.134) and action on complaints (mean: 4.124), and they were least satisfied with rush services (mean: 3.586), billing procedures (mean: 3.842), and delivery time variability (mean: 3.807).

Objective 2: Importance

To rank, in order of importance, different components of PDS as perceived by purchasers.

The component with the highest importance ranking was accuracy in filling orders, with a mean ranking of importance of 2.28 (1 = most important); the components returns policy and order methods had the lowest importance rankings, with means of 5.62 and 5.69, respectively.

Objective 3: Importance

To compare the importance of PDS with other factors influencing patronage decisions.

Product quality was regarded as the most important factor in selecting suppliers, whereas price was second and PDS third.

Objective 4: Relationships

To explore relationships between situational variables of the buying process, supplier variables, company variables, and satisfaction variables with the perceived importance of PDS in selecting suppliers.

This objective was operationalized in the form of hypotheses. Each of the hypotheses is repeated below, with the outcome of the test for every null hypothesis derived from each of the substantive hypotheses.

Hypothesis 1: The greater the number of deliveries, the greater the importance of PDS in selecting suppliers.

Hypothesis 2: The higher the proportion of backorders, the greater the importance of PDS in selecting suppliers.

These two null hypotheses were not rejected. Moreover, no other relationship between each pair of variables was found to be significant.

Hypothesis 3: The greater the average order cycle time, the greater the importance of PDS in selecting suppliers.

The null hypothesis was rejected and the hypothesized relationship between the variables confirmed.

Hypothesis 4: The greater the number of alternative suppliers, the lower the importance of PDS in selecting suppliers.

The null hypothesis could not be rejected; therefore, the hypothesized relationship between the variables was not confirmed nor was any other.

<u>Hypothesis 5</u>: The larger the company, either in terms of number of employees or in sales volume, the greater the importance of PDS as a factor in selecting suppliers.

When company size was measured in terms of number of employees, the null hypothesis was rejected. However, when size was measured in terms of sales volume, the null hypothesis was not rejected, and no other significant relationship between the variables existed.

<u>Hypothesis 6</u>: The greater the satisfaction with PDS, the lower its importance as a purchasing factor.

The null hypothesis could not be rejected, and no other relationship between the variables was found to be significant.

Objective 5: Comparative Analysis

To present a comparative analysis of the findings of this study with those reported by Perreault and Russ (1976a). This analysis compares the findings in the Brazilian and American environments on the following aspects: (a) satisfaction with overall PDS and each of its components, (b) importance of PDS as a factor influencing patronage decisions, and (c) relationships involving the perceived importance of PDS in selecting suppliers.

The major differences between the two studies centered on the following aspects:

--the ranking of satisfaction ratings of the PDS components billing procedures and average delivery time;

--the correlation of accuracy in filling orders with satisfaction with overall PDS;

--the importance ranking of price and PDS as factors in selecting suppliers;

--the relationship between number of deliveries and the importance of PDS;

--the relationship between satisfaction with overall PDS and its importance in selecting suppliers.

The relevant similarities between the two studies were as follows:

--the lowest ranking of satisfaction rating with delivery time variability and the higher rankings of both order methods and accuracy in filling orders;

--the high correlations of average delivery time and delivery time variability with satisfaction with overall PDS and the fairly low correlations of returns policy and billing procedures with satisfaction with overall PDS;

--the identical pattern concerning satisfaction with service and feedback about service needs;

--the highest importance ranking of product quality and the lowest ranking of reciprocity as factors in selecting suppliers;

--the unobserved relationships between number of alternative suppliers and proportion of backorders with importance of PDS in selecting suppliers.

The findings of the investigation were presented in this chapter. The interpretation of the findings, implications, and conclusions are contained in the following chapter.

CHAPTER V

CONCLUSIONS

In this chapter the major conclusions and implications drawn from the findings are presented. The conclusions and implications with respect to satisfaction with overall PDS and its components, the importance of PDS components, and factors affecting the patronage decision are examined in the first three sections. Then, a section on PDS and the patronage decision is presented. The next part deals with the comparative analysis of the findings of this research and those reported by Perreault and Russ (1976a). Finally, the investigator proposes further research that might be derived from this study.

Satisfaction With PDS

The major conclusions and implications concerning satisfaction with PDS and its components are presented and discussed below.

1. Respondents who used manufacturers as their major supplier of the chosen product were less satisfied with the overall PDS and with the components average delivery time, rush services, and returns policy than were respondents who used middlemen. For the other components, the relationships were not significant. Explanations of these findings relate to the underlying characteristics of middlemen and manufacturers in a channel-of-distribution context: Middlemen tend to be closer to their customers, smaller (at least in the Brazilian

environment), and more specialized than manufacturers. Moreover, in this research, the average order cycle time of manufacturers (30.6 days) was higher than the average order cycle time of middlemen (9.5 days). Two major implications can be drawn from this conclusion: First, manufacturers could enhance their customers' level of satisfaction, either by improving the overall level of service, or by relying on middlemen to distribute their products, or both. However, two important aspects should be considered in making this decision: The expectations of the customer with respect to the level of service that could be provided either by the middleman or the manufacturer and the cost of providing the service. The outcome might be that manufacturers should rely on middlemen to handle their distribution tasks, especially for highly service-oriented customers. Second, the customers can get better service, all else being equal, either by pressuring manufacturers to provide better services (such as reducing the average order cycle time) or by using middlemen as their major suppliers.

2. The higher the number of alternative suppliers, the lower the satisfaction with the service. Customers seem to require a higher level of performance when the number of suppliers increases. From a supplier perspective, a larger number of competitors would probably necessitate a higher level of service to satisfy the customers' expectations concerning the service provided.

3. The larger companies (measured in terms of number of employees) seemed to be less satisfied with the service provided than were smaller companies. This conclusion should be interpreted with

caution, though, because when company size was measured in terms of sales volume, that pattern could not be detected.

4. The higher the percentage of backorders, the lower the satisfaction with overall PDS. Moreover, respondents with no back-orders were significantly more satisfied with the overall PDS and its components (with the exception of billing procedures, for which no pattern was determined) than were respondents with a larger number of backorders. This seems to be an expected finding because number of backorders has a direct effect on the levels of inventory held by the companies. Thus, suppliers can increase the perceived level of satisfaction with PDS by reducing their percentage of backorders.

5. The longer the average order cycle time, the lower the satisfaction with overall PDS. Again, longer order cycle times affect inventory levels; therefore, suppliers can enhance their level of service by reducing the order cycle time.

6. A considerable number of suppliers sought feedback from their customers with respect to the services they were providing. However, if the revealed expectation was not met, the customers were highly dissatisfied with the service. Therefore, suppliers should be selective in obtaining feedback from their customers if they are not able to meet the customers' expectations about the level of services provided.

7. Even though customers were highly satisfied with the services they were receiving, a supplier should not neglect the constant monitoring of his customers' satisfaction with the services that he and his competitors are providing. This should enable the supplier

to adjust his service offerings to the needs of the customers and to possible competitive actions.

8. Suppliers are constantly faced with the decision of changing PDS levels, either by reducing or increasing their service offerings. Since PDS in itself can only be altered by making changes in its components, the issue rests on identifying the effect that each component has on overall satisfaction with PDS, as perceived by customers. Then the cost and revenue implications of altering the service level can be evaluated. This research can provide some insights into this type of decision. Table 5.1 presents the ranking of satisfaction ratings of PDS components and the correlation of each component with the satisfaction with overall PDS. The interpretation of the data in the table is straightforward. A component with a high correlation with satisfaction with overall PDS and a low satisfaction rating is a candidate for improvement (delivery time variability and rush services, for example). An improvement in a component having a low correlation with satisfaction with PDS and a low satisfaction rating (billing procedures and especially returns policy) was deemed to be unsuccessful in increasing the overall satisfaction level of customers with PDS. However, a component with a low correlation and a high satisfaction rating (order methods) could have its level of performance reduced so as to free more funds for increasing performance levels of other components. And components with high correlations and high satisfaction ratings (accuracy in filling orders and average delivery time) should be closely monitored so that high performance levels can be maintained. All these decisions concerning performance

levels should consider the customer's perceptions and consequent reactions to these changes and also the effects on costs and revenues associated with these changes. More meaningful interpretations of the data given in Table 5.1 can be made when the importance rankings of these components are brought into the overall picture. This is done in the following section.

Table 5.1.--Groups of satisfaction ratings and correlations.

Group	Component of PDS	Mean	Correlation With Overall Satisfaction
1	Order methods	4.134	.37
	Actions on complaints	4.124	.56
2	Accuracy in filling orders	4.058	.63
	Average delivery time	4.021	.59
3	Order status information	3.978	.53
4	Returns policy	3.896	.34
5	Rush services	3.856	.61
	Billing procedures	3.842	.48
	Delivery time variability	3.807	.63

All of the interpretations and implications concerning specific actions toward possible improvements in satisfaction with PDS should be considered with caution because the perceived satisfaction of the customers does not necessarily mean any change in patronage decisions (that is, either switching to or from the supplier in question or remaining with the supplier).

Importance of PDS Components

The mean importance rankings of the PDS components are summarized in Table 5.2, in descending order of importance.

Table 5.2.--Mean importance rankings of PDS components.

Order (or group)	Component	Mean
1	Accuracy in filling orders	2.267
2	Average delivery time	3.126
3	Rush services Billing procedures	3.864 3.932
4	Actions on complaints	4.576
5	Order status information	4.822
6	Delivery time variability	5.262
7	Returns policy Order methods	5.623 5.686

The most important PDS component, as perceived by the respondents, was accuracy in filling orders. This high ranking was probably a result of the qualifying statement made in the questionnaire about this component: "it means: if the ordered products are delivered with the correct specifications, and at the right time, quantity, and place besides being in usable condition." (See Appendix B for details on the questionnaire.) This statement certainly implies a more encompassing set of activities associated with the component. Moreover, it is an indication that the respondents perceived the major objective of logistics (". . . to deliver finished inventory and material

assortments, in correct quantities, when required, in usable condition, to the location where needed" [Bowersox, 1978, p. 4]) as the most important component of PDS. Also, accuracy in filling orders had the highest correlation with satisfaction with PDS (see Table 5.1). This evidence, coupled with the highest ranking of importance of this component, should constitute a strong argument for possible improvements in the performance level of accuracy in filling orders so as to provide an increase in the satisfaction with PDS and possibly to affect positively patronage decisions. Again, these improvements should be subordinate to forecasted cost and revenue outcomes.

Contrary to the theoretical standpoint and to some simulation studies (see Chapter III, section on Research in the Area of PDS), average delivery time was perceived as more important than delivery time variability. This confirms the findings of Ballou (1973)--that buyers apparently cannot discriminate the effects of variability from the average order cycle time. However, respondents from larger companies (measured in either sales volume or number of employees) considered delivery time variability more important than average delivery time. An explanation for this finding seems to be twofold: Larger companies have less flexibility in their operations, and they are more inclined to use sophisticated managerial techniques than smaller companies. A managerial implication of this finding is that suppliers can augment their service offerings, with respect to delivery time variability, according to the size of their customers. Moreover, delivery time variability also had the highest correlation with satisfaction with PDS (see Table 5.1). However, the importance ranking of

this component was very low, which might jeopardize any action toward improving overall satisfaction with PDS.

Since the larger the respondent's company (either in terms of sales volume or number of employees) the higher the importance of delivery time variability, rush services, and accuracy in filling orders; and the lower the importance of billing procedures, suppliers can segment their service offerings according to the size of their customers.

Factors Affecting the Patronage Decision

Following is a list of conclusions and implications in this area:

1. Product quality was regarded as the most important factor in selecting suppliers. Price was second and PDS third.

2. Respondents who used manufacturers as their major suppliers of the chosen product ranked both product quality and PDS higher in importance among factors in selecting suppliers than did respondents who used middlemen. Explanations of these findings rest in the manufacturers' possibilities of affecting the quality of their product offerings and in the possibility of suppliers obtaining higher levels of services from manufacturers, when demanded, than from middlemen. However, customers might expect higher performance levels from manufacturers than from middlemen in terms of both product quality and PDS.

3. With respect to price, the pattern was the opposite; that is, respondents with middlemen as suppliers ranked price higher than did respondents who used manufacturers. It seems that manufacturers

are more restrictive in their price policies (usually they are larger
companies and not always located close to their customers) than are
middlemen. If customers can bargain for lower prices, they certainly
consider price as an important factor in their purchasing decisions.

3. Respondents from larger companies regarded PDS as more
important in their patronage decisions than did those from smaller
companies. Therefore, suppliers should be more concerned with their
service offerings when dealing with larger companies. Also, this
finding could provide a basis for segmenting service offerings by
customer size.

PDS and the Patronage Decision

The relationships involving the importance of PDS in the
patronage decision were formulated in a series of hypotheses presented
in preceding chapters. The hypothesized relationships were not found
to be significant with respect to number of deliveries, proportion of
backorders, number of alternative suppliers, or satisfaction with PDS.

The hypothesis dealing with order cycle time was confirmed.
Thus, the greater the average order cycle time, the greater the impor-
tance of PDS in selecting suppliers. According to Perreault and Russ
(1976a), "all other things being equal, longer average lead times imply
greater variability in lead times, which presumably force the purchaser
to evaluate physical distribution service more closely" (p. 6). This
explanation was not supported by the findings of this research, since
average order cycle time was considered more important than order cycle
time variability as PDS components. The hypothesis, however, in itself,

could have been derived from the findings dealing with importance of PDS components because average order cycle time was in the second highest group of rankings (see Table 5.2). The implication of the relationship between average order cycle time and importance of PDS is that longer lead times would force the customer to evaluate PDS more closely.

With respect to company size and importance of PDS in selecting suppliers, the findings were not conclusive. When company size was measured in terms of number of employees, the relationship was confirmed. Even though the degree of association was extremely low, the direction of the relationship was meaningful. Thus, the larger the company, the higher the importance of PDS in the patronage decision. However, when company size was measured in terms of sales volume, the relationship was not found to be significant. Despite these two inconclusive findings, smaller companies in both measures of size showed significantly lower importance rankings for PDS as a factor in selecting suppliers. Nevertheless, further implications concerning these findings do not seem appropriate.

Even though customers were highly satisfied with PDS, almost all of the hypothesized relationships involving PDS were not significant, and PDS was ranked third as a factor in selecting suppliers, PDS is still an important element in the interface between the company and its customers. Evidence of this was the high percentage of respondents who would switch to another supplier because of a possible stockout situation. Also, almost half of the respondents had changed suppliers in the last two years, and of those, one-quarter had done so

because of the poor service they were receiving. Therefore, PDS is indeed an important element of customer service, and both suppliers and customers should be aware that a closer monitoring of services could enhance profitability levels, either by reducing costs or by increasing revenues or both.

Comparative Analysis

In this section the major aspects of the comparative analysis of the findings of this research and those reported by Perreault and Russ (1976a) are presented and discussed.

Satisfaction With PDS and Its Components

In essence, the findings of both studies were similar in degree, leading to the conclusion that, with few exceptions, the perceptions of satisfaction with PDS and its components can be generalized for the two environments. Thus, both studies were able to identify the components of PDS whose "improvement is most likely to increase customer satisfaction" (Perreault & Russ, 1976a, p. 10). In the two studies, order cycle time was found to be a candidate for improvement, in both average delivery time and delivery time variability. In contrast, both studies found that improvements in either billing procedures or rush services would not have a significant effect on overall satisfaction with PDS.

Importance of Factors in Selecting Suppliers

In both studies the subjects were industrial purchasers, and the responses dealt with products that have wide application in

manufacturing processes. As expected, respondents in both studies regarded product quality as the most important factor in selecting suppliers. At the other extreme was reciprocity: the least important factor in both studies.

The findings with respect to price and PDS were different. In the Brazilian environment, price was more important than PDS in selecting suppliers. In the Perreault and Russ study, PDS "was second only to product quality" (1976a, p. 5). The probable reasons for this difference seem to be twofold: (1) with an economy plagued by high inflation rates, companies tend to hold inventories for speculatory purposes and as a hedge against inflation; in these circumstances, price plays an important role in the patronage decision; (2) the concept of physical distribution in Brazil is still in its embrionic stages, and many managers are only beginning to get acquainted with the idea of PDS.

Since the importance rankings of the other factors in selecting suppliers were also different, generalizations about the findings of the two studies should be restricted to product quality and reciprocity.

Relationships

Similar findings were encountered in the relationship of number of alternative suppliers and percentage of backorders with importance of PDS in selecting suppliers. Both relationships were not significant. With respect to the other relationships, the findings of the two studies were different: In the Perreault and Russ

study, number of deliveries and satisfaction with overall PDS were significantly related to the importance of PDS in selecting suppliers, whereas in this research only average order cycle time was significantly related to importance of PDS in selecting suppliers. Therefore, generalizations can be made only on the similar findings.

In conducting this study, the investigator was concerned with the applicability of the findings reported by Perreault and Russ to the Brazilian environment. With the exception of the satisfaction findings, the importance ranking of product quality and reciprocity in selecting suppliers, and the nonexistence of a relationship between number of alternative suppliers and percentage of backorders with importance of PDS in patronage decisions, the other relevant findings cannot be generalized from one environment to the other.

Suggested Areas of Further Research

Since this research was conducted in the Brazilian environment, the areas of further research were considered in that context and are summarized below:

1. Perceptions of importance of and satisfaction with PDS could be extended to different geographical areas of Brazil, to different industries, and to other product categories.

2. PDS should be examined from a supplier's point of view to determine the level of service offerings and the perceived satisfaction with and importance of PDS. Also, the various components of PDS could be identified from the supplier's perspective.

3. Since PDS involves tradeoff aspects of cost to service and cost to cost, tradeoff analyses could be used to investigate determinations of adequate levels of service.

4. Additional relationships with PDS as a factor in selecting suppliers could be examined. For example, the activities performed by the executive in charge of purchasing could affect the importance of PDS, and some environmental constraints like inflation and interest rates might influence the importance ranking of PDS and also its different components.

5. Finally, the Perreault and Russ (1976a) framework, with the additions presented in this research, can be replicated in other environments so that additional comparative analyses can be made.

APPENDICES

APPENDIX A

CUSTOMER SERVICE ELEMENTS

CUSTOMER SERVICE ELEMENTS

La Londe and Zinszer (1976, p. 281)

- Pretransaction elements

    - Written statement of policy
    - Customer receives policy statement
    - Organizational structure
    - System flexibility
    - Management services

- Transaction elements

    - Stock-out level
    - Order information
    - Elements of order cycle
    - Expedite shipments
    - Transship
    - System accuracy
    - Order convenience
    - Product substitution

- Posttransaction elements

    - Installation, warranty, alterations, repairs, parts
    - Product tracing
    - Customer claims, complaints, returns
    - Temporary replacement of product

La Londe and Zinszer (1976, p. 118)

- Product availability

- Order cycle

    - Order entry
    - Order processing
    - Order picking and shipping
    - Transit

- Distribution flexibility

    - Expedite order
    - Backorder product
    - Substitute product
    - Faster transportation
    - Other

- Distribution information

    - Inventory status
    - Order status
    - Data base and forecasting
    - Other

- Distribution malfunction

    - Administrative errors
    - Picking errors
    - Shipping errors
    - Warehouse damage
    - Company-shipping damage
    - Carrier-shipping damage
    - Other

- Postsale product support

    - Repair parts availability
    - Repair service
    - Technical advice
    - Other

- Other

Coyle and Bardy (1980, pp. 346-50)   also Gustafson and Richard (1964)

- Time

    - Order transmittal
    - Order processing
    - Order preparation
    - Order shipment

- Dependability

    - Lead time
    - Safe delivery
    - Correct orders

- Communication

- Convenience

Rose (1979, p. 285)

- Product availability

    - Products available when needed
    - Order completeness
    - Order accuracy

- Order cycle

    - Order processing procedures and time
    - Order shipments
    - Order transit times

- Information services

    - Inventory reporting
    - Order status
    - Data base exchange

- Order and shipment flexibility

    - Expedited shipments
    - Product substitution
    - Backorder procedures
    - Alternative transportation service

- Order and damage adjustments

    - Adjusting order errors
    - Correcting shipping errors
    - Replacing damaged merchandise

- Product parts and services

    - Availability of repair parts
    - Availability of repair service
    - Technical assistance

Bowersox (1978, p. 265)

- Capability--order cycle

- Availability--inventory levels

- Quality

Christopher and Walters (1977, p. 56)

- Availability

- Delivery

- Delivery reliability

- Order processing and progressing

- Picking errors

- Back order procedures

- Returned goods

Christopher (1971, pp. 83-87)

- Order cycle length
    - Order transmission
    - Order preparation
    - Transport

- Consistency of order cycle length

- Meeting customer requirements

NCPDM--A. T. Kearney (1978, pp. 188-89)

- Order processing
    - Order entry/editing
    - Order scheduling
    - Preparation of order/shipper sets
    - Invoicing

- Customer communications
    - Order modification
    - Order status inquiries
    - Tracing and expediting
    - Error correction
    - Production information requests

- Inventory availability and order fill levels

- Order cycle times

- On-time delivery

- Packaging and special handling requirements

- Accuracy in all aspects of each customer transaction

Perreault and Russ (1976a, p. 8)

- Billing procedures
- Average delivery time
- Delivery time variability
- Rush service
- Returns policy
- Order status information
- Accuracy in filling orders

- Action on complaints
- Order methods

Perreault and Russ (1974, p. 40)
- Order processing time
- Order assembly time
- Inventory reliability
- Order size constraints
- Ordering convenience
- Delivery time
- Consistency
- Invoice format
- Claims procedure
- Inventory backup
- Condition of goods
- Salesmen's visits
- Billing procedures
- Order status information
- Consolidation allowed

Anderson, Jerman, and Constantin (1978, p. 21)
- Order cycle time
    - Transmit the order
    - Process the order
    - Ship the material
- Reliability
- Damage level
- Back orders
- Information systems

Stephenson and Willett (1968, p. 78)
- Order cycle length
- Consistency of order cycle length
- Order preparation
- Order accuracy
- Order condition

- Order size
- Order frequency
- Billing accuracy
- Billing efficiency
- Back orders
- Claims

Hutchinson and Stolle (1968, p. 88)
- Order processing time
- Order assembly time
- Delivery time
- Inventory reliability
- Order-size constraint
- Consolidation allowed
- Consistency

APPENDIX B

QUESTIONNAIRE

SERVIÇO PÚBLICO FEDERAL

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO

Prezado Senhor:

O Programa de Pós-Graduação em Administração da Universidade Federal do Rio Grande do Sul está iniciando uma pesquisa que tem como objetivo principal levantar dados acerca da importância da prestação de serviços, pelos fornecedores, como elemento influenciador na obtenção da demanda.

Tendo em vista que não haveria condições para serem pesquisadas todas as empresas (custo e tempo) foram selecionadas, por amostragem, um certo número de empresas para participarem deste estudo. Sua empresa foi uma das escolhidas para colaborar nesta pesquisa. Sua colaboração, que será mantida em sigilo, será efetivada através do preenchimento do questionário anexo.

Na certeza de que você compreenderá o alcance do trabalho que pretendemos realizar e a importância destes resultados para sua própria empresa, a UFRGS espera contar com a sua participação através da devolução do questionário devidamente preenchido até o dia ...../...../81. Para facilitar seu trabalho encontra-se anexo um envelope já selado.

Os resultados desta pesquisa serão condensados e analisados em um relatório que lhe será remetido oportunamente.

Pela sua compreensão e colaboração agradecemos antecipadamente.

PROF. FERNANDO BINS LUCE

QUESTIONÁRIO

Instruções para o preenchimento do QUESTIONÁRIO.

É importante que o questionário seja respondido pela pessoa a quem foi endereçado, ou o responsável pelo setor de compras da empresa.

Neste questionário você encontrará questões referentes à situação de compra, aos serviços oferecidos por seus fornecedores, a importância de certos aspectos na escolha de fornecedores, e algumas perguntas com relação à sua atitude perante certas situações.

O questionário é de fácil preenchimento, basta seguir as instruções contidas no seu interior.

Entretanto para facilitar seu trabalho, relacionamos alguns itens, que devem ser observados:

1. Leia com atenção cada questão formulada.

2. Das alternativas fornecidas em cada questão, escolha aquela que melhor represente a sua opinião em torno do assunto.

3. Não há resposta "certa" ou "errada".

4. A fim de cumprirmos um prazo já determinado, solicitamos, dentro do possível, que o questionário seja devolvido até o dia .....

5. Após ter respondido a última questão, faça uma conferência e verifique se nenhuma deixou de ser respondida.

6. Utilize para devolução, o envelope que foi enviado em anexo. Ele já está endereçado e selado basta fechá-lo e colocá-lo no correio.

7. O produto a ser escolhido .

Abaixo estão selecionados 6 tipos de produtos, genericamente utilizados em processos produtivos . Você deve escolher aquele que for de maior importância (em volume de compras) para sua empresa.

Os tipos de produtos foram colocados em ordem, isto é, se você não utilizar na sua empresa o primeiro produto que consta na lista, passe imediatamente para o segundo, e assim por diante, até encontrar aquele que lhe for mais significante.

(1)	Elementos de fixação	(4)	Abrasivos
(2)	Rolamentos	(5)	Eletrodos
(3)	Lubrificantes	(6)	Ácidos

A pesquisa refere-se aos fornecedores, e não ao produto em si, sendo que estes foram escolhidos exclusivamente como instrumentos do "design" da pesquisa. Assim sendo é importante que você não esqueça que suas respostas deverão ser a respeito *do fornecedor mais importante* em volume de compras do produto escolhido.

1. ESCREVA NAS LINHAS PONTILHADAS ABAIXO, QUAL O PRODUTO ESCOLHIDO: ....

   ....

2. SEU FORNECEDOR MAIS IMPORTANTE DESTE PRO-DUTO É:

   ( ) Fabricante
   ( ) Revendedor
   ( ) Distribuidor
   ( ) Outro (especifique) ....

3. O NÚMERO DE FORNECEDORES UTILIZADOS ......

   ....

4. O NÚMERO DE OUTROS FORNECEDORES CONHECI-DOS (não incluindo os utilizados) ....

DADOS DE IDENTIFICAÇÃO DA EMPRESA

5. O NÚMERO DE EMPREGADOS:

   ( )   1 a 49
   ( )   50 a 99
   ( )   100 a 499
   ( )   500 a 999
   ( ) 1000 a 4999
   ( ) 5000 ou mais

6. VOLUME DE VENDAS NO ANO DE 1980 (em milhões)

   ( ) de 20 a 49
   ( ) de 50 a 99
   ( ) de 100 a 499
   ( ) de 500 a 999
   ( ) acima de 1000

7. RAMO PRINCIPAL DE ATIVIDADE ....

   ....

8. VOCÊ EXERCE SUAS FUNÇÕES EXCLUSIVAMENTE NO SETOR DE COMPRAS?

SIM ....   NÃO ....

9. CASO SUA RESPOSTA TENHA SIDO "NÃO", INDIQUE AS OUTRAS ATIVIDADES QUE VOCÊ POSSUI

DENTRO DA EMPRESA: ....

....

....

....

I — SITUAÇÃO DE COMPRA

INSTRUÇÕES: Escreva nas linhas pontilhadas.

* As questões referem-se ao *fornecedor* do produto escolhido.

* Os dados fornecidos devem ser do *último ano* (1980).

PERGUNTAS

10. O NÚMERO DE ENTREGAS EM 1980: ....

11. PERCENTAGEM DE PEDIDOS NÃO ATENDIDOS NOS PRAZOS ACORDADOS (ou seja pedidos que ficaram pendentes ou em carteira). ....

....

12. PERCENTAGEM DE PEDIDOS PENDENTES CANCELADOS PELA SUA EMPRESA. ....

13. DURAÇÃO MÉDIA DO CICLO DO PEDIDO (EM DIAS). (intervalo entre a extração ou confirmação do pedido pelo fornecedor e entrega do produto) ....

II — AVALIAÇÃO DOS SERVIÇOS DE SUPRIMENTO DO FORNECEDOR

Indicação de seu nível de satisfação com relação aos serviços oferecidos por seu fornecedor mais importante do produto escolhido.

INSTRUÇÃO: Marque um X no interior do parênteses que melhor de-
fina o seu grau de satisfação, com relação a cada per-
gunta.

	TOTALMENTE INSATISFEITO	INSATISFEITO	INDIFERENTE	SATISFEITO	TOTALMENTE SATISFEITO
14. Procedimentos de faturamento:					
15. Prazo médio de entrega:					
16. Variabilidade do prazo de entrega: (refere-se às varia- ções em torno dos prazos médios de entrega).					
17. Pedidos urgentes:					
18. Política de devolu- ções:					
19. Informações sobre o andamento do pedido:					
20. Precisão no atendi- mento do pedido: (precisão neste ca- so significa: se os produtos solicitados chegam na especifi- cação, prazo, quan- tidade e local com- binados, e em con- dições de uso).					
21. Providências toma- das pelo fornecedor em casos de recla- mação:					
23. Métodos de extra- ção de pedidos:					
23. Serviços de supri- mento do fornece- dor: (trata-se de uma avaliação a- gregada de todos os itens anteriores).					

24. ABAIXO ENCONTRAM-SE OS 9 ITENS QUE COM-
PÕE OS SERVIÇOS DE SUPRIMENTO DO FORNECE-
DOR. ESCOLHA OS 5 ITENS MAIS IMPORTANTES
NA SUA OPINIÃO, E OS ENUMERE EM ORDEM DE
IMPORTÂNCIA.

INSTRUÇÃO: Coloque os números de 1 a 5 em ordem de importân-
cia, no interior dos parênteses (observe que o número 1
deve ser o de maior importância).

( ) Procedimentos de faturamento:
( ) Prazo médio de entrega:
( ) Variabilidade no prazo de entrega:
( ) Serviços de urgência:
( ) Política de devoluções:
( ) Informações sobre o andamento do pedido:
( ) Precisão no atendimento do pedido:
( ) Providências tomadas pelo fornecedor em ca-
sos de reclamação:
( ) Métodos de extração de pedidos:

III — FATORES INFLUENCIADORES NO PRO-
CESSO DE SELEÇÃO DE FORNECEDORES
PARA O PRODUTO ESCOLHIDO.

25. INDICAÇÃO DA IMPORTÂNCIA DE CADA UM DOS
FATORES ABAIXO COMO INFLUENCIADORES NA
ESCOLHA DE FORNECEDORES.

INSTRUÇÕES: Coloque os números de 1 a 7 em ordem de importân-
cia no interior dos parêntêses, (observe que o número
1 deve ser o de maior importância).

( ) Qualidade do Produto:
( ) Serviços de Suprimento do fornecedor:
( ) Preço:
( ) Gerência do fornecedor:
( ) Localização geográfica do fornecedor:
( ) Pedido mínimo requerido:
( ) Reprocidade:

IV — ATITUDES PERANTE CERTAS SITUAÇÕES DE COMPRA:

26. APÓS TER SIDO FEITO O PEDIDO DO PRODUTO SELECIONADO, SEU FORNECEDOR NOTIFICA QUE O MESMO NÃO ESTÁ DISPONÍVEL NO MOMENTO.

QUAL A SUA ATITUDE? ....

....

....

....

....

....

27. DURANTE OS ÚLTIMOS 2 ANOS, VOCÊ TEM MUDADO DE FORNECEDORES PARA ESTE PRODUTO?

SIM ....   NÃO ....

28. CASO SUA RESPOSTA TENHA SIDO "SIM", DESCREVA O MOTIVO DA MUDANÇA: ....

....

....

....

....

29. OS FORNECEDORES DESTE PRODUTO, CONTACTAM COM VOCÊ OBJETIVANDO SABER SE OS SERVIÇOS OFERECIDOS, SÃO ADEQUADOS ÀS SUAS NECESSIDADES?

( ) Sim, mas melhoramentos não são necessários.
( ) Sim, e fizeram mudanças que melhoraram os serviços.

( ) Sim, mas os serviços não melhoraram.
( ) Não, mas gostaria que fizessem .
( ) Não, e não é necessário.

30. SE VOCÊ QUISER FAZER ALGUMA OBSERVAÇÃO, UTILIZE O ESPAÇO ABAIXO. TODAS AS SUAS OPINIÕES SERÃO APRECIADAS.

Muito obrigado.

....
....
....
....
....
....

SERVIÇO PUBLICO FEDERAL

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

PROGRAMA DE PÓS-GRADUAÇÃO EM ADMINISTRAÇÃO

Dear Sir:

The Graduate Program in Business of the Federal University of Rio Grande do Sul--UFRGS--is developing a research project with the main purpose of gathering data on the importance of services provided by suppliers as a demand obtaining factor.

Considering that it is impossible to investigate all business companies (cost and time), a certain number of firms were selected, by sampling, to participate in this study. Your firm is one of those selected to collaborate in the research. Your confidential contribution will be effective through a response to the following questionnaire.

The UFRGS hopes to have your participation and the return of this questionnaire by ...../...../81 because it is counting on your understanding of this study's importance. In order to make the response easier, you will find enclosed a pre-stamped envelope.

Research findings and conclusions will be reported to you.

Thank you for your support and collaboration.

Prof. Fernando Bins Luce

QUESTIONNAIRE

Directions for answering the questionnaire.

> It is important that this questionnaire be answered by
> the person to whom it was addressed, or by the person
> in charge of the company's purchasing.

In this questionnaire you will find questions about the purchasing situation, the services offered by suppliers, the importance of certain factors in selecting suppliers, and some items concerning your attitude in specific situations.

This questionnaire should be easy to answer; you must only follow directions within it.

However, in order to facilitate your job, we outline some general observations:

1. Read each question carefully.
2. Among the alternatives presented in each question, select the one that best represents your opinion on the subject.
3. There is no "right" or "wrong" answer.
4. To help us meet the schedule, we ask that, whenever possible, you return the questionnaire by .... (date).
5. After you finish the last question, review to see that you have not missed any one.
6. Use the return envelope enclosed. It is already addressed and stamped; you only have to seal and mail it.
7. The chosen product:

Following are six types of products, generally utilized in production processes. You must choose the most important one for your company, in terms of purchasing volume.

The types of products listed below are ranked; that is, if you do not utilize the first one on the list, proceed on to the second and so on until you find the most important to you.

(1) fasteners   (4) abrasives
(2) bearings   (5) electrodes
(3) lubricants   (6) acids

The research is on suppliers and not on the products per se, which were chosen solely as a means to achieve the research objectives. Thus, it is crucial that you do not forget that your answers refer to the most important supplier, in purchasing volume, of your selected product.

1. In the following blanks, write the chosen product: . . . .

    . . . .

2. Your most important supplier of this product is a:
    ( ) manufacturer
    ( ) wholesaler
    ( ) distributor
    ( ) other (specify): . . . .

3. The number of suppliers utilized is: . . . .

4. The number of known alternative suppliers is (do not include the
    utilized suppliers): . . . .

INFORMATION ON YOUR COMPANY

5. Number of employees:
    ( )   1 to   49
    ( )   50 to   99
    ( )   100 to   499
    ( )   500 to   999
    ( ) 1000 to 4999
    ( ) 5000 or more

6. Sales volume in 1980 (millions of cruzeiros):
    ( )   20 to   49
    ( )   50 to   99
    ( )   100 to   499
    ( )   500 to   999
    ( ) over 1000

7. Major business activity . . . .

    . . . .

8. Do you work exclusively in the purchasing department?

   Yes . . . . .   No . . . . .

9. If your answer was <u>no</u>, state which other responsibilities you have in the company: . . . .

   . . . .

   . . . .

I. THE PURCHASING SITUATION

DIRECTIONS: Write in the blanks.

              *The questions refer only to the <u>supplier</u> for the chosen product.

              *Data used must be for the <u>last year</u> (1980).

QUESTIONS:

10. The number of deliveries in 1980: . . . .

11. Percentage of orders backordered (that is, orders that could not be filled within the requested time): . . . .

    . . . .

12. Percentage of backorders canceled by your company: . . . . . .

13. Average order cycle time--in days (that is, the time span between order placement and merchandise delivery) . . . .

II. EVALUATION OF SUPPLIER'S SERVICES

Indicate your satisfaction level concerning the services provided by the most important supplier of the chosen product.

Directions: Place an X in the box that best defines your satisfaction level concerning each item.

	Totally Dissatisfied	Dissatisfied	Indifferent	Satisfied	Totally Satisfied
14. Billing procedures					
15. Average delivery time					
16. Delivery time variability (refers to the variations in average delivery time)					
17. Rush service					
18. Returns policy					
19. Order status information					
20. Accuracy in filling orders (it means: if the ordered products are delivered with the correct specifications and at the right time, quantity, and place, besides being in usable condition)					
21. Actions taken by supplier in case of complaints					
22. Order methods					
23. Suppliers distribution services (that is, an aggregated evaluation of all items above)					

24. Following there are the nine items that constitute the suppliers' physical distribution services. Among them, choose the five you find most important and rank them in order of importance.

DIRECTIONS: Choose the five most important items and rank them from 1 to 5 in order of importance (note that 1 is the most important).

( ) billing procedures
( ) average delivery time
( ) delivery time variability
( ) rush service
( ) returns policy
( ) order status information
( ) accuracy in filling orders
( ) actions taken by supplier in case of complaints
( ) order methods

III. FACTORS INFLUENCING THE PROCESS OF SUPPLIER SELECTION FOR THE CHOSEN PRODUCT

25. For each of the factors listed below, indicate the importance they have in influencing the selection of suppliers.

DIRECTIONS: Rank the following factors from 1 to 7 in order of importance (note that 1 is the most important).

( ) product quality
( ) supplier's distribution services
( ) price
( ) supplier's management
( ) supplier's location
( ) minimum required order size
( ) reciprocity

IV. ATTITUDES ON CERTAIN PURCHASING SITUATIONS

26. After you place an order for the chosen product, your supplier notifies you that it is not available at the moment.
What is your attitude? . . . .
. . . .
. . . .
. . . .
. . . .

27. During the last two years, have you changed suppliers for the chosen product?

    Yes . . . . . .   No . . . .

28. If your answer was <u>yes</u>, describe the reasons for the change:

    . . . .
    . . . .
    . . . .
    . . . .

29. Do your suppliers of the chosen product check with you to see if the services they are providing are adequate in meeting your needs?

    ( ) Yes, but there are no needed improvements.
    ( ) Yes, and they have made improvements.
    ( ) Yes, but the services did not improve.
    ( ) No, but I would like them to do so.
    ( ) No, and it is not necessary.

30. If you want to make any additional observations, please use the
    blanks below. All your comments will be appreciated.

                                                    Thank you.

    . . . .

    . . . .

    . . . .

    . . . .

    . . . .

    . . . .

APPENDIX C

LIST OF VARIABLES

LIST OF VARIABLES

SITUATIONAL VARIABLES

V15--Number of deliveries (Question 10)

V16--Percentage of backorders (Question 11)

V17--Percentage of backorders cancelled (Question 12)

V18--Average order cycle time (Question 13)

SUPPLIER VARIABLES

V2--Category of supplier (Question 2)

V3--Number of suppliers utilized (Question 3)

V4--Number of other suppliers (Question 4)

V50--Number of alternative suppliers (V3 + V4)

COMPANY VARIABLES

V5--Size by number of employees (Question 5)

V6--Size by sales volume (Question 6)

V7--Type of industry (Question 7)

SATISFACTION VARIABLES

V19--Billing procedures (Question 14)

V20--Average delivery time (Question 15)

V21--Delivery time variability (Question 16)

V22--Rush services (Question 17)

V23--Returns policy (Question 18)

V24--Order status information (Question 19)

V25--Accuracy in filling orders (Question 20)

V26--Actions on complaints (Question 21)

V27--Order methods (Question 22)

V28--Overall PDS (Question 23)

V51--Overall PDS (weighted average of satisfaction of components by their respective importance)

IMPORTANCE VARIABLES (Question 24)

V29--Billing procedures

V30--Average delivery time

V31--Delivery time variability

V32--Rush services

V33--Returns policy

V34--Order status information

V35--Accuracy in filling orders

V36--Actions on complaints

V37--Order methods

PURCHASING FACTORS VARIABLES (Question 25)

V38--Product quality

V39--Physical distribution service (PDS)

V40--Price

V41--Supplier management

V42--Geographical location of supplier

V43--Required minimum order size

V44--Reciprocity

RESPONDENT VARIABLES

 V8--Purchasing function (Question 8)

 V9 to V14--Other functions or activities (Question 9):

  V9--General management

  V10--Finance

  V11--Production

  V12--Personnel

  V13--Marketing

  V14--Materials management

PRODUCT VARIABLE

 V1--The chosen product (Question 1)

GENERAL VARIABLES

 V45--Attitudes toward possible stockout (Question 26)

 V46--Changes in suppliers (Question 27)

 V52 to V55--Reasons for changing suppliers (Question 28):

  V52--Price

  V53--Product quality

  V54--PDS

  V55--Other

 V48--Feedback on services (Question 29)

 V49--Comments (Question 30)

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