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AN EMPIRICAL STUDY OF BUYER/SELLER RELATIONSHIPS IN U.S. MANUFACTURING FIRMS

By

Robert Landeros

A DISSERTATION

Submitted to
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ABSTRACT

AN EMPIRICAL STUDY OF BUYER/SELLER RELATIONSHIPS IN U.S. MANUFACTURING FIRMS

By

Robert Landeros

Previous buyer/seller relationship research has either attempted to assist selling firms to develop better marketing strategies, or has described the effect of *Just-In-Time* buyer/seller relationships on the purchasing activity. The research of this dissertation departs from these two previous perspectives. Specifically, it examines the influence of certain factors when choosing different buyer/seller relationships and the importance of certain source selection criteria when evaluating a potential supplier for the two different buyer/seller relationships.

The research used data from 680 completed questionnaires to test, statistically, hypotheses concerning the choice of a buyer/seller relationship and the evaluation of a potential supplier for one of two types of buyer/seller relationships. Upon further examination of the data, an assessment was made on the interrelationship of the influencing factors and two buyer/seller relationships, and the importance of various source selection criteria for two buyer/seller relationships. The assessment concluded that the choice of a buyer/seller relationship was influenced differently by the purchase requirement, the purchasing objectives of the buying firm, the characteristics of the possible suppliers, and the characteristics of the supply market. The assessment also concluded that source selection criteria varied in their importance when a potential supplier was evaluated for different buyer/seller relationships.

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Look at all my trails and tribulations,
Sinking in a gentle pool of wine.
Don't disturb me now I can see the answer,
'Till this evening is this morning life is fine . . .

Tim Rice, 1970

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I am grateful to my colleagues at Arizona State University for their unselfish support by providing me with the time to finish this research. Now I will start serving on committees and relieve some of you of your extra duties. Also I want to thank Vicki and Dwight for inspiring me to work diligently on my dissertation so we may begin joint research projects which up to this time we have only talked about.

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CHAPTER I

INTRODUCTION

Virtually all research concerning the relationships between manufacturing firms, buying from and selling to each other, has been conducted using two different perspectives. The first is an industrial marketing perspective which emphasizes the development of effective marketing strategies for differently defined buyer/seller relationships.[1] The second is a purchasing management perspective which describes the changes to the "purchasing process" caused by buyer/seller relationships in *just-in-time* environments.[2] However, prevailing research has not addressed two decision junctures associated with buyer/seller relationships: (1) whether differences exist between the influence of possible factors on the choice of a buyer/seller relationship; and (2) whether differences exist between the importance of various source selection criteria during the evaluation of a potential supplier for different types of buyer/seller relationships.

These two decision junctures associated with buyer/seller relationships are addressed by this dissertation. However, to address these two decision junctures, the

---

[1]H. Håkanson, J. Johanson and B. Wootz, "Influence Tactics in Buyer-Seller Processes," Industrial Marketing Management, December 1979, pp. 319-332.; also see F.S. DeBruicker and G.L. Summe, "Make Sure Your Customers Keep Coming Back," Harvard Business Review, January-February 1985, pp. 92-98.; also see D. Ford, "Buyer/Seller Relationships in International Markets, Industrial Marketing Management, May 1984, pp. 101-112.; also see C.M. Watson, "Balancing Dominance: Diagnosing the Buyer-Seller Relationship," Business Horizons, September-October 1984, pp. 62-65.

[2]G.H. Manoochehri, "Suppliers and the Just-In-Time Concept," Journal of Purchasing and Materials Management, Winter 1984, pp. 16-21.; also see R.J. Schonberger and A. Ansari, "Just-In-Time Purchasing Can Improve Quality," Journal of Purchasing and Materials Management, Spring 1984, pp. 2-7.; also see R.J. Schonberger and J.P Gilbert, "Just-In-Time Purchasing: A Challenge for U.S. Industry," California Management Review, Fall 1983, pp. 54-68.

research of this dissertation first developed three descriptive models for distinguishing between buyer/seller relationships. Next, two sets of hypotheses were tested. The first set of hypotheses tested for differences between the influence of certain factors on the choice of a buyer/seller relationship. The second set of hypotheses tested for differences between the importance of certain source selection criteria when evaluating a potential supplier for different buyer/seller relationships.

This chapter presents the development of buyer/seller relationship models. First, it explains the importance of having models which distinguish between different buyer/seller relationships. Second, it presents the theoretical underpinning for the models as well as the descriptive models themselves. Third, it states the research directions leading from these models, and the specific research questions addressed by the empirical research of this dissertation. Finally, this chapter describes the limitations of the empirical research and presents an overview of the following chapters.

IMPORTANCE OF BUYER/SELLER RELATIONSHIP MODELS

Models for distinguishing different buyer/seller relationships are important for two reasons. First, several recent practitioner publications have reported that U.S. manufacturing firms are changing the type of relationship they have with their suppliers.[3] Future research cannot begin to investigate and analyze fully the motivation behind

---

[3]L. Adkins and W. Diller, "Industry's Quiet Revolution," Dun's Business Month, June 1983, pp. 72-75.; J. Bohn, "Supplier Relationships Changing," Business Marketing, December 1983, p. 9.; P.B. Crosby, "Supplier Audits Shouldn't Be Used as Material Inspection Parties," Purchasing, June 7, 1984, p. 100A27.; S. Dowst, "Just-In-Time Isn't Just Inventory Reduction," Purchasing, December 19, 1985, p. 27.; T. Drozowski, "At GM, They've Got Young Car Buyers in Mind," Purchasing, November 7, 1985, pp. 67-71.; T. Drozowski, "Purchasing AT GM Restyles For The 90's," Purchasing, October 24, 1985, pp. 56-60.; E. Raia, "Survival: Your Supplier Gives You More Than An Outside Chance," Purchasing, December 5, 1985, p. 45.; G.S. Ruderman, "Motorola's Working Hard At Making Its Leverage Pay," Purchasing, June 7, 1984, pp. 100A18-100A21.; J.F. Russell, "Small Staff Brings Lots of Savvy to Electronics Buying," Purchasing, November 7, 1985, pp. 74A12-74A17.; A.J. Roger, "How Miller Electric Buys Metals," Purchasing, July 25, 1985, pp. 51- 53.; T.Stundza, "Now's the Time to Shed the 'We Buy, You Supply' Attitude," Purchasing, May 24, 1984, p. 34.; T.R. Temin, "Purchasing at AT&T Technologies: Getting Ready for What's Ahead," Purchasing, May 10, 1984, pp. 82-89.

these changes without models which illustrate the various types of buyer/seller relationships manufacturing firms may use.

Second, the purchasing activity accounts for a majority of most U.S. manufacturing firms' expenditures. Data collected by the U.S. Bureau of the Census show that, on average, U.S. manufacturing firms use 57.1 percent of their sales dollars for purchases; if expenditures for capital equipment are included, the proportion goes up to 60.5 percent.[4] This is about one-and-a-half times the remaining 39.5 percent available to pay salaries, wages, other operating expenses, taxes, interest and dividends. As U.S. manufacturing firms strive to become more efficient, it seems likely that they will increase their purchases from specialized suppliers,[5] and so the proportion of purchases to sales dollars may further increase.[6] Since the purchasing activity is a major component of U.S. manufacturing firms, research into the purchasing process requires models which include the type of relationships a firm may have with its suppliers, and thus provide a more complete representation of the purchasing process.

The theoretical research in this dissertation led to the development of three descriptive models for distinguishing between different buyer/seller relationships. The following section describes the background for developing these models as well as the descriptive models themselves.

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[4]U.S. Department of Commerce, Bureau of the Census, 1984 Annual Survey of Manufacturers: Statistics for Industry Groups and Industries, (Washington: Government Printing Office, July 1986), p. 4.

[5]D.N. Burt and W.R. Soukup, "Purchasing's Role in New Product Development," Harvard Business Review, September-October 1985, pp. 95-97.

[6]M.R. Leenders, H.E. Fearon and W.B. England, Purchasing and Materials Management (Homewood, Illinois: Richard D. Irwin, Inc., 1985), p. 8.

BUYER/SELLER RELATIONSHIP MODELS

U.S. manufacturing firms have traditionally restricted their buyer/seller relationships to the extreme options of open market bargaining and backward integration.[7] Open market bargaining prevents a buying firm from becoming too dependent on a single supplier by allowing it to select a supplier from a wide supply pool. This enables a buying firm to play one supplier off against another. Open market bargaining also provides firms with maximum control over the buyer/seller relationship as it allows the buying and selling firms to stipulate contingencies associated with purchases on separate contractual agreements. These agreements are often re-written at each contract interval with short-term forecasts of the immediate future as their primary concern.[8] In open market bargaining, buying and selling firms are separate and independent enterprises. The buying and selling firms do not exchange information about their activities nor cope collectively with changes in their operating environments.

Glassman described similar relationships between living systems and concluded that "the prominent overall feature is their independence of momentary environmental change, which they achieve by virtue of their self-adjusting properties."[9] Glassman identified this relationship as "loose coupling" among systems which is similar to Ashby's concept of "independence in systems."[10] Extending Glassman and Ashby's concepts to the purchasing behavior of a manufacturing firm buying goods and services in an open market bargaining situation, the following descriptive model of a "loosely coupled buyer/seller relationship" was developed:

---

[7]R.H. Hayes and S.C. Wheelwright, Restoring Our Competitive Edge: Competing Through Manufacturing (New York: John Wiley and Sons, 1984), p. 297.

[8]O.E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: The Free Press, 1975), p. 94.

[9]R.B. Glassman, "Persistence and Loose Coupling in Living Systems," Behavioral Science, March 1973, p. 84.

[10]W.R. Ashby, Design For A Brain (New York: John Wiley and Sons, Inc.: 1960), pp. 158-170.

- Acquires goods and services in a competitive environment where many suppliers are available.
- Plays one supplier off against another for the buying firm's benefits.
- Resolves disputes through unyielding negotiations.
- Exchanges only limited information with the supplier.
- Adjusts separately to operating and marketplace conditions.

A manufacturing firm may also furnish its own raw materials and components through backward integration. Ashby viewed this type of relationship as a "fully joined system" where a perturbation of any of the operating variables would require adjustment of all of the other variables in the system.[11] Backward integration is a strategic move to reduce costs or protect the manufacturing firm from supplier exploitation.[12] Each dependent intermediate production activity can provide information about price and material availability to the other production activities.[13] The accessibility of such information allows the firm to adjust all of its other activities through integrated decisions on firm-wide production levels and capital investments. However, uncertainty about final demand may lead to a perturbation of the entire system through expensive idle capacity of the integrated firm.[14]

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[11]Ashby, op. cit., pp. 148-157.

[12]M.E. Porter, Competitive Strategy (New York: The Free Press, 1980), pp. 122-123; see also A.A. Meitz and B.B. Castleman, "How to Cope with Supply Shortages," Harvard Business Review, January-February 1975, p. 96; see also Hayes and Wheelwright, op. cit., p. 275.

[13]K.J. Arrow, "Vertical Integration and Communication," Bell Journal of Economics, Spring 1975 pp. 173-174; see also D.W. Carlton, "Market Behavior with Demand Uncertainty and Price Inflexibility," American Economic Review, September 1978, pp. 582-585; see also D.W. Carlton, "Uncertainty, Production Lags, and Prices, American Economic Review, February 1977, p. 248.

[14]Arrow, op. cit., pp. 173-174.

Extending Ashby's concept of a "fully joined system"[15] to the purchasing behavior of an integrated manufacturing firm, the following descriptive model of a "fully coupled buyer/seller relationship" was developed:

- Acquires goods and services from an internally integrated source of supply.
- Manages the source of supply for the benefit of the total firm.
- Resolves disputes through managerial tradeoffs.
- Exchanges mutual information with the source of supply.
- Adjusts concurrently to operating and marketplace conditions.

A manufacturing firm may also acquire raw materials and components by limiting its supply base to one or a few preferred suppliers and allowing them access to its operating system. A similar situation is present in living systems when two independent systems allow each other access to certain variables in the other's system.[16] This type of buyer/seller relationship lies between loosely coupled and fully coupled buyer/seller relationships. On the one hand, it is similar to a fully coupled buyer/seller relationship since both encourage the acquiring firm and the source of supply to behave cooperatively when unforeseen contingencies develop, with a joint-profit maximization emphasis.[17] On the other hand, the buying firm does not own the production activities as is also the case in a loosely coupled buyer/seller relationship.

This intermediate type of buyer/seller relationship is being used by U.S. manufacturing firms to improve their supplier's productivity as well as their own, and to reduce their response time to market demands.[18] For example, by initiating this type of

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[15]Ashby, op. cit., p. 148.

[16]Glassman, op. cit., pp. 89-91.

[17]Williamson, op. cit, p. 91.

[18]J. Bohn, "Supplier Relationships Changing," Business Marketing, December 1983, p. 9; see also T. Drozowski, "At GM, They've Got Young Car Buyers in Mind," Purchasing, November 7, 1985, pp. 67-71; see also T. Drozowski, "Purchasing At GM Restyles For The 90's," Purchasing, October 24, 1985, pp. 56-60.

buyer/seller relationship, Ford Motor Company was able to help a supplier reduce its rejection rate of purchased relays from 40 percent to less than one percent within eight months. This raised production from 3,000 relays per line per shift to as much as 6,000 and cut the supplier's manufacturing costs by 20 percent.[19] In another example, Xerox Corporation was able to reduce its copier costs by 10 percent every year from 1980 to 1985 by working with its suppliers.[20]

However, this type of buyer/seller relationship usually loses flexibility because there is an increased dependence on a preferred supply or customer pool. A preferred supply pool does not allow the buying firm to maximize its objectives by playing one supplier off against another. Therefore, to stay viable, both separately and jointly, the buying and selling firms must cope collectively with environmental changes, and provide information on their activities which may impinge on or affect the other's operating system.[21]

The third model of purchasing behavior is based on Glassman's concept, Pfeffer and Salancik's concepts, and the intermediate buyer/seller relationship discussed above. This third model is identified as a "tightly coupled buyer/seller relationship," and differs from the other two models as follows:

- Acquires goods and services from one or a few preferred suppliers.
- Works with suppliers to improve productivity and to lower overall costs.
- Resolves disputes through joint problem solving efforts.
- Exchanges reciprocal operating information with the suppliers.
- Adjusts jointly to operating and marketplace conditions.

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[19]L. Adkins and W. Diller, "Industry's Quiet Revolution," Dun's Business Month, June 1983, pp. 72-75.

[20]E. Raia, "Survival: Your Supplier Gives You More Than An Outside Chance," Purchasing, December 5, 1985, p. 45.

[21]J. Pfeffer and G.R. Salancik, The External Control of Organizations: A Resource Dependence Perspective (New York: Harper and Row Publishers, 1978), p. 145.

The characteristics of loosely coupled, tightly coupled and fully coupled buyer/seller relationships are summarized in Figure I-1. The factors influencing the choice of loosely coupled and tightly coupled buyer/seller relationships, and the importance of certain source selection criteria when evaluating a potential supplier for these two buyer/seller relationships was assessed during the empirical research effort of this dissertation. Fully coupled buyer/seller relationships were not considered during the empirical research of this dissertation since independent buying and selling firms are not present.

FIGURE I-1
CHARACTERISTICS OF BUYER/SELLER RELATIONSHIPS

	Loosely Coupled Buyer/Seller Relationship	Tightly Coupled Buyer/Seller Relationship	Fully Coupled Buyer/Seller Relationship
Supply Pool Size	Many Suppliers In a Competitive Environment	One or a Few Preferred Suppliers	Internally Integrated Supplier
Commitment	Weak	Stronger	Strongest
Dispute Resolution	Unyielding Negotiations	Joint Problem Solving	Managerial Tradeoffs
Exchange of Information	Minimal	Greater	Greatest
Marketplace Adjustment	Separate	Joint	Concurrent

RESEARCH DIRECTION

The three models offered in this chapter are descriptive and simple. Nevertheless, these models provided direction to the current research effort of investigating the decisions facing manufacturing firms when choosing buyer/seller relationships, and when evaluating a potential supplier for different buyer/seller relationships. Furthermore, the models should facilitate future investigation into:

1. Recognizing the factors involved in the choice of a buyer/seller relationship, and which variables can be controlled to affect performance of the buying and selling firms,
2. Recognizing relevant costs and their magnitude, and
3. Identifying the relationship between costs and decision variables, and recognizing the important tradeoffs among costs.

Specifically, the empirical research studied two decision junctures associated with buyer/seller relationships. The first decision juncture is the choice to use either a loosely coupled or tightly coupled buyer/seller relationship. The second decision juncture is the evaluation of a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relationship. Therefore, the following two research questions were asked:

1. What factors influence the choice to use either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?
2. What source selection are important when evaluating a potential supplier for either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

As described earlier in this chapter, a "Loosely Coupled Buyer/Seller Relationship" is synonymous with open marketing bargaining, and a "Fully Coupled Buyer/Seller Relationship" is equivalent to an integrated firm. A "Tightly Coupled Buyer/Seller Relationship" lies somewhere between the other two buyer/seller relationships. It achieves some of the benefits of a fully coupled buyer/seller relationship while main-

taining separate and independent enterprises as with a loosely coupled buyer/seller relationship.

EMPIRICAL RESEARCH LIMITATIONS

The empirical research conducted for this dissertation has certain limitations. This section will state these limitations, so that the reader may consider them while reading this dissertation.

Since a questionnaire method was used to gather data regarding the two decision junctures associated with a buyer/seller relationship, the questionnaire is limited to those measures which were identified during its development. To mitigate this limitation, the measures were assessed for their relevance and validity during discussions with a number of purchasing professionals. A description of this procedure can be found in Chapter IV in the section entitled "Measures" (pp. 51-56).

The questionnaire used for this research was lengthy, and required roughly 45 to 60 minutes to complete it, and approximately 7 percent of the sample provided usable data. Chapter IV (pp. 47-51) shows that this response rate provides a 96.24 percent level of confidence. Even though the empirical study was based on a random sample of purchasers employed in U.S. manufacturing firms, generalizations in this dissertation will only refer to the purchasers who responded to the questionnaire. Also, generalizations cannot be made for any specific industry since the industry data did not have a homogeneous variance.

An important parametric assumption is that the scores are independent; that is, the score of any one dependent variable does not in any way affect the score of any other dependent variable. The questionnaire was designed to gather data on the influence of 39 factors on the choice of a buyer/seller relationship, and the importance of 39 source selection criteria when evaluating a potential supplier. Since the data were gathered from one questionnaire this assumption may have been violated. In other words, the

responses for a loosely coupled buyer/seller relationship may have affected the responses for a tightly coupled buyer/seller relationship, and *vice versa.*

Another important parametric assumption is that the data be distributed normally. Chapter V (pp. 63-65) discusses the issue of normality as it affects the analyses of the data during the empirical research. To mitigate the problem of abnormally distributed data, the empirical research set the statistical rejection level at 0.01.

The questionnaire also asked the respondents to indicate the influence of 39 factors on the choice of a loosely coupled and tightly coupled buyer/seller relationship, and the importance of 39 source selection criteria when evaluating a potential supplier for a loosely coupled and tightly coupled buyer/seller relationship. These questions assumed that the respondents did not acquire goods and/or services from "fully coupled buyer/seller relationships." In practice, U.S. manufacturing firms may obtain some goods and/or services from vertically integrated operations.

PREVIEW OF DISSERTATION

Chapter II presents a review of previous buyer/seller relationship research, relevant decision-making literature, purchasing objective literature, and source selection criteria research. A Source Selection Criteria Decision Model was developed from the reviewed literature and research. This Model served as the foundation of the Buyer/Seller Relationship Decision Model assessed during the empirical research effort of this dissertation.

Chapter III continues the review literature discussed in Chapter II as well as summarizes the interviews with purchasing executives, and the recommendations of the doctoral dissertation committee, which contributed to the development of the Buyer/Seller Relationship Decision Model. Also Chapter III sets forth the conjectures associated with the Buyer/Seller Relationship Decision Model which underpin the empirical research of this dissertation. The Buyer/Seller Relationship Decision Model

differs from the Source Selection Criteria Decision Model as it includes the concepts of loosely coupled and tightly coupled buyer/seller relationships.

Chapter IV presents the manner in which the conjectures associated with the Buyer/Seller Relationship Decision Model discussed in Chapter II were assessed for internal and external validity. Also presented are reasons for using a mail questionnaire survey design to gather empirical data, as well as the statistical considerations for the sample. The chapter goes on to explain the development of the measures used in the empirical research, and the statistical hypotheses to be tested in the research. Statistical techniques used to analyze the data are also discussed.

Chapter V presents descriptive statistics and results of hypothesis tests. The descriptive statistics were calculated for the six data sets obtained during the empirical research of this dissertation: one set of industry representation data of the responding sample, two sets of influence ratings assigned to factors when choosing a buyer/seller relationship, two sets of importance ratings assigned to source selection criteria for different buyer/seller relationships, and one set of percentages of loosely coupled and tightly coupled buyer/seller relationships in U.S. manufacturing firms. The statistics describe the normality of five data sets (excluding the data set of industry representation) and the confidence levels associated with the variables. Normality limitations, and the confidence levels identified in Chapter V, were used to guide the interpretation of subsequent analyses. Finally, this chapter presents hypothesis testing which led to the acceptance or rejection of the null hypotheses stated in Chapter IV.

Chapter VI presents the results of analyses to determine what patterns exist within four data sets obtained during the empirical research of this dissertation. First this chapter examines the significant and systematic differences between 39 factors as they (1) influence the choice of a loosely coupled buyer/seller relationship, and (2) influence the choice of a tightly coupled buyer/seller relationship. Next, the significant and systematic similarities and differences between the importance of 39 source selection criteria as they pertain to (1) the evaluation of a potential supplier for a loosely

coupled buyer/seller relationship, and (2) the evaluation of a potential supplier for a tightly coupled buyer/seller relationship are examined. Finally, a modification of the Buyer/Seller Relationship Decision Model is presented based on the research results.

Chapter VII presents a summary of this dissertation and its implications. Specifically, this chapter summarizes the findings of the empirical research and the conclusions drawn from this dissertation which assist in the understanding of buyer/seller relationships. This chapter goes on to state the implications of this dissertation to purchasing management; *viz*, the findings provide a standard which may be used by purchasing managers to judge their choice of different buyer/seller relationships, and recommendations of which source selection criteria are important when evaluating a potential supplier for different buyer/seller relationships. This chapter also states the implications of this dissertation to future purchasing research. Future buyer/seller relationship research directions are presented.

CHAPTER II

LITERATURE REVIEW[1]

This chapter presents a review of previous buyer/seller relationship research, decision-making literature, purchasing objective literature, and source selection criteria research. A Source Selection Criteria Decision Model was developed from the literature reviewed in this chapter. This model serves as the foundation for the Buyer/Seller Relationship Decision Model assessed during the empirical research effort of this dissertation.

PREVIOUS BUYER/SELLER RELATIONSHIP RESEARCH

Previous research into buyer/seller relationships has been conducted using two different perspectives. The first is an industrial marketing perspective which emphasizes the development of effective marketing strategies within different buyer/seller relationships. The second is a purchasing management perspective which describes the changes to the "purchasing process" caused by the different types of buyer/seller relationships.

For example, Håkanson, Johanson and Wootz provided a classification of buying-selling situations based on three types of uncertainty facing buying firms, (1) need uncertainty, (2) market uncertainty, and (3) transaction uncertainty.[2] The authors illustrated that, from these uncertainties, selling firms can develop effective marketing

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[1]Chapter III also continues the review of literature presented in this Chapter. However, in Chapter III the literature review is used to develop the Buyer/Seller Relationship Decision Model.

[2]H. Håkanson, J. Johanson and B. Wootz, "Influence Tactics in Buyer-Seller Processes," Industrial Marketing Management, December 1979, pp. 319-332.

strategies. In another study, DeBruicker and Summe investigated the effect of the product-life-cycle concept on buyer/seller relationships.[3] They suggested that as a buying firm changes from an "inexperienced generalist" to an "experienced specialist," the selling firm must adopt different marketing strategies to take advantage of the change. Ford emphasized the importance of buyer/seller relationships and "relationship management" in international industrial marketing.[4] He indicated that price and product quality are important elements in industrial marketing; however, a substantial amount of variation in a buying firm's perception of a supplier's technical and commercial skill is associated with the supplier's adaptability to the needs of the buying firm, the working environment, the commitment of the firms to each other, and the manner in which conflicts are resolved between them. Ford suggested that industrial marketers should include these elements, along with price and product quality, when developing a relationship with a buying firm.

Watson developed a stability matrix which can serve both buying and selling firms as a visual tool for testing assumptions about the stability of their buyer/seller relationships.[5] He suggested that the stability matrix could be used to represent the positions, moves and prospects of the buying and selling firms, and lead to better decisions by both firms.

Some research efforts have focused on Just-In-Time (JIT) manufacturing and its effect on buyer/seller relationships. Manoochehri suggested that JIT requires the development of a new relationship between the buying and selling firms as they change from a traditional competitive/cost attitude to a cooperative, "win-win" attitude.[6]

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[3]F.S. DeBruicker and G.L. Summe, "Make Sure Your Customers Keep Coming Back," Harvard Business Review, January-February 1985, pp. 92-98.

[4]D. Ford, "Buyer/Seller Relationships in International Markets, Industrial Marketing Management, May 1984, pp. 101-112.

[5]C.M. Watson, "Balancing Dominance: Diagnosing the Buyer-Seller Relationship," Business Horizons, September-October 1984, pp. 62-65.

[6]G.H. Manoochehri, "Suppliers and the Just-In-Time Concept," Journal of Purchasing and Materials Management, Winter 1984, pp. 16-21.

Schonberger and Ansari illustrated that purchasing activities in a JIT environment would result in a buyer/seller relationship which would enhance the quality of purchased items.[7] Schonberger and Gilbert were primarily interested in the quality and productivity benefits derived by cutting inventories through JIT purchasing.[8] They described characteristics of JIT purchasing, compared typical U.S. purchasing tendencies with JIT purchasing tendencies, and suggested benefits of JIT purchasing to the buying firm.

However, since recent practitioner publications[9] have reported that some U.S. manufacturing firms are moving away from what has been identified in this dissertation as *loosely coupled buyer/seller relationships* to *tightly coupled buyer/seller relationships*, this dissertation will determine what factors influence a purchasing decision-maker to choose these buyer/seller relationships, and whether a purchasing decision-maker rationally evaluates a potential supplier differently for these buyer/seller relationships.

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[7]R.J. Schonberger and A. Ansari, "Just-In-Time Purchasing Can Improve Quality," Journal of Purchasing and Materials Management, Spring 1984, pp. 2-7.

[8]R.J. Schonberger and J.P Gilbert, "Just-In-Time Purchasing: A Challenge for U.S. Industry," California Management Review, Fall 1983, pp. 54-68.

[9]L. Adkins and W. Diller, "Industry's Quiet Revolution," Dun's Business Month, June 1983, pp. 72-75.; J. Bohn, "Supplier Relationships Changing," Business Marketing, December 1983, p. 9.; P.B. Crosby, "Supplier Audits Shouldn't Be Used as Material Inspection Parties," Purchasing, June 7, 1984, p. 100A27.; S. Dowst, "Just-In-Time Isn't Just Inventory Reduction," Purchasing, December 19, 1985, p. 27.; T. Drozowski, "At GM, They've Got Young Car Buyers in Mind," Purchasing, November 7, 1985, pp. 67-71.; T. Drozowski, "Purchasing AT GM Restyles For The 90's," Purchasing, October 24, 1985, pp. 56-60.; E. Raia, "Survival: Your Supplier Gives You More Than An Outside Chance," Purchasing, December 5, 1985, p. 45.; G.S. Ruderman, "Motorola's Working Hard At Making Its Leverage Pay," Purchasing, June 7, 1984, pp. 100A18-100A21.; J.F. Russell, "Small Staff Brings Lots of Savvy to Electronics Buying," Purchasing, November 7, 1985, pp. 74A12-74A17.; A.J. Roger, "How Miller Electric Buys Metals," Purchasing, July 25, 1985, pp. 51- 53.; T.Stundza, "Now's the Time to Shed the 'We Buy, You Supply' Attitude," Purchasing, May 24, 1984, p. 34.; T.R. Temin, "Purchasing at AT&T Technologies: Getting Ready for What's Ahead," Purchasing, May 10, 1984, pp. 82-89.

PURCHASING PROCESS DECISION-MAKING

Several authors have developed conceptual models of the buying decision process in complex economic organizations.[10] These models view the buyer as a rational decision-maker and suggest that information gathering is vital to the purchasing process. Using the gathered information, a rational purchasing decision-maker selects the alternative which will maximize the amount of output for a given input. Thus, a purchasing decision-maker will choose a buyer/seller relationship which will maximize the purchasing requirement. In a similar manner, a purchasing decision-maker will evaluate suppliers and select the supplier which will also maximize the purchasing requirement.

Therefore, assuming that a purchasing decision-maker will choose a buyer/seller relationship rationally, the following choice process was adapted from Cyert, Simon and Trow[11] to illustrate this purchasing decision:

1. An individual purchasing decision-maker is confronted with a choice of buyer/seller relationships.

2. To each of these buyer/seller relationships is attached a set of consequences that will ensue when a relationship is chosen.

3. The individual purchasing decision-maker has a system of preferences or *utilities* that permit him to rank the consequences according to preference and to choose the relationship with the preferred consequences.

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[10]F.E. Webster, Jr. "Modeling the Industrial Buying Process," Journal of Marketing Research, November 1965, p. 370-376; F.E. Webster, Jr. and Y. Wind, Organization Buying Behavior (Englewood, New Jersey: Prentice-Hall, 1972), pp. 28-39; F.E. Webster, Jr. and Y. Wind, "A General Model of Organizational Buyer Behavior," Journal of Marketing April 1972, pp. 12-19.

[11]R.M. Cyert, H.A. Simon and D.D. Trow, "Observations of a Business Decision," Journal of Business October 1956, pp. 237-248.

Again, assuming that a purchasing decision-maker will evaluate a supplier rationally, the following choice process was also adapted from Cyert, Simon and Trow[12] to illustrate this purchasing decision:

1. An individual purchasing decision-maker is confronted with a choice between a number of potential suppliers.
2. To each of these potential suppliers is attached a set of consequences that will ensue when one particular supplier is chosen for a specific buyer/seller relationship.
3. The individual purchasing decision-maker has a system of preferences or *utilities* that permit him to rank the consequences according to preference and to select the supplier with the preferred consequences.

The individual purchasing decision-maker is confronted with a number of consequences during the choice of a buyer/seller relationship, and the evaluation of a supplier. The consequences of choosing a buyer/seller relationship, or selecting a particular supplier, affect the objectives established by the purchasing function. Some of the general purchasing objectives, which may be considered by the purchasing decision-maker during these two decision junctures, are as follows:

1. Ensuring adequate dependable sources of supply for materials, supplies, equipment, and designated services procured by the [purchasing] department while maintaining an optimum balance of quality, utility, and cost.
2. Maximizing purchasing strengths in the marketplace to obtain most favorable terms and conditions of purchase.
3. Contributing to maximum corporate profitability through judicious and ethical buying of raw materials, equipment, supplies, and designated services.
4. Developing and applying sound purchasing principles, practices, and techniques to the [purchasing] function.

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[12]Cyert, et. al., loc. cit., pp. 237-248.

5. Developing and maintaining a competent purchasing staff and managing company-wide procurement activities to achieve the lowest cost to adequately carry out the [purchasing] function.

6. Contributing to improved management decision making through development and maintenance of information services in the areas of (1) new items and services, (2) market demands, (3) new sources, (4) price fluctuation and trends, (5) equipment design changes, and (6) new materials and methods.

7. Promoting a positive company image among vendors and the general public.

8. Establishing and maintaining equitable and mutually profitable relationships with suppliers.

9. Cooperating with other company management to promote the best interests of the corporation.

10. Developing and implementing contractual safeguards which clearly establish responsibility for warranting of design, materials, workmanship, performance, and patents for all purchased materials, goods, and services.

11. Optimizing investment in purchased material inventories through cooperative and supportive activity with operating departments.

12. Minimizing total delivered costs through management and control of in-bound transportation, in cooperation with traffic and distribution departments.

13. Using internal sources of supply when this is to the advantage of the company.

14. Maximizing investment recovery through judicious scrap and surplus disposal.

15. Contributing to the orderly development and implementation of a materials management concept in the company.[13]

Therefore, an individual purchasing decision-maker, who is either choosing a buyer/seller relationship or evaluating a supplier, will gather appropriate information

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[13]R.M. Monczka, P.L. Carter, and J.H. Hoagland, Purchasing Performance: Measurement and Control (East Lansing, Michigan: Division of Research, Graduate School of Business Administration, 1979), pp. 41-42.

before making the decision. The information will assist the purchasing decision-maker to rank the consequences to the purchasing objectives, and then choose the buyer/seller relationship, or the supplier, with the preferred consequences. Previous research has concentrated on the criteria used to evaluate and select a supplier.

SOURCE SELECTION CRITERIA LITERATURE

An early study into source selection criteria surveyed 273 purchasing agents.[14] The purchasing agents were asked to read four source selection cases concerning the purchase of paint, desks, a computer, and art work, and place themselves in the position of the purchasing agent responsible for evaluating a supplier. Then the purchasing agents were asked to rate the importance of 23 different source selection criteria for each case. This study concluded that three factors were crucial in the evaluation of a supplier in all four cases: the ability to meet quality standards, the ability to deliver the product on time, and the supplier's performance history. However, the importance placed on the criteria varied according to the product being purchased.

In a questionnaire survey study, 216 randomly selected purchasing managers were asked to rank the influence of supplier characteristics in the purchase of semiconductors, bearings, hydrochloric acid, sulfuric acid, sheet plastic, fasteners, and machine lubricants.[15] This study found that the source selection criteria used to evaluate a supplier varied according to product type. The most important criteria were product quality, physical distribution services, price, supplier management, distance from purchaser, required order size, minority/small business, and reciprocity.

A survey of 379 purchasing managers in electric utilities and electronics manufacturing firms was used to investigate the importance placed on supplier attributes when

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[14]G.W. Dickson, "An Analysis of Vendor Selection Systems and Decisions," Journal of Purchasing February 1966, pp. 5-17.

[15]W.D. Perreault and F.A. Russ, "Physical Distribution Service in Industrial Purchase Decisions," Journal of Marketing, April 1976, pp. 3-10.

buying a modified rebuy item and a new-buy item.[16] Specifically, the purchasing managers were asked to assess the importance of supplier attributes and buyer information sources in connection with the purchase of capital equipment (a new-buy task) and component material (a modified rebuy task). This study concluded that the relative importance of the individual supplier attributes differed depending on whether the purchase item was a new-buy or a modified rebuy task. A factor analysis was then used to determine the fundamental evaluation criteria for both buying tasks. The most important source selection criteria were identified as (1) supplier stability, (2) basic economics, (3) geographic affinity, (4) attendant service, and (5) assurance mechanisms.

A survey was used to determine the importance of sixty source selection criteria when purchasing two general product categories, "standard" and "special.[17] Based on a response of 199 educational buyers, this study concluded that only eight source selection criteria were important and common to both "standard" and "special" products. Therefore, the use and importance of source selection criteria was dependent on the product type.

A survey of 220 randomly selected purchasers was used to determine the relative importance of the following five source selection criteria,[18]

1. Product performance (the extent to which the product was likely to maximize performance in its application).
2. Economic (the anticipated cost outlay associated with buying, storing, using, and maintaining the product).
3. Integrative (the willingness of the supplier to cooperate).

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[16]W.A. Dempsey, "Vendor Selection and the Buying Process," Industrial Marketing Management, 1978, pp. 257-267.

[17]C.P. Rao and G.E. Kiser, "Educational Buyers' Perception of Vendor Attributes," Journal of Purchasing and Materials Management, Winter 1980, pp. 25-30.

[18]D.R. Lehmann and J. O'Shaughnessy, "Decision Criteria Used in Buying Different Categories of Products," Journal of Purchasing and Materials Management, Spring 1982, pp. 9-14.

4. Adaptive (the ability to meet the buyer's requirements of quantity and delivery).

5. Legalistic (the constraints of government regulations, company policies and practices, etc.).

The 220 purchasers provided information on the importance of these five source selection criteria when evaluating potential suppliers of the following eight contrived product-types,

1. Standard product with a simple composition and configuration, standard application and low dollar expenditure.

2. Standard product with a complex composition and configuration, novel application and high dollar expenditure.

3. Non-standard product with a simple composition and configuration, novel application and high dollar expenditure.

4. Non-standard product with a complex composition and configuration, standard application and low dollar expenditure.

5. Standard product with a simple composition and configuration, standard application and high dollar expenditure.

6. Standard product with a complex composition and configuration, novel application and low dollar expenditure.

7. Non-standard product with a simple composition and configuration, novel application and low dollar expenditure.

8. Non-standard product with a complex composition and configuration, standard application and high dollar expenditure.

Based on the responses of the 220 purchasers, this study concluded that all five source selection criteria were used and that economic criteria and product performance were

the most important. Furthermore, this study suggested that product types influenced the source selection criteria used by the purchasers.

Buying game experiments have also been used to investigate supplier choice by industrial purchasers. In one study, a probability sample of 64 Twin Cities Purchasing Management Association members was used.[19] This study used eight contrived purchase decision cases which varied in risk by total dollar value of the requisition, the complexity of the purchased commodity, the buyer's visibility, and the consequences of choosing an unacceptable supplier. The 64 subjects were asked to read each case and to select up to five bidders from a directory of 160 possible sources. The subjects were then provided with a contrived quotation from the selected bidders. However, this experiment only considered the following six source selection criteria for evaluating the potential supplier:

1. The suppliers were either well known or unfamiliar to the buyer.
2. The suppliers had either prior relationships with the buying firm or none.
3. The suppliers stressed low price products.
4. The suppliers stressed the ability to meet product specifications.
5. The suppliers stressed prompt delivery to the buyer.
6. The directory either provided high or low amounts of information on the suppliers.

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[19]R.N. Cardozo and J.W. Cagley, "Experimental Study of Industrial Buyer Behavior," Journal of Marketing Research August 1971, pp. 329-334.

This experiment concluded that the source selection criteria used to evaluate a potential supplier were influenced by the amount and type of risk associated with the purchasing situations which were, in turn, affected by the purchase requirement.

In another buying game research project 14 industrial buyers were asked to state their decision-making procedures for a hypothetical purchasing situation.[20] The situation involved the purchase of a medium cost (approximately $5.00) rebuy electronic component. The investigators constructed deterministic models of the choice strategy used by experienced industrial buyers both in evaluating suppliers from whom to request quotations, and in deciding on a final supplier. The deterministic models were based on an elimination of "unworthy" suppliers in a non-compensatory fashion. This study concluded that the basic structure of the choice strategies may remain relatively stable for components purchases within the modified rebuy context. However, in another similar study, twelve industrial buyers were asked to determine differences in supplier evaluation for a new-buy task.[21] Each buyer was to assume that he or she was responsible for the purchase of electronic components needed in the production of a new microwave oven by a medium-size kitchen appliances manufacturer. This study found that in a new-buy task, the buyer did not have a standard priority rule for delivery, quality, or technical assistance. These studies suggested that product types, whether modified rebuy or new buy, influenced the source selection criteria used by the purchasing decision-make.

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[20]L.E. Crow, R.W. Olshavsky, and J.O Summers, "Industrial Buyers' Choice Strategies: A Protocol Analysis," Journal of Marketing Research, April 1980, pp. 34-44.

[21]L.E. Crow and J.D. Lindquist, "Buyers Differ In Evaluating Supplier," Industrial Marketing Management, 1982, pp. 205-214.

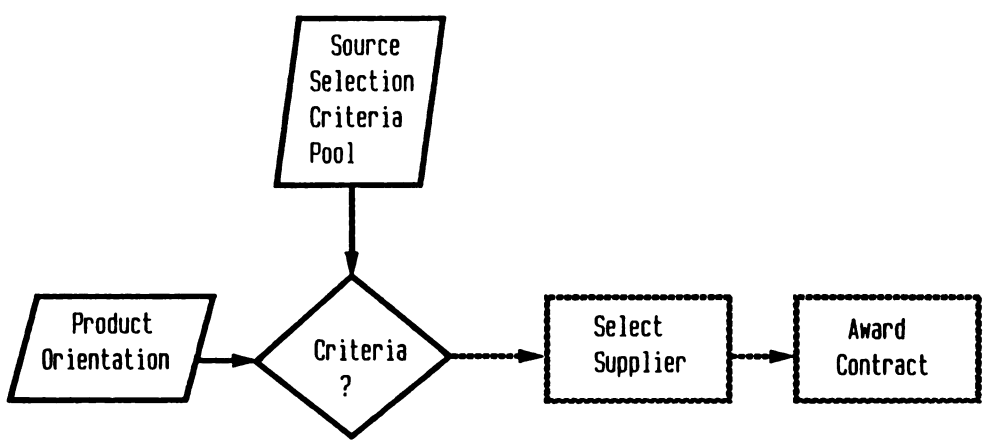
SUMMARY OF REVIEWED LITERATURE

In summary, the reviewed source selection criteria research literature suggests that purchase requirement types influence the importance assigned to source selection criteria when evaluating a potential supplier. Figure II-1 illustrates this by showing that the purchasing decision-maker will decide on a set of source selection criteria which are consistent with the purchase requirement. The source selection criteria allow the purchasing decision-maker to select a supplier with the preferred consequences for the purchase requirement.

Since past source selection criteria research has used product types as independent variables, the Source Selection Criteria Decision Model (Figure II-1) was inadequate for the empirical research of this dissertation because it does not consider the type of

FIGURE II-1

SOURCE SELECTION CRITERIA DECISION MODEL



relationship between the buying and selling firms. Nevertheless, the Source Selection Criteria Decision Model does serve as the basis for the Buyer/Seller Relationship Decision Model which underpins the empirical research.

The Buyer/Seller Relationship Decision Model is described in Chapter III. Chapter III also continues the review of literature presented in this Chapter; however, in Chapter III the literature review is used to develop the Buyer/Seller Relationship Decision Model.

CHAPTER III

BUYER/SELLER RELATIONSHIP DECISION MODEL

This chapter presents the Buyer/Seller Relationship Decision Model (Figure III-1) used in the empirical research aspect of this dissertation. The model is based on a review of practitioner literature,[1] interviews with several purchasing executives employed by two Fortune 500 electronic manufacturing firms, and recommendations of the doctoral dissertation committee. The Buyer/Seller Relationship Decision Model uses the Source Selection Criteria Decision Model (Figure II-1) which was developed from a review of source selection criteria literature in Chapter II. The Buyer/Seller Relationship Decision Model differs from the Source Selection Criteria Decision Model by its inclusion of loosely coupled and tightly coupled buyer/seller relationships.

The Buyer/Seller Relationship Decision Model (Figure III-1) consists of two sections. The first section of the model illustrates that once the purchasing decision-maker identifies the orientation of the purchase requirement, the purchasing objectives of the buying firm, the characteristics of the possible suppliers, and the characteristics of the supply market, a choice is made to use either a loosely or a tightly coupled buyer/seller relationship. The second section of the model illustrates that after choosing a buyer/seller relationship, the purchasing decision-maker will then evaluate a

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[1]P.B. Crosby, "Suppliers Audits Shouldn't Be Used as Material Inspection Parties," Purchasing, June 7, 1984, p. 100127; A.J. Roger, "How Miller Electric Buys Metals," Purchasing, July 25, 1984, pp. 51-53; G.S. Ruderman, "Motorola's Working Hard at Making Its Leverage Pay," Purchasing, June 7, 1984, pp. 100A18-100A21; T. Stundza, "Now's the Time to Shed the 'We Buy, You Supply' Attitude," Purchasing, May 24, 1985, p. 34; T.R. Temin, "Purchasing at AT&T Technologies: Getting Ready for What's Ahead," Purchasing, May 10, 1984, pp. 82-89.

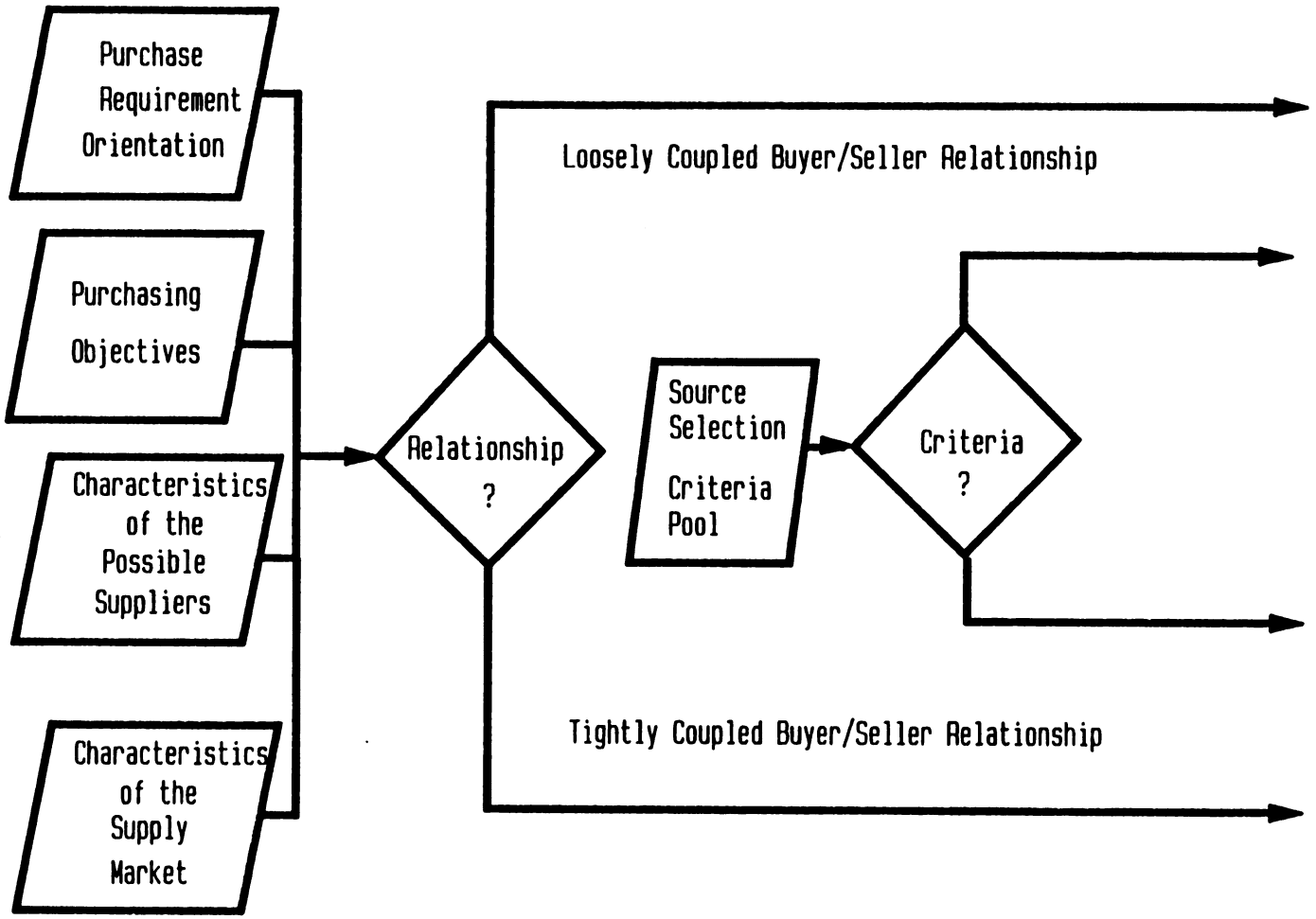


FIGURE III-1

BUYER/SELLER RELATIONSHIP DECISION MODEL

potential supplier by using the source selection criteria appropriate for either a loosely coupled or a tightly coupled buyer/seller relationship.

FACTORS INFLUENCING THE BUYER/SELLER RELATIONSHIP

Purchase requirement factors (Figure III-2) influence the choice of buyer/seller relationship in addition to determining the source selection criteria used to evaluate a potential supplier.[2] Specifically, the product type, the process technology used to produce the product, the application of the product, the length of time the purchased product is needed, and the annual dollar commitment, would all influence the choice of buyer/seller relationship. For example, the purchase requirement may be an industry standard (e.g., an off-the-shelf electronic component) or a custom-made product (e.g., a specially designed electronic component). The production process for producing the purchase requirement may be simple (e.g., commercial stainless steel, a machined part) or complex (e.g., exotic stainless steel, sub-assembly). The purchase requirement may have a non-critical application (e.g., commercial fasteners) or critical application (e.g., newly designed component). The annual dollar commitment for the purchase requirement may be high or low relative to the buying firm's dollar purchases. Also, the need for the purchase requirement may be of short or long duration.

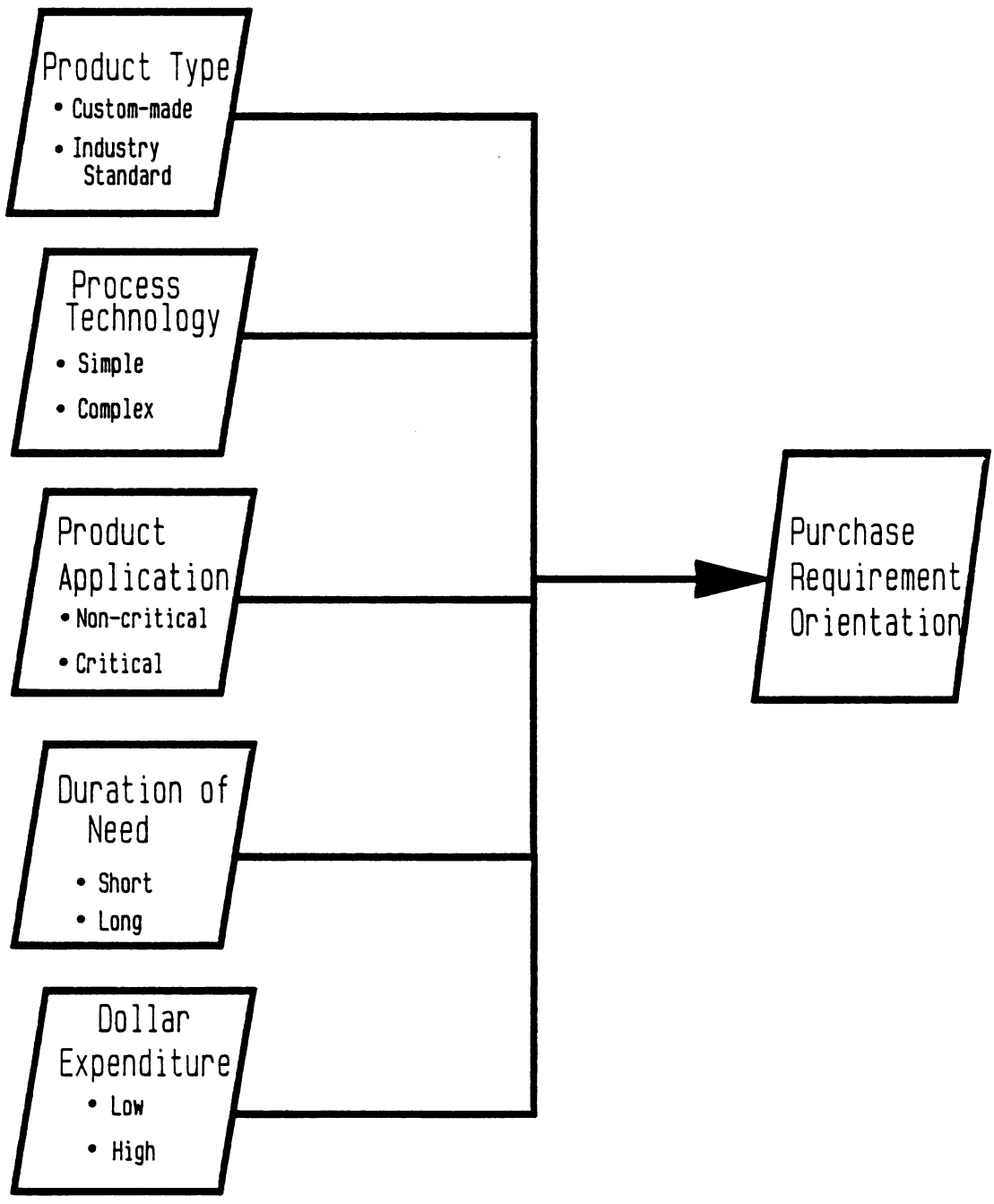
Based on the interviews, it was conjectured that a purchase requirement would favor the choice of a tightly coupled buyer/seller relationship when it is a custom-made product, manufactured by complex process technology, used for a critical application, required for a long duration, or expected to have a high annual dollar commitment relative to the firm's annual dollar purchases. The reasoning behind these conjectures was that the buying firm would need to work closely with one or a few suppliers to mitigate possible perturbation of its operating system. On the other hand, a purchase requirement which is an industry standard, manufactured by a simple production process,

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[2]The inclusion of purchase requirement factors is based on interviews with purchasing executives at two Fortune 500 manufacturing firms.

FIGURE III-2

PURCHASE REQUIREMENT ORIENTATION
INFLUENCING FACTORS



used for a non-critical application, required for a short duration, or expected to have a low annual dollar commitment relative to the firm's annual dollar purchases, would favor the choice of a loosely coupled buyer/seller relationship. The choice of a loosely coupled buyer/seller relationship was conjectured since the buying firm's operation is not apt to be adversely affected by a purchase requirement of this type. The buying firm would not need to work closely with one or a few suppliers, and it could purchase the requirement from any supplier in a wide supply pool to take advantage of a quoted lower price, better delivery, higher quality, etc.

Recommendations of the doctoral dissertation committee, and a review of practitioner literature,[3] suggested the inclusion of the purchasing objectives of the buying firm as influencing factors on the choice of buyer/seller relationship (Figure III-3). It was conjectured that if a buying firm had certain specific purchasing objectives, they would influence the choice of a tightly coupled buyer/seller relationship rather than a loosely coupled one. The empirical research of this dissertation includes the following purchasing objectives: reducing costs associated with the purchased products or items, improving quality of purchased products or items, obtaining process technology and innovations from suppliers, obtaining product technology and innovations from suppliers, reducing inventory levels of purchased products or items, and contributing to the reduction of the time interval from product design to availability of the finished goods to the final customer.

The interviews with purchasing executives also indicated that characteristics of the possible suppliers (Figure III-4) would influence the choice of either a tightly coupled or a loosely coupled buyer/seller relationship. Specifically, the interviews led to the conjectures that past experience with the possible supplier's delivery performance, the supplier's price history, the level of confidence the buying firm had in the supplier's product quality, and the production process used by a possible supplier, would also

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[3]Crosby, loc. cit.; Roger, loc. cit.; Ruderman, loc. cit.; Stundza, loc. cit.; Temin, loc. cit.

FIGURE III-3

PURCHASING OBJECTIVES OF THE BUYING FIRM
INFLUENCING FACTORS

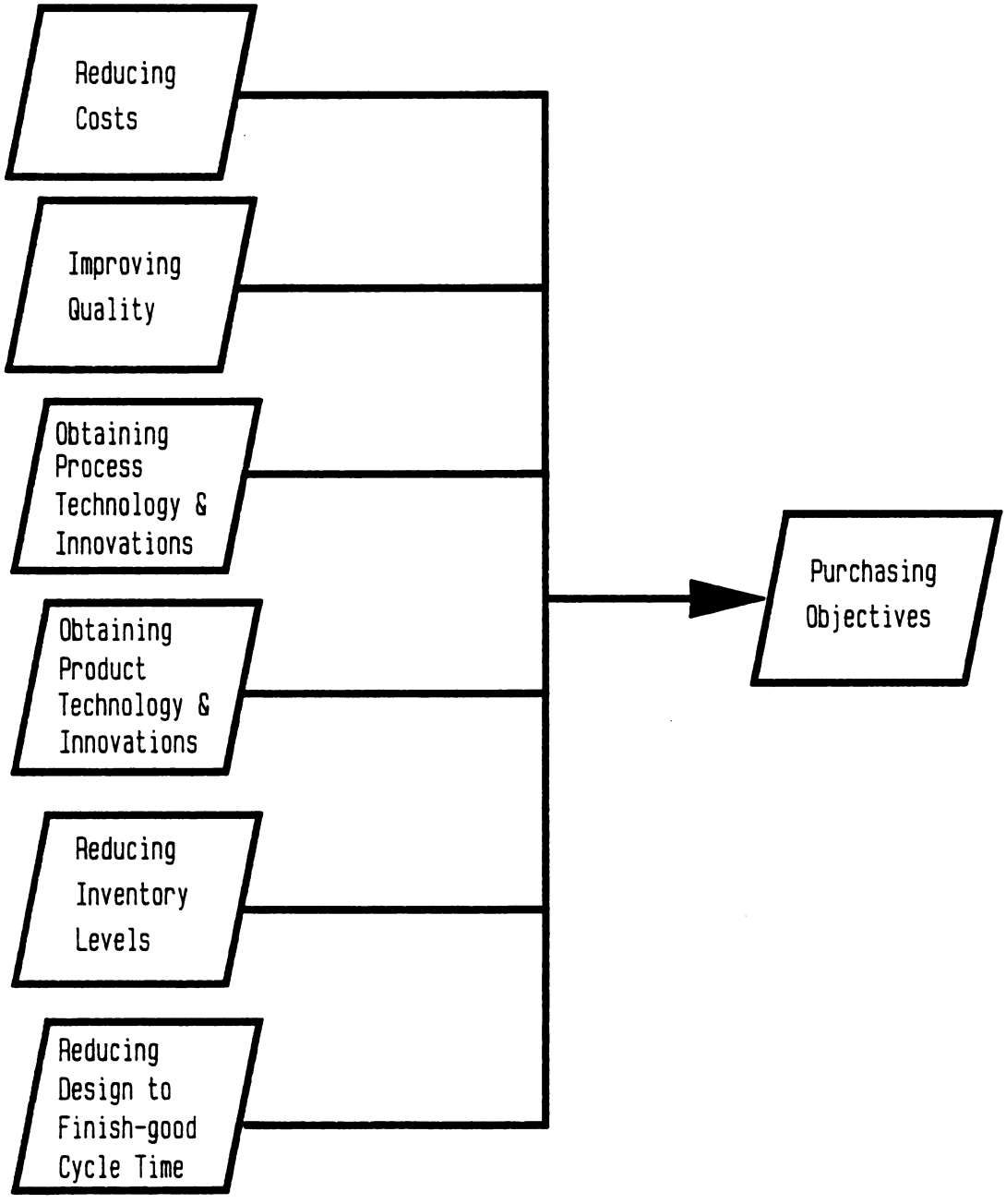
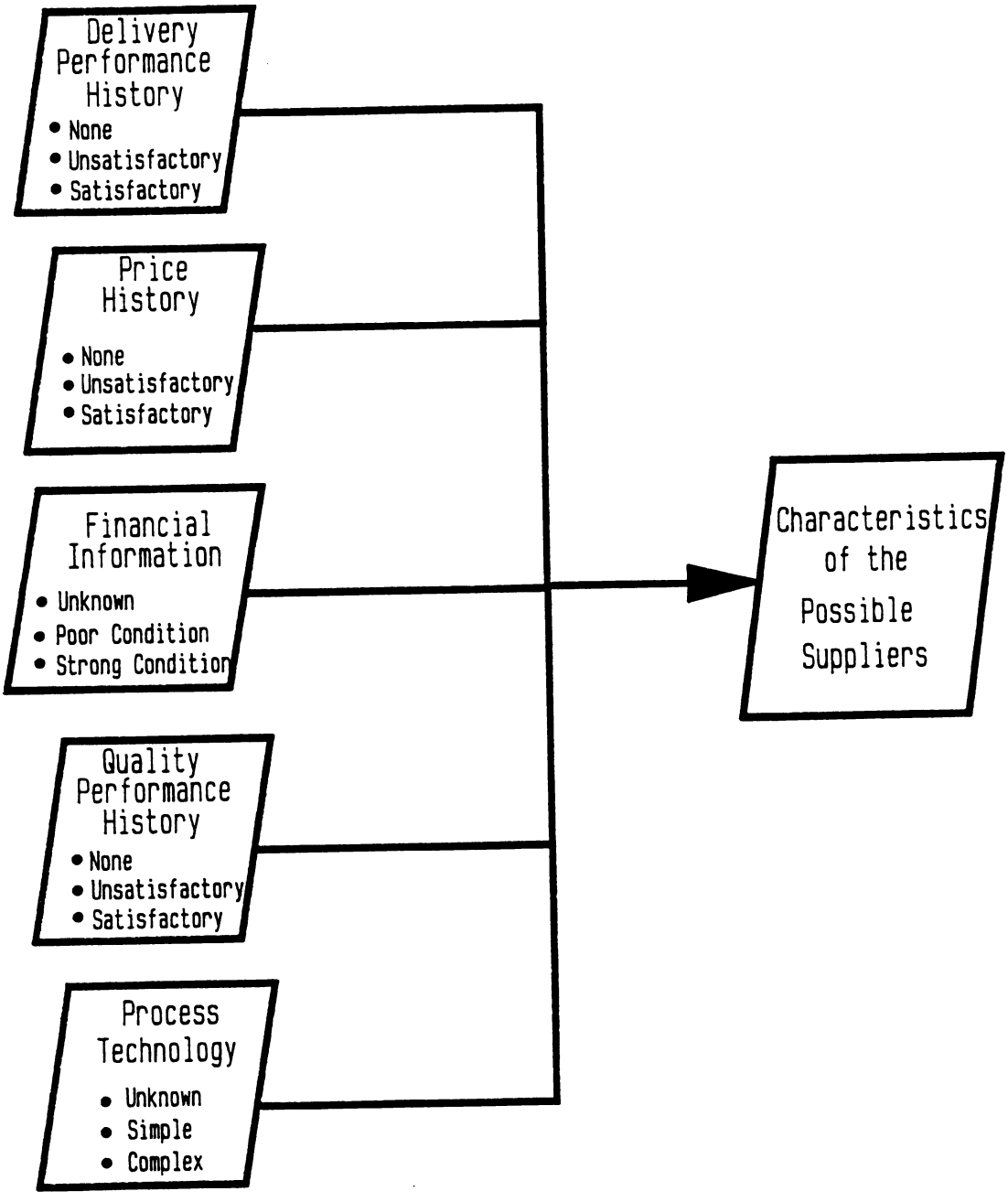


FIGURE III-4

CHARACTERISTICS OF THE POSSIBLE SUPPLIERS
INFLUENCING FACTORS

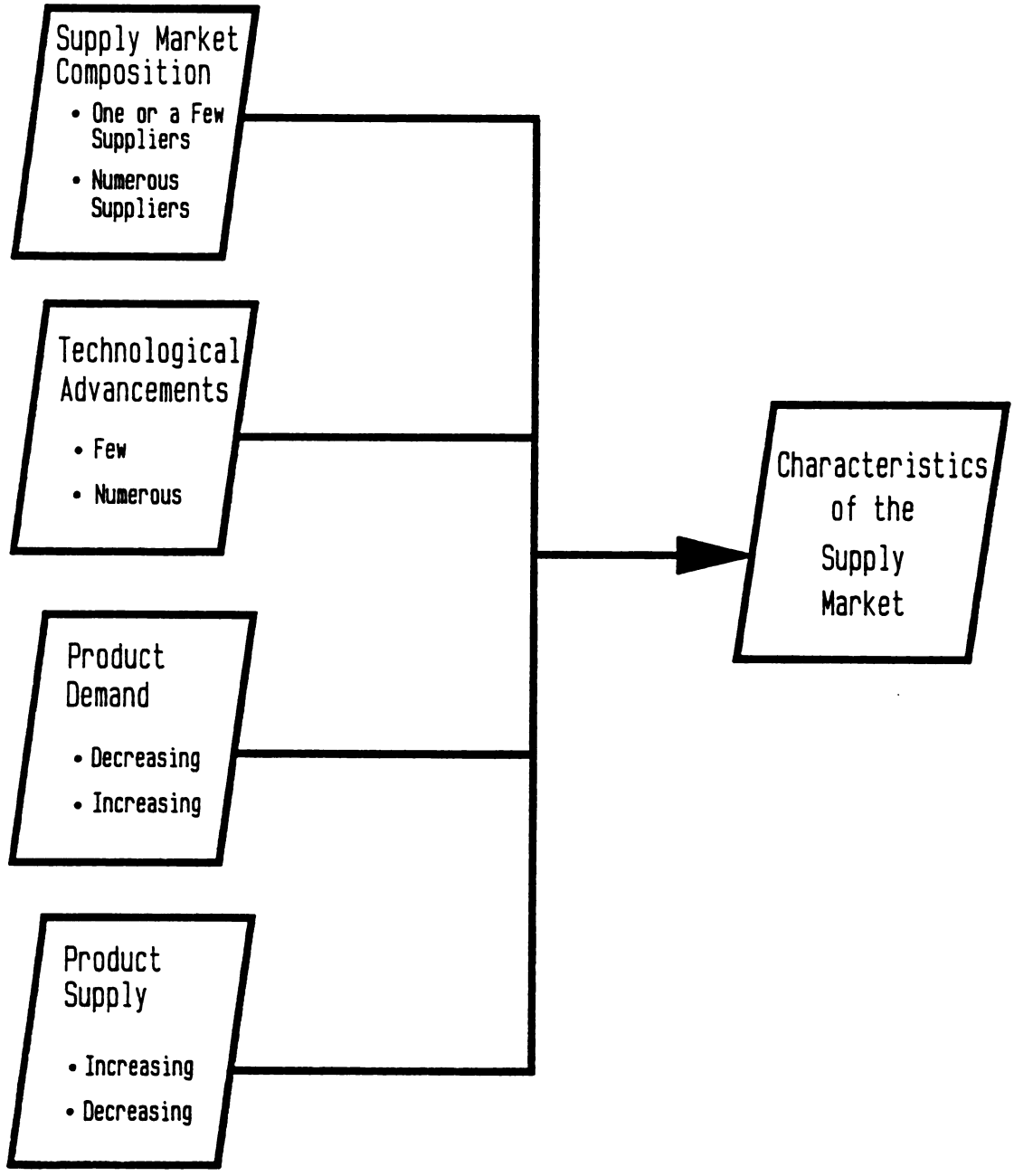


influence the choice of a buyer/seller relationship. The doctoral dissertation committee also suggested that the financial strength of the possible suppliers would also influence the choice of the buyer/seller relationship. Specifically, it was conjectured that successful past experience with the possible suppliers' delivery performance, satisfaction with their prices, confidence in their ability to produce products of high quality, their use of a complex production process, and a supplier's strong financial condition, would favor the choice of a tightly coupled buyer/seller relationship. Conversely, unsuccessful or no experience with the possible suppliers' delivery performance, unsatisfactory or no price history, little confidence in their product quality or no information on their quality performance, their use of a simple production process or no information on their production process, and no financial condition information or a supplier's weak financial condition, would favor the choice of a loosely coupled buyer/seller relationship.

Discussions with the doctoral dissertation committee also led to the inclusion of factors related to the supply market (Figure III-5). Specifically, these factors are concerned with the number of possible suppliers in the supply market, the rate of technological changes in the supply market, and the general economic condition of the supply market. It was conjectured that the existence of one or a few possible suppliers in the supply market would lead a buying firm to choose a tightly coupled buyer/seller relationship. The choice of this type of buyer/seller relationship would help insure a continuity of supply from a small supply base. However, if numerous suppliers are available, the buying firm might choose a loosely coupled buyer/seller relationship, since it would be able to play one supplier off against another to gain an advantage in the purchasing situation without sacrificing continuity of supply. It was also conjectured that numerous technological changes in the supply market would lead to the choice of a tightly coupled buyer/seller relationship since the buying firm would want to work closely with the possible suppliers to obtain technological advancements. However, few technological changes would favor the choice of a loosely coupled buyer/seller relationship since the buying firm may not rely on the accessibility of technological advance-

FIGURE III-5

CHARACTERISTICS OF THE SUPPLY MARKET
INFLUENCING FACTORS



ments. It was also conjectured that, if the demand was increasing for products available from the supply market, a tightly coupled buyer/seller relationship would be chosen. However, a loosely coupled buyer/seller relationship would be chosen if demand was decreasing. In a similar vein, it was conjectured that if the availability of products in the supply market was decreasing, a tightly coupled buyer/seller relationship would be chosen. However, a loosely coupled buyer/seller relationship would be chosen if products were becoming more available. Thus, the buying firm would be able to take advantage of supply market conditions for the given purchasing situation.

SOURCE SELECTION CRITERIA AND BUYER/SELLER RELATIONSHIPS

In the Source Selection Criteria Decision Model (Figure III-1), purchasing decision-makers use source selection criteria to evaluate potential suppliers. However, in the Buyer/Seller Relationship Decision Model, the purchasing decision-maker uses source selection criteria *appropriate* for the chosen buyer/seller relationship. This section sets forth conjectures that certain source selection criteria are more important when evaluating a potential supplier for a loosely coupled buyer/seller relationship than a tightly coupled one, and *vice versa.*

Previous research suggested that lowest price, required quality and best possible lead-time are of salient importance when evaluating a potential supplier.[4] Since U.S.

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[4]G.W. Dickson, "An Analysis of Vendor Selection Systems and Decisions," Journal of Purchasing, February 1966, pp. 5-17; R.N. Cardozo and J.W. Cagley, "Experimental Study of Industrial Buyer Behavior," Journal of Marketing Research, August 1971, pp. 329-334; W.D.Perreault and F.A. Russ, "Physical Distribution Service in Industrial Purchase Decisions," Journal of Marketing, April 1976, pp. 3-10; J.P. Kelly and J.W. Coaker, "The Importance of Price as a Choice Criterion for Industrial Purchasing Decisions," Industrial Marketing Journal, 1976, pp. 281-293; W.A. Dempsey, "Vendor Selection and the Buying Process," Industrial Marketing Management, 1978, pp. 257-267; C.P. Rao and G.E. Kiser, "Educational Buyers' Perceptions of Vendor Attributes," Journal of Purchasing and Materials Management, Winter 1980, pp. 25-30; L.E. Crow, R.W. Olshavsky and J.O. Summers, "Industrial Buyers' Choice Strategies: A Protocol Analysis," Journal of Marketing Research, April 1980, pp. 34-44; L.E. Crow and J.D. Lindquist, "Buyers Differ in Evaluating Suppliers," Industrial Marketing Management, 1982, pp. 205-214; D.R. Lehmann and J. O'Shaughnessy, "Decision Criteria Used in Buying Different Categories of Products, " Journal of Purchasing and Materials Management, Spring 1982, pp. 9-14.

firms have historically relied on loosely coupled relationships,[5] it was conjectured that these three source selection criteria would be of importance when evaluating a potential supplier for a loosely coupled buyer/seller relationship. There is no evidence, however, to suggest that a quote of the lowest price, the required quality, and the best possible lead-time will not also be important in the evaluation of a potential supplier for a tightly coupled buyer/seller relationship. Therefore, it was also conjectured that these three source selection criteria would be important when evaluating a potential supplier for a tightly coupled relationship.

Other source selection criteria concern activities of the potential supplier which may affect the buying firm. For example, a buying firm could maintain higher levels of inventories[6] to counter the effect of inconsistent quality,[7] erratic delivery performances,[8] unsuitable equipment and/or unavailable production time.[9] Alternatively, the buying firm could use certain source selection criteria to evaluate a potential tightly coupled supplier to minimize its purchased inventory levels without affecting its operations and operating capital. Therefore, it was conjectured that source selection criteria concerning activities of the potential supplier which may affect the buying firm, would be important when evaluating a potential supplier for a tightly coupled buyer/seller relationship.

The review of the previous source selection literature identified several source selection criteria which could aid a purchasing decision-maker to evaluate a potential

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[5]R.H. Hayes and S.C. WheelWright, Restoring Our Competitive Edge: Competing Through Manufacturing (New York: John Wiley and Sons, 1984), p. 297.

[6]R. Peterson and E.A. Silver, Decision Systems for Inventory Management and Production Systems (New York: John Wiley and Sons: 1979), p. 65.

[7]G.E. Inman and R. Schoenberger, "Selecting Source of Supply," in P.V. Farrell (ed.), Aljian's Purchasing Handbook (New York: McGraw-Hill Book Company: 1982), pp. 6-15; D.W. Dobler, L. Lee and D.N. Burt, Purchasing and Materials Management (New York: McGraw-Hill Book Company: 1984), p. 116.

[8]Inman and R. Schoenberger, loc. cit., pp. 6-15; D.W. Dobler, et. al., loc. cit., p. 116.

[9]Inman and R. Schoenberger, loc. cit., pp. 6-15; D.W. Dobler, et. al., loc. cit., p. 116.

supplier's possible affect on the buying firm because of issues related to quality, delivery/availability, and production capacity.

Specifically, the three quality related source selection criteria which were identified during the literature review are included in the source selection criteria pool of the Buyer/Seller Relationship Decision Model. These criteria are: provides quality control performance information,[10] provides product warranties,[11] and provides repair services.[12] The doctoral dissertation committee recommended that two more quality related source selection criteria should be included, namely, uses statistical process control, and has had few in-coming inspection rejections. Since these source selection criteria are concerned with the performance and attributes of the potential supplier, it was conjectured that these criteria will be more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one.

Six source selection criteria pertaining to delivery and availability issues were identified during the literature review: provides "rush" deliveries,[13] provides frequent deliveries,[14] provides on-time deliveries,[15] maintains a plant or warehouse near the buying firm,[16] advises of product unavailability,[17] and provides special handling.[18] If a manufacturing firm depends on these supplier capabilities, a tightly coupled buyer/seller relationship may be chosen, because the buying firm would suffer adverse affects if its

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[10]Dempsey, loc. cit.; Dickson, loc. cit.

[11]Dickson, loc. cit.; Rao and Kiser, loc. cit.

[12]Dempsey, loc. cit.; Dickson, loc. cit.; Rao and Kiser, loc. cit.

[13]Cardozo and Cagley, loc. cit.; Perreault and Russ, loc. cit.; Rao and Kiser, loc. cit.

[14]Rao and Kiser, loc. cit.

[15]Perreault and Russ, loc. cit.; Rao and Kiser, loc. cit.

[16]Dempsey, loc. cit.; Dickson, loc. cit.; Kelly and Coaker, loc. cit.; Perreault and Russ, loc. cit.; Rao and Kiser, loc. cit.

[17]Rao and Kiser, loc. cit.

[18]Rao and Kiser, loc. cit.

supplier failed in any of these areas. Therefore, it was conjectured that these source selection criteria would be important when evaluating a potential supplier for a tightly coupled buyer/seller relationship.

Source selection criteria related to production capacity were also identified during the review of previous research. Specifically, three criteria were identified which dealt directly with the potential supplier's production capacity, namely, has the ability to expand production capacity,[19] updates production capacity availability,[20] and provides "on-going" production status.[21] Since carrying inventories can be viewed as stored capacity,[22] the source selection criteria of providing finished-goods inventory status,[23] and providing a family of products,[24] are also included in the source selection criteria pool of the Buyer/Seller Relationship Decision Model. Additionally, the doctoral dissertation committee recommended that the criterion of having available production capacity be included. The conjectures associated with production capacity predicted that these source selection criteria would be important when evaluating a potential supplier for a tightly coupled buyer/seller relationship since these capabilities should allow the buying firm to reduce its inventory without suffering adverse affects to its operating system.

Other source selection criteria come into play when a manufacturing firm chooses a tightly coupled relationship since it will have to cooperate with its supplier using a joint-profit maximization emphasis.[25] Therefore, the buying and selling firms need to

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[19]Rao and Kiser, loc. cit.

[20]Dickson, loc. cit.; Dempsey, loc. cit.; Lehmann and O'Shaughnessy, loc. cit.

[21]Dickson, loc. cit.; Dempsey, loc. cit.; Lehmann and O'Shaughnessy, loc. cit.

[22]R.H. Hayes and S.C. Wheelwright, loc. cit., p. 50.

[23]Dempsey, loc. cit.

[24]Rao and Kiser, loc. cit.

[25]O.E. Williamson, Markets and Hierarchies: Analysis and Antitrust Implications (New York: The Free Press: 1975), p. 91.

deal collectively with changes in their environments. Thus, it was conjectured that this set of source selection criteria will be important when evaluating a supplier for a tightly coupled buyer/seller relationship. This set of source selection criteria may be categorized into three groups, supplier management, technical capabilities, and economic issues.

Six source selection criteria related to the management of the supplier were identified during the literature review: providing a labor relation record free of strikes or work-stoppages,[26] adapting to specific needs of the buying firm,[27] providing technical field services,[28] cooperating when unforeseen difficulties occur,[29] helping in overcoming the buying firm's errors,[30] and helping in emergency situations.[31] In addition to the source selection criteria used in previous research, the doctoral dissertation committee recommended the inclusion of having a capable management team, having productivity improvement potential, having a cooperative business philosophy, anticipating future purchase requirements, and having a helpful sales force. All these source selection criteria would allow the buying firm to deal with changes in its operating environment during the course of a buyer/seller relationship; therefore, it was conjectured that these source selection criteria were important when evaluating a supplier for a tightly coupled buyer/seller relationship.

A potential supplier may also be evaluated on the basis of its technical capabilities.[32] The source selection criteria pool of the Buyer/Seller Relationship Decision Model, therefore, includes the criteria of performing research and development on its

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[26]Dickson, loc. cit.; Dempsey, loc. cit.; Rao and Kiser, loc. cit.

[27]Rao and Kiser, loc. cit.

[28]Rao and Kiser, loc. cit.

[29]Rao and Kiser, loc. cit.

[30]Rao and Kiser, loc. cit.

[31]Rao and Kiser, loc. cit.

[32]Rao and Kiser, loc. cit.

products and processes.[33] Also included in the pool are two source selection criteria recommended by the doctoral dissertation committee which concern two relatively new technical capabilities of a potential supplier, bar-coding and electronic-data-interchange (EDI). These source selection criteria would allow the buying firm to deal with changes in the technical and operating environment during the course of a buyer/seller relationship; therefore, it was conjectured that this group of source selection criteria will be important when evaluating a supplier for a tightly coupled buyer/seller relationship.

Finally, the review of previous source selection criteria research indicated that additional criteria related to economic issues, besides the lowest quoted price, should also be included.[34] Therefore, the source selection criteria of having a sound financial condition, providing manufacturing cost information, and providing price guarantees were included in the source selection criteria pool. These source selection criteria would allow the buying firm to deal with possible changes in the economic environment during the course of a buyer/seller relationship; therefore, it was conjectured that this group of source selection criteria would be important when evaluating a supplier for a tightly coupled buyer/seller relationship.

Figure III-6 summarizes the source selection criteria pool of the Buyer/Seller Relationship Decision Model. The thirty-nine source selection criteria found in Figure III-6 were assessed in this dissertation to determine their importance when evaluating a potential supplier for a loosely coupled and a tightly coupled buyer/seller relationship.

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[33]Dickson, loc. cit.; Dempsey, loc. cit.; Rao and Kiser, loc. cit.

[34]Crow and Lindquist, loc. cit.; Crow Olshavsky and Summers, loc. cit.; Dempsey, loc. cit.; Dickson, loc. cit.; Kelly and Coaker, loc. cit.; Lehmann and O'Shaughnessy, loc. cit.; Rao and Kiser, loc. cit.

FIGURE III-6

SOURCE SELECTION CRITERIA POOL OF THE
BUYER/SELLER RELATIONSHIP DECISION MODEL

ECONOMIC

Lowest Price
Sound Financial Condition
Manufacturing Cost Information
Payment Terms
Price Guarantees

TECHNICAL

Research and Development
- Processes
- Products

Bar-Coding
EDI

QUALITY

Required Quality
Statistical Process Control
Quality Control Information
Product Warranties
In-Coming Inspection
Repair Services

PRODUCTION CAPACITY

Capacity Expansion
Update Production Status
On-Going Production Status
Family of Products
Available Capacity
Finish-Goods Status

DELIVERY

Best Delivery Lead-Time
Rush Deliveries
Location of Supplier
Frequent Deliveries
Product Unavailability
On-Time Deliveries
Special Handling

MANAGEMENT

Capable Management
Productivity Improvements
Strike/Work-Stoppage Record
Cooperative Philosophy
Adapts to Specific Needs
Field Service
Anticipates Requirements
Cooperation
Helpful Sales Force
Overcomes Buyer Errors
Helps in Emergencies

BUYER/SELLER RELATIONSHIP DECISION MODEL SUMMARY

In summary, it was conjectured that, in the Buyer/Seller Relationship Decision Model, purchase requirement orientation, purchasing objectives of the buying firm, characteristics of the possible suppliers, and characteristics of the supply market, would influence the choice of a buyer/seller relationship. After a buyer/seller relationship is chosen by a purchasing decision-maker, it was also conjectured that, the source selection criteria appropriate for the chosen buyer/seller relationship would be used to evaluate a potential supplier for that buyer/seller relationship.

CHAPTER IV

RESEARCH DESIGN AND METHODS

This chapter presents the research design and methods used to assess the Buyer/Seller Relationship Decision Model (Figure III-1) developed in Chapter III, and to answer the following two research questions:

1. What factors influence the choice to use either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

2. What source selection criteria are important when evaluating a potential supplier for either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

Specifically, this chapter describes the manner in which the conjectures laid out in Chapter III were assessed for internal and external validity, and the reasons for using a mail questionnaire survey design in the empirical research. This chapter also presents the statistical considerations for the sampling plan used in the empirical research, and goes on to explain the development of the measures used. Finally, this chapter presents the statistical hypotheses tested during the empirical research and the reasons for selecting the statistical techniques used to analyze the data.

VALIDATION OF BUYER/SELLER RELATIONSHIP DECISION MODEL

As previously discussed in Chapter III, the conjectures associated with the Buyer/Seller Decision Model are based on a review of existing research and practitioner literature, together with interviews of purchasing executives, and recommendations from

the doctoral dissertation committee. The validation of these conjectures was accomplished in two stages. Initially, the descriptive models of buyer/seller relationships developed in Chapter I, and the Buyer/Seller Relationship Decisions Model conjectures stated in Chapter III, were tested for their internal validity. Statistical hypotheses were developed to test the external validity of the conjectures associated with the Buyer/Seller Decision Model.

Internal Validation. Establishing content and construct validity rests heavily on expert judgment and subjective impressions.[1] Therefore, to demonstrate internal validity of the descriptive models of buyer/seller relationships and the conjectures associated with the Buyer/Seller Relationship Model, a group of purchasing executives were asked to assess the extent to which they applied to, and represented, their respective domains.

The group of judges was selected from participants of *The Purchasing and Materials Management Seminar* held June 1986 at Michigan State University, and from past and present chairmen of the professional development committees belonging to local Purchasing Management Associations. This group of judges was selected since (1) they have been exposed to recent trends in the field of purchasing and materials management, (2) they have practical purchasing and materials management experience, (3) they have a commitment to purchasing and materials management education, and (4) they were known to the researcher. Specifically, six judges were identified who (1) had at least ten years of purchasing and materials management experience, (2) represented various manufacturing industries, (3) had managerial responsibility, and (4) were willing to assess the internal validity of the conjectures associated with the Buyer/Seller Relationship Decision Model, the questionnaire, and the descriptive models of buyer/seller relationships.

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[1]American Psychological Association, American Educational Research Association and National Council on Measurement Education, Standards for Educational and Psychological Test, (Washington, D.C.: American Psychological Association, Inc.), 1974; E.F. Stone, Research Methods in Organizational Behavior, (Santa Monica, California: Goodyear Publishing Company), 1978, pp. 51-60.

Copies of the loosely coupled and tightly coupled buyer/seller relationship descriptive models, the conjectures associated with the Buyer/Seller Relationship Decision Model, and a working copy of the questionnaire, were mailed to each judge (See Appendix A for examples of these items). The reviews of the judges resulted in major modification and enhancement of the Buyer/Seller Relationship Decision Model, the definitions, and the questionnaire.

External Validation. The next three sections of this Chapter describe the Research Design and the Methods used to assess external validity by means of a mail questionnaire survey. The final section of this Chapter presents the statistical hypotheses and used to analyze the empirical data gathered for this dissertation.

MAIL QUESTIONNAIRE SURVEY DESIGN

A questionnaire was chosen as the data gathering instrument since this method has been used in similar research efforts[2] and it allowed data to be collected from a diverse set of purchasing professionals in widely scattered locations. However, there are several inherent limitations to this type of design which had to considered and addressed.

One inherent limitation of a questionnaire survey design is that the respondents may misunderstand certain parts of the questionnaire, incorrectly answer certain questions, or not answer certain questions. This limitation was addressed during the

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[2]G.W. Dickson, "An Analysis of Vendor Selection Systems and Decisions," Journal of Purchasing, February 1966, pp. 5-17; W.A. Dempsey, "Vendor Selection and the Buying Process," Industrial Marketing Management, 1978, pp. 257-267; W.D. Perreault and F.A. Russ, "Physical Distribution Service in Industrial Purchase Decisions," Journal of Marketing, April 1976, pp. 3-10; C.P. Rao and G.E. Kiser, "Educational Buyer's Perceptions of Vendor Attributes," Journal of Purchasing and Materials Management, Winter 1980, pp. 25-30; D.R. Lehmann and J. O'Shaughnessy, "Decision Criteria Used in Buying Different Categories," Journal of Purchasing and Materials Management, Spring 1982, pp. 9-14.

development of the measures for the questionnaire.[3] The questionnaire's length was minimized by including only relevant questions, and these were evolved into clear and concise queries (see Appendix B for an example of the questionnaire). Completion of the questionnaire was encouraged by not requiring that the respondents sign the questionnaire and by offering to them a summary of the final results.

Also, the *a priori* scope of a questionnaire limited the study to those measures which were identified during its development. To mitigate this limitation, the measures were assessed for their relevance and validity with the aid of a number of purchasing professionals. A discussion of this procedure can be found in this Chapter in the section entitled "Measures."

Another limitation of a questionnaire survey design is that a relatively large percentage of the questionnaires may not be returned. In addition, the sample may not be truly representative of the population. These two limitations are addressed in the following section.

RESEARCH SAMPLE

Important statistical requirements had to be considered, in addition to merely practical considerations, when the specific sampling plan was determined for the empirical research of this dissertation.

The first statistical requirement was to obtain an *unbiased* sample truly representative of the population of purchasers employed in U.S. manufacturing firms. A sampling plan is acceptably free from bias if it is a random sample.[4] A stratified random selection of individuals responsible for purchasing in U.S. manufacturing firms was used to attempt to obtain an unbiased sample. The sample was proportionally

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[3]The section entitled "Measures" of this Chapter addresses this limitation of a questionnaire research design, p. 51.

[4]R. Rosenthal and R.L. Rosnow, Essentials of Behavioral Research: Methods and Data Analysis, (New York: McGraw-Hill Book Company), 1984, p. 156.

stratified by all twelve manufacturing categories available from the mailing list of Purchasing magazine. The sample was randomly drawn in the following proportions of purchasers employed by twelve industries (SIC codes):

Food and Kindred Products	5.8 percent
Furniture and Fixtures	2.4 percent
Paper and Allied Products	3.1 percent
Chemical and Allied Products	8.4 percent
Rubber and Plastic Products	2.7 percent
Primary Metal Industries	4.6 percent
Fabricated Metal Products	12.5 percent
Machinery (Except Electrical)	22.2 percent
Electrical Equipment and Supplies	18.7 percent
Transportation Equipment	9.7 percent
Instruments and Related Products	7.4 percent
Miscellaneous Manufacturing Industries	2.5 percent
	100.0 percent

Even though this is not a complete representation of professional purchasers, the mailing list identified 81,003 individuals authorized to purchase various products and/or services for U.S. manufacturing firms.

In addition to freedom from bias, another statistical requirement was *sample stability*. Stability means that all samples produced by the sampling plan will yield essentially the same results.[5] Instability will occur if the sample size is too small, even if the samples have been chosen without bias. A sample is also too small if the results are not precise enough for the research aims.

A minimum confidence level of 95 percent was desired for the empirical research. A *95 percent confidence level* implies that if the same sampling plan were used many times in the total population of purchasers employed in U.S. manufacturing firms, a statement made from anyone sample would be correct 95 percent of the time. There was no reason to assume that the responses would not approximate a normal distri-

[5]A. Kaplan, The Conduct of Inquiry: Methodology for Behavioral Sciences, (Scranton, Pennsylvania: Chandler Press), 1964.

bution; therefore, the abscissa of a normal curve of 1.96 (t) for a 95 percent confidence level was used to determine the required sample size.

There was also no reason to assume that population of purchasers employed in U.S. manufacturing firms would greatly vary in their responses, and so a 5 percent limit of error (d) was considered acceptable. In other words, if 43 percent of the respondents to the survey indicate that certain factors are important to loosely coupled relationships, the percentage for the entire population of purchasers employed in U.S. manufacturing should lie between 38 to 48 percent.

Finally, an advance estimate of population variance (δ^2) was made before the sample size was calculated. Population variance (δ^2) is the product of the observations (p and q) to be made across some range.[6] The conservative approach used in this dissertation assumed that the distribution of the population of purchasers employed in U.S. manufacturing firms would be binomial, thereby deriving the largest possible sample to achieve the 5 percent limit of error (d). In other words, it was assumed that half of the responses should be from proportion p and the other half from proportion q. Thus, the population variance (δ^2) was assumed to be the conservative value of 0.25.

Cochran provides the following formula for determining sample size (n′) from an infinite population:[7]

$$n' = t^2pq/d^2.$$

Therefore, the empirical research required a sample size of,

$$n' = (1.96)^2\ (0.5)(0.5)/(0.05)^2$$

$$n' = 0.9604/.0025$$

$$n' = 348.16 \approx 349.$$

Even though the population from which the sample was drawn is finite (81,003 purchasers), a "finite population correction" (*fpc*) was not necessary since the sampling

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[6]W.G. Cochran, Sampling Techniques (New York: John Wiley & Sons), 1967, p. 79.

[7]Cochran, loc. cit., pp. 75-86.

faction, n'/N, in the *fpc* calculation n'/1+(n'/N) remains low. In other words, if the denominator is close to unity, the finite population, as such, has no impact on the standard error of the sample means.[8]

As the questionnaire was long and detailed and required nearly one hour to complete, questionnaires, along with cover letters and postage-paid envelopes, were mailed on March 6, 1987 to 10,000 randomly selected purchasers to insure an adequate sample for the empirical research. Each cover letter outlined the research questions, and requested their assistance. By using this strategy, by April 30, 1987, 680 completed questionnaires were obtained from purchasers employed in twelve U.S. manufacturing firms. In appreciation of their assistance with the survey, a summary of the results will be mailed to the 420 respondents who requested copies. The actual responses to the questionnaire are listed by industries (SIC) as follows:

Food and Kindred Products	31
Furniture and Fixtures	20
Paper and Allied Products	14
Chemical and Allied Products	60
Rubber and Plastic Products	35
Primary Metal Industries	20
Fabricated Metal Products	134
Machinery (Except Electrical)	42
Electrical Equipment and Supplies	147
Transportation Equipment	63
Instruments and Related Products	63
Miscellaneous Manufacturing Industries	51
	680

An assessment of the actual response rate to the questionnaire can be found in Chapter V (pp. 61-63).

The formula used earlier, to determine the required sample size with a 5 percent limit of error (d), was then used to determine the percent limit of error (d') with the

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[8]Cochran, loc. cit., p. 23.

known sample size of 680. Thus, the percent confidence level associated with the actual response rate is,

$$d' = \sqrt{[t^2 pq/n']}$$

$$d' = \sqrt{[1.96^2(0.5)(0.5)/680]}$$

$$d' = \sqrt{[0.0096/680]}$$

$$d' = 3.76.$$

Therefore, a confidence level of 96.24 percent was obtained from the sample of 680 responses for the empirical research. This confidence level is higher than the 95 percent confidence level requirement established during the planning of the empirical research.

MEASURES

An established method to validate measures is to incorporate the recommendations of a small number of experts. A group of six judges representing the furniture and fixture industry (SIC 25), the fabricating metal products industry (SIC 34), the machinery industry (SIC 35), and transportation equipment (SIC 37), assisted in validating the measures before the final printing of the questionnaire. The group of judges were brought together on December 13, 1986 at Michigan State University. Each measure was assessed to determine its appropriateness and format. Relevant recommendations regarding the measures and question format were incorporated before printing the final questionnaire.

Influencing Factors. As stated earlier, the objective of the first research question was to determine the influence that certain factors have on the choice to use either a loosely coupled or a tightly coupled buyer/seller relationship. The independent variables for this research question were the categorical classifications of (1) loosely coupled buyer/seller relationship and (2) tightly coupled buyer/seller relationship. The following

statements were provided to respondents *in lieu* of the descriptive models developed in Chapter I:

Loosely Coupled Buyer/Seller Relationship:

> The situation where required goods and services are purchased in a competitive environment in which one supplier is often played-off against another for the buying firm's short-term benefits; disputes are resolved through unyielding negotiations; only limited information is exchanged with the supplier; and adjustments to operating and marketplace conditions are made separately by the buying and selling firms.

Tightly Coupled Buyer/Seller Relationship:

> The situation where required goods and services are purchased from one or a few preferred suppliers; disputes are resolved through joint problem solving efforts; information which may affect the buying and/or selling firms' operations is exchanged to improve mutual productivity and to obtain lower overall costs; and adjustments to operating and marketplace conditions are made jointly by the buying and selling firms.

The respondents were told to use these categorical classifications as a point of reference from which to answer the questions relating to the dependent variables, the influencing factors. Using a five point rating scale (1 for not at all influential, 2 for slightly influential, 3 for moderately influential, 4 for very influential, and 5 for extremely influential), the respondents were asked to indicate the influence each of the following factors had on their choice to use a loosely coupled buyer/seller relationship, and on their choice to use a tightly coupled buyer/seller relationship:

Purchase Requirement Orientation:

1. The purchase requirement is an industry standard.
2. The purchase requirement is a custom-made product.
3. The purchase requirement uses a simple production process.
4. The purchase requirement uses a complex production process.
5. The purchase requirement is used for a non-critical application.
6. The purchase requirement is used for a critical application.

7. The purchase requirement is needed for a short duration of time.
8. The purchase requirement is needed for a long duration of time.
9. The purchase requirement is estimated to be a low dollar expenditure.
10. The purchase requirement is estimated to be a high dollar expenditure.

Purchasing Objectives of the Buying Firm:

11. Reducing costs associated with the purchased products or items.
12. Improving quality of purchased products or items.
13. Obtaining process technology and innovations from suppliers.
14. Obtaining product technology and innovations from suppliers.
15. Reducing inventory levels of purchased products or items.
16. Contributing to the reduction of the time interval from product design to availability of finished-goods to the final customer.

Characteristics of the Possible Suppliers:

17. There is no delivery performance history for possible suppliers.
18. There is unsatisfactory delivery performance history for possible suppliers.
19. There is satisfactory delivery performance history for possible suppliers.
20. There is no price history for possible suppliers.
21. There is unsatisfactory price history for possible suppliers.
22. There is satisfactory price history for possible suppliers.
23. There is no quality performance history for possible suppliers.
24. There is unsatisfactory quality performance history for possible suppliers.
25. There is satisfactory quality performance history for possible suppliers.
26. Financial information about possible suppliers is unavailable.
27. Financial information about possible suppliers states their financial strength is poor.
28. Financial information about possible suppliers states their financial strength is strong.
29. The process technology used by possible suppliers is unknown to the buying activity.
30. The process technology used by possible suppliers is simple.
31. The process technology used by possible suppliers is complex.

Characteristics of the Supply Market:

32. There are only one or a few possible suppliers in the supply market.
33. There are numerous supplier in the supply market.
34. The supply market experiences numerous technological advancements.
35. The supply market experiences few technological advancements.
36. Demand is decreasing for the products or items available from the supply market.
37. Demand is increasing for the products or items available from the supply market.
38. There is a decrease in availability of products or items in the supply market.
39. There is an increase in availability of products or items in the supply market.

Source Selection Criteria. The second aspect of the empirical research was to answer the research question pertaining to the importance assigned to source selection criteria when evaluating a potential supplier for a loosely coupled and a tightly coupled buyer/seller relationship. The independent variables, for this set of hypotheses, were again the categorical classifications of (1) a loosely coupled buyer/seller relationship and (2) a tightly coupled buyer/seller relationship. The respondents were told to use the categorical classifications as a point of reference from which to answer the questions relating to the dependent variables, the source selection criteria.

The dependent variables for this aspect of the empirical research consisted of thirty-nine source selection criteria. The respondents were asked to rank their importance on a five point rating scale (1 for unimportant, 2 for slightly important, 3 for moderately important, 4 for very important, 5 for extremely important). The scale was applied to the following source selection criteria when evaluating a potential supplier for a loosely coupled buyer/seller relationship and for a tightly coupled one:

Source Selection Criteria:

1. Quotes the lowest price.
2. Has a sound financial condition.
3. Provides manufacturing cost information.
4. Provides favorable payment terms.
5. Provides price guarantees for a relevant time period.
6. Offers the required quality.
7. Uses statistical process control.
8. Has had few in-coming inspection rejections.
9. Provides repair services.
10. Provides a product warranty.
11. Provides field technical services.
12. Provides quality control performance information.
13. Offers the best possible lead-time.
14. Maintains on-time delivery schedules.
15. Provides "rush" deliveries.
16. Provides frequent deliveries.
17. Provides special handling.
18. Maintains plant or warehouse near the buying firm.
19. Has available production capacity.
20. Has the ability to expand production capacity.
21. Updates production capacity availability.
22. Cooperates when unforeseen difficulties occur.
23. Helps in emergency situations.
24. Helps in overcoming buying company's errors.
25. Advises of product or item unavailability.
26. Adapts to specific needs of the buying firm.
27. Offers a family of products.
28. Anticipates future purchase requirements.
29. Performs research and development on its processes.
30. Performs research and development on its products.
31. Provides "on-going" production status information.
32. Provides a labor relation record free of strikes or work-stoppages.
33. Provides information on finished-goods inventory levels.
34. Provides Electronic Data Interchange (EDI) capabilities.
35. Provides bar-coding capabilities.

36. Has productivity improvement potential.
37. Has a capable management team.
38. Has a cooperative business philosophy.
39. Has a helpful sales forces.

Other Measures. The empirical research had an auxiliary objective of determining the use of loosely coupled and tightly coupled buyer/seller relationships by U.S. manufacturing firms. Therefore, the respondents were asked to estimate for their firms, (1) the percentage of current contracts which could be categorized as loosely coupled and tightly coupled buyer/seller relationships; (2) the percentage of current suppliers participating in loosely coupled and tightly coupled buyer/seller relationships; and (3) the percentage of current dollar expenditures on loosely coupled and tightly coupled buyer/seller relationships.

STATISTICAL HYPOTHESES AND DATA ANALYSES

Statistical hypotheses and methods used to analyzed the empirical data are presented in this section. The data were analyzed using descriptive statistics, matched *t*-tests, and other related statistical tests. Computation of the data was accomplished using the Statistical Package for the Social Sciences (SPSS®) available on Arizona State University's IBM® Mainframe, SPSS/PC+®, and Lotus 123® Spreadsheet.

Descriptive Statistics. Collective properties of the data gathered during the empirical research were analyzed by examining frequency distributions, by inspecting Geary Numbers indices to assess the normality of the data, and by observing the estimates of interval confidence for the collected data. Three *t*-tests were also conducted to determine whether significant differences exist between: (1) the percentages of loosely coupled and tightly coupled buyer/seller relationships used by U.S. manufacturing firms; (2) the percentages of loosely coupled and tightly coupled suppliers used by U.S. manufacturing firms; and (3) the percentages of loosely coupled and tightly coupled dollar expenditures made by U.S. manufacturing firms. The purpose of these

tests was to determine if statistical differences exist between the categorical variables of loosely coupled and tightly coupled buyer/seller relationships. Results of these assessments and tests may be found in Chapter V (pp. 73-74).

Analysis of Influencing Factor Differences. This aspect of the empirical research determined whether the influence of the thirty-nine factors differed significantly when a loosely coupled buyer/seller relationship or a tightly coupled one are chosen. The first null hypothesis used to determine if there was the statistical differences between the influencing factors and the chosen buyer/seller relationship was,

Null Hypothesis 1:

> There are no significant differences between the influence of *a factor* on the choice to use a loosely coupled or a tightly coupled buyer/seller relationship.

Rejection of this null hypothesis would permit acceptance of the alternative hypothesis, that the influence of *a factor* differs significantly when choosing either a loosely coupled or a tightly coupled buyer/seller relationships. Rejection of Null Hypothesis 1 is important to this analysis since it will demonstrate whether each factor has its own degree of influence when choosing a loosely coupled or tightly coupled buyer/seller relationship, and thus allow modelling of the choice to use either buyer/seller relationship.

The testing of Null Hypothesis 1 was operationally conducted by thirty-nine matched *t*-tests which substituted the phase in null hypothesis statement, *a factor*, with the influencing factor under consideration. In other words, thirty-nine matched *t*-tests permitted the identification of those influencing factors (f) which differ significantly when choosing a loosely coupled (LC) and a tightly coupled buyer/seller relationships (TC). Specifically,

$$\mu_{fLC} \neq \mu_{fTC}.$$

A two-tailed probability test was used since directional differences were not assumed. The thirty-nine matched *t*-tests were tested at the 0.01 level of significance. The relative differences (deltas) of the influencing factors proven to differ significantly were then reported, e.g.,

$$\mu_{fLC} < \mu_{fTC}; \mu_{fLC} > \mu_{fTC}.$$

Deltas which are positive numbers are more influential when choosing a tightly coupled buyer/seller relationship, while those with negative numbers are more influential when choosing a loosely coupled buyer/seller relationship. The influencing factors which differed significantly were categorized and examined to ascertain those factors which were more influential when choosing a loosely coupled buyer/seller relationship and those which were more influential when choosing a tightly coupled one.

Analysis of Source Selection Criteria Differences. This aspect of the empirical research determined which source selection criteria are more important when evaluating a potential supplier for a loosely coupled and a tightly coupled buyer/seller relationship. The null hypothesis used to determine if there was the significant differences between the importance of the source selection criteria was,

Null Hypothesis 2:

> There are no significant difference between the importance of *a source selection criterion* when evaluating a potential supplier for a loosely coupled or a tightly coupled buyer/seller relationship.

Rejection of this null hypothesis would permit acceptance of the alternative hypothesis, that the importance of *a source selection criterion* differs significantly when evaluating a potential supplier for a loosely coupled or a tightly coupled buyer/seller relationship. Rejection of Null Hypothesis 2 is also important to this research since it will demonstrate whether each source selection criterion has its own degree of importance when evaluating a potential supplier for a loosely coupled or tightly coupled buyer/seller

relationship, and thus allow further modelling of the evaluation process for different buyer/seller relationships.

The testing of Null Hypothesis 2 was operationally conducted by thirty-nine matched *t*-tests which substituted the phase in null hypothesis statement, *a source selection criterion*, with the criterion under consideration. In other words, thirty-nine matched *t*-tests permitted the identification of those source selection criteria (c) which differ significantly when evaluating a potential supplier for a loosely coupled (LC) and a tightly coupled (TC) buyer/seller relationships. Specifically,

$$\mu_{cLC} \neq \mu_{cTC}.$$

A two-tailed probability test was also used since directional differences were not assumed. The thirty-nine matched *t*-tests were tested at the 0.01 level of significance. The relative differences (deltas) of the source selection criteria proven to differ significantly were also reported, e.g.,

$$\mu_{cLC} < \mu_{cTC}; \mu_{cLC} > \mu_{cTC}.$$

Source Selection Criteria with positive numbers (deltas) are more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship and those with negative numbers (deltas) are more importance when choosing a loosely coupled buyer/seller relationship. The source selection criteria which differed significantly were categorized and examined to ascertain those criteria which are more important when evaluating a potential supplier for each buyer/seller relationship.

SUMMARY OF RESEARCH DESIGN AND METHODS

This chapter described the research design and methods used to assess the Buyer/Seller Relationship Decision Model presented in Chapter III. Specifically, this chapter set forth the research design and methods used to assess the developed model for internal and external validity. Internal validity assessment corroborated the conjectures associated with the Buyer/Seller Relationship Decision Model for a small segment of U.S.

manufacturing firms. External validity was assessed through the use of statistical hypotheses presented to a larger segment of U.S. manufacturing firms.

Descriptive statistics associated with the data used in the empirical research of this dissertation and the results of null hypothesis testing are presented in Chapter V. Insights into the influence of purchase requirement orientation factors, purchasing objectives of the buying firm, the characteristics of the possible suppliers, and the characteristics of the supply market on the choice to use either a loosely coupled or a tightly coupled buyer/seller relationship, and insights into the importance placed on source selection criteria when evaluating a potential supplier for either buyer/seller relationships are presented in Chapter VI.

CHAPTER V

RESEARCH FINDINGS

This chapter presents descriptive statistics and hypothesis testing results. The descriptive statistics were calculated from the six data sets obtained during the empirical research of this dissertation: (1) one set of industry representation of the responding sample, (2) two sets of 39 means for the factors influencing the choice for a buyer/seller relationship, (3) two sets of 39 means for source selection criteria importance when evaluating potential suppliers for different buyer/seller relationships, and (4) one set of six means of the percentages of loosely coupled and tightly coupled buyer/seller relationships in U.S. manufacturing firms. The descriptive statistics discussed in this chapter measure collective properties of each data set, and, in so doing, describe the essential features of each data set. Also, included in this chapter are results of *t*-tests which determine the differences between loosely coupled and tightly coupled buyer/seller relationships currently used by U.S. manufacturing firms. Finally, this chapter presents hypothesis testing results which either accept or reject the null hypotheses stated in Chapter IV of this dissertation.

DESCRIPTIVE STATISTICS

Responses. Six-hundred-and-eighty completed questionnaires were obtained from purchasers employed in twelve U.S. manufacturing categories and provided the data used in subsequent analyses. The frequencies and percentages of the purchasers who provided data are listed below by their manufacturing industries:

	Actual Frequencies	Actual Percentages
Food and Kindred Products	31	4.56
Furniture and Fixtures	20	2.94
Paper and Allied Products	14	2.06
Chemical and Allied Products	60	8.82
Rubber and Plastic Products	35	5.15
Primary Metal Industries	20	2.94
Fabricated Metal Products	134	19.71
Machinery (Except Electrical)	42	6.18
Electrical Equipment and Supplies	147	21.62
Transportation Equipment	63	9.26
Instruments and Related Products	63	9.26
Miscellaneous Manufacturing Industries	51	7.50
Totals:	680	100.00

If the responses matched the proportions provided by Purchasing's mailing list, the following frequencies and percentages would have been obtained:

	Derived Frequencies from *Purchasing* Mailing List	Possible Percentages
Food and Kindred Product	39.44	5.80
Furniture and Fixtures	16.32	2.40
Paper and Allied Products	21.08	3.10
Chemical and Allied Products	57.12	8.40
Rubber and Plastic Products	18.36	2.70
Primary Metal Industries	31.28	4.60
Fabricated Metal Products	85.00	12.50
Machinery (Except Electrical)	151.96	22.20
Electrical Equipment and Supplies	127.16	18.70
Transportation Equipment	66.96	9.70
Instruments and Related Products	50.32	7.40
Miscellaneous Manufacturing Industries	17.00	2.50
Totals:	680.00	100.00

Since the data of the *actual* and *derived* response rates, or industry representation, consist of frequencies in discrete categories, a chi-square (χ^2) test was used to determine significant differences between the actual and ideal response rates.[1] The computed $\chi^2 = 102.97$ ($d.f. = 11$) was significant beyond 0.001;[2] therefore, the sample is significantly different from the proportions of purchasers derived from the Purchasing's

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[1]S. Siegel, Nonparametric Statistics for the Behavioral Sciences, (New York: McGraw-Hill Book Company), 1956, p. 104.

[2]Siegel, loc. cit., p. 249.

mailing list. However, there is no evidence whether the Purchasing mailing list is representative of all purchasing decision-makers employed by U.S. manufacturing firms. Nevertheless, conclusions can be drawn regarding those purchasing decision-makers responding to the questionnaire.

All the data collected from the questionnaires were used in the empirical research; therefore, the sample size varied depending on the analysis performed since some of the questionnaires were incomplete. In reporting the data in this chapter, the actual sample size is identified by "N."

Normality of the Data Sets. This section assesses the deviations from normality of the five data sets used in this dissertation. There are a plethora of tests for judging departures from normality but no single test is optimal for all possible deviations. The commonly used chi-square test was not chosen for this dissertation since, according to Wegman, it is a rather insensitive normality test.[3] Instead, the Geary test was selected since it is sensitive to a wide range of non-normal populations, and it is considered to be an omnibus test.[4] This test statistic, Γ, depends upon the ratio of the mean deviation to the standard deviation,[5]

$$\Gamma = \frac{\sum(|\, x_r - x \,|)/n}{\sqrt{[\,\sum(|\, x_r - \bar{x} \,|)^2/n]}}$$

When the variables of the data are normally distributed, Γ is expected to be approximately 0.80. Leptokurtic distributions (those which are more peaked and prone to have more observations straggling into the extreme tails than normal distributions) tend to have values of Γ less than 0.80 while platykurtic distributions (those which are flatter than normal distributions) tend to have values greater than 0.80.

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[3]E. J. Wegman, "Tests for Departures from Normality," Encyclopedia of Statistical Sciences (1982), Vol. 2, p. 318.

[4]Wegman, op. cit., p. 322.

[5]R. C. Geary, "The Ratio of the Mean Deviation to the Standard Deviation as a Test of Normality", Biometrika, October 1935, pp. 311-331.

The test statistic, Γ, was calculated for the three data sets (Appendix C). Interpolation of Geary's 5 percent probability points[6] provided critical values from which normality was assessed (see Appendix D for formula and results).

By examining Tables C-1, C-2, C-3 and C-4 (Appendix C) it was determined that, (1) 23.08 percent of the factors influencing the choice of a loosely coupled buyer/seller relationship, (2) 38.46 percent of the factors influencing the choice of a tightly coupled buyer/seller relationship, (3) 38.46 percent of the source selection criteria used to evaluate a potential supplier for a loosely coupled buyer/seller relationship, and (4) 25.64 percent of the source selection criteria used to evaluate a potential supplier for a tightly coupled buyer/seller relationship, can be correctly modeled by a normal distribution. Similarly, by examining Tables C-5 and C-6 (Appendix C) it was determined that, out of the percentage of buyer/seller contracts used, the percentage of loosely coupled suppliers used, and the percentage of loosely coupled and tightly coupled dollar expenditures made by U.S. manufacturing firms, only the latter (dollar expenditures for both loosely coupled and tightly coupled buyer/seller relationships) are correctly modeled by a normal distribution.

Normality of the five data sets may appear to be a major concern for subsequent analyses. However, the following guidance was used to counter the concern of abnormal data sets:

> [Norton] . . . conducted Monte Carlo tests where the scores were drawn from distributions having the same shape and from distributions having different shapes. [Norton] found that with homogeneous distributions, there was a close matching of empirical and theoretical percentages. The match was not quite as good when populations were of markedly different form. In the latter case, the discrepancies were of the order of a 2 to 3 percentage point over-estimation of the 5 percent significance level and of a 1 to 2 percentage point over-estimation of the 1 percent significance level. This means, for example, that when an experimenter chooses an $\alpha = .05$, the *actual* α level may be as large as $p = .08$.[7]

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[6]Geary, op. cit, p. 330.

[7]G. Keppel, Design and Analysis: A Researcher's Handbook Englewood Cliffs, New Jersey, 1982), p. 86.

Since the empirical research of this dissertation uses a 1 percent rejection level, the empirically determined rejection region (the type I error) would be no larger than $\alpha = 0.03$ even for the most deviant comparisons. According to Keppel it is safe to conclude that violations of the normality assumption do not constitute a serious problem.[8] Therefore, all subsequent analyses of the five data sets assume normality.

Centrality of the Data Sets. This section reports the ranking of the means for the five data sets used in the empirical research of this dissertation. The five data sets are discussed in three sections, (1) two sets of 39 means for the factors influencing the choice of a buyer/seller relationship, (2) two sets of 39 means for the importance of source selection criteria when evaluating potential suppliers for different buyer/seller relationships, and (3) a set of six means of the percentages of loosely coupled and tightly coupled buyer/seller relationships in U.S. manufacturing firms. The set of six means of loosely coupled and tightly coupled buyer/seller relationships currently used by U.S. manufacturing firms are discussed with *t*-tests which determine differences between the percentages.

Influencing Factors. The ranking of means representing the influence of each influencing factors as they pertain to the choice a loosely coupled buyer/seller relationship are listed in Table V-1. By examining Table V-1 it is clear that "Unsatisfactory Quality Performance" (3.913) is the most influential factor when the choice of a loosely coupled buyer/seller relationship is being considered. Similarly, "Purchase Requirement Uses a Complex Production Process" (2.780) has the least influence on the choice of a loosely coupled buyer/seller relationship. Using the scale provided in the questionnaire, the 39 factors lie between "slightly influential" and "very influential."

The ranking of means representing the influence of each influencing factors as they pertain to the choice a tightly coupled buyer/seller relationship are listed in Table V-2. After examining Table V-2, it was determined that "Improving Quality of Purchased Products or Items" (4.467) is the most influential factor when choosing a tightly

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[8]Keppel, loc. cit., P.86.

TABLE V-1

RANKING OF MEANS OF FACTORS INFLUENCING THE CHOICE OF LOOSELY COUPLED BUYER/SELLER RELATIONSHIPS

	Mean	Std. Error	Std. Deviation	Variance	N
1. There is Unsatisfactory Quality Performance History for Possible Suppliers	3.913	0.051	1.323	1.750	670
2. Reducing Cost Associated with the Purchased Products or Items	3.869	0.045	1.176	1.383	671
3. There is Unsatisfactory Delivery Performance History for Possible Suppliers	3.860	0.047	1.217	1.481	670
4. The Purchase Requirement is an Industry Standard	3.751	0.044	1.127	1.270	670
5. There is Unsatisfactory Price Performance History for Possible Suppliers	3.742	0.047	1.226	1.502	671
6. There is Satisfactory Delivery Performance History for Possible Suppliers	3.660	0.043	1.119	1.253	670
7. There is Satisfactory Quality Performance History for Possible Suppliers	3.629	0.045	1.170	1.368	669
8. Financial Information About Possible Suppliers States Their Financial Condition is Poor	3.529	0.050	1.293	1.672	669
9. There is Satisfactory Price Performance History for Possible Suppliers	3.515	0.043	1.103	1.216	668
10. Improving Quality of Purchased Products of Items	3.461	0.055	1.429	2.043	670
11. There is an Increasing in Availability of Products or Items in the Supply Market	3.407	0.041	1.071	1.148	670
12. There are Numerous Suppliers in the Supply Market	3.387	0.047	1.213	1.472	670
13. There are Only One or a Few Suppliers in the Supply Market	3.354	0.053	1.372	1.882	670
14. There is a Decreasing in Availability of Products or Items in the Supply Market	3.342	0.051	1.312	1.720	670
15. There is No Quality Performance History for Possible Suppliers	3.333	0.046	1.186	1.408	666
16. Demand is Decreasing for the Products or Items Available from the Supply Market	3.331	0.043	1.113	1.240	671
17. The Supply Market Experiences Numerous Technological Advancements	3.298	0.044	1.134	1.286	668
18. Reducing Inventory Levels of Purchased Products or Items	3.294	0.050	1.306	1.706	671
19. Financial Information About Possible Suppliers States Their Financial Condition is Strong	3.254	0.046	1.192	1.420	669
20. Demand is Increasing for the Products or Items Available from the Supply Market	3.253	0.046	1.199	1.438	669

TABLE V-1 (Cont'd.)

	Mean	Std. Error	Std. Deviation	Variance	N
21. The Purchase Requirement is Estimated to be a High Dollar Expenditure	3.216	0.055	1.432	2.049	668
22. The Purchase Requirement is Needed for a Short Duration of Time	3.214	0.047	1.221	1.491	668
23. The Purchase Requirement Uses a Simple Production Process	3.192	0.043	1.117	1.247	668
24. The Purchase Requirement is Used for a Non-Critical Application	3.163	0.048	1.253	1.571	669
25. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	3.120	0.051	1.328	1.764	669
26. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	3.115	0.049	1.261	1.590	669
27. The Purchase Requirement is Used for a Critical Application	3.097	0.060	1.555	2.419	671
28. There is No Delivery Performance History for Possible Suppliers	3.088	0.042	1.099	1.209	671
29. The Process Technology Used by Possible Supplier is Simple	3.064	0.045	1.151	1.325	667
30. There is No Price Performance History for Possible Suppliers	3.021	0.044	1.134	1.286	671
31. The Purchase Requirement is Needed for a Long Duration of Time	3.015	0.053	1.375	1.892	667
32. The Process Technology Used by Possible Supplier is Complex	2.917	0.048	1.244	1.547	666
33. The Supply Market Experiences Few Technological Advancements	2.896	0.041	1.066	1.137	670
34. Obtaining Product Technology and Innovations from Suppliers	2.891	0.051	1.319	1.738	670
35. The Purchase Requirement is a Custom-Made Product	2.865	0.058	1.492	2.227	669
36. Financial Information About Possible Suppliers is Unavailable	2.862	0.046	1.186	1.407	667
37. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	2.819	0.044	1.136	1.290	667
38. Obtaining Process Technology and Innovations from Suppliers	2.785	0.051	1.313	1.724	670
39. The Purchase Requirement Uses a Complex Production Process	2.780	0.055	1.423	2.025	668

TABLE V-2

RANKING OF MEANS OF FACTORS INFLUENCING THE CHOICE OF TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS

	Mean	Std. Error	Std. Deviation	Variance	N
1. Improving Quality of Purchased Products of Items	4.467	0.028	0.729	0.531	675
2. The Purchase Requirement is Used for a Critical Application	4.413	0.031	0.815	0.664	671
3. The Purchase Requirement is a Custom-Made Product	4.352	0.033	0.861	0.742	671
4. There are Only One or a Few Suppliers in the Supply Market	4.316	0.033	0.866	0.749	673
5. The Purchase Requirement is Estimated to be a High Dollar Expenditure	4.225	0.034	0.893	0.797	672
6. Reducing Cost Associated with the Purchased Products or Items	4.194	0.036	0.942	0.887	675
7. There is a Decreasing in Availability of Products or Items in the Supply Market	4.146	0.035	0.896	0.803	673
8. The Purchase Requirement Uses a Complex Production Process	4.065	0.039	1.013	1.027	672
9. The Purchase Requirement is Needed for a Long Duration of Time	4.063	0.037	0.959	0.920	670
10. There is Unsatisfactory Quality Performance History for Possible Suppliers	4.043	0.050	1.290	1.665	671
11. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	4.013	0.038	0.983	0.967	674
12. There is Unsatisfactory Delivery Performance History for Possible Suppliers	3.993	0.046	1.187	1.409	673
13. Obtaining Product Technology and Innovations from Suppliers	3.963	0.038	0.979	0.958	673
14. There is Satisfactory Quality Performance History for Possible Suppliers	3.914	0.038	0.977	0.954	671
15. Demand is Increasing for the Products or Items Available from the Supply Market	3.914	0.037	0.957	0.915	671
16. Reducing Inventory Levels of Purchased Products or Items	3.899	0.041	1.070	1.146	674
17. Obtaining Process Technology and Innovations from Suppliers	3.896	0.039	1.015	1.029	674
18. The Supply Market Experiences Numerous Technological Advancements	3.801	0.038	0.981	0.962	672
19. There is Satisfactory Delivery Performance History for Possible Suppliers	3.781	0.040	1.027	1.055	671

TABLE V-2 (Cont'd.)

	Mean	Std. Error	Std. Deviation	Variance	N
20. There is Unsatisfactory Price Performance History for Possible Suppliers	3.761	0.048	1.250	1.563	670
21. There is Satisfactory Price Performance History for Possible Suppliers	3.759	0.038	0.977	0.955	669
22. The Process Technology Used by Possible Supplier is Complex	3.735	0.042	1.101	1.211	672
23. Financial Information About Possible Suppliers States Their Financial Condition is Poor	3.671	0.051	1.332	1.773	671
24. Financial Information About Possible Suppliers States Their Financial Condition is Strong	3.647	0.042	1.076	1.159	672
25. There is No Quality Performance History for Possible Suppliers	3.467	0.045	1.168	1.364	670
26. There is No Delivery Performance History for Possible Suppliers	3.306	0.043	1.119	1.251	671
27. Demand is Decreasing for the Products or Items Available from the Supply Market	3.206	0.043	1.116	1.246	670
28. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	3.168	0.042	1.100	1.209	671
29. There is an Increasing in Availability of Products or Items in the Supply Market	3.159	0.041	1.064	1.131	671
30. There is No Price Performance History for Possible Suppliers	3.146	0.042	1.086	1.180	670
31. Financial Information About Possible Suppliers is Unavailable	3.087	0.044	1.144	1.310	669
32. The Supply Market Experiences Few Technological Advancements	2.845	0.037	0.966	0.933	672
33. There are Numerous Suppliers in the Supply Market	2.762	0.040	1.045	1.092	671
34. The Process Technology Used by Possible Supplier is Simple	2.739	0.040	1.041	1.084	670
35. The Purchase Requirement is an Industry Standard	2.709	0.046	1.183	1.400	671
36. The Purchase Requirement is Needed for a Short Duration of Time	2.604	0.041	1.068	1.141	669
37. The Purchase Requirement Uses a Simple Production Process	2.554	0.038	0.974	0.949	668
38. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	2.508	0.038	0.971	0.942	669
39. The Purchase Requirement is Used for a Non-Critical Application	2.470	0.036	0.939	0.882	668

coupled buyer/seller relationship. The factor of "Purchase Requirement is Used for a Non-Critical Application" (2.470) has the least influence on the choice of a tightly coupled buyer/seller relationship. Using the scale provided in the questionnaire, the 39 factors lie between "slightly influential" and "extremely influential."

Source Selection Criteria. The ranking of means representing the importance of each source selection criteria as they pertain to the evaluation of potential suppliers for a loosely coupled buyer/seller relationship are listed in Table V-3. Inspection of Table V-3 indicates that "Offers the Required Quality" (4.311) is of the greatest importance when evaluating a potential supplier for a loosely coupled buyer/seller relationship. Similarly, "Providing Bar-Coding Capabilities" (2.127) has the least importance when a potential supplier is being evaluated for a loosely coupled buyer/seller relationship. Using the scale provided in the questionnaire, the 39 source selection criteria lie between "slightly important" and "extremely important" when used to evaluate a potential supplier for a loosely coupled buyer/seller relationship.

The ranking of the means of the source selection criteria importance ratings, as they pertain to the evaluation of potential suppliers for a tightly coupled buyer/seller relationship, are listed in Table V-4. The Table shows that "Offers the Required Quality" (4.581) is the most important criterion used to evaluate a potential supplier for a tightly coupled buyer/seller relationship. As mentioned earlier, this source selection criterion was also the most important one when evaluating a potential supplier for a loosely coupled buyer/seller relationship. A comparison of Tables V-3 and V-4 shows that the first four source selection criteria are ranked the same for both types of relationships. These four source selection criteria are,

1. Offers the Required Quality;
2. Maintains On-Time Delivery Schedules;
3. Helps in Emergency Situations; and
4. Cooperates When Unforeseen Difficulties Occur.

TABLE V-3

RANKING OF MEANS OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL LOOSELY COUPLED SUPPLIER

	Mean	Std. Error	Std. Deviation	Variance	N
1. Offers the Required Quality	4.311	0.032	0.832	0.692	671
2. Maintains On-Time Delivery Schedules	4.253	0.032	0.833	0.694	671
3. Helps in Emergency Situations	4.135	0.036	0.919	0.844	669
4. Cooperates When Unforeseen Difficulties Occur	4.072	0.035	0.905	0.819	671
5. Quotes the Lowest Price	4.024	0.036	0.922	0.850	671
6. Offers the Best Possible Delivery Lead-Time	3.999	0.034	0.872	0.760	668
7. Provides "Rush" Deliveries	3.991	0.035	0.918	0.843	670
8. Has Had Few In-Coming Inspection Rejections	3.942	0.036	0.941	0.885	671
9. Provides Price Guarantees for a Relevant Time Period	3.936	0.037	0.964	0.929	671
10. Advises of Product or Item Unavailability	3.720	0.038	0.984	0.968	669
11. Has a Helpful Sales Force	3.720	0.036	0.920	0.847	671
12. Has a Cooperative Business Philosophy	3.659	0.037	0.961	0.924	671
13. Provides a Product Warranty	3.591	0.039	1.013	1.025	670
14. Provides Favorable Payment Terms	3.587	0.038	0.995	0.990	670
15. Adapts to Specific Needs of the Buying Firm	3.552	0.039	1.001	1.001	667
16. Provides Frequent Deliveries	3.469	0.039	1.009	1.019	669
17. Has a Capable Management Team	3.460	0.040	1.035	1.072	669
18. Provides Quality Control Performance Information	3.459	0.043	1.104	1.219	667
19. Helps in Overcoming Buying Company Errors	3.450	0.038	0.986	0.972	669
20. Has Available Production Capacity	3.435	0.040	1.040	1.081	669
21. Provides Technical Field Services	3.357	0.042	1.084	1.176	667
22. Has a Sound Financial Condition	3.262	0.037	0.963	0.928	671
23. Provides Special Handling	3.260	0.041	1.052	1.107	668
24. Provides Repair Services	3.195	0.042	1.092	1.191	668
25. Has the Ability to Expand Production Capacity	3.139	0.040	1.039	1.080	668
26. Uses Statistical Process Control	3.079	0.047	1.205	1.451	670
27. Provides "On-Going" Production Status Information	3.058	0.040	1.047	1.097	669
28. Maintains Plant or Warehouse Near the Buying Firm	3.037	0.044	1.141	1.301	668
29. Anticipates Future Purchase Requirements	2.987	0.040	1.045	1.091	669
30. Updates Production Capacity Availability	2.962	0.040	1.038	1.077	666
31. Performs Research and Development on its Products	2.942	0.043	1.123	1.262	669
32. Provides Manufacturing Cost Information	2.925	0.044	1.137	1.292	670
33. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	2.910	0.044	1.140	1.300	669
34. Performs Research and Development on its Processes	2.896	0.043	1.106	1.224	670
35. Has Productivity Improvement Potential	2.883	0.042	1.098	1.205	669
36. Offers a Family of Products	2.803	0.042	1.092	1.193	670
37. Provides Information on Finished-Goods Inventory Levels	2.754	0.041	1.059	1.121	668
38. Provides Electronic Data Interchange Capabilities	2.378	0.044	1.132	1.282	670
39. Provides Bar-Coding Capabilities	2.127	0.044	1.126	1.269	668

TABLE V-4

RANKING OF MEANS OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL TIGHTLY COUPLED SUPPLIER

	Mean	Std. Error	Std. Deviation	Variance	N
1. Offers the Required Quality	4.581	0.026	0.681	0.464	673
2. Maintains On-Time Delivery Schedules	4.523	0.026	0.672	0.452	673
3. Helps in Emergency Situations	4.499	0.027	0.697	0.485	673
4. Cooperates When Unforeseen Difficulties Occur	4.468	0.027	0.705	0.497	671
5. Has a Cooperative Business Philosophy	4.230	0.030	0.782	0.612	673
6. Provides Price Guarantees for a Relevant Time Period	4.230	0.031	0.811	0.658	671
7. Has Had Few In-Coming Inspection Rejections	4.214	0.033	0.862	0.743	673
8. Provides "Rush" Deliveries	4.141	0.035	0.895	0.801	672
9. Has a Capable Management Team	4.133	0.034	0.888	0.789	669
10. Offers the Best Possible Delivery Lead-Time	4.088	0.033	0.853	0.727	672
11. Has a Helpful Sales Force	4.070	0.033	0.849	0.721	672
12. Adapts to Specific Needs of the Buying Firm	4.021	0.032	0.838	0.703	672
13. Advises of Product or Item Unavailability	3.981	0.036	0.933	0.870	673
14. Has a Sound Financial Condition	3.964	0.036	0.922	0.850	673
15. Provides Quality Control Performance Information	3.838	0.040	1.034	1.069	672
16. Provides a Product Warranty	3.829	0.039	1.019	1.039	672
17. Helps in Overcoming Buying Company Errors	3.811	0.037	0.954	0.911	672
18. Has Available Production Capacity	3.774	0.037	0.956	0.914	672
19. Provides Technical Field Services	3.761	0.039	1.006	1.012	669
20. Provides Frequent Deliveries	3.679	0.040	1.038	1.077	672
21. Provides Favorable Payment Terms	3.676	0.037	0.952	0.907	673
22. Has the Ability to Expand Production Capacity	3.674	0.037	0.970	0.941	672
23. Provides Special Handling	3.623	0.038	0.989	0.978	669
24. Performs Research and Development on its Products	3.622	0.041	1.057	1.118	672
25. Provides Manufacturing Cost Information	3.587	0.041	1.060	1.124	673
26. Performs Research and Development on its Processes	3.560	0.040	1.048	1.097	671
27. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	3.545	0.042	1.097	1.204	673
28. Has Productivity Improvement Potential	3.524	0.040	1.033	1.066	672
29. Provides Repair Services	3.507	0.041	1.063	1.130	672
30. Quotes the Lowest Price	3.485	0.039	1.017	1.034	672
31. Uses Statistical Process Control	3.481	0.047	1.221	1.490	672
32. Provides "On-Going" Production Status Information	3.463	0.039	1.004	1.007	671
33. Anticipates Future Purchase Requirements	3.452	0.039	1.003	1.005	672
34. Updates Production Capacity Availability	3.434	0.039	1.018	1.037	671
35. Provides Information on Finished-Goods Inventory Levels	3.271	0.040	1.034	1.070	671
36. Maintains Plant or Warehouse Near the Buying Firm	3.203	0.046	1.182	1.398	671
37. Offers a Family of Products	2.955	0.044	1.137	1.294	671
38. Provides Electronic Data Interchange Capabilities	2.725	0.046	1.190	1.417	673
39. Provides Bar-Coding Capabilities	2.417	0.049	1.258	1.582	672

Similarly, "Provides Bar-Coding Capabilities" (2.417) has the least importance when evaluating a potential supplier for a tightly coupled buyer/seller relationship, as was also the case for a loosely coupled one. In fact, the last two source selection criteria are ranked the same for both relationships. The two source selection criteria are,

38. Provides Electronic Data Interchange (EDI) Capabilities; and

39. Provides Bar-Coding Capabilities.

Using the scale provided in the questionnaire, the 39 source selection criteria lie between "slightly important" and "extremely important" when used to evaluate a potential supplier for a tightly coupled buyer/seller relationship.

Percentages of Buyer/Seller Relationships. Table V-5 lists the means obtained for the percentages of loosely and tightly coupled buyer/seller relationships used, the percentages of loosely and tightly coupled suppliers used, and the percentages of dollar expenditures on loosely and tightly coupled buyer/seller relationships by U.S. manufacturing firms represented in the sample. Of the 680 purchasers completing the questionnaire, only 630 provided information about the percentages of loosely coupled and tightly coupled contracts currently being used by their firms. Also, 650 respondents provided information about the suppliers participating in loosely coupled and tightly

TABLE V-5

MEANS OF PERCENTAGES FOR LOOSELY COUPLED AND TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP—THE SAMPLE FIRMS

	Mean	Standard Error	Standard Deviation	Variance	N
Loosely Coupled Buyer/Seller Relationship					
Contracts Currently Used	45.68	1.212	30.42	925.41	630
Suppliers Currently Used	58.42	1.132	28.86	833.09	650
Current Dollar Expenditures	34.29	0.904	23.00	528.83	647
Tightly Coupled Buyer/Seller Relationship					
Contracts Currently Used	54.09	1.213	30.44	926.67	630
Suppliers Currently Used	41.45	1.133	28.89	834.70	650
Current Dollar Expenditures	65.80	0.905	23.02	529.77	647

coupled buyer/seller relationships, and 647 purchasers provided information about the dollars expended on loosely coupled and tightly coupled buyer/seller relationships. By examining Appendix E, it is evident that significant differences (99.99 percent and above) exist between the percentages of (1) loosely coupled and tightly coupled contracts currently used by aggregate U.S. manufacturing firms used in this research, (2) suppliers participating in loosely coupled and tightly coupled buyer/seller relationships, and (3) dollars expended on loosely coupled and tightly coupled buyer/seller relationships. Therefore, further analyses of the empirical data gathered for this dissertation were performed with the assumption that the respondents were able to distinguish between the two categorical variables of loosely coupled and tightly coupled buyer/seller relationships.

Estimate of Interval Confidence. Another important descriptor of the five data sets is the confidence interval estimate of the overall mean for each variable, μ. Since normality of the data sets was assumed, each variable mean can be modeled by,

$$[(\mu_1 - u)/(\sigma/\sqrt{n})] - t(n - 1),$$

for any value of n (obtained sample), and where σ is the standard error of the data mean.[9] From this formula a confidence level can be derived as,

$$\mu \pm t\,(n - 1) * \sigma/(\sqrt{n})$$

where t is equal to the t-distribution value.

Influencing Factors. Using the results in Table V-1 for factors influencing the choice of a loosely coupled buyer/seller relationship, t was solved for a confidence parameter of 0.005 using a normal probability table.[10] In other words, the data mean (μ) for each factor influencing the choice of a loosely coupled buyer/seller relationship is $\mu \pm 0.005$. The results shown in Table F-1 (Appendix F) indicate that the confidence intervals are above 98.46 percent. However, when the means were examined, it was

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[9]R. A. Cooper and A. J. Weekes, Data, Models and Statistical Analysis (Oxford, England: Philip Allan Publishers Limited, 1983), p. 99-100.

[10]S. M. Selby (ed.) Standard Mathematical Tables (16th ed.; Cleveland, Ohio: The Chemical Rubber Company, 1968), pp. 549-556.

observed that means of five influencing factors were separated by 0.005, two by 0.004, two by 0.003, four by 0.002 and two by 0.001. Therefore, five confidence parameters, ±0.004, ±0.003, ±0.002, ±0.001 and ±0.0005, were also calculated. The results of these additional confidence levels are shown in Table F-2 (Appendix F). The confidence levels are above 96.86 percent and 94.18 percent for model parameters of ±0.004 and ±0.003, respectively. However, with model parameters of ±0.002, ±0.001 and ±0.0005, the confidence levels drop to below 86.86 percent, 72.57 percent and 61.03 percent, respectively. Interpretation of subsequent analyses considered these lower confidence levels.

A *t* statistic also was solved for factors influencing the choice of a tightly coupled buyer/seller relationship using the results in Table V-2, the normal probability table,[11] and a confidence parameter of 0.005. As before, the data mean for the influence that the factors exert on the choice of a tightly coupled buyer/seller relationship would be $\mu \pm 0.005$. The results are shown in Table F-3 (Appendix F), and indicate that the confidence interval is above 99.45 percent. However, when the means were examined, it was observed that two influencing factors were separated by 0.003, four by 0.002, and two had the same mean. Therefore, three additional confidence intervals, ±0.002, ±0.001 and ±0.00001, were solved, and the confidence levels were found to be below 91.47, 75.80 percent, and 50.40 percent, respectively (Table F-4). Interpretation of subsequent analyses considered these lower confidence levels.

Source Selection Criteria. *t* was also solved for the importance assigned to the data set of source selection criteria using the results in Table V-3, the normal probability table,[12] and a confidence parameter of 0.005. The results in Table F-5 (Appendix F) indicate that the confidence intervals are above 99.70 percent. However, when the means were examined, it was observed that two source selection criteria were separated by 0.004, two by 0.002, two by 0.001 and two had the same mean. Therefore, confidence parameters of ±0.003, ±0.001, ±0.0005 and ±0.00025 were calculated, and the

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[11]Selby, loc. cit.

[12]Selby, loc. cit.

confidence levels were found to be below 97.67 percent, 73.57 percent, 61.79 percent, and 56.75 percent, respectively (Table F-6). Interpretation of subsequent analyses data considered these lower confidence levels.

The test statistic, t, also was solved for the importance assigned to the data set of source selection criteria when evaluating a supplier for a tightly coupled buyer/seller relationship using the results in Table V-4, the normal probability table,[13] and a confidence parameter of 0.005. The results in Table F-7 (Appendix G), indicate that the confidence intervals are above 99.60 percent. However, when the means were examined, it was observed that two source selection criteria were separated by 0.003, two by 0.002, two others by 0.001 and two had the same mean. Therefore, additional confidence parameters of ±0.002, ±0.001, ±0.0005 and ±0.00025 were solved, and the confidence levels were found to be 91.32 percent, 75.80 percent, 63.31 percent, and 58.71 percent, respectively (Table F-8). Interpretation of further analyses of the data considered these lower confidence levels.

Percentages of Buyer/Seller Relationships. The test statistic, t, was solved for the percentage of loosely coupled and tightly coupled contracts currently in use by U.S. manufacturing firms, the percentage of loosely coupled and tightly coupled suppliers, and the percentage of loosely coupled and tightly coupled expenditures. The procedure to solve for t used the results in Table V-5, the normal probability table,[14] and a confidence parameter of 0.001. The data mean, for these percentages, was estimated to be μ ±0.001 since the smallest difference is between loosely coupled and tightly coupled contracts currently used by U.S. manufacturing firms (8.414). The results are shown in Table F-9 (Appendix F) and indicate that the confidence interval is above 98.08 percent.

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[13]Selby, loc. cit.

[14]Selby, loc. cit.

HYPOTHESIS TESTING RESULTS

This section reports the results of hypothesis testing which provide the basis for either rejecting or accepting the null hypotheses stated in Chapter IV. The null hypotheses were used to assess the two decision junctures in the Buyer/Seller Relationship Decision Model. The first decision juncture concerns the choice to use either a loosely coupled or tightly coupled buyer/seller relationship. The second decision juncture pertains to the evaluation of a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relationship. Therefore, the first null hypothesis relates to the following research question:

1. What factors influence the choice to use either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

The second null hypothesis is associated with the following research question:

2. What source selection criteria are important when evaluating a potential supplier for either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

Influencing Factors. The null hypothesis used to determine if there was any statistical differences between the influencing factors and the choice of a loosely coupled and a tightly coupled buyer/seller relationship was,

Null Hypothesis 1:

> There are no significant differences between the influence of *a factor* on the choice to use a loosely coupled or a tightly coupled buyer/seller relationship.

Rejection of this null hypothesis would permit acceptance of the alternative hypothesis, that the influence of *a factor* differs significantly when choosing a loosely coupled and a tightly coupled buyer/seller relationships. Null Hypothesis 1 was operationally tested by 39 matched *t*-tests; therefore, the phrase, *a factor*, in the null hypothesis statement was substituted by the specific influencing factor under consideration. The means used for the 39 matched *t*-tests can be found in Tables V-6 and V-7. If these two Tables

TABLE V-6

RANKING OF MATCHED *t*-TEST MEANS FOR THE 39 INFLUENCING FACTORS WHEN CHOOSING LOOSELY COUPLED BUYER/SELLER RELATIONSHIPS

	Means	Standard Deviations	Standard Errors	N
1. There is Unsatisfactory Quality Performance History for Possible Suppliers	3.917	1.324	0.051	662
2. Reducing Cost Associated with the Purchased Products or Items	3.868	1.179	0.046	666
3. There is Unsatisfactory Delivery Performance History for Possible Suppliers	3.861	1.222	0.047	664
4. There is Unsatisfactory Price Performance History for Possible Suppliers	3.754	1.224	0.048	662
5. The Purchase Requirement is an Industry Standard	3.750	1.131	0.044	663
6. There is Satisfactory Delivery Performance History for Possible Suppliers	3.657	1.123	0.044	662
7. There is Satisfactory Quality Performance History for Possible Suppliers	3.623	1.170	0.046	661
8. Financial Information About Possible Suppliers States Their Financial Condition is Poor	3.536	1.290	0.050	661
9. There is Satisfactory Price Performance History for Possible Suppliers	3.514	1.106	0.043	659
10. Improving Quality of Purchased Products of Items	3.457	1.431	0.055	665
11. There is an Increasing in Availability of Products or Items in the Supply Market	3.412	1.068	0.042	662
12. There are Numerous Suppliers in the Supply Market	3.393	1.210	0.047	662
13. There are Only One or a Few Suppliers in the Supply Market	3.354	1.369	0.053	664
14. There is a Decreasing in Availability of Products or Items in the Supply Market	3.346	1.308	0.051	664
15. There is No Quality Performance History for Possible Suppliers	3.339	1.187	0.046	658
16. Demand is Decreasing for the Products or Items Available from the Supply Market	3.337	1.112	0.043	662
17. The Supply Market Experiences Numerous Technological Advancements	3.304	1.127	0.044	661
18. Reducing Inventory Levels of Purchased Products or Items	3.292	1.309	0.051	665
19. Demand is Increasing for the Products or Items Available from the Supply Market	3.256	1.193	0.046	661
20. Financial Information About Possible Suppliers States Their Financial Condition is Strong	3.254	1.190	0.046	662

TABLE V-6 (Cont'd.)

	Means	Standard Deviations	Standard Errors	N
21. The Purchase Requirement is Needed for a Short Duration of Time	3.212	1.225	0.048	660
22. The Purchase Requirement is Estimated to be a High Dollar Expenditure	3.210	1.433	0.056	662
23. The Purchase Requirement Uses a Simple Production Process	3.193	1.122	0.044	658
24. The Purchase Requirement is Used for a Non-Critical Application	3.173	1.254	0.049	659
25. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	3.118	1.328	0.052	664
26. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	3.109	1.264	0.049	660
27. There is No Delivery Performance History for Possible Suppliers	3.087	1.105	0.043	663
28. The Purchase Requirement is Used for a Critical Application	3.083	1.556	0.060	664
29. The Process Technology Used by Possible Supplier is Simple	3.064	1.153	0.045	658
30. There is No Price Performance History for Possible Suppliers	3.026	1.137	0.044	662
31. The Purchase Requirement is Needed for a Long Duration of Time	3.012	1.375	0.054	660
32. The Process Technology Used by Possible Supplier is Complex	2.923	1.243	0.048	659
33. The Supply Market Experiences Few Technological Advancements	2.899	1.065	0.041	663
34. Obtaining Product Technology and Innovations from Suppliers	2.888	1.314	0.051	663
35. Financial Information About Possible Suppliers is Unavailable	2.865	1.185	0.046	657
36. The Purchase Requirement is a Custom-Made Product	2.864	1.493	0.058	662
37. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	2.827	1.137	0.044	659
38. Obtaining Process Technology and Innovations from Suppliers	2.782	1.312	0.051	664
39. The Purchase Requirement Uses a Complex Production Process	2.769	1.423	0.055	662

TABLE V-7

RANKING OF MATCHED *t*-TEST MEANS FOR THE 39 INFLUENCING FACTORS WHEN CHOOSING TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS

	Means	Standard Deviations	Standard Errors	N
1. Improving Quality of Purchased Products of Items	4.466	0.732	0.028	665
2. The Purchase Requirement is Used for a Critical Application	4.413	0.814	0.032	664
3. The Purchase Requirement is a Custom-Made Product	4.351	0.863	0.034	662
4. There are Only One or a Few Suppliers in the Supply Market	4.324	0.866	0.034	664
5. The Purchase Requirement is Estimated to be a High Dollar Expenditure	4.231	0.887	0.034	662
6. Reducing Cost Associated with the Purchased Products or Items	4.194	0.944	0.037	666
7. There is a Decreasing in Availability of Products or Items in the Supply Market	4.143	0.899	0.035	664
8. The Purchase Requirement is Needed for a Long Duration of Time	4.074	0.946	0.037	660
9. The Purchase Requirement Uses a Complex Production Process	4.062	1.012	0.039	662
10. There is Unsatisfactory Quality Performance History for Possible Suppliers	4.033	1.295	0.050	662
11. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	4.008	0.986	0.038	664
12. There is Unsatisfactory Delivery Performance History for Possible Suppliers	3.985	1.191	0.046	664
13. Obtaining Product Technology and Innovations from Suppliers	3.964	0.978	0.038	663
14. Demand is Increasing for the Products or Items Available from the Supply Market	3.912	0.961	0.037	661
15. There is Satisfactory Quality Performance History for Possible Suppliers	3.905	0.976	0.038	661
16. Reducing Inventory Levels of Purchased Products or Items	3.899	1.076	0.042	665
17. Obtaining Process Technology and Innovations from Suppliers	3.893	1.012	0.039	664
18. The Supply Market Experiences Numerous Technological Advancements	3.802	0.986	0.038	661
19. There is Satisfactory Delivery Performance History for Possible Suppliers	3.767	1.025	0.040	662
20. There is Unsatisfactory Price Performance History for Possible Suppliers	3.755	1.252	0.049	662

TABLE V-7 (Cont'd.)

	Means	Standard Deviations	Standard Errors	N
21. There is Satisfactory Price Performance History for Possible Suppliers	3.753	0.979	0.038	659
22. The Process Technology Used by Possible Supplier is Complex	3.742	1.100	0.043	659
23. Financial Information About Possible Suppliers States Their Financial Condition is Poor	3.664	1.332	0.052	661
24. Financial Information About Possible Suppliers States Their Financial Condition is Strong	3.642	1.071	0.042	662
25. There is No Quality Performance History for Possible Suppliers	3.454	1.169	0.046	658
26. There is No Delivery Performance History for Possible Suppliers	3.297	1.119	0.043	663
27. Demand is Decreasing for the Products or Items Available from the Supply Market	3.198	1.117	0.043	662
28. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	3.165	1.094	0.043	659
29. There is an Increasing in Availability of Products or Items in the Supply Market	3.151	1.063	0.041	662
30. There is No Price Performance History for Possible Suppliers	3.143	1.086	0.042	662
31. Financial Information About Possible Suppliers is Unavailable	3.084	1.148	0.045	657
32. The Supply Market Experiences Few Technological Advancements	2.842	0.966	0.038	663
33. There are Numerous Suppliers in the Supply Market	2.755	1.040	0.040	662
34. The Process Technology Used by Possible Supplier is Simple	2.740	1.038	0.040	658
35. The Purchase Requirement is an Industry Standard	2.704	1.185	0.046	663
36. The Purchase Requirement is Needed for a Short Duration of Time	2.609	1.070	0.042	660
37. The Purchase Requirement Uses a Simple Production Process	2.547	0.977	0.038	658
38. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	2.509	0.972	0.038	660
39. The Purchase Requirement is Used for a Non-Critical Application	2.470	0.941	0.037	659

are compared with their counterparts (Tables V-1 and V-2) presented earlier in this chapter, discrepancies will be observed. The discrepancies are due to the fact that match *t*-tests were calculated, so datum items which did not match directly (one for loosely coupled and one for tightly coupled buyer/seller relationships in a questionnaire) were excluded from the analysis. Using matched *t*-tests only slightly altered the relatively ranking of each influencing factor. Specifically, for loosely coupled buyer/seller relationships, ten factors are ranked differently, and for tightly coupled buyer/seller relationships, two factors are ranked differently. The change in ranking was only an exchange between two adjacent factors. For example, for a loosely coupled buyer/seller relationship, "There is Unsatisfactory Price History for Possible Suppliers" is fourth in Table V-6 instead of fifth, as shown in Table V-1. The factors which rankings were exchanged for the matched *t*-tests are noted in Tables V-6 and V-7 by bracketing of the means.

Using a critical value of 0.01, the ranking of the matched *t*-tests (Table V-8) shows that 31 of the 39 influencing factors significantly differ in their influence on the choice to use either a loosely coupled or a tightly coupled buyer/seller relationship ($P \leq 0.01$).[15] Accordingly, 31 of the 39 operationally tested null hypotheses associated with the first research question were rejected in favor of their alternative hypotheses. Specifically,

Alternative Hypothesis 1:

> There are significant differences between the influence of *a factor* on the choice to use a loosely coupled or a tightly coupled buyer/seller relationship.

Acceptance of Alternative Hypothesis 1 allows further development of the Buyer/Seller Relationship Decision Model since the influence of *a factor* is significantly different when choosing a loosely coupled and a tightly coupled buyer/seller relationship.

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[15]Chapter V discusses the concern of normality and the effect it may have on Type I errors; the true critical value may actually be as high as 0.03 instead of 0.01 for the 31 influencing factors, pp. 63-65.

TABLE V-8

RANKING OF MATCHED *t*-TEST RESULTS FOR THE 39 INFLUENCING FACTORS WHEN CHOOSING BUYER/SELLER RELATIONSHIPS

	t Values	Degrees of Freedom	2-Tail Probability
1. The Purchase Requirement is a Custom-Made Product	-21.49	661	0.000
2. The Purchase Requirement is Used for a Critical Application	-19.32	663	0.000
3. The Purchase Requirement Uses a Complex Production Process	-19.28	661	0.000
4. Obtaining Process Technology and Innovations from Suppliers	-18.07	663	0.000
5. Obtaining Product Technology and Innovations from Suppliers	-17.41	662	0.000
6. Improving Quality of Purchased Products of Items	-17.14	664	0.000
7. The Purchase Requirement is Needed for a Long Duration of Time	-16.63	659	0.000
8. The Purchase Requirement is an Industry Standard	16.53	662	0.000
9. There are Only One or a Few Suppliers in the Supply Market	-16.31	663	0.000
10. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	-15.88	663	0.000
11. The Purchase Requirement is Estimated to be a High Dollar Expenditure	-15.84	661	0.000
12. The Process Technology Used by Possible Supplier is Complex	-15.08	658	0.000
13. There is a Decreasing in Availability of Products or Items in the Supply Market	-14.05	663	0.000
14. Demand is Increasing for the Products or Items Available from the Supply Market	-12.48	660	0.000
15. The Purchase Requirement is Used for a Non-Critical Application	11.76	658	0.000
16. The Purchase Requirement Uses a Simple Production Process	11.36	657	0.000
17. Reducing Inventory Levels of Purchased Products or Items	-10.83	664	0.000
18. There are Numerous Suppliers in the Supply Market	10.39	661	0.000
19. The Purchase Requirement is Needed for a Short Duration of Time	9.83	659	0.000
20. The Purchase Requirement is Estimated to be a Low Dollar	9.57	659	0.000

TABLE V-8 (Cont'd.)

	t Values	Degrees of Freedom	2-Tail Probability
21. The Supply Market Experiences Numerous Technological Advancements	-9.20	660	0.000
22. Financial Information About Possible Suppliers States Their Financial Condition is Strong	-7.69	661	0.000
23. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	-6.75	658	0.000
24. The Process Technology Used by Possible Supplier is Simple	6.10	657	0.000
25. Reducing Cost Associated with the Purchased Products or Items	-6.04	665	0.000
26. There is Satisfactory Quality Performance History for Possible Suppliers	-5.53	660	0.000
27. There is an Increasing in Availability of Products or Items in the Supply Market	4.92	661	0.000
28. There is Satisfactory Price Performance History for Possible Suppliers	-4.85	658	0.000
29. Financial Information About Possible Suppliers is Unavailable	-4.19	656	0.000
30. There is No Delivery Performance History for Possible Suppliers	-3.84	662	0.000
31. Demand is Decreasing for the Products or Items Available from the Supply Market	2.60	661	0.010
32. There is No Price Performance History for Possible Suppliers	-2.22	661	0.027
33. Financial Information About Possible Suppliers States Their Financial Condition is Poor	-2.22	660	0.027
34. There is Unsatisfactory Delivery Performance History for Possible Suppliers	-2.22	663	0.027
35. There is Satisfactory Delivery Performance History for Possible Suppliers	-2.13	661	0.033
36. There is No Quality Performance History for Possible Suppliers	-2.12	657	0.034
37. There is Unsatisfactory Quality Performance History for Possible Suppliers	-2.00	661	0.046
38. The Supply Market Experiences Few Technological Advancements	1.13	662	0.259
39. There is Unsatisfactory Price Performance History for Possible Suppliers	-0.03	661	0.979

Rejection of Null Hypothesis 1 demonstrate that each factor has its own degree of influence when choosing a loosely coupled or tightly coupled buyer/seller relationship, and thus allowing the modelling the choice of a buyer/seller relationship in the Buyer/Seller Relationship Decision Model.

Source Selection Criteria. The null hypothesis used to determine if there was any statistical differences between the source selection criteria when evaluating a potential supplier for a loosely coupled and a tightly coupled buyer/seller relationship was,

Null Hypothesis 2:

> There are no significant differences between the importance of *a source selection criterion* when evaluating a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relationship.

Rejection of this null hypothesis would permit acceptance of the alternative hypothesis, that the influence of *a source selection criterion* differs significantly when evaluating a potential supplier for a loosely coupled and a tightly coupled buyer/seller relationships. Null Hypothesis 2 was operationally tested by 39 matched *t*-tests; therefore, the phrase, *a source selection criterion*, in the null hypothesis statement was substituted by the specific source selection criterion under consideration. The means of the importance of the source selection criteria when evaluating a potential supplier for a loosely coupled or a tightly coupled buyer/seller relationship can be found in Tables V-9 and V-10, respectively. These means were used for 39 matched *t*-tests. If the means found in Table V-9 are compared with its counterpart presented earlier in this chapter (Table V-4) discrepancies will be observed. These discrepancies are due to the fact that matched *t*-tests were calculated, so datum items which did not match directly (one for loosely coupled and one tightly coupled buyer/seller relationships in a questionnaire) were excluded from the analysis. This only altered the relatively ranking of two source selection criteria used when evaluating a potential supplier for a tightly coupled buyer/seller relationship. Specifically, "Provides Price Guarantees for a Relevant Time Period" is ranked fifth in Table V-10 and sixth in Table V-4, and "Has a Cooperative

TABLE V-9

RANKING OF MATCH *t*-TEST MEANS FOR THE 39 SOURCE SELECTION CRITERIA WHEN EVALUATING A POTENTIAL SUPPLIER FOR A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP

	Means	Standard Deviations	Standard Errors	N
1. Offers the Required Quality	4.308	0.834	0.032	665
2. Maintains On-Time Delivery Schedules	4.251	0.833	0.032	665
3. Helps in Emergency Situations	4.133	0.920	0.036	663
4. Cooperates When Unforeseen Difficulties Occur	4.066	0.906	0.035	663
5. Quotes the Lowest Price	4.029	0.921	0.036	664
6. Offers the Best Possible Delivery Lead-Time	3.997	0.873	0.034	662
7. Provides "Rush" Deliveries	3.994	0.915	0.036	663
8. Has Had Few In-Coming Inspection Rejections	3.940	0.942	0.037	665
9. Provides Price Guarantees for a Relevant Time Period	3.929	0.966	0.038	663
10. Advises of Product or Item Unavailability	3.725	0.982	0.038	663
11. Has a Helpful Sales Force	3.717	0.921	0.036	664
12. Has a Cooperative Business Philosophy	3.654	0.962	0.037	665
13. Provides a Product Warranty	3.599	1.007	0.039	663
14. Provides Favorable Payment Terms	3.584	0.994	0.039	664
15. Adapts to Specific Needs of the Buying Firm	3.554	1.003	0.039	660
16. Provides Frequent Deliveries	3.470	1.013	0.039	662
17. Has a Capable Management Team	3.464	1.038	0.040	660
18. Provides Quality Control Performance Information	3.462	1.103	0.043	660
19. Helps in Overcoming Buying Company Errors	3.453	0.985	0.038	663
20. Has Available Production Capacity	3.438	1.043	0.041	662
21. Provides Technical Field Services	3.358	1.087	0.042	659
22. Has a Sound Financial Condition	3.265	0.964	0.037	665
23. Provides Special Handling	3.261	1.058	0.041	660
24. Provides Repair Services	3.203	1.086	0.042	661
25. Has the Ability to Expand Production Capacity	3.143	1.040	0.040	662
26. Uses Statistical Process Control	3.077	1.203	0.047	664
27. Provides "On-Going" Production Status Information	3.067	1.046	0.041	662
28. Maintains Plant or Warehouse Near the Buying Location	3.047	1.136	0.044	661
29. Anticipates Future Purchase Requirements	2.991	1.044	0.041	663
30. Updates Production Capacity Availability	2.961	1.041	0.041	659
31. Performs Research and Development on its Products	2.946	1.125	0.044	663
32. Provides Manufacturing Cost Information	2.929	1.136	0.044	664
33. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	2.909	1.140	0.044	663
34. Performs Research and Development on its Processes	2.899	1.109	0.043	662
35. Has Productivity Improvement Potential	2.885	1.102	0.043	662
36. Offers a Family of Products	2.804	1.094	0.043	662
37. Provides Information on Finished-Goods Inventory Levels	2.755	1.055	0.041	661
38. Provides Electronic Data Interchange Capabilities	2.381	1.133	0.044	664
39. Provides Bar-Coding Capabilities	2.130	1.126	0.044	661

TABLE V-10

RANKING OF MATCH *t*-TEST MEANS FOR THE 39 SOURCE SELECTION CRITERIA WHEN EVALUATING A POTENTIAL SUPPLIER FOR A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP

	Means	Standard Deviations	Standard Errors	N
1. Offers the Required Quality	4.576	0.684	0.027	665
2. Maintains On-Time Delivery Schedules	4.520	0.674	0.026	665
3. Helps in Emergency Situations	4.495	0.699	0.027	663
4. Cooperates When Unforeseen Difficulties Occur	4.463	0.707	0.027	663
5. Provides Price Guarantees for a Relevant Time Period	4.235	0.813	0.032	663
6. Has a Cooperative Business Philosophy	4.226	0.784	0.030	665
7. Has Had Few In-Coming Inspection Rejections	4.207	0.864	0.033	665
8. Provides "Rush" Deliveries	4.142	0.894	0.035	663
9. Has a Capable Management Team	4.138	0.873	0.034	660
10. Offers the Best Possible Delivery Lead-Time	4.086	0.854	0.033	662
11. Has a Helpful Sales Force	4.066	0.848	0.033	664
12. Adapts to Specific Needs of the Buying Firm	4.015	0.841	0.033	660
13. Advises of Product or Item Unavailability	3.971	0.935	0.036	663
14. Has a Sound Financial Condition	3.962	0.917	0.036	665
15. Provides Quality Control Performance Information	3.833	1.036	0.040	660
16. Provides a Product Warranty	3.822	1.022	0.040	663
17. Helps in Overcoming Buying Company Errors	3.804	0.956	0.037	663
18. Has Available Production Capacity	3.773	0.959	0.037	662
19. Provides Technical Field Services	3.756	1.009	0.039	659
20. Provides Frequent Deliveries	3.683	1.036	0.040	662
21. Provides Favorable Payment Terms	3.681	0.952	0.037	664
22. Has the Ability to Expand Production Capacity	3.675	0.971	0.038	662
23. Provides Special Handling	3.624	0.988	0.038	660
24. Performs Research and Development on its Products	3.621	1.063	0.041	663
25. Provides Manufacturing Cost Information	3.592	1.052	0.041	664
26. Performs Research and Development on its Processes	3.565	1.049	0.041	662
27. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	3.547	1.099	0.043	663
28. Has Productivity Improvement Potential	3.524	1.037	0.040	662
29. Provides Repair Services	3.502	1.061	0.041	661
30. Quotes the Lowest Price	3.490	1.020	0.040	664
31. Uses Statistical Process Control	3.479	1.218	0.047	664
32. Provides "On-Going" Production Status Information	3.458	1.007	0.039	662
33. Anticipates Future Purchase Requirements	3.455	1.003	0.039	663
34. Updates Production Capacity Availability	3.434	1.016	0.040	659
35. Provides Information on Finished-Goods Inventory Levels	3.275	1.039	0.040	661
36. Maintains Plant or Warehouse Near the Buying Location	3.195	1.184	0.046	661
37. Offers a Family of Products	2.953	1.138	0.044	662
38. Provides Electronic Data Interchange Capabilities	2.729	1.191	0.046	664
39. Provides Bar-Coding Capabilities	2.405	1.254	0.049	661

Business Philosophy" is ranked sixth in Table V-10 and fifth in Table V-4. These source selection criteria are noted in Table V-10 by bracketing the two means.

Using a critical value of 0.01, the ranking of the matched *t*-tests (Table V-11) shows that 38 of the 39 source selection criteria significantly differ in their importance when evaluating a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relationship ($P \leq 0.005$).[16] Accordingly, 38 of the 39 operationally tested null hypotheses associated with the second research question were rejected in favor of their alternative hypotheses. Specifically,

Alternative Hypothesis 2:

> There are significant differences between the importance of *a source selection criterion* when evaluating a potential supplier for a loosely coupled or a tightly coupled buyer/seller relationship.

Acceptance of Alternative Hypothesis 2 allows the further development of the Buyer/Seller Relationship Decision Model since the importance of *a source selection criteria* is significantly different when evaluating a potential supplier for either a loosely coupled and a tightly coupled buyer/seller relationship. This demonstrates that thirty-eight source selection criteria have their own degree of importance when used to evaluate a potential supplier for a loosely coupled or tightly coupled buyer/seller relationship.

SUMMARY OF RESEARCH FINDINGS

This chapter presented descriptive statistics and hypotheses testing results. The descriptive statistics were calculated from the six data sets which were used during the empirical research aspect of this dissertation: one set of industry representation data, two sets of factors influencing the choice of a buyer/seller relationship, two sets of source selection criteria importance for different buyer/seller relationships, and one set

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[16]Chapter V discusses the concern of normality and the effect it may have on Type I errors; the true critical value may actually be as high as 0.015 instead of 0.005 for the 38 source selection criteria pp. 63-65.

TABLE V-11

RANKING OF MATCH *t*-TESTS FOR THE 39 SOURCE SELECTION CRITERIA WHEN EVALUATING A POTENTIAL SUPPLIER

	t Values	Degrees of Freedom	2-Tail Probability
1. Has a Capable Management Team	17.59	659	0.000
2. Has a Sound Financial Condition	17.50	664	0.000
3. Has a Cooperative Business Philosophy	15.52	664	0.000
4. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	15.22	662	0.000
5. Performs Research and Development on its Products	14.65	662	0.000
6. Performs Research and Development on its Processes	14.65	661	0.000
7. Has Productivity Improvement Potential	14.60	661	0.000
8. Provides Manufacturing Cost Information	14.45	663	0.000
9. Provides Information on Finished-Goods Inventory Levels	13.58	660	0.000
10. Has the Ability to Expand Production Capacity	12.74	661	0.000
11. Updates Production Capacity Availability	11.83	658	0.000
12. Quotes the Lowest Price	11.35	663	0.000
13. Anticipates Future Purchase Requirements	11.31	662	0.000
14. Adapts to Specific Needs of the Buying Firm	10.81	659	0.000
15. Cooperates When Unforeseen Difficulties Occur	10.19	662	0.000
16. Has a Helpful Sales Force	10.12	663	0.000
17. Helps in Emergency Situations	-9.90	662	0.000
18. Provides "On-Going" Production Status Information	-9.78	661	0.000
19. Helps in Overcoming Buying Company Errors	-9.67	662	0.000
20. Uses Statistical Process Control	-9.53	663	0.000
21. Provides Technical Field Services	-9.37	658	0.000
22. Provides Special Handling	-9.05	659	0.000
23. Provides Quality Control Performance Information	-8.88	659	0.000
24. Provides Electronic Data Interchange (EDI) Capabilities	-8.87	663	0.000
25. Has Available Production Capacity	-8.21	661	0.000
26. Provides Price Guarantees for a Relevant Time Period	-8.00	662	0.000
27. Provides Repair Services	-7.94	660	0.000
28. Provides Bar-Coding Capabilities	-7.90	660	0.000
29. Offers the Required Quality	-7.84	664	0.000
30. Maintains On-Time Delivery Schedules	-7.54	664	0.000
31. Has Had Few In-Coming Inspection Rejections	-7.22	664	0.000
32. Provides a Product Warranty	-6.21	662	0.000
33. Advises of Product or Item Unavailability	-6.18	662	0.000
34. Provides Frequent Deliveries	-5.28	661	0.000
35. Provides "Rush" Deliveries	-3.87	662	0.000
36. Maintains Plant or Warehouse Near the Buying Location	-3.35	660	0.001
37. Offers a Family of Products	-3.30	661	0.001
38. Provides Favorable Payment Terms	-2.79	663	0.005
39. Offers the Best Possible Delivery Lead-Time	-2.38	661	0.017

of percentages of loosely coupled and tightly coupled buyer/seller relationships in U.S. manufacturing firms. The descriptive statistics presented in this chapter measured the collective properties of the six data sets, and described essential features of each data set. Finally, this chapter presented results of hypothesis testing which allowed the rejection of the null hypotheses stated in Chapter IV of this dissertation in favor of their alternative hypotheses. Refinement of the Buyer/Seller Relationship Decision Model, however, was possible by further examination of which factors influencing the choice of a buyer/seller relationship, and which source selection criteria are importance when evaluating a potential supplier for a buyer/seller relationship. Refinement and assessment of the Buyer/Seller Relationship is presented in the following Chapter.

CHAPTER VI

ASSESSMENT OF THE BUYER/SELLER RELATIONSHIP DECISION MODEL

This chapter presents an assessment of the two decision junctures found in the Buyer/Seller Relationship Decision Model. The first decision juncture concerns the choice of a buyer/seller relationship, and the second decision juncture concerns the evaluation of a potential supplier for different buyer/seller relationships. Specifically, this chapter examines the significant and systematic differences between 39 factors as they (1) influence the choice of a loosely coupled buyer/seller relationship, and (2) influence the choice of a tightly coupled buyer/seller relationship. Next, this chapter examines the significant and systematic similarities and differences between the importance of 39 source selection criteria as they pertain to (1) the evaluation of a potential supplier for a loosely coupled buyer/seller relationship, and (2) the evaluation of a potential supplier for a tightly coupled buyer/seller relationship.

INFLUENCING FACTORS AND THE BUYER/SELLER RELATIONSHIP DECISION MODEL

This section assesses the first decision juncture of the Buyer/Seller Relationship Decision Model which concerns the choice to use either a loosely coupled or tightly coupled buyer/seller relationship. The assessment presented in this section is based on the rejection (see Chapter V, pp. 77-85) of Null Hypothesis 1 of this dissertation stated in Chapter IV. Accordingly, the Model assessment presented in this section will specifically answer the following research question:

What factors influence the choice to use either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

To answer this research question, the primary area of interpretation will be related to the results of the matched *t*-tests (See Table V-8, pp. 83-84) which show that 31 of the 39 influencing factors significantly differ in their influence on the choice to use either a loosely coupled or a tightly coupled buyer/seller relationship ($P \leq 0.01$).[1] The relative differences (deltas) between the significantly different influencing factors are shown in Table VI-1. Deltas with positive numbers are more influential when choosing a tightly coupled buyer/seller relationship, and those with negative numbers when choosing a loosely coupled one. Examination of Table VI-1 shows that 22 influencing factors are more influential when choosing a tightly coupled buyer/seller relationship than a loosely coupled one, whereas nine factors are more influential when choosing a loosely coupled buyer/seller relationship than a tightly coupled one. The deltas associated with the influence of *a factor* for choosing a buyer/seller relationship are shown in brackets in the following discussion. The influencing factors were then categorized by their respective groupings (*i.e.*, purchase requirement orientations, characteristics of the supply market, characteristics of the possible suppliers, and purchasing objectives of the buying firm). Examination of the four categories then showed the influence of each factor, within a grouping, on the choice of a buyer/seller relationship.

Examination of Table VI-1 shows that the Purchase Requirement Orientation influencing factors have greatest difference in their importance when choosing a buyer/seller relationship. The importance of these factors with Buyer/Seller Relationship Decision Model is consistent with the interviews conducted with purchasing

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[1]Chapter V discusses the concern of normality and the effect it may have on Type I errors; the true critical value may actually be as high as 0.03 instead of 0.01 for the 31 influencing factors, pp. 63-65.

TABLE VI-1

RANKING OF DELTAS* FOR THE THIRTY-ONE SIGNIFICANTLY DIFFERENT INFLUENCING FACTORS

	Delta
1. The Purchase Requirement is a Custom-Made Product	1.487
2. The Purchase Requirement is Used for a Critical Application	1.330
3. The Purchase Requirement Uses a Complex Production Process	1.139
4. Obtaining Process Technology and Innovations from Suppliers	1.111
5. Obtaining Product Technology and Innovations from Suppliers	1.075
6. The Purchase Requirement is Needed for a Long Duration of Time	1.062
7. The Purchase Requirement is Estimated to be a High Dollar Expenditure	1.021
8. Improving Quality of Purchased Products of Items	1.009
9. There are Only One or a Few Suppliers in the Supply Market	0.970
10. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	0.890
11. The Process Technology Used by Possible Supplier is Complex	0.819
12. There is a Decreasing in Availability of Products or Items in the Supply Market	0.797
13. Demand is Increasing for the Products or Items Available from the Supply Market	0.656
14. Reducing Inventory Levels of Purchased Products or Items	0.607
15. The Supply Market Experiences Numerous Technological Advancements	0.498
16. Financial Information About Possible Suppliers States Their Financial Condition is Strong	0.388
17. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	0.338
18. Reducing Cost Associated with the Purchased Products or Items	0.326
19. There is Satisfactory Quality Performance History for Possible Suppliers	0.281
20. There is Satisfactory Price Performance History for Possible Suppliers	0.238
21. Financial Information About Possible Suppliers is Unavailable	0.219
22. There is No Delivery Performance History for Possible Suppliers	0.210
23. Demand is Decreasing for the Products or Items Available from the Supply Market	-0.139
24. There is an Increasing in Availability of Products or Items in the Supply Market	-0.261
25. The Process Technology Used by Possible Supplier is Simple	-0.324
26. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	-0.600
27. The Purchase Requirement is Needed for a Short Duration of Time	-0.603
28. There are Numerous Suppliers in the Supply Market	-0.638
29. The Purchase Requirement Uses a Simple Production Process	-0.646
30. The Purchase Requirement is Used for a Non-Critical Application	-0.703
31. The Purchase Requirement is an Industry Standard	-1.046

*Positive numbers (deltas) are more influential when choosing a Tightly Coupled Buyer/Seller Relationship, and negative numbers (deltas) are more influential when choosing a Loosely Coupled Buyer/Seller Relationship.

executives at two Fortune 500 manufacturing firms.[2] Specifically, "An Industry Standard" [-1.046] is relatively more influential when choosing a loosely coupled buyer/seller relationship and, therefore, relatively less influential when choosing a tightly coupled one. By contrast, "A Custom-Made Product" [+1.487] is relatively influential when choosing a tightly coupled buyer/seller relationship and relatively less influential when choosing a loosely coupled one. In a similar manner, "A Non-Critical Application" [-0.703], "A Simple Production Process" [-0.646], "A Short Duration of Need" [-0.603], and "An Estimated Low Dollar Expenditure" [-0.600] were all found to be relatively influential when choosing a loosely coupled buyer/seller relationship and, thus, relatively less influential when choosing a tightly coupled one. The remaining "Purchase Requirement Orientation" influencing factors of "A Critical Application" [+1.330], "A Complex Production Process [+1.293], "A Long Duration of Need" [+1.062], and "An Estimated High Dollar Expenditure" [+1.021] are all relatively influential when choosing a tightly coupled buyer/seller relationship and, therefore, relatively less influential when choosing a loosely coupled one.

Based on the examination of the deltas for Purchase Requirement Orientation it was concluded that the choice of a tightly coupled buyer/seller relationship would be made when the purchase requirement is a custom-made product, manufactured by complex process technology, used for a critical application, required for a long duration, or expected to have a high annual dollar commitment relative to the firm's annual dollar purchases. A tightly coupled buyer/seller relationship may be chosen because the buying firm would need to work closely with one or a few suppliers to mitigate possible perturbation of its operating system which may be caused by purchase requirements of these types. On the other hand, a purchase requirement which is an industry standard, manufactured by a simple production process, used for a non-critical application, required for a short duration, or expected to have a low annual dollar commitment

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[2]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of purchase requirement orientations in the *preliminary* Buyer/Seller Relationship Decision Model, pp. 29-31.

relative to the firm's annual dollar purchases, would favor the choice of a loosely coupled buyer/seller relationship. The choice of a loosely coupled buyer/seller relationship would be preferred since the buying firm's operation is not apt to be adversely affected by a purchase requirement of this type. In other words, the buying firm would not need to work closely with one or a few suppliers, and it could purchase the requirement from any supplier in a wide supply pool to take advantage of a quoted lower price, etc.

Three of the Characteristics of the Supply Market influencing factors also have significant influence when choosing a loosely coupled buyer/seller relationship (Table VI-1). Specifically, "Numerous Suppliers in the Supply Market" [-0.637], "Increasing Availability of Products or Items in the Supply Market" [-0.261], and "Decreasing Availability of Products or Items in the Supply Market" [-0.139] are relatively influential when choosing a loosely coupled buyer/seller relationship and, thus, relatively less influential when choosing a tightly coupled one. In contrast, "One or a Few Suppliers in the Supply Market" [+0.970], "Decreasing Availability of Products or Items in the Supply Market" [+0.797], and "Increasing Availability of Products or Items in the Supply Market" [+0.657] are relatively influential when choosing a tightly coupled buyer/seller relationship and, therefore, relatively less influential when choosing a loosely coupled one. These factors are consistent with the conjectures associated with supply market characteristics outlined in Chapter III.[3]

Therefore, the existence of one or a few possible suppliers in the supply market would lead a buying firm to choose a tightly coupled buyer/seller relationship. The choice of this type of buyer/seller relationship would help insure a continuity of supply from one of a few possible suppliers. However, if numerous suppliers are available, the buying firm is more likely to choose a loosely coupled buyer/seller relationship, since it would be able to play one supplier off against another to achieve benefits (*e.g.*, lower

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[3]Chapter III discusses the recommendations of the doctoral dissertation committee which lead to the conjectures associated with the influence of supply market characteristics in the *preliminary* Buyer/Seller Relationship Decision Model, pp. 34-36.

prices) without sacrificing continuity of supply. Also, if demand is increasing for products available in the supply market, a tightly coupled buyer/seller relationship may be chosen; however, a loosely coupled buyer/seller relationship may be chosen if demand is decreasing. Correspondingly, if the availability of products in the supply market is decreasing, a tightly coupled buyer/seller relationship may be chosen, but a loosely coupled buyer/seller relationship may be chosen if products are becoming more available. Thus, the buying firm would be able to retain a continuity of supply by maintaining a loosely coupled relationship when numerous suppliers are available, or when products are abundant through decreased demand or increased availability; or by maintaining a tightly coupled relationship when only one or a few suppliers are available, or when products are scarce through increased demand or decreased availability.

Only one of the Characteristics of the Possible Suppliers influencing factors is more influential when choosing a loosely coupled buyer/seller relationship (Table VI-1). This factor is consistent with the conjecture associated with possible supplier characteristics outlined in Chapter III.[4] Specifically, "The Process Technology Used by Possible Supplier is Simple" [-0.324] is relatively more influential when choosing a loosely coupled buyer/seller relationship while "The Process Technology Used by Possible Supplier is Complex" [+0.819] is relatively more influential when choosing a tightly coupled buyer/seller relationship. Therefore, if a supplier uses a "simple production technology," a buying firm would choose a loosely coupled buyer/seller relationship and thus be able to switch suppliers without sacrificing continuity of supply since numerous suppliers should be able to sustain a "simple production technology." However, a buying firm would choose a tightly coupled buyer/seller relationship to insure a working relationship with a supplier using a "complex production technology" which may not be available from other suppliers.

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[4]Chapter III discusses the interviews with purchasing executives which lead to the conjectures associated with the influence of possible supplier characteristics in the *preliminary* Buyer/Seller Relationship Decision Model, pp. 31-34.

In general, the six Purchasing Objectives of the Buying Firm used in this research were proven, statistically, to be more influential when choosing a tightly coupled buyer/seller relationship than a loosely coupled one (Table VI-1). Specifically, the most influential purchasing objectives (those having deltas greater than +0.656; the smallest delta which was discussed with the other influencing factors) for choosing a tightly coupled buyer/seller relationship are: "obtaining process technology and innovations from suppliers" [+1.111], "obtaining product technology and innovations from suppliers" [+1.075], "improving quality of the purchased products or items" [+1.009], and "contributing to the reduction of the time interval from product design to availability of the finished goods to the final customer" [+0.890]. Therefore, it appears that buying firms, with these purchasing objectives, may use tightly coupled buyer/seller relationships, which limit the suppliers to a select group, thus permitting an exchange of information and a cooperative environment to achieve these objectives.[5] Accordingly, purchasing objectives should be considered as factors influencing the choice of tightly coupled buyer/seller relationships.

Assessment of Factors Influencing the Choice of a Buyer/Seller Relationship

The first portion of the *modified* Buyer/Seller Relationship Decision Model (Figure VI-1) illustrates that once the purchasing decision-maker considers the influencing factors discussed in this Chapter, a choice will then be made to use either a loosely coupled or a tightly coupled buyer/seller relationship.[6] This section modifies the conjectures pertaining to the influencing factors of the Buyer/Seller Relationship Decision Model in light of the conclusions drawn earlier in this Chapter. The following

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[5]Chapter III discusses the interviews and recommendations of the doctoral dissertation committee which lead to the conjectures associated with the influence of purchasing objectives of the buying firm in the *preliminary* Buyer/Seller Relationship Decision Model, p. 31.

[6]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the Influence Factors and the *preliminary* Buyer/Seller Relationship Decision Model, pp. 27-36.

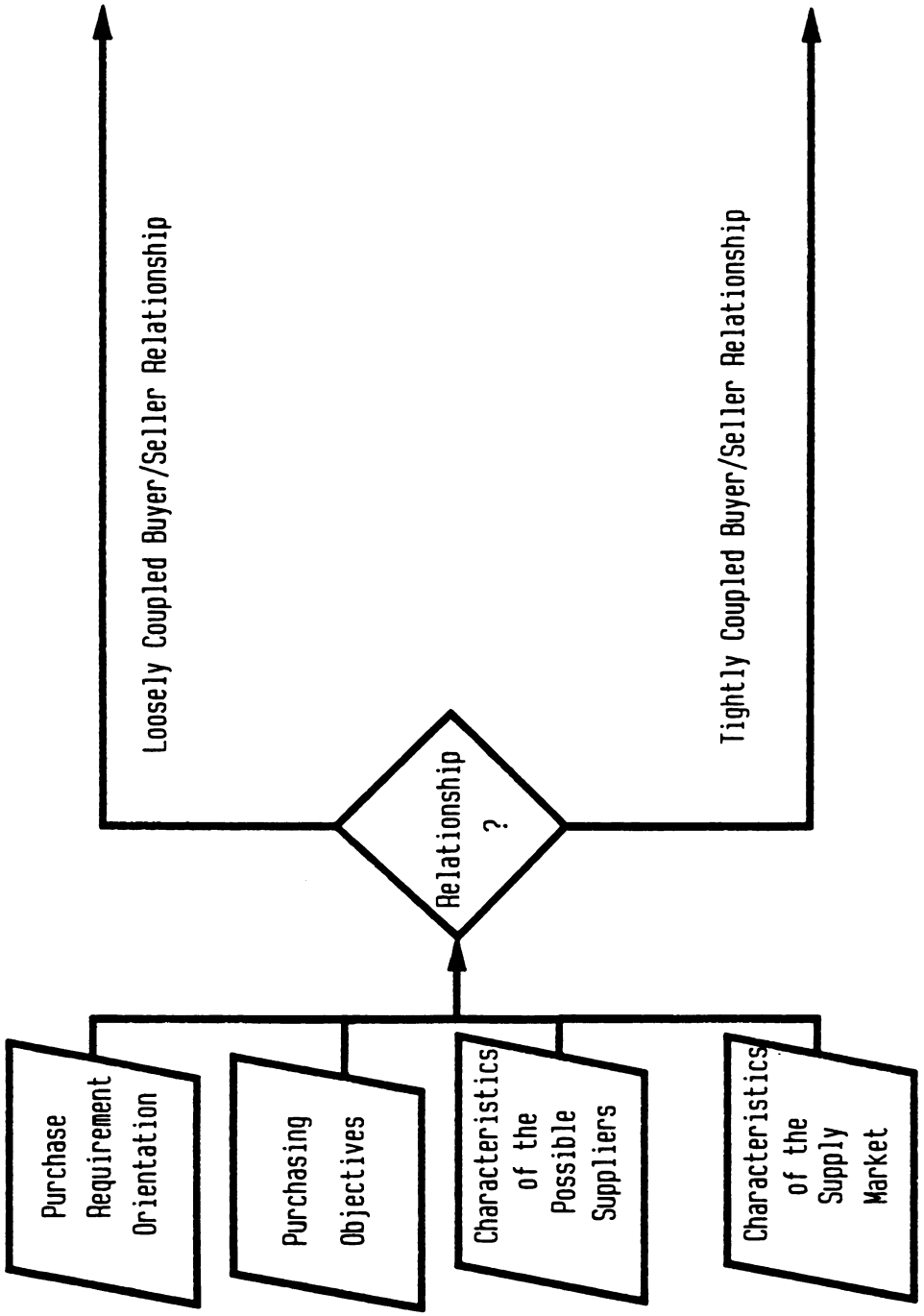


FIGURE VI-1

FACTORS INFLUENCING THE CHOICE OF A BUYER/SELLER RELATIONSHIP

discussion is presented in three sections: (1) purchase requirement orientation, (2) characteristics of the supply market, (3) characteristics of the possible suppliers, (4) purchasing objectives of the buying firm.

Purchase Requirement Orientation. The importance of these influencing factors implies that a custom-made product, a critical application, an estimated high dollar expenditure, a complex production, and a long duration of need, all greatly influence the choice of a tightly coupled buyer/seller relationship. The choice to use such a buyer/seller relationship for these product requirement orientations is consistent with the conjectures of the influencing factors associated with the Buyer/Seller Relationship Decision Model, and is caused by the buying firm's need to work closely with one or a few suppliers to mitigate possible perturbations to its operating systems. Correspondingly, these purchase requirement orientation factors are less influential when choosing a loosely coupled buyer/seller relationship.[7]

The purchase requirement orientation factor which most greatly influenced the choice of a loosely coupled buyer/seller relationship was "an industry standard." Conversely, this factor had little influence on the choice of a tightly coupled buyer/seller relationship. An industry standard should be available from numerous suppliers, and thus the buying firm would not need to work closely with a supplier since perturbations to its operating systems could be mitigated by switching suppliers. It was also shown that the purchase requirement orientations of a non-critical application, a simple production process, a short duration of need, and a low estimated dollar expenditure were more influential when choosing a loosely coupled buyer/seller relationship than a tightly coupled one. As before, the buying firm would not need to work closely with a supplier to develop a tightly coupled buyer/seller relationship since perturbations to its operating systems, caused by purchase requirements with these orientations, could be

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[7]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of the Purchasing Requirement Orientations on the choice of a Tightly Coupled Buyer/Seller Relationship, p. 29.

mitigated by switching suppliers. Consequently, these purchase requirement orientation factors are less influential when choosing a tightly coupled buyer/seller relationship.[8]

Characteristics of the Supply Market. The influencing factor of "only one or a few suppliers in the supply market" is more influential when choosing a tightly coupled buyer/seller relationship than when choosing a loosely coupled one. These results support the conjectures of the influencing factors associated with the Buyer/Seller Relationship Decision Model, that a tightly coupled buyer/seller relationship will help insure a continuity of supply when there are only one or a few suppliers in the supply market.[9] Conversely, if numerous suppliers are available, the buying firm will choose a loosely coupled buyer/seller relationship since it will be able to play one supplier off against the other to achieve short term cost benefits without sacrificing continuity of supply. Also, if demand is increasing for products available in the supply market, a tightly coupled buyer/seller relationship will be chosen. However, a loosely coupled buyer/seller relationship would be chosen if demand is decreasing. Correspondingly, if the availability of products in the supply market is decreasing, a tightly coupled buyer/seller relationship will be chosen. However, a loosely coupled buyer/seller relationship will be chosen if products are becoming more available. Thus, the buying firm would be able to take advantage of supply market conditions, by maintaining a loosely coupled relationship when numerous suppliers are available, or when products are abundant through decreased demand or increased availability; and by maintaining a tightly coupled relationship when only one or a few suppliers are available, or when products are scarce through increased demand or decreased availability.[10]

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[8]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of the Purchasing Requirement Orientations on the choice of a Loosely Coupled Buyer/Seller Relationship, p. 31.

[9]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of the *supply base* on the choice of a Tightly Coupled Buyer/Seller Relationship, p. 34.

[10]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of *product supply and demand* on the choice of a Buyer/Seller Relationship, pp. 34-36.

Characteristics of the Possible Suppliers. In general, these influencing factors should be regarded as being influential for choosing a tightly coupled buyer/seller relationship. Nevertheless, the one factor which had a significant interaction effect was that of the possible supplier using "a simple production technology" which is more influential when choosing a loosely coupled buyer/seller relationship rather than a tightly coupled one. Thus, if a supplier uses a "simple production technology," a buying firm would choose a loosely coupled buyer/seller relationship which will allow the switching of suppliers without sacrificing continuity of supply since numerous suppliers should maintain the required technology. However, if a supplier use a "complex production technology," a buying firm would choose a tightly coupled buyer/seller relationship to insure a working relationship with the supplier using technology which may not be available elsewhere.[11]

Purchasing Objectives of the Buying Firm. In general, the influence of purchasing objectives is greater for choosing a tightly coupled buyer/seller relationship than a loosely coupled one. Specifically, the most influential purchasing objectives for choosing a tightly coupled buyer/seller relationship are: "obtaining process technology and innovations from suppliers," "obtaining product technology and innovations from suppliers," "improving quality of the purchased products or items," and "contributing to the reduction of the time interval from product design to availability of the finished goods to the final customer." The predominate influence of these purchasing objectives when choosing a tightly coupled buyer/seller relationship, indicates that the buying firm will work with suppliers and exchange information with them to achieve these objectives. For example, if the potential supplier provides a specialized product which may impinge on the buying organization's operations, then a tightly coupled buyer/seller relationship may be chosen to improve quality, obtain process and product innovations, and reduce total design to finish product lead times.

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[11]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the influence of a *supplier's production technology* on the choice of a Buyer/Seller Relationship, p. 34.

Summary. All of the original conjectures pertaining to the association of product orientation of the purchase requirement with the *preliminary* Buyer/Seller Relationship Decision Model were supported during the empirical research; therefore, all these influencing factors should be included in the *modified* Buyer/Seller Relationship Decision Model. Also, the size of the supply pool, and the supply and demand of the purchase requirement would abet the depiction of the choice of a buyer/seller relationship. Additionally, production technology used by the possible supplier would also influence the choice of a buyer/seller relationship, and should also be included in the *modified* Buyer/Seller Relationship Decision Model. Finally, all of the purchasing objectives of the buying firm were found to influence the choice of a tightly coupled buyer/seller relationship. Accordingly, the category of purchasing objectives should also be included in the *modified* Buyer/Seller Relationship Decision Model.

THE SOURCE SELECTION CRITERIA POOL AND THE BUYER/SELLER RELATIONSHIP DECISION MODEL

This section assesses the second decision juncture of the Buyer/Seller Relationship Decision Model which concerns the evaluation of a potential supplier after the choice to use either a loosely coupled or tightly coupled buyer/seller relationship has been made. The assessment presented in this section is based on the rejection (see Chapter V, pp. 85-88) of Null Hypothesis 2 of this dissertation stated in Chapter IV. Accordingly, the Model assessment presented in this section will specifically answer the second research question of this dissertation:

> What source selection criteria are important when evaluating a potential supplier for either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

To answer this research question, the primary area of interpretation will be related to the results of the matched *t*-tests (see Table V-11, p. 89) which show that 38 of the 39 source selection criteria significantly differ in their importance when evaluating a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relation-

ship ($P \leq 0.005$).[12] The relative differences (deltas) of all the source selection criteria are shown in Table VI-2. Deltas with positive numbers are more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship, and those with negative numbers for a loosely coupled one. Examination of Table VI-2 shows that 37 source selection criteria are more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship, whereas only one source selection criterion has more importance when evaluating a potential supplier for a loosely coupled buyer/seller relationship. The deltas depicting the importance of the source selection criteria are shown in brackets in the following discussion.

Examination of Table VI-2 shows that the source selection criterion of "Quotes the Lowest Price" is the only criterion having more importance [-0.539] when evaluating a potential supplier for a loosely coupled buyer/seller relationship, and is, relatively less important when evaluating a potential supplier for a tightly coupled one. Previous source selection criteria research, discussed in Chapter III, stated that the criterion of quoting the lowest price was of paramount importance; however, since previous research did not consider the type of buyer/seller relationship, previous research conclusions may be considered suspect.[13]

Since the other source selection criteria have positive deltas, it may be concluded that they are all more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one. However, the object of this research is to distinguish those source selection criteria which can be considered *most* important when evaluating a potential supplier for a tightly coupled buyer/seller relationship. Therefore, the following percentiles were calculated from the 37 deltas

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[12]Chapter V discusses the concern of normality and the effect it may have on Type I errors; the true critical value may actually be as high as 0.015 instead of 0.005 for the 38 source selection criteria pp. 63-65.

[13]Chapter III discusses previous source selection criteria research and the importance of *price*, *delivery*, and *quality* when evaluating a potential supplier, pp. 36-37.

TABLE V-2

RANKING OF DELTAS* FOR THE 38 SIGNIFICANTLY DIFFERENT SOURCE SELECTION CRITERIA WHEN EVALUATING A POTENTIAL SUPPLIER

	Deltas
1. Has a Sound Financial Condition	0.697
2. Performs Research and Development on its Products	0.675
3. Has a Capable Management Team	0.674
4. Performs Research and Development on its Processes	0.666
5. Provides Manufacturing Cost Information	0.663
6. Has Productivity Improvement Potential	0.639
7. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	0.638
8. Has a Cooperative Business Philosophy	0.572
9. Has the Ability to Expand Production Capacity	0.532
10. Provides Information on Finished-Goods Inventory Levels	0.520
11. Updates Production Capacity Availability	0.474
12. Anticipates Future Purchase Requirements	0.464
13. Adapts to Specific Needs of the Buying Firm	0.461
14. Uses Statistical Process Control	0.402
15. Provides Technical Field Services	0.398
16. Cooperates When Unforeseen Difficulties Occur	0.397
17. Provides "On-Going" Production Status Information	0.391
18. Provides Quality Control Performance Information	0.371
19. Provides Special Handling	0.364
20. Helps in Emergency Situations	0.362
21. Helps in Overcoming Buying Company Errors	0.351
22. Has a Helpful Sales Force	0.349
23. Provides Electronic Data Interchange (EDI) Capabilities	0.348
24. Has Available Production Capacity	0.335
25. Provides Price Guarantees for a Relevant Time Period	0.306
26. Provides Repair Services	0.300
27. Provides Bar-Coding Capabilities	0.275
28. Maintains On-Time Delivery Schedules	0.269
29. Has Had Few In-Coming Inspection Rejections	0.268
30. Offers the Required Quality	0.268
31. Advises of Product or Item Unavailability	0.246
32. Provides a Product Warranty	0.223
33. Provides Frequent Deliveries	0.213
34. Offers a Family of Products	0.150
35. Maintains Plant or Warehouse Near the Buying Location	0.148
36. Provides "Rush" Deliveries	0.148
37. Provides Favorable Payment Terms	0.096
38. Quotes the Lowest Price	-0.539

*Positive numbers (deltas) are more important when evaluating a potential supplier for a Tightly Coupled Buyer/Seller Relationship, and negative numbers (deltas) are more important when evaluating a potential supplier for a Loosely Coupled Buyer/Seller Relationship.

associated with source selection criteria which are more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship:

25th Percentile	(Median) 50th Percentile	75th Percentile
+0.269	+0.364	+0.526

Accordingly, this research assumes that the nine source selection criteria with deltas greater than the 75th percentile (+0.526) have *predominate* importance when evaluating a potential supplier for a tightly coupled buyer/seller relationship.

The source selection criteria of "Has a Sound Financial Condition" [+0.698] and "Provides Manufacturing Cost Information" [+0.663] indicate that some economic related source selection criteria are more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one (Table VI-2). These results are consistent with the conjectures stated in Chapter III.[14] Thus, it follows that, when evaluating a potential supplier for a tightly coupled buyer/seller relationship, a sound financial condition is important since the relationship will continue over an extended period of the time; they will need a supplier who will not be forced to cease operations because of a poor financial condition. Furthermore, as the number of suppliers in the supply pool is reduced in tightly coupled buyer/seller relationships, the ability to determine a *fair* and *reasonable* price through competitive bidding may also be reduced. Therefore, the purchaser in a tightly coupled buyer/seller relationship will have to rely on a potential supplier's manufacturing cost information to evaluate the *fairness* and *reasonableness* of its costs and price.

The technically related source selection criteria of "Performs Research Development on Its Products" [+0.676] and "Performs Research and Development of Its Processes" [+0.666] are also more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one. These conclusions are

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[14]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the importance of economic related source selection criteria in the *preliminary* Buyer/Seller Relationship Decision Model, p. 41.

also consistent with the conjectures of the association of source selection criteria and the *preliminary* Buyer/Seller Relationship Decision Model stated in Chapter III.[15] In a tightly coupled buyer/seller relationship, the buying firm works with its suppliers to improve productivity and to lower overall costs. Therefore, by having access to the supplier's research and development projects, the buying firm may be able to incorporate some these to improve productivity and lower costs.

The conjectures of the association of source selection criteria and the *preliminary* Buyer/Seller Relationship Decision Model in Chapter III predicted that source selection criteria related to the management of the potential supplier would be more important when evaluating a supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one.[16] These conjectures are supported by the deltas of the source selection criteria of "Has a Capable Management Team" [+0.674], "Has Productivity Improvement Potential" [+0.639], "Provides a Labor Relation Record Free of Strikes or Work-Stoppages" [+0.638], and "Has a Cooperative Business Philosophy" [+0.571]. These results are consistent with the descriptive models of buyer/seller relationships as the commitment between the buying and selling firms is high in a tightly coupled buyer/seller relationship. Buying firms using this type of relationship would require a capable supplier management team since a tightly coupled buyer/seller relationship will usually last for some time. Also, the purchasers in the sample may prefer a supplier with a favorable strikes and work-stoppages record since strikes or work-stoppages could affect the supply of goods and services in a relationship with only one or a few suppliers. Similarly, buying firms using tightly coupled buyer/seller relationships, may desire suppliers with cooperative business philosophies in order to resolve disputes

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[15]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the importance of technically related source selection criteria in the *preliminary* Buyer/Seller Relationship Decision Model, pp. 40-41.

[16]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the importance of management related source selection criteria in the *preliminary* Buyer/Seller Relationship Decision Model, pp. 39-40.

through joint problem solving efforts, or to adjust jointly to changes in the marketplace (*e.g.* increased or decreased customer demand).

The conjectures of the association of source selection criteria associated with the Buyer/Seller Relationship Decision Model in Chapter III also predicted that capacity related source selection criteria would be more important when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one.[17] This notion is supported by the source selection criterion, "Has the Ability to Expand Production Capacity" [+0.532]. In a tightly coupled buyer/seller relationship, the buying firm and the selling firm will cooperate when changes occur in their operating environments, and, therefore, the buying firm would be certain that the selected supplier could expand production capacity to deal with changes in the marketplace (*e.g.*, increased customer demands).

In summary, this section has discussed the variability among the cell means of the importance of the source selection criteria used to evaluate potential suppliers for loosely and tightly coupled buyer/seller relationships. Specifically, examination of the deltas (Table VI-2) brought forward the concepts of the "low-price-rule" and the "delayed-benefit-rule." The "low-price-rule" is of primary concern when evaluating a potential supplier for a loosely coupled buyer/seller relationship. Thus, when lower prices are available from another supplier, the buying firm would be able to switch to a competing supplier or play the suppliers off against each other to lower the purchase price. On the other hand, "delayed-benefit-rule" source selection criteria are used when evaluating a potential supplier for a tightly coupled buyer/seller relationship since the buying and selling firms work together to improve productivity and to lower overall costs over a period of time.

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[17]Chapter III discusses the interviews and literature review which lead to the conjectures associated with the importance of production capacity related source selection criteria in the *preliminary* Buyer/Seller Relationship Decision Model, p. 39.

Assessment of Source Selection Criteria Importance When Evaluating a Potential Supplier

The second portion of the *modified* Buyer/Seller Decision Relationship Model (Figure VI-2) illustrates that purchasing decision-makers will use the appropriate source selection criteria when evaluating a potential supplier for either a loosely coupled or a tightly coupled buyer/seller relationship.[18] This section will assess the source selection criteria pool of the Buyer/Seller Decision Relationship Model in light of the conclusions drawn in this section.

Loosely Coupled Buyer/Seller Relationships. The source selection criterion of "Quotes the Lowest Price" was significantly more important when evaluating a potential supplier for a loosely coupled buyer/seller relationship than for a tightly coupled one. This source selection criterion suggests a *low-price-rule* for the pending purchase requirement. Thus, when *lower prices* are available from another supplier, the buying firm would be able to switch to a competing supplier, or play the suppliers off against each other, to achieve the lowest purchase price.

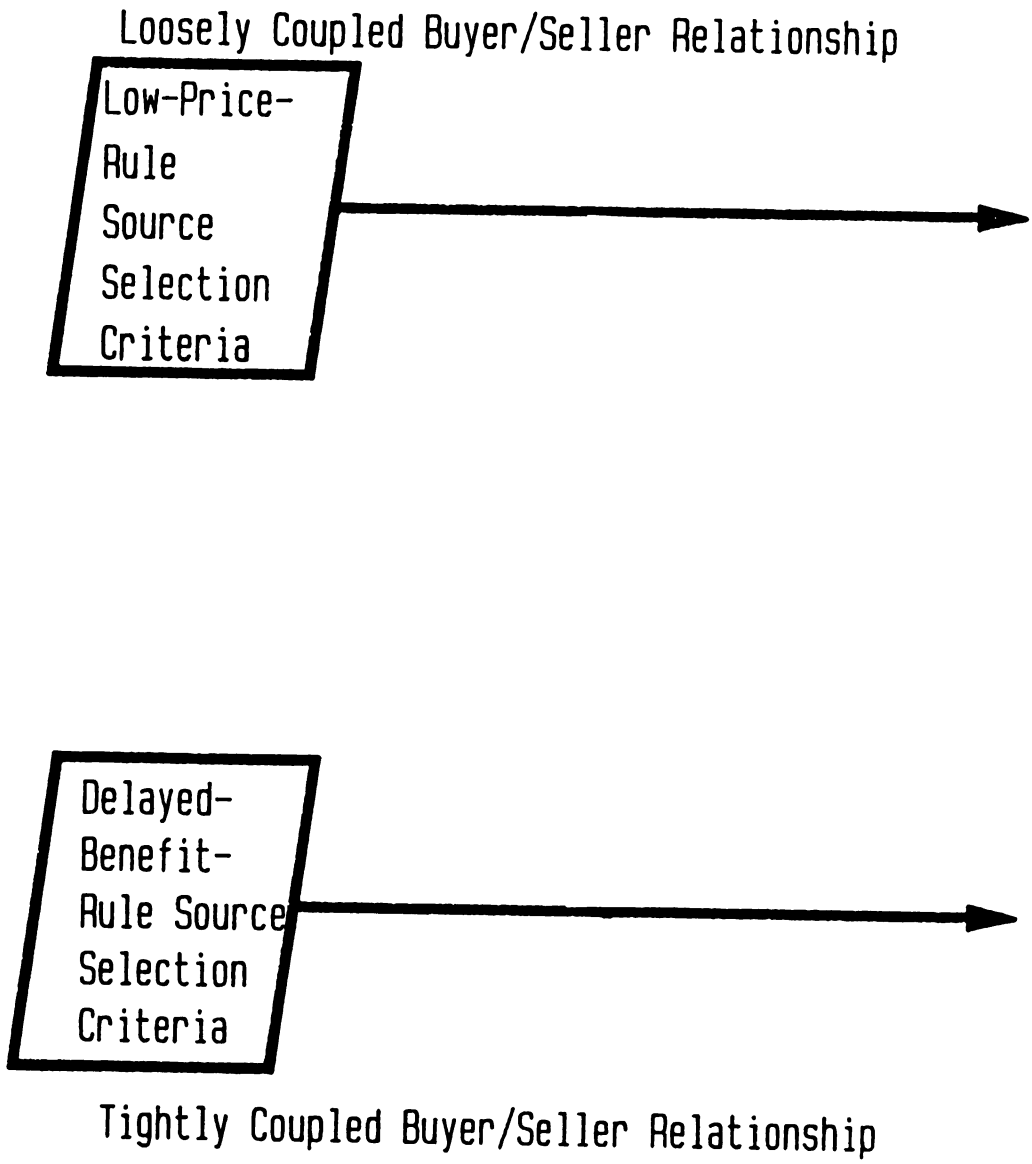
Tightly Coupled Buyer/Seller Relationships. Nine source selection criteria were identified to have predominate importance when evaluating a potential supplier for a tightly coupled buyer/seller relationship (75th percentile and above). These nine source selection criteria can be used to evaluate the future activities of a potential supplier; therefore, *delayed-benefit-rule* source selection criteria are consequential to the purchasing decision-maker when evaluating a potential supplier for a tightly coupled buyer/seller relationship. *Delayed-benefit-rule* source selection criteria are used when evaluating a potential supplier for a tightly coupled buyer/seller relationship since the buying and selling firms will work together in the long-run to improve productivity and to lower overall costs. The *delayed-benefit-rule* source selection criteria identified to be important when evaluating a potential supplier for a tightly coupled buyer/seller relationship are: "having a sound financial condition," "performing research and develop-

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[18]Chapter III discusses the development of the Source Selection Criteria Pool component of the Buyer/Seller Relationship Decision Model, pp. 36-42.

FIGURE VI-2

SOURCE SELECTION CRITERIA CATEGORIES USED WHEN EVALUATING A POTENTIAL SUPPLIER



ment on its products," "having a capable management team," "performing research and development on its processes," "providing manufacturing cost information," "having productivity improvement potential," "providing a labor relation record free of strikes or work-stoppages," "having a cooperative business philosophy," and "having the ability to expand production capacity."

Summary. Based on the findings presented in this section, it was determined that certain source selection criteria are more important when evaluating a potential supplier for loosely coupled buyer/seller relationships, while other are more important for tightly coupled buyer/seller relationships.

SUMMARY OF THE BUYER/SELLER RELATIONSHIP DECISION MODEL ASSESSMENT

All of the original conjectures pertaining to the influence of purchase requirement orientation were supported by the empirical assessment of the Buyer/Seller Relationship Decision Model. Accordingly, the "product type being purchased," the "process technology used to produce the purchase requirement," the "application of the purchase requirement," the "length of time the purchase requirement is needed," and the "estimated annual dollar expenditure for the purchase requirement," all influence the choice of buyer/seller relationship and should be included in the Modified Buyer/Seller Relationship Decision Model. Also, some of the conjectures related to the characteristics of the supply market also influence the choice of a loosely coupled buyer/seller relationship and should be included in the Modified Buyer/Seller Relationship Decision Model, *viz* the *supply* of and the *demand* for the product being purchased, as well as the "number of suppliers in the supply market," assist in the choice of a buyer/seller relationship. Additionally, only one of the characteristics of the possible suppliers, namely the "process technology used by the possible supplier" influenced the choice of a buyer/seller relationship, and should be included in the Modified Buyer/Seller Relationship Decision Model. All of the purchasing objectives of the buying firm were found to influence the choice of a tightly coupled buyer/seller relationship; accordingly, the

category of purchasing objectives is included in the Buyer/Seller Relationship Decision Model.

In this Chapter, it was also demonstrated that the Source Selection Criteria Pool of the Modified Buyer/Seller Decision Relationship Model should delineate between source selection criteria for each buyer/seller relationship. Specifically, the Source Selection Criteria Pool should consist of low-price-rule and delayed-benefit-rule source selection criteria. Generally, the low-price-rule source selection criterion is important when evaluating potential suppliers for loosely coupled buyer/seller relationships; conversely, delayed-benefit-rule source selection criteria are important when evaluating potential suppliers for tightly coupled buyer/seller relationships.

CHAPTER VII

SUMMARY AND IMPLICATIONS

This chapter presents a summary of the dissertation and its implications. Besides assisting in understanding buyer/seller relationships, this dissertation also provides purchasing decision-makers with guidelines on how different buyer/seller relationships are chosen, and recommendations on how a potential supplier is evaluated for different buyer/seller relationships. Furthermore, the dissertation provides a paradigm of buyer/seller relationships which can underpin future purchasing research, and thus lead to better decision-making by purchasing managers.

SUMMARY OF THE DISSERTATION

This dissertation contributes to the study of industrial purchasing by (1) generating models to describe different buyer/seller relationships, (2) quantifying the influence of certain factors when purchasing decision-makers are choosing between buyer/seller relationship approaches, and (3) providing new information on the importance assigned by purchasing decision-makers to different source selection criteria when evaluating a potential supplier for different buyer/seller relationships.

Models of Buyer/Seller Relationships. During preliminary interviews with purchasing executives it became apparent that consistent definitions of buyer/seller relationships were not available. However, using previous research on "living systems" and organizational theory as well as the interviews with purchasing executives, the following descriptive models of the relationships between independent and separately owned enterprises buying from, and selling to, each other were developed.

Loosely Coupled Buyer/Seller Relationship:

> The situation where required goods and services are purchased in a competitive environment in which one supplier is often played-off against another for the buying firm's short-term benefits; disputes are resolved through unyielding negotiations; only limited information is exchanged with the supplier; and adjustments to operating and marketplace conditions are made separately by the buying and selling firms.

Tightly Coupled Buyer/Seller Relationship:

> The situation where required goods and services are purchased from one or a few preferred suppliers; disputes are resolved through joint problem solving efforts; information which may affect the buying and/or selling firms' operations is exchanged to improve mutual productivity and to obtain lower overall costs; and adjustments to operating and marketplace conditions are made jointly by the buying and selling firms.

Using these depictions of buyer/seller relationships, and building upon previous research into buyer/seller relationships and source selection criteria, the following two research questions were asked:

1. What factors influence the choice to use either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

2. What source selection criteria are important when evaluating a potential supplier for either a loosely coupled buyer/seller relationship or a tightly coupled buyer/seller relationship?

To answer these research questions, a survey questionnaire was used to gather information on the influence of 39 factors on the choice of a buyer/seller relationship, and the importance of 39 source selection criteria for the evaluation of a potential supplier for the two different buyer/seller relationships. The gathered data was also analyzed to determine significant differences between (1) percentages of loosely coupled and tightly coupled contracts currently used by the firms in the survey, (2) percentages of suppliers awarded loosely coupled and tightly coupled buyer/seller relationships, and

(3) the percentage of dollars spent on loosely coupled and tightly coupled buyer/seller relationships. On average:

1. Approximately 54 percent of contracts awarded by the firms in the survey can be classified as tightly coupled buyer/seller relationships, and 46 percent as loosely coupled ones,

2. Approximately 42 percent of suppliers used by the firms in the survey have been awarded tightly coupled buyer/seller relationships, and 58 percent in loosely coupled ones, and

3. Approximately 58 percent of expenditures made by the firms in the survey are for tightly coupled buyer/seller relationships, and 42 percent are for loosely coupled ones.

In conclusion, the results of three match *t*-tests showed that manufacturing firms represented in the sample currently have: a greater percentage of their contracts classified as tightly coupled buyer/seller relationships than loosely coupled ones ($P < 0.001$); a smaller percentage of their supply base has been awarded tightly coupled buyer/seller relationships than loosely coupled ones ($P < 0.0001$); and a greater percentage of their expenditures made to suppliers participating in tightly coupled buyer/seller relationships than loosely coupled ones ($P < 0.0001$).

Data from the completed questionnaires were then used in two full factorial designs to test, statistically, hypotheses concerning the choice of a buyer/seller relationship and the evaluation of a potential supplier for one of two types of buyer/seller relationship. A synopsis of the results is provided in the following two sections.

Choice of a Buyer/Seller Relationship. Based on the data analysis, it was determined that four categories of factors influenced the choice of a buyer/seller relationship. The four categories of influencing factors are: (1) purchase requirement orientation, (2) purchasing objectives of the buying firm, (3) characteristics of the possible suppliers, and (4) characteristics of the supply market.

Purchasing Requirement Orientation. All the purchase requirement factors used in the research were shown to be influential when choosing a buyer/seller relationship. The purchase requirement factors were (1) product type, (2) the process technology used to produce the product, (3) the application of the product, (4) the length of time the purchased product is needed, and (5) the estimated annual dollar commitment for the purchase requirement. Specifically, product types were considered to be either an "industry standard" or a "custom-made product." The possible production processes used to produce the purchase requirement were deemed to be either "simple production technology" or "complex production technology." The likely application of the purchase requirement was judged to be either "non-critical" or "critical." The expected annual dollar commitment for the purchase requirement was estimated to be either "a high or a low dollar expenditure." Finally, the need for the purchase requirement was estimated to be of either "a short or a long period of time."

Based on the results of the statistical analysis of the data, it was concluded that a purchase requirement which is "custom-made," "manufactured by complex process technology," "used for a critical application," "needed for a long period of time," or "expected to have a high annual dollar expenditure" would influence a purchasing decision-maker to choose a tightly coupled buyer/seller relationship. This conclusion seems reasonable since a buying firm with these purchase requirements would need to work closely and cooperatively with its suppliers to mitigate possible perturbation of its operating system. For example, purchase requirements which are custom-made, or manufactured by complex process technologies, may be available from specialized suppliers, and thus the buying firm may not have the option of switching suppliers. Also, for purchase requirements which are critical to the buying firm, have a high estimated dollar commitment, or are needed for a long period of time, the buying firm may prefer not to switch suppliers or play one supplier off against another. Thus, the buying firm would choose a tightly coupled buyer/seller relationship which would allow

the supplier to gain competence in producing the critical requirement, economies-of-scale, and experience in producing the purchase requirements.

On the other hand, it was also concluded that a purchase requirement which is an "industry standard," "manufactured by a simple production process," "used for a non-critical application," "required for a short length of period," or "expected to have a low annual dollar commitment relative to the firm's annual dollar purchases," would influence a purchasing decision-maker to choose a loosely coupled buyer/seller relationship. This conclusion seems reasonable as the buying firm's operation is not apt to be adversely affected by these orientations of the purchase requirement. Therefore, the buying firm would not need to work closely with one or a few suppliers, nor would there have to be any cooperation or commitment by the buying firm, since purchase requirements which are industry standards or non-critical to the buying firm may be available from numerous suppliers. In other words, the buying firm could easily switch from one supplier to another thereby obtaining benefits of quoted lower prices, etc. Also, purchase requirements which are required for a short length of period or expected to have a low annual dollar commitment, relative to the firm's annual dollar purchases, should not impact the buying firm's operations and, therefore, the buying firm would not need to develop tightly coupled buyer/seller relationships with suppliers to insure a continuity of supply.

Purchasing Objectives of the Buying Firm. In general, the influence of purchasing objectives is greater for choosing a tightly coupled buyer/seller relationship than a loosely coupled one. Specifically, the most influential purchasing objectives for choosing a tightly coupled buyer/seller relationship are: "obtaining process technology and innovations from suppliers," "obtaining product technology and innovations from suppliers," "improving quality of the purchased products or items," and "contributing to the reduction of the time interval from product design to availability of the finished goods to the final customer." Therefore, it appears that buying firms, with these purchasing objectives, may use tightly coupled buyer/seller relationships, which limit the suppliers

to a select group, thus permitting an exchange of information and a cooperative environment to achieve these objectives.

Characteristics of the Supply Market. Three of the supply market characteristics influenced the choice of buyer/seller relationship. Specifically, the analysis of the data obtained for this research confirmed that "one or a few possible suppliers in the supply market" would lead a buying firm to choose a tightly coupled buyer/seller relationship. The choice of this type of buyer/seller relationship would help insure a continuity of supply from one or a few possible suppliers. However, if "numerous suppliers" are available, the buying firm would be more likely to choose a loosely coupled buyer/seller relationship, since it would be able to play one supplier off against another to achieve benefits (*e.g.*, lower prices) without sacrificing continuity of supply. Also, if the "demand is increasing for products available in the supply market," a tightly coupled buyer/seller relationship will be chosen; however, a loosely coupled buyer/seller relationship would be chosen if "demand is decreasing." Similarly, if the availability of products in the supply market is decreasing, a tightly coupled buyer/seller relationship will be chosen, but a loosely coupled buyer/seller relationship will be chosen if products are becoming more available. Thus, the buying firm would be able to retain a continuity of supply within a loosely coupled relationship when numerous suppliers are available, or when products are *abundant* because of decreased demand or increased availability. In contrast, the buying firm would need to maintain a tightly coupled relationship when only one or a few suppliers are available, or when products are *scarce* through increased demand or decreased availability.

Characteristics of the Possible Suppliers. Only one characteristic pertaining to possible suppliers influences the choice of a buyer/seller relationship. Specifically, the data provided evidence that if suppliers are using a "simple process technology" the purchasing decision-maker would choose a loosely coupled buyer/seller relationship. A simple production process should be readily available from numerous suppliers and thus a buying firm would not have to develop long-term commitments to any one supplier.

Therefore, the buying firm would be able to play one supplier off against another to obtain immediate benefits associated with the purchase requirement. However, if a supplier uses a "complex production technology," a purchasing decision-maker would choose a tightly coupled buyer/seller relationship to insure a working relationship with the supplier, as a complex production technology may not be available from other suppliers.

In summary, the factors influencing the choice of loosely coupled buyer/seller relationships are listed in Table VII-1, those influencing the choice of tightly coupled buyer/seller relationships are listed in Table VII-2.

TABLE VII-1

PREDOMINATE FACTORS WHICH INFLUENCE THE CHOICE OF A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP

	Average Influence for a Tightly Coupled Buyer/Seller Relationship	Average Influence for a Loosely Coupled Buyer/Seller Relationship
Purchase Requirement Orientations		
Industry Standard	2.704	3.750
Short Duration of Need	2.609	3.212
Simple Production Process	2.547	3.193
Non-Critical Application	2.470	3.173
Low Dollar Expenditure	2.509	3.109
Characteristics of the Possible Supplier		
Simple Process Technology	2.740	3.064
Characteristics of the Supply Market		
Increasing Availability	3.151	3.412
Numerous Suppliers	2.755	3.393
Decreasing Demand	3.198	3.337

TABLE VII-2

PREDOMINATE FACTORS WHICH INFLUENCE THE CHOICE OF A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP

	Average Influence for a Tightly Coupled Buyer/Seller Relationship	Average Influence for a Loosely Coupled Buyer/Seller Relationship
Purchase Requirement Orientations		
Critical Application	4.413	3.083
Custom-Made Product	4.351	2.864
High Dollar Expenditure	4.231	3.210
Long Duration of Need	4.074	3.012
Complex Production Process	4.062	2.769
Characteristics of the Possible Supplier		
Complex Process Technology	4.062	2.923
Characteristics of the Supply Market		
Only One or a Few Suppliers	4.324	3.354
Decreasing Availability	4.143	3.346
Increasing Demand	3.912	3.256
Purchasing Objectives of the Buying Firm		
Improving Purchase Product Quality	4.266	3.457
Reducing Total Lead-Time	4.008	3.118
Obtaining Product Technology	3.964	2.888
Obtaining Process Technology	3.893	2.782

Evaluation of a Potential Supplier. A second set of data obtained from the questionnaires was analyzed to answer the second research question. Based on this analysis, it was determined that certain source selection criteria are more important when evaluating a potential supplier for loosely coupled buyer/seller relationships, while others are more important for tightly coupled buyer/seller relationships.

Loosely Coupled Buyer/Seller Relationships. The source selection criterion of "Quotes the Lowest Price" was significantly more important when evaluating a potential supplier for a loosely coupled buyer/seller relationship than for a tightly coupled one. Thus, when *lower prices* are available from another supplier, a purchasing decision-

maker would be able to switch to a competing supplier, or play the suppliers off against each other, to achieve the lowest purchase price.

Tightly Coupled Buyer/Seller Relationships. Thirty-seven of the 39 source selection criteria used in the research were found to have means greater when evaluating a potential supplier for a tightly coupled buyer/seller relationship than for a loosely coupled one. The research categorized the 37 source selection criteria into percentiles, and then assumed that source selection criteria in the 75th percentile had predominate importance when evaluating a potential supplier for a tightly coupled buyer/seller relationship. The following nine source selection criteria are assumed to have predominate important when evaluating a potential supplier for a tightly coupled buyer/seller relationship: "having a sound financial condition," "performing research and development on its products," "having a capable management team," "performing research and development on its processes," "providing manufacturing cost information," "having productivity improvement potential," "providing a labor relation record free of strikes or work-stoppages," "having a cooperative business philosophy," and "having the ability to expand production capacity." Thus, in a tightly coupled buyer/seller relationship, the purchaser needs to be certain that both firms will be able to work cooperatively, with *joint-profit* maximization emphasis and mutual productivity interest to obtain reciprocal benefits over an extended period of time.

The source selection criterion which is the only one important solely when evaluating a potential supplier for loosely coupled buyer/seller relationships is listed in Table VII-3. The source selection criteria which are most important when evaluating a potential supplier for tightly coupled buyer/seller relationships, are listed in Tables VII-4.

TABLE VII-3

PREDOMINATE SOURCE SELECTION CRITERION WHICH IS IMPORTANT WHEN EVALUATING A POTENTIAL SUPPLIER FOR LOOSELY COUPLED BUYER/SELLER RELATIONSHIPS

	Average Importance for a Tightly Coupled Buyer/Seller Relationship	Average Importance for a Loosely Coupled Buyer/Seller Relationship
Quotes the Lowest Price	3.490	4.029

TABLE VII-4

PREDOMINATE SOURCE SELECTION CRITERIA WHICH ARE IMPORTANT WHEN EVALUATING A POTENTIAL SUPPLIER FOR TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS

	Average Importance for a Tightly Coupled Buyer/Seller Relationship	Average Importance for a Loosely Coupled Buyer/Seller Relationship
Cooperative Business Philosophy	4.226	3.654
Capable Management Team	4.138	3.464
Sound Financial Condition	3.962	3.265
Ability to Expand Production Capacity	3.675	3.143
Product Research and Development	3.621	2.946
Manufacturing Cost Information	3.592	2.929
Process Research and Development	3.565	2.899
Labor Record Free of Work-Stoppages	3.547	2.909
Productivity Improvement Potential	3.524	2.885

IMPLICATIONS OF THE RESEARCH

The final Buyer/Seller Relationship Decision Model (Figure VII-1) depicts the interrelationship of the results of this dissertation. The Buyer/Seller Relationship Decision Model consists of two sections, the first of which illustrates that once the purchasing decision-maker identifies the orientation of the purchase requirement, the characteristics of the possible suppliers, and the characteristics of the supply market, a choice is made to use either a loosely or a tightly coupled buyer/seller relationship.

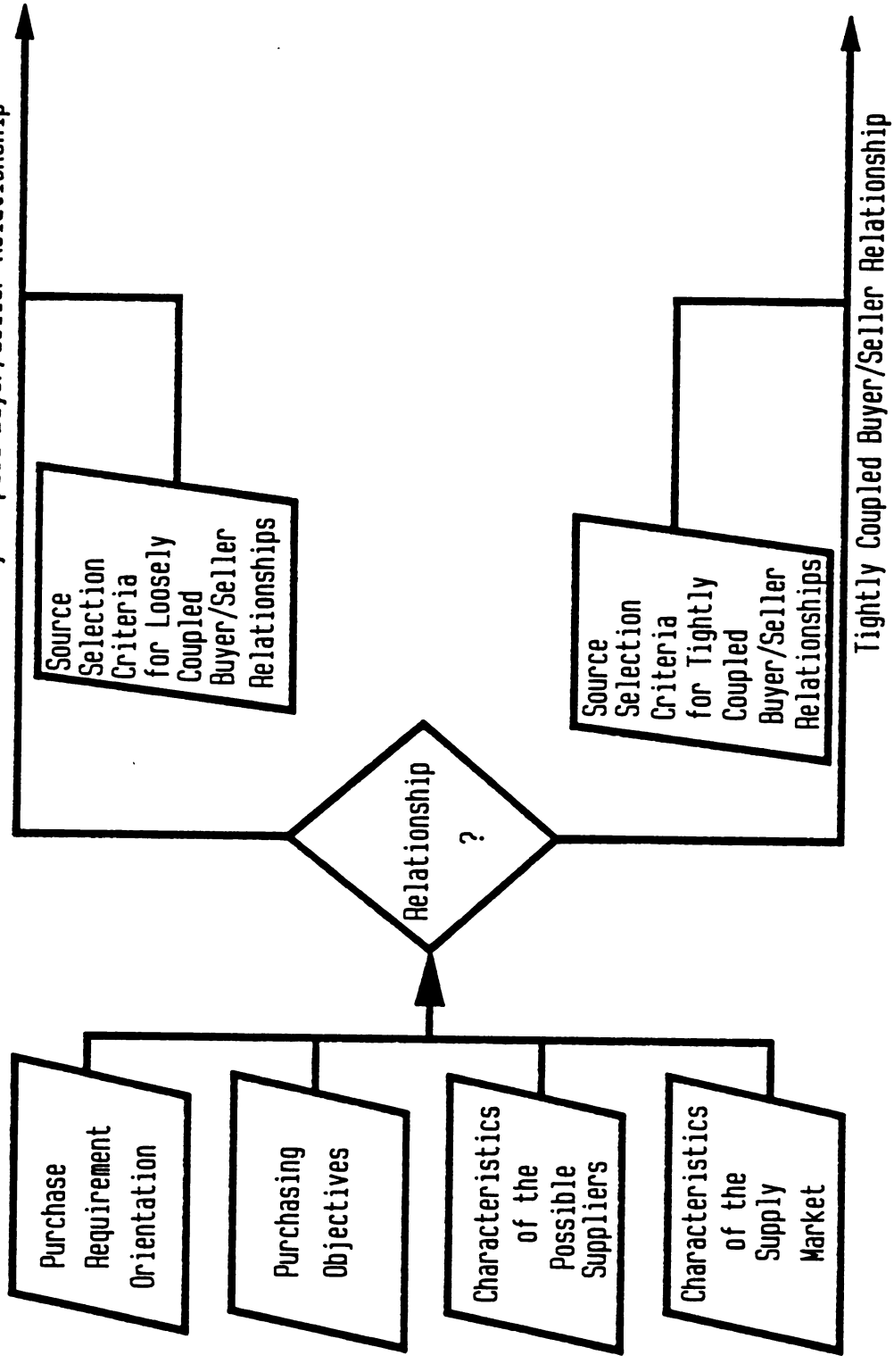


FIGURE VII-1

FINAL BUYER/SELLER RELATIONSHIP DECISION MODEL

The second section of the model illustrates that after choosing a buyer/seller relationship, the purchasing decision-maker will then evaluate a potential supplier by using the source selection criteria appropriate to the chosen buyer/seller relationship. Additionally, the results of this dissertation have implications for both purchasing management and future buyer/seller relationship research. The following two sections describe these implications.

Purchasing Management. The research identified some patterns which may have implications for purchasing managers. Although these patterns cannot be generalized to all purchasing management situations, they can (1) provide a possible procedure for choosing buyer/seller relationships, and (2) identify source selection criteria important when evaluating a potential supplier for different buyer/seller relationships.

Generally, the purchasing objectives of a buying firm influence the choice of a tightly coupled buyer/seller relationship; therefore, purchasing decision-makers with the specific purchasing objectives of "Improving Purchased Product Quality," "Reducing Design to Final Product Availability Lead-Time," "Obtaining Product Technology or Innovation," and "Obtaining Product Technology or Innovation" will use choose a tightly coupled buyer/seller relationship to achieve these objectives. Furthermore, purchasing decision-makers should systematically identify specific purchase requirements from specialized suppliers (*e.g.*, custom-made, produced by a complex production processes), and those readily available from general suppliers (*e.g.*, industry standards, produced by a simple production processes). The purchasing decision-maker should also identify purchase requirements which may impinge on the buying organization's operations during the course of a tightly coupled buyer/seller relationship (*e.g.*, used for critical applications, required for a long duration, expected to have a high dollar expenditure), and those which are not likely to affect the operations (*e.g.*, used for non-critical applications, required for a short duration, expected to have a low dollar expenditure). Thus, if the supplier provides a general product, and the product will not affect the buying organization's operation, then a loosely coupled buyer/seller relationship may be chosen.

However, if the supplier provides a specialized product which may impinge on the buying organization's operations, then a tightly coupled buyer/seller relationship should be chosen, thus establishing a means for achieving lower costs and improved quality. Also, purchasing decision-makers should consider certain factors relating to the supply market—and then chose a loosely coupled buyer/seller relationship when the supply availability is increasing, the demand for the purchase requirement is decreasing or when there are numerous suppliers in the supply market; but, chose a tightly coupled buyer/seller relationship when the supply availability is decreasing, the demand for the purchase requirement is increasing or when there is only one or a few suppliers in the supply market. Additionally, purchasing decision-makers should balance certain factors relating to the characteristics of the possible suppliers—and then chose a loosely coupled buyer/seller relationship when the possible suppliers use a simple production technology; but chose a tightly coupled buyer/seller relationship when the possible suppliers use a complex production technology. Even though, these influencing factors were shown to be applicable to the sample responding to the questionnaire of this dissertation, purchasing managers can use these factors as standards to determine whether their choice of a buyer/seller relationship is consistent with the findings of this dissertation.

The findings of source selection criteria importance suggest that purchasing decision-makers must use a distinctive strategy when evaluating a potential supplier for different buyer/seller relationships. A purchasing decision-maker will primarily evaluate a potential supplier for a loosely coupled buyer/seller relationship on its ability to provide the lowest quoted price. This evaluation process can be easily accomplished by an individual purchasing decision-maker. However, a potential supplier being evaluated for a tightly coupled buyer/seller relationship requires a more critical examination and, accordingly, this evaluation should be augmented by several functional experts in the buying organization. Ideally, the evaluation process should proceed with the assistance of financial experts who would assess the soundness of the potential supplier's financial condition and appraise its manufacturing cost information; engineering experts should

assess the effects of a potential supplier's research and development on its products and processes; operations management experts should assess the potential supplier on its ability to expand production capacity, and on its productivity improvement capability, as well as assisting in the appraisal of its manufacturing costs information. The purchasing decision-maker should also evaluate the labor record of a potential supplier to determine if work-stoppages or strikes may impact a tightly coupled buyer/seller relationship, assess a potential supplier's management team to determine if it is capable of directing and controlling its firm during the course of the relationship, and ascertain if the potential supplier's business philosophy is congruent with the buying firm's purchase needs. The collaboration of financial, engineering and operations management experts with the purchasing decision-maker should lead to a more critical and comprehensive evaluation of a potential supplier, and the selection of the most appropriate supplier for the tightly coupled buyer/seller relationship.

Future Research. The Buyer/Seller Relationship Decision Model, based on the results of this dissertation, also provides a paradigm of purchasing decision-making behavior when using different buyer/seller relationships. This paradigm allows future research into buyer/seller relationships to progress with a basic understanding of which factors influence a buyer/seller relationship, and which source selection criteria are important when evaluating a potential supplier for two different buyer/seller relationships. Therefore, future research should be able to answer specific questions which should assist purchasing managers using different buyer/seller relationships. Specifically, the findings of this dissertation should facilitate future investigation into:

1. Determining which of the variables used in choosing a buyer/seller relationship, and in evaluating a potential supplier, can be controlled to affect performance of the buying and selling firms;

2. Categorizing the relevant costs and their magnitude, when choosing a buyer/seller relationship and when evaluating a potential supplier;

3. Identifying the association between costs and decision variables when choosing a buyer/seller relationship and when evaluating a potential supplier, and recognizing the important tradeoffs among these costs;

4. Conducting longitudinal studies to determine the long-term effects of using different buyer/seller relationships on the buying and selling firms;

5. Investigating the three-way interaction of buyer/seller relationships, influencing factors and source selection criteria;

6. Discovering patterns of influencing factor and source selection criteria importance in different manufacturing industries;

7. Examining different multinational companies to determine patterns of influencing factors and source selection criteria importance between nations and cultures;

8. Examining the patterns of influencing factor and source selection criteria importance within the service sector;

9. Examining the selling firm's choice process when confronted by tightly coupled buyer/seller relationship opportunities.

Previous research into buyer/seller relationships either has attempted to assist selling firms to develop better marketing strategies, or has described the effect of different buyer/seller relationships on the purchasing activity. Source selection criteria research has emphasized the role of product orientation when evaluating a potential supplier. However, additional research, which combines buyer/seller relationships and source selection criteria, was and is necessary to fully understand purchasing decision-making behavior. This dissertation is one of the first studies which considers the buyer/seller relationships and source selection criteria together; it should not be the last.

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August 13, 1986

Thank you for agreeing to help with my dissertation. As I mentioned to you in our telephone conversation, I am soon to sample 10,000 purchasing professionals by a questionnaire to determine the influence that factors of product orientation, supplier profile and competitive congruency have on the choice of a buyer and seller relationship; and the importance of certain source selection criteria once the buyer and seller relationship has been chosen.

I appreciate your willingness to comment on my definitions of buyer and seller relationships; to assess the applicability of the my hypotheses concerning factor influence and source selection criterion importance when you choose a relationship and evaluate a potential supplier; and to critique my questionnaire. Please record your comments, assessments and criticisms on the enclosures, and return them to me in the provided envelope.

Results to the survey should be available within six months, and I will sent you a copy of my findings. Again, thank you for your interest and willingness to assist me in my doctoral studies.

Sincerely yours,

Robert Landeros
Doctoral Candidate
Purchasing and Materials Management

Enclosures: Definitions of Buyer and Seller Relationships
Comment Sheet for Definitions of Buyer and Seller Relationships
Research Hypotheses and Assessment Sheet
Questionnaire
Critique Sheet for Questionnaire

MSU is an Affirmative Action Equal Opportunity Institution

BUYER AND SELLER RELATIONSHIPS

U.S. manufacturing firms have traditionally restricted their buyer and seller relationships to two extreme options, open market bargaining and backward integration (Hayes and Wheelwright, 1984; p. 297). Open market bargaining prevents a buying firm from becoming too dependent on a single supplier by allowing it to select a supplier from a wide supply pool consisting of several potential suppliers. This enables a buying firm to play one supplier off against another. Open market bargaining provides buying firms with maximum control over the buyer-seller relationship as it allows the buying and selling firms to stipulate contingencies associated with purchases on separate contractual agreements. These agreements are often re-written at each contract interval and are only concerned with short-term forecasts of the immediate future (Williamson, 1975; p. 94). In open market bargaining, buying and selling firms are separate and independent enterprises. This type of arrangement can be classified under the definition of loosely coupled relationships (Glassman, 1973; p. 84), since the buying and selling firms are not required to provide information on each other's activities or cope collectively with changes in their operating environments. A "loosely coupled relationship" will be defined, for the proposed research project, as follows:

> The condition in which required goods and services are purchased in a competitive environment such that one supplier can be played-off against another for short-term gains; disputes are resolved through legal interpretation of the contract; only limited information is exchanged with the supplier, and adjustments to operating and marketplace conditions are made by the buying and selling firms separately.

Backward integration, the other extreme of buyer and seller relationships, can be regarded as a strategic move used to reduce costs or protect the buying firm against supplier exploitation. Protection is gained though the ownership and management of all supplier activities (Hayes and Wheelwright, 1984; p. 275). Each dependent intermediate production activity can provide information about price and material availability to the other production activities (Arrow, 1975; Carlton, 1977, 1978). The accessibility of such information allows integrated decisions on firm-wide production levels and capital investments. However, uncertainty about final demand may lead to expensive idle capacity of the integrated firm (Arrow, 1975; Carlton, 1977, 1978). Therefore, an integrated firm can be considered a fully coupled relationship since a perturbation of one of the intermediate production activities may affect another (Glassman, 1973; p. 84). The proposed research project will not consider fully coupled relationships since independent buying and selling enterprises are not present. Nevertheless, for consistency of definitions, "a fully coupled relationship" is defined as follows:

> The condition in which required input goods and services are produced by the buying firm; disputes are resolved by management trade-offs; information is exchanged to optimize integrated production planning and control; and adjustments to operating and marketplace conditions are made by the user and supplier concurrently.

A tightly coupled relationship lies between loosely and fully coupled relationships. On the one hand, tightly coupled relationships are similar to fully coupled relationships since both encourage the buying and selling firms to behave cooperatively when unforeseen contingencies develop, with a joint-profit maximization emphasis (Williamson, 1975; p. 91). On the other hand, the production activities are separately owned in tightly coupled relationships as is also the case in loosely coupled relationships.

Tightly coupled relationships are being used by U.S. manufacturing firms in an effort to improve their productivity as well as their suppliers' productivity (Bohn, 1983; p. 9); and to reduce their response time to market demands (Drozowski, 1985a; p.45). For example, by coupling tightly with some of its suppliers, Ford Motor Company was able to help them reduce their rejection rate of purchased relays from 40 percent to less than one percent within eight months, thereby raising production from 3,000 relays per line per shift to as much as 6,000 and cutting the supplier's manufacturing costs 20 percent (Adkins and Diller, 1983; p. 75). In another example, Xerox Corporation was able to reduce its copier costs by 10 percent every year from 1980 to 1985 by maintaining tightly coupled relationships with its suppliers (Raia, 1985; p.45).

Tightly coupled relationships usually suffer a loss of flexibility because there is an increased dependence on a narrow supply or customer pool. A narrow supply pool will not allow the buying firm to maximize its objectives by playing one supplier off against the other. Therefore, to stay viable, both separately and jointly, the buying and selling firms must provide information on their activities which impinge on or affect the other's system, and cope collectively with environmental changes (Pfeffer and Salancik, 1978; p. 145). Within these constraints, the proposed research project defines a "tightly coupled relationship" as follows:

> The condition in which required input goods and services are purchased from one or a few suppliers; disputes are resolved through joint problem solving efforts; information which may affect the other party's operation is exchanged to improve mutual productivity and to obtain lower overall costs; and adjustments to operating and marketplace conditions are made by the buying and selling firms jointly.

The following table summarizes the attributes of loosely and tightly coupled relationships which will be used in the proposed research project. For conceptual clarification, the table also summarizes the attributes of fully coupled relationships.

	LOOSELY COUPLED RELATIONSHIPS	TIGHTLY COUPLED RELATIONSHIPS	FULLY COUPLED RELATIONSHIPS
SUPPLY POOL	MANY SUPPLIERS IN A COMPETITIVE ENVIRONMENT	ONE OR FEW DEDICATED SUPPLIERS	INTERNALLY INTEGRATED SUPPLIERS
COMMITMENT	WEAK: PLAYS ONE SUPPLIER AGAINST THE OTHER	STRONGER: WORKS WITH SUPPLIER FOR MUTUAL BENEFITS	STRONGEST: SUPPLY SOURCE IS A PART OF THE BUYING FIRM
DISPUTE RESOLUTION	PURCHASE ORDER'S TERMS AND CONDITIONS	JOINT PROBLEM SOLVING	MANAGERIAL TRADE-OFFS
EXCHANGE OF INFORMATION	RESTRICTED	RECIPROCAL	MUTUAL
MARKETPLACE ADJUSTMENTS	SEPARATELY	JOINTLY	CONCURRENTLY

Please comment on the acceptability of the LOOSELY COUPLED BUYER AND SELLER RELATIONSHIP definition:

Please comment on the acceptability of the FULLY COUPLED BUYER AND SELLER RELATIONSHIP definition:

Please comment on the acceptability of the TIGHTLY COUPLED BUYER AND SELLER RELATIONSHIP definition:

(please return this page)

Please make your comments on the applicability of the following hypotheses in the margins.

RESEARCH HYPOTHESES

The following research hypotheses have been developed to test the type and influence of factors when choosing a buyer and seller relationship, and to test the type and importance of source selection criteria when evaluating loosely or tightly coupled suppliers. The first set of hypotheses are designed to test the relative influence that product orientation factors, supplier profile factors, and competitive congruency factors have on the eventual type of relationship. The relative importance of the source selection criteria used by the purchasing decision-maker when evaluating loosely and tightly coupled suppliers will be determined using the second set of hypotheses.

HYPOTHESES OF FACTORS INFLUENCING THE CHOICE OF LOOSELY AND TIGHTLY COUPLED RELATIONSHIPS

The first set of hypotheses will test the type and relative influence of product orientation factors (Dickson, 1966; Cardozo and Cagley, 1971; Kelly and Coaker, 1976; Perreault and Russ, 1976; Dempsey, 1978; Crow, Olshavsky and Summers, 1980; Crow and Lindquist, 1982; Lehmann and O'Shaughnessy, 1982; Rao and Kiser, 1982), supplier profile factors (Porter, 1980; Crosby, 1984; Ruderman, 1984), and competitive congruency factors (Buffa, 1983; Roger, 1985; Ruderman, 1984; Stundza, 1985; Temin, 1984) on the choice of a buyer and seller relationship. The hypotheses to be tested are:

H1. The factors which orient the product or item to be purchased will influence differently the choice of either a loosely or tightly coupled relationship:

- H1A. The degree of product or item standardization will have a different influence when choosing either a loosely or tightly coupled relationship:
  - H1Aa. A standard product or item will be more influential when choosing a loosely coupled relationship.
  - H1Ab. A non-standard product or item will be more influential when choosing a tightly coupled relationship.
- H1B. The make-up of the product or item will have a different influence when choosing either a loosely or tightly coupled relationship:
  - H1Ba. A product or item with a simple composition and configuration will be more influential when choosing a loosely coupled relationship.
  - H1Bb. A product or item with a complex composition and configuration will be more influential when choosing a tightly coupled relationship.
- H1C. The intended application of the product or item will have a different influence when choosing either a loosely or tightly coupled relationship:
  - H1Ca. A product or item with a standard application will be more influential when choosing a loosely coupled relationship.
  - H1Cb. A product or item with a novel application will be more influential when choosing a tightly coupled relationship.

(Please return this page)

H1D. The annual quantities required for the product or item will have a different influence when choosing either a loosely or tightly coupled relationship:

H1Da. A product or item required in small quantities will be more influential when choosing a loosely coupled relationship.

H1Db. A product or item required in large quantities will be more influential when choosing a tightly coupled relationship.

H1E. The annual dollar commitment of the product or item will have a different influence when choosing either a loosely or tightly coupled relationship:

H1Ea. A product or item with a low annual dollar commitment will be more influential when choosing a loosely coupled relationship.

H1Eb. A product or item with a high annual dollar commitment will be more influential when choosing a tightly coupled relationship.

H2. The factors which profile the supplier will influence differently the choice of either a loosely or tightly coupled relationship:

H2A. The experience the buying firm has with the supplier will have a different influence when choosing either a loosely or tightly coupled relationship:

H2Aa. Unsuccessful or no experience with a supplier will be more influential when choosing a loosely coupled relationship.

H2Ab. Successful experience will be more influential when choosing a tightly coupled relationship.

H2B. The level of confidence the buying firm has in the supplier's product will have a different influence when choosing either a loosely or tightly coupled relationship:

H2Ba. Low confidence in the supplier's product will be more influential when choosing a loosely coupled relationship.

H2Bb. High confidence in the supplier's product will be more influential when choosing a tightly coupled relationship.

H2C. The level of confidence the buying firm has in the supplier's production process will have a different influence when choosing either a loosely or tightly coupled relationship:

H2Ca. Low confidence in the supplier's production process will be more influential when choosing a loosely coupled relationship.

H2Ab. High confidence in the supplier's production process will be more influential when choosing a tightly coupled relationship.

H2D. The relationship maintained by the supplier with its sources of supply will have a different influence when choosing either a loosely or tightly coupled relationship:

H2Da. A supplier maintaining loosely coupled relationships with its source of supply will be more influential when choosing a loosely coupled relationship.

H2Db. A supplier maintaining tightly or fully coupled relationship with its sources of supply will be more influential when choosing a tightly coupled relationship.

H2E. The relationship maintained by the supplier with its distribution channel will have a different influence when choosing either a loosely or tightly coupled relationship:

H2Ea. A supplier maintaining loosely coupled relationships with its distribution channel will be more influential when choosing a loosely coupled relationship.

H2Eb. A supplier maintaining tightly or fully coupled relationship with its distribution channel will be more influential when choosing a tightly coupled relationship.

H3. Competitive congruency factors will influence differently the choice of either a loosely or tightly coupled relationship:

H3A. When a buying firm competes on the basis of low cost, its choice of either a loosely or tightly coupled relationship will be influenced differently by the supplier's competitive strategy:

H3Aa. A supplier with a low cost competitive strategy will be more influential when choosing a tightly coupled relationship.

H3Ab. A supplier with a high quality product strategy will be more influential when choosing a loosely coupled relationship.

H3Ac. A supplier with a dependability of supply strategy will be more influential when choosing a loosely coupled relationship.

H3Ad. A supplier with a flexibility/service strategy will be more influential when choosing a loosely coupled relationship.

H3B. When a buying firm competes on the basis of high product quality, its choice of either a loosely or tightly coupled relationship will be influenced differently by the supplier's competitive strategy:

H3Ba. A supplier with a low cost competitive strategy will be more influential when choosing a loosely coupled relationship.

H3Bb. A supplier with a high quality product strategy will be more influential when choosing a tightly coupled relationship.

H3Bc. A supplier with a dependability of supply strategy will be more influential when choosing a loosely coupled relationship.

H3Bd. A supplier with a flexibility/service strategy will be more influential when choosing a loosely coupled relationship.

H3C. When a buying firm competes on the basis of dependability of supply, its choice of either a loosely or tightly coupled relationship will be influenced differently by the supplier's competitive strategy:

H3Ca. A supplier with a low cost competitive strategy will be more influential when choosing a loosely coupled relationship.

H3Cb. A supplier with a high quality product strategy will be more influential when choosing a loosely coupled relationship.

H3Cc. A supplier with a dependability of supply strategy will be more influential when choosing a tightly coupled relationship.

H3Cd. A supplier with a flexibility/service strategy will be more influential when choosing a loosely coupled relationship.

H3D. When a buying firm competes on the basis of flexibility/service, its choice of either a loosely or tightly coupled relationship will be influenced differently by the supplier's competitive strategy:

H3Da. A supplier with a low cost competitive strategy will be more influential when choosing a loosely coupled relationship.

H3Db. A supplier with a high quality product strategy will be more influential when choosing a loosely coupled relationship.

H3Dc. A supplier with a dependability of supply strategy will be more influential when choosing a loosely coupled relationship.

H3Dd. A supplier with a flexibility/service strategy will be more influential when choosing a tightly coupled relationship.

H4. The influence of product orientation factors, supplier profile factors, and competitive congruency factors will differ significantly when choosing a loosely coupled relationship.

H5. The influence of product orientation factors, supplier profile factors, and competitive congruency factors will differ significantly when choosing a tightly coupled relationship.

In summary, the first set of hypotheses should test the type and influence of product orientation factors, supplier profile factors, competitive factors when choosing loosely and tightly coupled relationships.

HYPOTHESES OF SOURCE SELECTION CRITERIA FOR EVALUATING POTENTIAL LOOSELY AND TIGHTLY COUPLED SUPPLIERS

This set of research hypotheses will test the type and importance of the source selection criteria used in evaluating both loosely and tightly coupled suppliers:

H6. Similar importance will be placed on conditional source selection criteria when evaluating a potential loosely or tightly coupled supplier:

H6a. A low price criterion will have similar importance when evaluating a potential loosely or tightly coupled supplier.

H6b. A high quality criterion will have similar importance when evaluating a potential loosely or tightly coupled supplier.

H6c. A best delivery criterion will have similar importance when evaluating a potential loosely or tightly coupled supplier.

H7. More importance will be placed on environmental source selection criteria when evaluating a supplier for a tightly coupled relationship than for a loosely coupled one:

H7a. Ability to expand production capacity will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7b. Willingness to cooperate when unforeseen difficulties occur will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7c. Willingness to help in emergency situations will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7d. Helpfulness to overcome errors will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7e. Willingness to provide repair services will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7f. Willingness to provide a warranty policy will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7g. Willingness to provide field technical services will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7h. Willingness to provide aid and advice will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7i. Willingness to provide training and educational aids will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7j. Willingness to advise of potential problems will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7k. Willingness to adapt to specific needs will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7l. Ability to offer a family of products will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7m. Ability to anticipate buyer's purchase requirements will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H7n. Research and development capability will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8. More importance will be placed on informational source selection criteria when evaluating a supplier for a tightly coupled relationship, then for a loosely coupled one:

H8a. Production facility information will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8b. Production capacity information will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8c. Willingness to provide "rush" delivery services will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8d. Willingness to provide frequent deliveries will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8e. Willingness to provide special handling will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8f. Willingness to provide price guarantees will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8g. Willingness to provide financial information will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8h. A stable labor relation record will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8i. Information on a supplier's inventory control system will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8j. Information on a supplier's quality control system will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8k. Information on a supplier's technical capability will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8l. A supplier's proximity to the buying firm's final delivery location will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H8m. A supplier's on-time delivery history will be a more important criterion when evaluating a supplier for a tightly coupled relationship.

H9. There is a significant difference in the importance assigned to the source selection criteria used when evaluating a potential loosely coupled supplier.

H10. There is a significant difference in the importance assigned to the source selection criteria used when evaluating a potential tightly coupled supplier.

In summary, the second set of hypotheses should test the type and importance of different source selection criteria used when evaluating loosely and tightly coupled supplier. It is hypothesized that conditional source selection criteria will be important when evaluating both loosely and tightly coupled suppliers. However, it is suggested that the evaluation of a tightly coupled supplier will rely more on environmental and informational source selection criteria.

BUYER AND SELLER RELATIONSHIPS QUESTIONNAIRE

PURPOSE OF THE QUESTIONNAIRE

I am conducting a study on the subject of buyer and seller relationships to fulfill the dissertation requirement for my Ph.D. degree. There are two primary objectives for this questionnaire. The first objective is to determine what factors influence the choice of a buyer and seller relationship by purchasing professionals. The second objective is to determine the relative importance of certain source selection criteria when evaluating a potential supplier once the relationship has been chosen.

Results of the study will be made available to you. These results should permit you to use the most influential factors when choosing a buyer and seller relationship, and the most important source selection criteria when evaluating a potential supplier for different buyer and seller relationships. Enclosed is a post-card to request a summary of the results.

DEFINITIONS OF BUYER AND SELLER RELATIONSHIPS

The questionnaire does not use conventional terms of buyer and seller relationships (e.g., short-term, spot buying, long-term contracts; partners-in-excellence) since they may be viewed differently by various industries. Therefore, the questionnaire uses the following terms and definitions of buyer and seller relationships:

LOOSELY COUPLED RELATIONSHIP:

The condition in which required input goods and services are purchased in a competitive environment such that one supplier can be played-off against another for short-term gains; disputes are resolved through legal interpretation of the contract; only limited information is exchanged with the supplier, and adjustments to operating and marketplace conditions are made by the buying and selling firms separately.

TIGHTLY COUPLED RELATIONSHIP:

The condition in which required input goods and services are purchased from one or a few dedicated suppliers; disputes are resolved through joint problem solving efforts; information which may affect the buying and/or selling firms' operations is exchanged to improve mutual productivity and to obtain lower overall costs; and adjustments to operating and marketplace conditions are made by the buying and selling firms jointly.

PLEASE REFER TO THESE TERMS AND DEFINITIONS WHEN COMPLETING THE QUESTIONS ON THE FOLLOWING PAGES.

GENERAL INSTRUCTIONS

In the following pages, you will be requested to indicate the influence of certain factors when choosing the use of a buyer and seller relationships defined above, and the importance of certain source selection criteria when evaluating a potential supplier for the defined relationships. The last section contains questions regarding your purchasing activity so I can determine the proportion of these relationships currently used by U.S. manufacturing firms.

Please be assured that your response will be held confidential. The results of this study will only be published in totals, and no individual or firm will be specifically identified.

I want to thank you in advance for taking time to complete the questionnaire, and returning it to me in the enclosed envelope. Returning the the competed questionnaire by September 30, 1986, would be greatly appreciated. If you have any questions please call me at (517) 353-5415.

Robert Landeros
Doctoral Candidate
Graduate School of Business Administration
Michigan State University

Michigan State University

FACTORS INFLUENCING THE CHOICE OF A BUYER AND SELLER RELATIONSHIP:

Using the 5 point scale provided below, please circle the number corresponding to the degree of influence that the following INFLUENCING FACTORS (the center column) have on your CHOICE to use a LOOSELY COUPLED RELATIONSHIP (the left column) and a TIGHTLY COUPLED RELATIONSHIP (the right column):

Never Influential	Seldom Influential	Sometimes Influential	Often Influential	Always Influential
1	2	3	4	5

If, for example, "The purchase requirement is an off-the-shelf product or item" would always influence you to use a LOOSELY COUPLED RELATIONSHIP, please circle "5" in the left column; and if "The purchase requirement is an off-the-shelf product or item" would seldom influence you to use a TIGHTLY COUPLED RELATIONSHIP, then you should circle "2" in the right column, and so on for the balance of the INFLUENCING FACTORS.

Degree of influence when choosing to use a LOOSELY COUPLED RELATIONSHIP	Influencing Factors	Degree of influence when chosing to use a TIGHTLY COUPLED RELATIONSHIP
1 2 3 4 5	The purchase requirement is an off-the-shelf product or item	1 2 3 4 5
1 2 3 4 5	The purchase requirement is a specially designed product or item	1 2 3 4 5
1 2 3 4 5	The purchase requirement has a simple composition or configuration (e.g., commercial stainless steel, machined parts)	1 2 3 4 5
1 2 3 4 5	The purchase requirement has a complex composition or configuration (e.g., exotic stainless steel; sub-assemblies)	1 2 3 4 5
1 2 3 4 5	The purchase requirement has a standard application (e.g., commercial fasteners)	1 2 3 4 5
1 2 3 4 5	The purchase requirement has a non-standard application (e.g., newly designed component)	1 2 3 4 5
1 2 3 4 5	The purchase requirement will be needed in small annual quantities	1 2 3 4 5
1 2 3 4 5	The purchase requirement will be needed in large annual quantities	1 2 3 4 5
1 2 3 4 5	The purchase requirement is estimated to have a low annual dollar expenditure	1 2 3 4 5
1 2 3 4 5	The purchase requirement is estimated to have a high annual dollar expenditure	1 2 3 4 5
1 2 3 4 5	The buying firm has had unsuccessful or no experience with the supplier	1 2 3 4 5
1 2 3 4 5	The buying firm has had successful experience with the supplier	1 2 3 4 5
1 2 3 4 5	The buying firm has low confidence in the products available from the supplier	1 2 3 4 5
1 2 3 4 5	The buying firm has high confidence in the products available from the supplier	1 2 3 4 5
1 2 3 4 5	The buying firm has low confidence in the supplier's production process	1 2 3 4 5
1 2 3 4 5	The buying firm has high confidence in the supplier's production process	1 2 3 4 5
1 2 3 4 5	The supplier is loosely coupled with its source of supply	1 2 3 4 5
1 2 3 4 5	The supplier is tightly coupled with its source of supply	1 2 3 4 5

Degree of influence when choosing to use a LOOSELY COUPLED RELATIONSHIP	Influencing Factors	Degree of influence when choosing to use a TIGHTLY COUPLED RELATIONSHIP
1 2 3 4 5	The supplier is loosely coupled with its channels of distribution	1 2 3 4 5
1 2 3 4 5	The supplier is tightly coupled with its channels of distribution	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of low cost and the supplier also competes on the basis of low cost	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of low cost but the supplier competes on the basis of high product quality	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of low cost but the supplier competes on the basis of dependability of supply	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of low cost but the supplier competes on the basis of flexibility/service	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of high product quality but the supplier competes on the basis of low cost	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of high product quality and the supplier also competes on the basis of high product quality	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of high product quality but the supplier competes on the basis of dependability of supply	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of high product quality but the supplier competes on the basis of flexibility/service	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of dependability of supply but the supplier competes on the basis of low cost	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of dependability of supply but the supplier competes on the basis of high product quality	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of dependability of supply and the supplier also competes on the basis of dependability of supply	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of dependability of supply but the supplier competes on the basis of flexibility/service	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of flexibility/service but the supplier competes on the basis of low cost	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of flexibility/service but the supplier competes on the basis of high product quality	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of flexibility/service but the supplier competes on the basis of dependability of supply	1 2 3 4 5
1 2 3 4 5	The buying firm competes on the basis of flexibility/service and the supplier also competes on the basis of flexibility/service	1 2 3 4 5

MichiganStateUniversity

SOURCE SELECTION CRITERIA WHEN EVALUATING LOOSELY AND TIGHTLY COUPLED SUPPLIERS:

Using the 7 point scale provided below, please circle the number corresponding to the degree of importance for the following SOURCE SELECTION CRITERIA (the center column) when you are EVALUATING a potential LOOSELY COUPLED SUPPLIER (the left column) and a potential TIGHTLY COUPLED SUPPLIER (the right column):

Extremely Unimportant	Unimportant	Slightly Unimportant	Neutral	Slightly Important	Important	Extremely Important
1	2	3	4	5	6	7

If, for example, "The potential supplier offers the lowest price" would be extremely important to you when evaluating a LOOSELY COUPLED SUPPLIER, please circle "7" in the left column; and if "The potential supplier offers the lowest price" would be neutral to you when evaluating a potential TIGHTLY COUPLED SUPPLIER, then you should circle "4" in the right column, and so on for the balance of the SOURCE SELECTION CRITERIA.

Degree of importance when evaluating a LOOSELY COUPLED SUPPLIER	Source Selection Criteria	Degree of importance when evaluating a TIGHTLY COUPLED SUPPLIER
1 2 3 4 5 6 7	The potential supplier offers the lowest price	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers the highest quality	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers the best delivery	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers the ability to expand production capacity	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to cooperate when unforeseen difficulties occur	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to help in emergency situations	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to help in overcoming errors	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide repair services	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide a warranty policy	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide field technical services	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide aid and advice	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide training and educational aids	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to advise of potential problems	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to adapt to specific needs of the buying firm	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers a family of products	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to anticipate buyer's purchase requirements	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to perform research and development	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers production facility information	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers production capacity information	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to provide "rush" delivery services	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers frequent deliveries	1 2 3 4 5 6 7

Degree of importance when evaluating a LOOSELY COUPLED SUPPLIER	Source Selection Criteria	Degree of importance when evaluating a TIGHTLY COUPLED SUPPLIER
1 2 3 4 5 6 7	The potential supplier offers special handling	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers price guarantees	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers financial information	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers a stable labor relation record	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers information on its inventory control system	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers information on its quality control system	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers information on its technical capabilities	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers to maintain production or warehouse facilities near the buying firm	1 2 3 4 5 6 7
1 2 3 4 5 6 7	The potential supplier offers an on-time delivery schedule	1 2 3 4 5 6 7

PROPORTION OF LOOSELY AND TIGHTLY COUPLED RELATIONSHIPS CURRENTLY USED:

The remaining questions pertain to the type of business done by your firm, division, buying site, etc.; the number of purchase orders or contracts currently under award by your firm, division, buying site, etc.; and the number of purchase orders or contracts which can be categorized as Loosely and Tightly Coupled Relationships:

Which one of the following is most descriptive of the business done by your firm, division, buying site, etc. (Please check only one):

[] Food and kindred products (SIC 20)

[] Furniture and fixtures (SIC 25)

[] Paper and allied products (SIC 26)

[] Chemical and allied products (SIC 28)

[] Rubber and plastics products (SIC 30)

[] Primary metal industries (SIC 33)

[] Fabricated metal products (SIC 34)

[] Machinery (except electrical) (SIC 35)

[] Electrical equipment and supplies (SIC 36)

[] Transportation equipment supplies (SIC 37)

[] Instruments and related products (SIC 38)

[] Miscellaneous manufacturing industries (SIC 39)

Please indicate _____

_____

Please estimate the total number of purchase orders or contracts awarded annually by your firm, division, buying site, etc.

_____

Please estimate the total number of LOOSELY COUPLED RELATIONSHIPS currently maintained by your firm, division, buying site, etc.

_____

Please estimate the total number of TIGHTLY COUPLED RELATIONSHIPS currently maintained by your firm, division, buying site, etc.

_____

CRITIQUE OF QUESTIONNAIRE VALIDATION GROUP

Comments and criticisms on PURPOSE OF THE QUESTIONNAIRE section

Comments and criticisms on DEFINITIONS OF BUYER AND SELLER RELATIONSHIPS section

(Please return this page)

Comments and criticisms on GENERAL INSTRUCTIONS section

Comments and criticisms on INFLUENCING THE CHOICE OF A BUYER AND SELLER RELATIONSHIPS section

(Please return this page)

Comments and criticisms on SELECTION SELECTION CRITERIA WHEN EVALUATING LOOSELY AND TIGHTLY COUPLED SUPPLIERS section

Comments and criticisms on PROPORTION OF LOOSELY AND TIGHTLY COUPLED RELATIONSHIPS CURRENTLY USED section

(Please return this page)

General comments, criticisms and recommendations on the questionnaire

APPENDIX B

COVER LETTER AND QUESTIONNAIRE

MICHIGAN STATE UNIVERSITY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
DEPARTMENT OF MANAGEMENT (517) 353-5415

EAST LANSING · MICHIGAN · 48824-1121

March 6, 1987

Dear Purchasing Professional:

The enclosed survey questionnaire is part of a nationwide study being conducted by Mr. Robert Landeros to fulfill his Ph.D. degree requirements at Michigan State University. The study is partially funded by a Doctoral Grant from the National Association of Purchasing Management.

Mr. Landeros' project is concerned with determining the factors that influence purchasers to choose either a tightly or loosely coupled working relationship with their suppliers, and the relative importance of different source selection criteria once the buyer/seller relationship has been established. The results of his project should provide you with comparative information about why purchasers choose different kinds of supplier relationships and key source selection criteria for each.

Mr. Landeros would very much like to obtain your response to the enclosed questionnaire which has been pretested with a sample of purchasing professionals in Michigan. The average time to complete the questionnaire is 45 minutes.

Would you please complete the questionnaire by April 13th and return it to Mr. Landeros in the self-addressed, postage paid envelope. Please be assured that he will hold your response in the strictest confidence. Your reply is extremely important to the success of the research.

Furthermore, Mr. Landeros will be pleased to send you a summary of the results. A post-card requesting the summary is enclosed.

THANK YOU FOR SUPPORTING THIS IMPORTANT RESEARCH.

Sincerely yours,

Robert M. Monczka
Professor of Purchasing
and Materials Management

RMM/cjw

Enclosures

MSU is an Affirmative Action/Equal Opportunity Institution

BUYER/SELLER RELATIONSHIP QUESTIONNAIRE

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION
MICHIGAN STATE UNIVERSITY

PURPOSE OF THE QUESTIONNAIRE

I am conducting a study on the subject of buyer/seller relationships to fulfill the dissertation requirement for my Ph.D. degree. The questionnaire has two objectives. The first is to determine what factors influence the choice of a buyer/seller relationship by purchasing professionals. The second is to determine the relative importance of certain source selection criteria when evaluating a potential supplier once the type of relationship has been chosen.

The results of the study will provide you with information which should be useful when choosing a buyer/seller relationship, and when evaluating potential suppliers for different buyer/seller relationships. Enclosed is a post-card for you to request a summary of the results. The post-card may be enclosed with the completed questionnaire, or mailed seperately.

DEFINITIONS OF BUYER/SELLER RELATIONSHIPS

The questionnaire does not use conventional terms usually associated with buyer/seller relationships (e.g., short-term, spot buying, long-term contracts, partners-in-excellence) since they may be viewed differently by purchasers in various industries. Therefore, the following terms and definitions of buyer/seller relationships have been established for the purposes of this questionnaire:

LOOSELY COUPLED BUYER/SELLER RELATIONSHIP:

> The situation where required input goods and services are purchased in a competitive environment in which one supplier is often played-off against another for the buying firm's short-term benefits; disputes are resolved through unyielding negotiations; only limited information is exchanged with the supplier; and adjustments to operating and marketplace conditions are made separately by the buying and selling firms.

TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP:

> The situation where required input goods and services are purchased from one or a few preferred suppliers; disputes are resolved through joint problem solving efforts; information which may affect the buying and/or selling firms' operations is exchanged to improve mutual productivity and to obtain lower overall costs; and adjustments to operating and marketplace conditions are made jointly by the buying and selling firms.

PLEASE REFER TO THESE TERMS AND DEFINITIONS WHEN COMPLETING THE QUESTIONS ON THE FOLLOWING PAGES.

GENERAL INSTRUCTIONS

In completing this questionnaire you will be requested to indicate the influence of certain factors on choosing to establish Loosely Coupled and Tightly Coupled Buyer/Seller Relationships, and the importance of certain source selection criteria when evaluating a potential supplier for both a Loosely Coupled and a Tightly Coupled Buyer/Seller Relationship. Finally, you will be asked to indicate the type of business done at your location, and the proportion of Loosely Coupled and Tightly Coupled Buyer/Seller Relationships established by your firm, division,buying site, etc. **Please respond to these questions from the perspective of your buying assignment.**

Please be assured that your response will be held confidential. The results of this study will only be published in totals, and no individual or firm will be specifically identified.

I want to thank you in advance for taking time to complete the questionnaire, and returning it to me in the enclosed envelope. It is important that the questionnaire be **completed and returned by April 13, 1987.** If you have any questions please call me at my Arizona State University Office, (602) 965-6175.

Robert Landeros
Doctoral Candidate
Graduate School of Business Administration
Michigan State University

FACTORS INFLUENCING THE CHOICE OF A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP:

Using the 5 point scale provided below, please circle the number corresponding to the degree of influence that the INFLUENCING FACTORS have on your CHOICE to establish a **LOOSELY COUPLED BUYER/SELLER RELATIONSHIP:**

Not at All Influential	Slightly Influential	Moderately Influential	Very Influential	Extremely Influential
1	2	3	4	5

For example, if your judgment is that "The purchase requirement is an industry standard" is "Extremely Influential" on your choice to establish a LOOSELY COUPLED BUYER/SELLER RELATIONSHIP, please circle "5". Continue in the same manner for the balance of the INFLUENCING FACTORS.

INFLUENCING FACTORS FOR A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP	Degree Of Influence					
PURCHASE REQUIREMENT ORIENTATION						
The purchase requirement is an industry standard	1	2	3	4	5	[001]
The purchase requirement is a custom-made product	1	2	3	4	5	[002]
The purchase requirement uses a simple production process	1	2	3	4	5	[003]
The purchase requirement uses a complex production process	1	2	3	4	5	[004]
The purchase requirement is used for a non-critical application	1	2	3	4	5	[005]
The purchase requirement is used for a critical application	1	2	3	4	5	[006]
The purchase requirement is needed for a short duration of time	1	2	3	4	5	[007]
The purchase requirement is needed for a long duration of time	1	2	3	4	5	[008]
The purchase requirement is estimated to be a low dollar expenditure	1	2	3	4	5	[009]
The purchase requirement is estimated to be a high dollar expenditure	1	2	3	4	5	[010]
PURCHASING OBJECTIVES OF THE BUYING FIRM						
Reducing costs associated with the purchased products or items	1	2	3	4	5	[011]
Improving quality of purchased products or items	1	2	3	4	5	[012]
Obtaining process technology and innovations from suppliers	1	2	3	4	5	[013]
Obtaining product technology and innovations from suppliers	1	2	3	4	5	[014]
Reducing inventory levels of purchased products or items	1	2	3	4	5	[015]
Contributing to the reduction of the time interval from product design to availability of finished goods to the final customer	1	2	3	4	5	[016]

INFLUENCING FACTORS FOR A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP	Degree Of Influence					
CHARACTERISTICS OF THE POSSIBLE SUPPLIERS						
There is no delivery performance history for possible suppliers	1	2	3	4	5	[017]
There is unsatisfactory delivery performance history for possible suppliers	1	2	3	4	5	[018]
There is satisfactory delivery performance history for possible suppliers	1	2	3	4	5	[019]
There is no price history for possible suppliers	1	2	3	4	5	[020]
There is unsatisfactory price history for possible suppliers	1	2	3	4	5	[021]
There is satisfactory price history for possible suppliers	1	2	3	4	5	[022]
There is no quality performance history for possible suppliers	1	2	3	4	5	[023]
There is unsatisfactory quality performance history for possible suppliers	1	2	3	4	5	[024]
There is satisfactory quality performance history for possible suppliers	1	2	3	4	5	[025]
Financial information about possible suppliers is unavailable	1	2	3	4	5	[026]
Financial information about possible suppliers states their financial strength is poor	1	2	3	4	5	[027]
Financial information about possible suppliers states their financial strength is strong	1	2	3	4	5	[028]
The process technology used by possible suppliers is unknown to the buying activity	1	2	3	4	5	[029]
The process technology used by possible suppliers is simple	1	2	3	4	5	[030]
The process technology used by possible suppliers is complex	1	2	3	4	5	[031]
CHARACTERISTICS OF THE SUPPLY MARKET						
There are only one or a few possible suppliers in the supply market	1	2	3	4	5	[032]
There are numerous suppliers in the supply market	1	2	3	4	5	[033]
The supply market experiences numerous technological advancements	1	2	3	4	5	[034]
The supply market experiences few technological advancements	1	2	3	4	5	[035]
Demand is decreasing for the products or items available from the supply market	1	2	3	4	5	[036]
Demand is increasing for the products or items available from the supply market	1	2	3	4	5	[037]
There is a decrease in availability of products or items in the supply market	1	2	3	4	5	[038]
There is an increase in availability of products or items in the supply market	1	2	3	4	5	[039]

FACTORS INFLUENCING THE CHOICE OF A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP:

Using the 5 point scale provided below, please circle the number corresponding to the degree of influence that the INFLUENCING FACTORS have on your CHOICE to establish a **TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP:**

Not at All Influential	Slightly Influential	Moderately Influential	Very Influential	Extremely Influential
1	2	3	4	5

For example, if your judgment is that "The purchase requirement is an industry standard" is "Slightly influential" on your choice to establish a TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP, please circle "2". Continue in the same manner for the balance of the INFLUENCING FACTORS.

INFLUENCING FACTORS FOR A **TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP**	Degree Of Influence					
PURCHASE REQUIREMENT ORIENTATION						
The purchase requirement is an industry standard	1	2	3	4	5	[040]
The purchase requirement is a custom-made product	1	2	3	4	5	[041]
The purchase requirement uses a simple production process	1	2	3	4	5	[042]
The purchase requirement uses a complex production process	1	2	3	4	5	[043]
The purchase requirement is used for a non-critical application	1	2	3	4	5	[044]
The purchase requirement is used for a critical application	1	2	3	4	5	[045]
The purchase requirement is needed for a short duration of time	1	2	3	4	5	[046]
The purchase requirement is needed for a long duration of time	1	2	3	4	5	[047]
The purchase requirement is estimated to be a low dollar expenditure	1	2	3	4	5	[048]
The purchase requirement is estimated to be a high dollar expenditure	1	2	3	4	5	[049]
PURCHASING OBJECTIVES OF THE BUYING FIRM						
Reducing costs associated with the purchased products or items	1	2	3	4	5	[050]
Improving quality of purchased products or items	1	2	3	4	5	[051]
Obtaining process technology and innovations from suppliers	1	2	3	4	5	[052]
Obtaining product technology and innovations from suppliers	1	2	3	4	5	[053]
Reducing inventory levels of purchased products or items	1	2	3	4	5	[054]
Contributing to the reduction of the time interval from product design to availability of finished goods to the final customer	1	2	3	4	5	[055]

INFLUENCING FACTORS FOR A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP	Degree Of Influence					
CHARACTERISTICS OF THE POSSIBLE SUPPLIERS						
There is no delivery performance history for possible suppliers	1	2	3	4	5	[056]
There is unsatisfactory delivery performance history for possible suppliers	1	2	3	4	5	[057]
There is satisfactory delivery performance history for possible suppliers	1	2	3	4	5	[058]
There is no price history for possible suppliers	1	2	3	4	5	[059]
There is unsatisfactory price history for possible suppliers	1	2	3	4	5	[060]
There is satisfactory price history for possible suppliers	1	2	3	4	5	[061]
There is no quality performance history for possible suppliers	1	2	3	4	5	[062]
There is unsatisfactory quality performance history for possible suppliers	1	2	3	4	5	[063]
There is satisfactory quality performance history for possible suppliers	1	2	3	4	5	[064]
Financial information about possible suppliers is unavailable	1	2	3	4	5	[065]
Financial information about possible suppliers states their financial strength is poor	1	2	3	4	5	[066]
Financial information about possible suppliers states their financial strength is strong	1	2	3	4	5	[067]
The process technology used by possible suppliers is unknown to the buying activity	1	2	3	4	5	[068]
The process technology used by possible suppliers is simple	1	2	3	4	5	[069]
The process technology used by possible suppliers is complex	1	2	3	4	5	[070]
CHARACTERISTICS OF THE SUPPLY MARKET						
There are only one or a few possible suppliers in the supply market	1	2	3	4	5	[071]
There are numerous suppliers in the supply market	1	2	3	4	5	[072]
The supply market experiences numerous technological advancements	1	2	3	4	5	[073]
The supply market experiences few technological advancements	1	2	3	4	5	[074]
Demand is decreasing for the products or items available from the supply market	1	2	3	4	5	[075]
Demand is increasing for the products or items available from the supply market	1	2	3	4	5	[076]
There is a decrease in availability of products or items in the supply market	1	2	3	4	5	[077]
There is an increase in availability of products or items in the supply market	1	2	3	4	5	[078]

SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL SUPPLIER FOR A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP:

Using the 5 point scale provided below, please circle the number corresponding to the relative importance of the following SOURCE SELECTION CRITERIA when you are EVALUATING a potential supplier for a **LOOSELY COUPLED BUYER/SELLER RELATIONSHIP:**

Unimportant	Slightly Important	Moderately Important	Very Important	Extremely Important
1	2	3	4	5

For example, if a potential supplier "Quotes the lowest price" and if this would be "Extremely Important" to you when evaluating the supplier for a **LOOSELY COUPLED BUYER/SELLER RELATIONSHIP**, please circle "5". Continue in the same manner for the balance of the SOURCE SELECTION CRITERIA.

SOURCE SELECTION CRITERIA FOR EVALUATING A SUPPLIER FOR A **LOOSELY COUPLED BUYER/SELLER RELATIONSHIP**	Relative Importance					
Quotes the lowest price	1	2	3	4	5	[079]
Has a sound financial condition	1	2	3	4	5	[080]
Provides manufacturing cost information	1	2	3	4	5	[081]
Provides favorable payment terms	1	2	3	4	5	[082]
Provides price guarantees for a relevant time period	1	2	3	4	5	[083]
Offers the required quality	1	2	3	4	5	[084]
Uses statistical process control	1	2	3	4	5	[085]
Has had few in-coming inspection rejections	1	2	3	4	5	[086]
Provides repair services	1	2	3	4	5	[087]
Provides a product warranty	1	2	3	4	5	[088]
Provides technical field services	1	2	3	4	5	[089]
Provides quality control performance information	1	2	3	4	5	[090]
Offers the best possible delivery lead-time	1	2	3	4	5	[091]
Maintains on-time delivery schedules	1	2	3	4	5	[092]
Provides "rush" deliveries	1	2	3	4	5	[093]
Provides frequent deliveries	1	2	3	4	5	[094]
Provides special handling	1	2	3	4	5	[095]
Maintains plant or warehouse near your location	1	2	3	4	5	[096]
Has available production capacity	1	2	3	4	5	[097]
Has the ability to expand production capacity	1	2	3	4	5	[098]
Updates production capacity availability	1	2	3	4	5	[099]
Cooperates when unforeseen difficulties occur	1	2	3	4	5	[100]
Helps in emergency situations	1	2	3	4	5	[101]
Helps in overcoming buying company's errors	1	2	3	4	5	[102]
Advises of product or item unavailability	1	2	3	4	5	[103]
Adapts to specific needs of the buying firm	1	2	3	4	5	[104]
Offers a family of products	1	2	3	4	5	[105]
Anticipates future purchase requirements	1	2	3	4	5	[106]
Performs research and development on its processes	1	2	3	4	5	[107]
Performs research and development on its products	1	2	3	4	5	[108]
Provides "on-going" production status information	1	2	3	4	5	[109]
Provides a labor relation record free of strikes or work-stoppages	1	2	3	4	5	[110]
Provides information on finished-goods inventory levels	1	2	3	4	5	[111]
Provides Electronic Data Interchange (EDI) capabilities	1	2	3	4	5	[112]
Provides bar-coding capabilities	1	2	3	4	5	[113]
Has productivity improvement potential	1	2	3	4	5	[114]
Has a capable management team	1	2	3	4	5	[115]
Has a cooperative business philosophy	1	2	3	4	5	[116]
Has a helpful sales force	1	2	3	4	5	[117]

SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL SUPPLIER FOR A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP:

Using the 5 point scale provided below, please circle the number corresponding to the relative importance of the following SOURCE SELECTION CRITERIA when you are EVALUATING a potential supplier for a **TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP:**

Unimportant	Slightly Important	Moderately Important	Very Important	Extremely Important
1	2	3	4	5

For example, if a potential supplier "Quotes the lowest price" and if this would be "Unimportant" to you when evaluating the supplier for a **TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP**, please circle "1". Continue in the same manner for the balance of the SOURCE SELECTION CRITERIA.

SOURCE SELECTION CRITERIA FOR EVALUATING A SUPPLIER FOR A **TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP**	Relative Importance					
Quotes the lowest price	1	2	3	4	5	[118]
Has a sound financial condition	1	2	3	4	5	[119]
Provides manufacturing cost information	1	2	3	4	5	[120]
Provides favorable payment terms	1	2	3	4	5	[121]
Provides price guarantees for a relevant time period	1	2	3	4	5	[122]
Offers the required quality	1	2	3	4	5	[123]
Uses statistical process control	1	2	3	4	5	[124]
Has had few in-coming inspection rejections	1	2	3	4	5	[125]
Provides repair services	1	2	3	4	5	[126]
Provides a product warranty	1	2	3	4	5	[127]
Provides technical field services	1	2	3	4	5	[128]
Provides quality control performance information	1	2	3	4	5	[129]
Offers the best possible delivery lead-time	1	2	3	4	5	[130]
Maintains on-time delivery schedules	1	2	3	4	5	[131]
Provides "rush" deliveries	1	2	3	4	5	[132]
Provides frequent deliveries	1	2	3	4	5	[133]
Provides special handling	1	2	3	4	5	[134]
Maintains plant or warehouse near your location	1	2	3	4	5	[135]
Has available production capacity	1	2	3	4	5	[136]
Has the ability to expand production capacity	1	2	3	4	5	[137]
Updates production capacity availability	1	2	3	4	5	[138]
Cooperates when unforeseen difficulties occur	1	2	3	4	5	[139]
Helps in emergency situations	1	2	3	4	5	[140]
Helps in overcoming buying company's errors	1	2	3	4	5	[141]
Advises of product or item unavailability	1	2	3	4	5	[142]
Adapts to specific needs of the buying firm	1	2	3	4	5	[143]
Offers a family of products	1	2	3	4	5	[144]
Anticipates future purchase requirements	1	2	3	4	5	[145]
Performs research and development on its processes	1	2	3	4	5	[146]
Performs research and development on its products	1	2	3	4	5	[147]
Provides "on-going" production status information	1	2	3	4	5	[148]
Provides a labor relation record free of strikes or work-stoppages	1	2	3	4	5	[149]
Provides finished-goods inventory level information	1	2	3	4	5	[150]
Provides Electronic Data Interchange (EDI) capabilities	1	2	3	4	5	[151]
Provides bar-coding capabilities	1	2	3	4	5	[152]
Has productivity improvement potential	1	2	3	4	5	[153]
Has a capable management team	1	2	3	4	5	[154]
Has a cooperative business philosophy	1	2	3	4	5	[155]
Has a helpful sales force	1	2	3	4	5	[156]

NATURE OF YOUR BUSINESS ACTIVITY:

Which one of the following is most descriptive of the business done at your location (e.g., firm, division, buying site, etc.). Please check only one [157]:

- ☐ Food and kindred products (SIC 20)
- ☐ Furniture and fixtures (SIC 25)
- ☐ Paper and allied products (SIC 26)
- ☐ Chemical and Allied Products (SIC 28)
- ☐ Rubber and plastics products (SIC 30)
- ☐ Primary metal industries (SIC 33)
- ☐ Fabricated metal products (SIC 34)
- ☐ Machinery (except electrical) (SIC 35)
- ☐ Electrical equipment and supplies (SIC 36)
- ☐ Transportation Equipment (SIC 37)
- ☐ Instruments and related products (SIC 38)
- ☐ Miscellaneous manufacturing industries (SIC 39)

Please indicate _____

_____

PROPORTION OF ESTABLISHED LOOSELY COUPLED AND TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS:

Please estimate the percentage of purchase orders, contracts, etc. established by your firm, division, buying site, etc. which can be categorized as Loosely Coupled and Tightly Coupled Buyer/Seller Relationships; the percentage of suppliers which can be categorized as participating in Loosely Coupled and Tightly Coupled Buyer/Seller Relationships; and the percentage of annual dollar expenditures for Loosely Coupled and Tightly Coupled Buyer/Seller Relationships:

	Percent of Contracts	Percent of Suppliers	Percent of Dollar Expenditures
LOOSELY COUPLED BUYER/SELLER RELATIONSHIPS:	_____ % [158]	_____ % [159]	_____ % [160]
TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS:	_____ % [161]	_____ % [162]	_____ % [163]
TOTALS:	100 %	100 %	100 %

APPENDIX C

GEARY NUMBER TABLES

TABLE C-1

RANKING OF GEARY TEST NUMBERS OF FACTORS INFLUENCING THE CHOICE OF A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP

		Geary Number
1.	The Purchase Requirement is Used for a Critical Application	0.90
2.	Improving Quality of Purchased Products of Items	0.89
3.	The Purchase Requirement is a Custom-Made Product	0.89
4.	The Purchase Requirement Uses a Complex Production Process	0.88
5.	There are Only One or a Few Suppliers in the Supply Market	0.88
6.	There is a Decreasing in Availability of Products or Items in the Supply Market	0.87
7.	The Purchase Requirement is Estimated to be a High Dollar Expenditure	0.87
8.	Reducing Inventory Levels of Purchased Products or Items	0.86
9.	Obtaining Process Technology and Innovations from Suppliers	0.86
10.	Financial Information About Possible Suppliers States Their Financial Condition is Poor	0.86
11.	There are Numerous Suppliers in the Supply Market	0.86
12.	Obtaining Product Technology and Innovations from Suppliers	0.85
13.	The Purchase Requirement is Needed for a Long Duration of Time	0.85
14.	There is an Increasing in Availability of Products or Items in the Supply Market	0.85
15.	Demand is Decreasing for the Products or Items Available from the Supply Market	0.85
16.	Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	0.84
17.	Demand is Increasing for the Products or Items Available from the Supply Market	0.84
18.	There is Satisfactory Price Performance History for Possible Suppliers	0.84
19.	There is Satisfactory Quality Performance History for Possible Suppliers	0.84

TABLE C-1 (Cont'd.)

		Geary Number
20.	There is No Quality Performance History for Possible Suppliers	0.84
21.	There is Satisfactory Delivery Performance History for Possible Suppliers	0.83
22.	The Purchase Requirement is Used for a Non-Critical Application	0.83
23.	The Purchase Requirement is Estimated to be a Low Dollar Expenditure	0.83
24.	The Supply Market Experiences Numerous Technological Advancements	0.83
25.	The Purchase Requirement is an Industry Standard	0.82
26.	The Purchase Requirement is Needed for a Short Duration of Time	0.82
27.	Financial Information About Possible Suppliers States Their Financial Condition is Strong	0.82
28.	There is Unsatisfactory Price Performance History for Possible Suppliers	0.82
29.	There is Unsatisfactory Quality Performance History for Possible Suppliers	0.81
30.	The Purchase Requirement Uses a Simple Production Process	0.81
31.	The Process Technology Used by Possible Supplier is Complex	0.81
32.	The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	0.80
33.	Reducing Cost Associated with the Purchased Products or Items	0.80
34.	Financial Information About Possible Suppliers is Unavailable	0.79
35.	There is Unsatisfactory Delivery Performance History for Possible Suppliers	0.78
36.	The Process Technology Used by Possible Supplier is Simple	0.78
37.	The Supply Market Experiences Few Technological Advancements	0.78
38.	There is No Delivery Performance History for Possible Suppliers	0.76
39.	There is No Price Performance History for Possible Suppliers	0.75

TABLE C-2

RANKING OF GEARY TEST NUMBERS OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL LOOSELY COUPLED SUPPLIER

		Geary Number
1.	Provides Favorable Payment Terms	0.98
2.	Provides Quality Control Performance Information	0.85
3.	Provides Electronic Data Interchange (EDI) Capabilities	0.85
4.	Has Available Production Capacity	0.84
5.	Has a Capable Management Team	0.84
6.	Helps in Overcoming Buying Company Errors	0.84
7.	Adapts to Specific Needs of the Buying Firm	0.84
8.	Provides Frequent Deliveries	0.84
9.	Provides Technical Field Services	0.83
10.	Provides a Product Warranty	0.83
11.	Has a Sound Financial Condition	0.83
12.	Has a Cooperative Business Philosophy	0.83
13.	Provides Special Handling	0.82
14.	Provides Information on Finished-Goods Inventory Levels	0.82
15.	Offers the Required Quality	0.81
16.	Advises of Product or Item Unavailability	0.81
17.	Uses Statistical Process Control	0.81
18.	Has a Helpful Sales Force	0.80
19.	Offers a Family of Products	0.80
20.	Provides Repair Services	0.80
21.	Maintains On-Time Delivery Schedules	0.80
22.	Performs Research and Development on its Products	0.79
23.	Has the Ability to Expand Production Capacity	0.79
24.	Performs Research and Development on its Processes	0.79
25.	Provides Manufacturing Cost Information	0.79
26.	Has Productivity Improvement Potential	0.79
27.	Provides a Labor Relation Record Free of Strikes or Work-Stoppages	0.79
28.	Provides Bar-Coding Capabilities	0.79
29.	Maintains Plant or Warehouse Near the Buying Location	0.78
30.	Provides "On-Going" Production Status Information	0.77
31.	Helps in Emergency Situations	0.77
32.	Anticipates Future Purchase Requirements	0.75
33.	Provides Price Guarantees for a Relevant Time Period	0.75
34.	Updates Production Capacity Availability	0.74
35.	Cooperates When Unforeseen Difficulties Occur	0.73
36.	Quotes the Lowest Price	0.73
37.	Has Had Few In-Coming Inspection Rejections	0.72
38.	Provides "Rush" Deliveries	0.71
39.	Offers the Best Possible Delivery Lead-Time	0.69

TABLE C-3

RANKING OF GEARY TEST NUMBERS OF FACTORS INFLUENCING THE CHOICE OF A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP

		Geary Number
1.	There is No Quality Performance History for Possible Suppliers	0.85
2.	Financial Information About Possible Suppliers States Their Financial Condition is Poor	0.84
3.	Financial Information About Possible Suppliers States Their Financial Condition is Strong	0.84
4.	The Purchase Requirement is an Industry Standard	0.84
5.	Improving Quality of Purchased Products of Items	0.84
6.	There is Satisfactory Price Performance History for Possible Suppliers	0.84
7.	The Purchase Requirement Uses a Simple Production Process	0.84
8.	There is Satisfactory Delivery Performance History for Possible Suppliers	0.83
9.	The Purchase Requirement is Estimated to be a Low Dollar Expenditure	0.83
10.	The Purchase Requirement is Used for a Non-Critical Application	0.83
11.	There is No Delivery Performance History for Possible Suppliers	0.83
12.	The Purchase Requirement is Needed for a Short Duration of Time	0.83
13.	Demand is Decreasing for the Products or Items Available from the Supply Market	0.83
14.	The Purchase Requirement is a Custom-Made Product	0.82
15.	The Purchase Requirement is Used for a Critical Application	0.82
16.	The Process Technology Used by Possible Supplier is Complex	0.81
17.	There is Unsatisfactory Price Performance History for Possible Suppliers	0.81
18.	The Process Technology Used by Possible Supplier is Simple	0.81
19.	There are Only One or a Few Suppliers in the Supply Market	0.81
20.	There is an Increasing in Availability of Products or Items in the Supply Market	0.80
21.	The Supply Market Experiences Numerous Technological Advancements	0.80
22.	There are Numerous Suppliers in the Supply Market	0.80
23.	There is No Price Performance History for Possible Suppliers	0.79

TABLE C-3 (Cont'd.)

		Geary Number
24.	Reducing Cost Associated with the Purchased Products or Items	0.79
25.	The Purchase Requirement is Estimated to be a High Dollar Expenditure	0.79
26.	The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	0.78
27.	Financial Information About Possible Suppliers is Unavailable	0.78
28.	There is Satisfactory Quality Performance History for Possible Suppliers	0.78
29.	Reducing Inventory Levels of Purchased Products or Items	0.78
30.	Obtaining Process Technology and Innovations from Suppliers	0.78
31.	The Supply Market Experiences Few Technological Advancements	0.77
32.	There is Unsatisfactory Quality Performance History for Possible Suppliers	0.76
33.	There is a Decreasing in Availability of Products or Items in the Supply Market	0.76
34.	Obtaining Product Technology and Innovations from Suppliers	0.76
35.	Demand is Increasing for the Products or Items Available from the Supply Market	0.74
36.	The Purchase Requirement Uses a Complex Production Process	0.74
37.	There is Unsatisfactory Delivery Performance History for Possible Suppliers	0.73
38.	Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	0.73
39.	The Purchase Requirement is Needed for a Long Duration of Time	0.72

TABLE C-4

RANKING OF GEARY TEST NUMBERS OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A POTENTIAL TIGHTLY COUPLED SUPPLIER

		Geary Number
1.	Uses Statistical Process Control	0.86
2.	Cooperates When Unforeseen Difficulties Occur	0.86
3.	Provides Bar-Coding Capabilities	0.86
4.	Helps in Emergency Situations	0.85
5.	Maintains On-Time Delivery Schedules	0.85
6.	Quotes the Lowest Price	0.85
7.	Provides Special Handling	0.84
8.	Provides Manufacturing Cost Information	0.84
9.	Updates Production Capacity Availability	0.84
10.	Provides Frequent Deliveries	0.84
11.	Provides Electronic Data Interchange (EDI) Capabilities	0.84
12.	Provides a Labor Relation Record Free of Strikes or Work-Stoppages	0.84
13.	Anticipates Future Purchase Requirements	0.83
14.	Performs Research and Development on its Processes	0.83
15.	Provides "On-Going" Production Status Information	0.83
16.	Provides Repair Services	0.83
17.	Has Productivity Improvement Potential	0.83
18.	Provides Favorable Payment Terms	0.83
19.	Performs Research and Development on its Products	0.83
20.	Offers the Required Quality	0.82
21.	Has the Ability to Expand Production Capacity	0.82
22.	Maintains Plant or Warehouse Near the Buying Location	0.82
23.	Provides Information on Finished-Goods Inventory Levels	0.81
24.	Provides Price Guarantees for a Relevant Time Period	0.81
25.	Has a Cooperative Business Philosophy	0.80
26.	Provides Technical Field Services	0.80
27.	Helps in Overcoming Buying Company Errors	0.79
28.	Provides Quality Control Performance Information	0.79
29.	Has Had Few In-Coming Inspection Rejections	0.79
30.	Has Available Production Capacity	0.79
31.	Provides a Product Warranty	0.79
32.	Provides "Rush" Deliveries	0.78
33.	Offers the Best Possible Delivery Lead-Time	0.77
34.	Has a Capable Management Team	0.77
35.	Offers a Family of Products	0.76
36.	Has a Helpful Sales Force	0.74
37.	Advises of Product or Item Unavailability	0.73
38.	Has a Sound Financial Condition	0.72
39.	Adapts to Specific Needs of the Buying Firm	0.70

TABLE C-5

RANKING OF GEARY TEST NUMBERS OF PERCENTAGES FOR LOOSELY COUPLED BUYER/SELLER RELATIONSHIPS

	Geary Number
Percent of Contracts	0.90
Percent of Suppliers	0.87
Percent of Expenditures	0.81

TABLE C-6

RANKING OF GEARY TEST NUMBERS OF PERCENTAGES FOR TIGHTLY COUPLED BUYER/SELLER RELATIONSHIPS

	Geary Number
Percent of Contracts	0.90
Percent of Suppliers	0.87
Percent of Expenditures	0.81

APPENDIX D

ESTIMATE OF GEARY NUMBER FOR TESTING NORMALITY

ESTIMATED 5 PERCENT PROBABILITY POINTS FOR GEARY (Γ) TEST

Figure D-1 was plotted from Geary's Table F (p. 330) which suggest that the 5 percent probability points are logarithm. Therefore, the following logarithmic regression formula was to estimate the required probability points for this dissertation:

$$\Gamma_i = a + b^{*}lnN$$

where,

N = Sample size, and

a = 0.88479

b = 0.01113

for the upper 5 percent level (Γ_U) with an $r^2 = 0.9884$;

a = 0.71708

b = 0.01031

for the lower 5 percent level (Γ_L) with an $r^2 = 0.9821$; and

a = 0.80361

b = 0.00082

for the mean of (Γ_M) with an $r^2 = 0.9605$; which resulted in the following table (See Figure D-2 for plotting of Estimated Γ's):

N	Upper 5%	Mean	Lower 5%
630	0.8130	0.7983	0.7835
647	0.8127	0.7983	0.7838
650	0.8127	0.7983	0.7839
668	0.8124	0.7983	0.7841
669	0.8124	0.7983	0.7842
670	0.8123	0.7983	0.7842
671	0.8123	0.7983	0.7842
672	0.8123	0.7983	0.7842
673	0.8123	0.7983	0.7842
674	0.8123	0.7983	0.7842
675	0.8123	0.7983	0.7842

FIGURE D-1

5 PERCENT PROBABILITY POINTS—GEARY NUMBER*

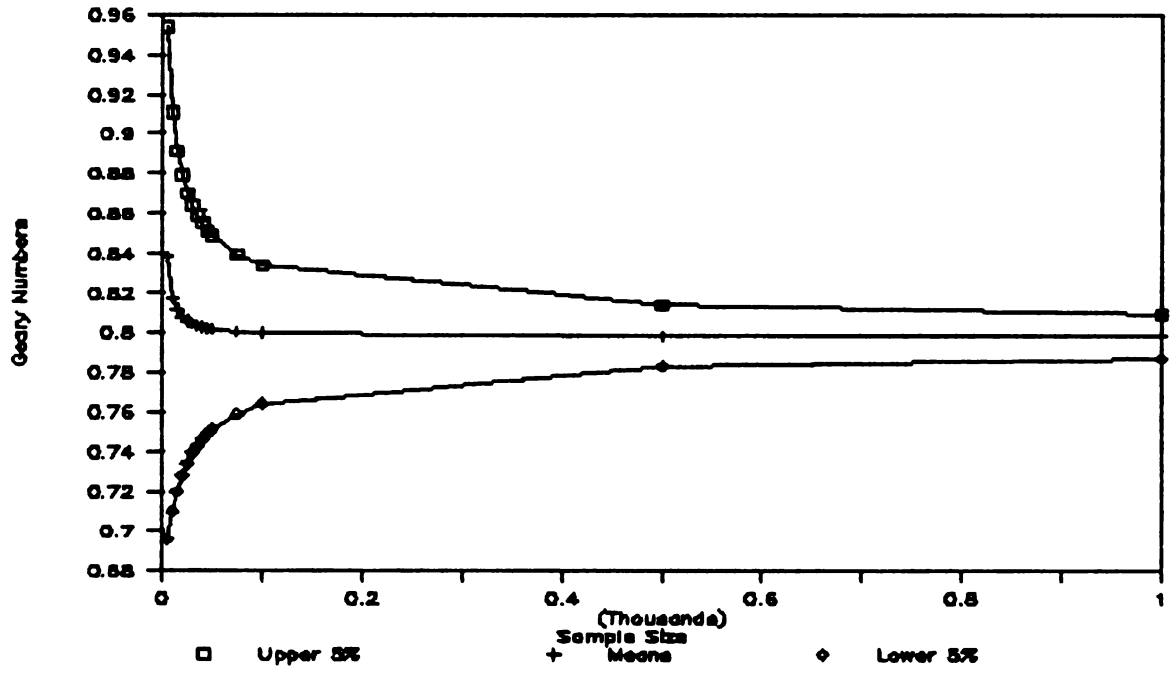
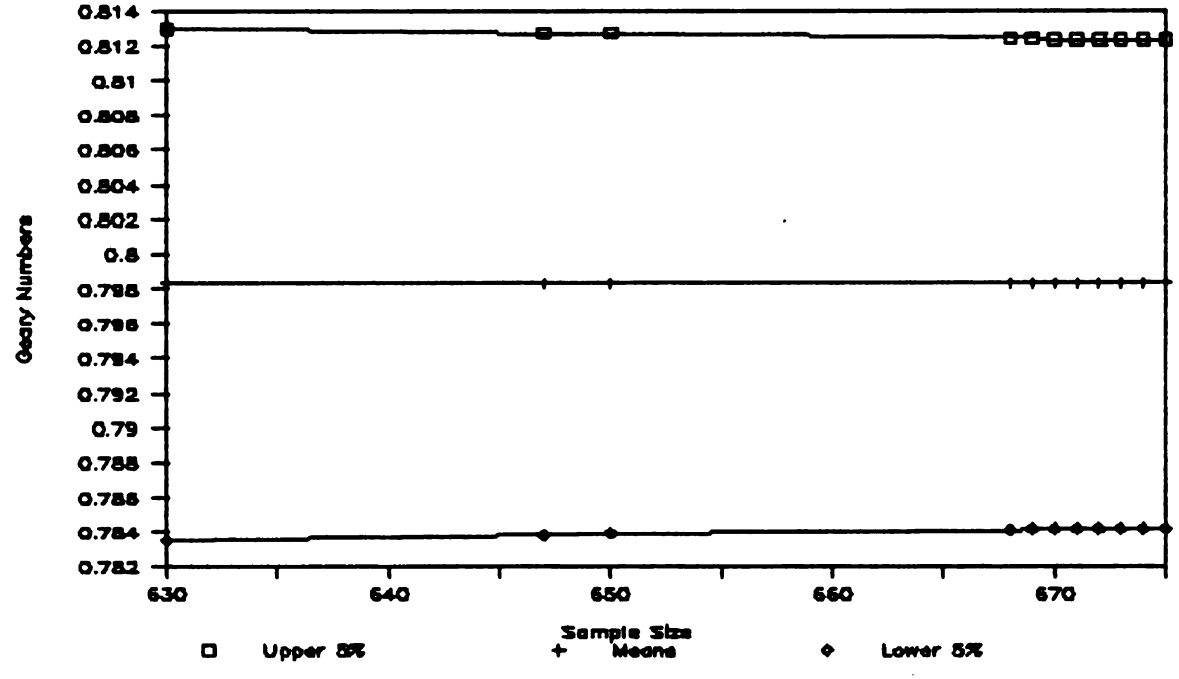


FIGURE F-2

5 PERCENT PROBABILITY POINTS—ESTIMATED GEARY



*R.C. Geary, "The Ratio of the Mean Deviation to the Standard Deviation as a Test of Normality," Biometrika, October 1935, p. 330.

APPENDIX E

t-TESTS RESULT FOR PERCENTAGES OF BUYER/SELLER RELATIONSHIPS BY INDUSTRIES

TABLE E-1

RANKING OF MATCHED *t*-TESTS RESULTS FOR THE PERCENT OF CONTRACTS

	Mean*	Mean§	t-value	P	d.f.
U.S. Manufacturing Firms in the Sample	45.678	54.092	-3.48	0.001	629
Chemical and Allied Products (SIC 28)	39.695	60.305	-2.44	0.018	58
Furniture and Fixtures (SIC 25)	36.500	63.500	-2.31	0.036	15
Instruments and Related Products (SIC 38)	41.810	58.190	-2.18	0.033	57
Electrical Equipment and Supplies (SIC 36)	45.831	54.169	-1.63	0.106	135
Paper and Allied Products (SIC 26)	35.417	64.583	-1.41	0.185	11
Miscellaneous Manufacturing Industries (SIC 39)	45.273	54.727	-1.02	0.314	43
Rubber and Plastics Products (SIC 30)	43.933	53.233	-0.79	0.438	29
Machinery (Except Electrical) (SIC 35)	46.537	53.463	-0.73	0.468	40
Food and Kindred Products (SIC 20)	46.387	53.613	-0.66	0.517	30
Primary Metals Industries (SIC 33)	53.350	46.650	+0.55	0.589	19
Fabricated Metal Products (SIC 34)	48.423	51.089	-0.50	0.621	122
Transportation Equipment (SIC 37)	51.483	48.517	+0.36	0.721	59

*Loosely Coupled Buyer/Seller Relationship

§Tightly Coupled Buyer/Seller Relationship

TABLE E-2

RANKING OF MATCHED *t*-TESTS RESULTS FOR THE PERCENT OF SUPPLIERS

	Mean*	Mean§	t-value	P	d.f.
U.S. Manufacturing Firms in the Sample	58.422	41.449	+7.51	0.000	649
Electrical Equipment and Supplies (SIC 36)	62.130	38.158	+5.25	0.000	138
Fabricated Metal Products (SIC 34)	58.294	41.389	+3.19	0.002	125
Instruments and Related Products (SIC 38)	60.721	39.279	+3.07	0.003	60
Rubber and Plastics Products (SIC 30)	61.853	38.147	+2.43	0.021	33
Chemical and Allied Products (SIC 28)	57.717	40.717	+2.11	0.039	59
Transportation Equipment (SIC 37)	57.117	42.883	+1.85	0.069	59
Miscellaneous Manufacturing Industries (SIC 39)	57.800	42.200	+1.71	0.095	44
Food and Kindred Products (SIC 20)	58.419	41.581	+1.52	0.139	30
Machinery (Except Electrical) (SIC 35)	54.167	45.833	+0.97	0.338	41
Furniture and Fixtures (SIC 25)	50.500	50.056	+0.04	0.965	17
Paper and Allied Products (SIC 26)	50.000	50.000	+0.00	1.000	13
Primary Metals Industries (SIC 33)	50.000	50.000	+0.00	1.000	19

*Loosely Coupled Buyer/Seller Relationship

§Tightly Coupled Buyer/Seller Relationship

TABLE E-3

RANKING OF MATCHED *t*-TESTS RESULTS FOR THE PERCENT OF EXPENDITURES

	Mean*	Mean§	t-value	P	d.f.
U.S. Manufacturing Firms in the Sample	34.294	65.804	-17.49	0.000	646
Paper and Allied Products (SIC 26)	75.769	24.231	+9.74	0.000	12
Rubber and Plastics Products (SIC 30)	26.394	73.606	-8.33	0.000	32
Furniture and Fixtures (SIC 25)	29.056	70.944	-7.97	0.000	17
Chemical and Allied Products (SIC 28)	30.300	68.867	-7.27	0.000	59
Electrical Equipment and Supplies (SIC 36)	36.142	63.929	-7.26	0.000	140
Fabricated Metal Products (SIC 34)	36.621	63.202	-5.85	0.000	123
Instruments and Related Products (SIC 38)	33.803	66.197	-5.81	0.000	60
Miscellaneous Manufacturing Industries (SIC 39)	31.021	68.979	-5.49	0.000	46
Transportation Equipment (SIC 37)	35.000	65.000	-4.36	0.000	56
Machinery (Except Electrical) (SIC 35)	37.238	65.738	-4.34	0.000	41
Food and Kindred Products (SIC 20)	36.226	63.774	-2.91	0.007	30
Primary Metals Industries (SIC 33)	41.100	58.900	-1.55	0.136	19

*Loosely Coupled Buyer/Seller Relationship

§Tightly Coupled Buyer/Seller Relationship

APPENDIX F

CONFIDENCE INTERVAL ESTIMATE TABLES

TABLE F-1

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF FACTORS INFLUENCING THE CHOICE OF A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP AT A ±0.005 MODEL PARAMETER

	t Distribution Value	1-F(x)	Confidence Interval
1. The Purchase Requirement is Used for a Critical Application	2.16	0.0154	98.46
2. The Purchase Requirement is a Custom-Made Product	2.23	0.0129	98.71
3. The Purchase Requirement is Estimated to be a High Dollar Expenditure	2.36	0.0091	99.09
4. The Purchase Requirement Uses a Complex Production Process	2.36	0.0091	99.09
5. Improving Quality of Purchased Products of Items	2.36	0.0091	99.09
6. The Purchase Requirement is Needed for a Long Duration of Time	2.44	0.0073	99.27
7. There are Only One or a Few Suppliers in the Supply Market	2.45	0.0071	99.29
8. There is Unsatisfactory Quality Performance History for Possible Suppliers	2.54	0.0055	99.45
9. Obtaining Product Technology and Innovations from Suppliers	2.54	0.0055	99.45
10. There is a Decrease in the Availability of Products or Items in the Supply Market	2.54	0.0055	99.45
11. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	2.55	0.0054	99.46
12. Obtaining Process Technology and Innovations from Suppliers	2.55	0.0054	99.46
13. Financial Information About Possible Suppliers States Their Financial Condition is Poor	2.59	0.0048	99.52
14. Reducing Inventory Levels of Purchased Products or Items	2.60	0.0047	99.53
15. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	2.64	0.0041	99.59
16. The Purchase Requirement is Used for a Non-Critical Application	2.69	0.0036	99.64
17. The Process Technology Used by Possible Supplier is Complex	2.70	0.0035	99.65
18. The Purchase Requirement is Needed for a Short Duration of Time	2.75	0.0030	99.70
19. There is Unsatisfactory Price Performance History for Possible Suppliers	2.75	0.0030	99.70
20. There are Numerous Suppliers in the Supply Market	2.76	0.0029	99.71

TABLE F-1 (Cont'd.)

	t Distribution Value	1-F(x)	Confidence Interval
21. There is Unsatisfactory Delivery Performance History for Possible Suppliers	2.76	0.0029	99.71
22. Financial Information About Possible Suppliers is Unavailable	2.81	0.0025	99.75
23. There is No Quality Performance History for Possible Suppliers	2.81	0.0025	99.75
24. Demand is Increasing for the Products or Items Available from the Supply Market	2.82	0.0024	99.76
25. Financial Information About Possible Suppliers States Their Financial Condition is Strong	2.82	0.0024	99.76
26. The Process Technology Used by Possible Supplier is Simple	2.88	0.0020	99.80
27. There is Satisfactory Quality Performance History for Possible Suppliers	2.88	0.0020	99.80
28. Reducing Cost Associated with the Purchased Products or Items	2.89	0.0019	99.81
29. There is No Price Performance History for Possible Suppliers	2.94	0.0016	99.84
30. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	2.94	0.0016	99.84
31. The Purchase Requirement is an Industry Standard	2.94	0.0016	99.84
32. The Supply Market Experiences Numerous Technological Advancements	2.95	0.0016	99.84
33. The Purchase Requirement Uses a Simple Production Process	3.01	0.0013	99.87
34. There is Satisfactory Price Performance History for Possible Suppliers	3.01	0.0013	99.87
35. Demand is Decreasing for the Products or Items Available from the Supply Market	3.01	0.0013	99.87
36. There is Satisfactory Delivery Performance History for Possible Suppliers	3.01	0.0013	99.87
37. There is No Delivery Performance History for Possible Suppliers	3.08	0.0010	99.90
38. There is an Increasing in Availability of Products or Items in the Supply Market	3.16	0.0008	99.92
39. The Supply Market Experiences Few Technological Advancements	3.16	0.0008	99.92

TABLE F-2

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SELECTED FACTORS INFLUENCING THE CHOICE OF A LOOSELY COUPLED BUYER/SELLER RELATIONSHIP AT VARIOUS MODEL PARAMETER

	Model Parameter	t Distribution Value	1-F(x)	Confidence Interval
The Purchase Requirement Uses a Complex Production Process	±0.004	1.89	0.0314	96.86
Obtaining Product Technology and Innovations from Suppliers	±0.004	2.03	0.0212	97.88
Obtaining Process Technology and Innovations from Suppliers	±0.004	2.04	0.0207	97.93
Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished-Goods to the Final Customer	±0.004	2.04	0.0207	97.93
The Purchase Requirement is Estimated to be a Low Dollar Expenditure	±0.004	2.11	0.0174	98.26
The Supply Market Experiences Few Technological Advancements	±0.004	2.53	0.0057	99.43
Reducing Inventory Levels of Purchased Products or Items	±0.003	1.56	0.0582	94.18
The Supply Market Experiences Numerous Technological Advancements	±0.003	1.77	0.0384	96.16
The Purchase Requirement is a Custom-Made Product	±0.002	0.89	0.1867	81.33
Financial Information About Possible Suppliers is Unavailable	±0.002	1.12	0.1314	86.86
The Purchase Requirement is Estimated to be a High Dollar Expenditure	±0.001	0.47	0.3192	68.08
The Purchase Requirement is Needed for a Short Duration of Time	±0.001	0.55	0.2912	70.88
There is No Quality Performance History for Possible Suppliers	±0.001	0.56	0.2877	71.23
Demand is Decreasing for the Products or Items Available from the Supply Market	±0.001	0.60	0.2743	72.57
Financial Information About Possible Suppliers States Their Financial Condition is Strong	±0.0005	0.28	0.3897	61.03
Demand is Increasing for the Products or Items Available from the Supply Market	±0.0005	0.28	0.3897	61.03

TABLE F-3

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF FACTORS INFLUENCING THE CHOICE OF A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP AT A ±0.005 MODEL PARAMETER

	t Distribution Value	1-F(x)	Confidence Interval
1. Financial Information About Possible Suppliers States Their Financial Condition is Poor	2.54	0.0055	99.45
2. There is Unsatisfactory Quality Performance History for Possible Suppliers	2.59	0.0048	99.52
3. There is Unsatisfactory Price Performance History for Possible Suppliers	2.70	0.0035	99.65
4. The Purchase Requirement is an Industry Standard	2.82	0.0024	99.76
5. There is Unsatisfactory Delivery Performance History for Possible Suppliers	2.82	0.0024	99.76
6. There is No Quality Performance History for Possible Suppliers	2.88	0.0020	99.80
7. Financial Information About Possible Suppliers is Unavailable	2.94	0.0016	99.84
8. Demand is Decreasing for the Products or Items Available from the Supply Market	3.01	0.0013	99.87
9. There is No Delivery Performance History for Possible Suppliers	3.01	0.0013	99.87
10. There is No Price Performance History for Possible Suppliers	3.08	0.0010	99.90
11. The Process Technology Used by Possible Supplier is Unknown to the Buying Activity	3.08	0.0010	99.90
12. Financial Information About Possible Suppliers States Their Financial Condition is Strong	3.09	0.0010	99.90
13. The Process Technology Used by Possible Supplier is Complex	3.09	0.0010	99.90
14. The Purchase Requirement is Needed for a Short Duration of Time	3.15	0.0008	99.92
15. There is an Increasing in Availability of Products or Items in the Supply Market	3.16	0.0008	99.92
16. Reducing Inventory Levels of Purchased Products or Items	3.17	0.0008	99.92
17. The Process Technology Used by Possible Supplier is Simple	3.24	0.0006	99.94
18. There are Numerous Suppliers in the Supply Market	3.24	0.0006	99.94
19. There is Satisfactory Delivery Performance History for Possible Suppliers	3.24	0.0006	99.94
20. The Purchase Requirement Uses a Complex Production Process	3.32	0.0004	99.96

TABLE F-3 (Cont'd.)

	t Distribution Value	1-F(x)	Confidence Interval
21. Obtaining Process Technology and Innovations from Suppliers	3.33	0.0004	99.96
22. The Purchase Requirement Uses a Simple Production Process	3.40	0.0003	99.97
23. The Purchase Requirement is Estimated to be a Low Dollar Expenditure	3.40	0.0003	99.97
24. There is Satisfactory Price Performance History for Possible Suppliers	3.40	0.0003	99.97
25. There is Satisfactory Quality Performance History for Possible Suppliers	3.41	0.0003	99.97
26. The Supply Market Experiences Numerous Technological Advancements	3.41	0.0003	99.97
27. Obtaining Product Technology and Innovations from Suppliers	3.41	0.0003	99.97
28. Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	3.42	0.0003	99.97
29. The Purchase Requirement is Needed for a Long Duration of Time	3.50	0.0002	99.98
30. Demand is Increasing for the Products or Items Available from the Supply Market	3.50	0.0002	99.98
31. The Supply Market Experiences Few Technological Advancements	3.50	0.0002	99.98
32. The Purchase Requirement is Used for a Non-Critical Application	3.59	0.0002	99.98
33. Reducing Cost Associated with the Purchased Products or Items	3.61	0.0002	99.98
34. There is a Decreasing in Availability of Products or Items in the Supply Market	3.71	0.0001	99.99
35. The Purchase Requirement is Estimated to be a High Dollar Expenditure	3.81	0.0001	99.99
36. The Purchase Requirement is a Custom-Made Product	3.92	0.0000	100.00
37. There are Only One or a Few Suppliers in the Supply Market	3.93	0.0000	100.00
38. The Purchase Requirement is Used for a Critical Application	4.18	0.0000	100.00
39. Improving Quality of Purchased Products of Items	4.64	0.0000	100.00

TABLE F-4

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SELECTED FACTORS INFLUENCING THE CHOICE OF A TIGHTLY COUPLED BUYER/SELLER RELATIONSHIP AT VARIOUS MODEL PARAMETER

	Model Parameter	t Distribution Value	1-F(x)	Confidence Interval
There is No Delivery Performance History for Possible Suppliers	±0.002	1.20	0.1151	88.49
Contributing to the Reduction of the Time Interval from Product Design to Availability of Finished Goods to the Final Customer	±0.002	1.37	0.0853	91.47
There is Unsatisfactory Price Performance History for Possible Suppliers	±0.001	0.54	0.2946	70.54
There is No Price Performance History for Possible Suppliers	±0.001	0.62	0.2676	73.24
The Purchase Requirement is Estimated to be a Low Dollar Expenditure	±0.001	0.68	0.2483	75.17
The Purchase Requirement is Needed for a Long Duration of Time	±0.001	0.70	0.2420	75.80
Obtaining Product Technology and Innovations from Suppliers	±0.0001	0.01	0.4960	50.40
Reducing Inventory Levels of Purchased Products or Items	±0.0001	0.01	0.4960	50.40

TABLE F-5

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A LOOSELY COUPLED SUPPLIER AT A ±0.005 MODEL PARAMETER

	t Distribution Value	1-F(x)	Confidence Interval
1. Uses Statistical Process Control	2.75	0.0030	99.70
2. Provides Bar-Coding Capabilities	2.94	0.0016	99.84
3. Maintains Plant or Warehouse Near the Buying Location	2.94	0.0016	99.84
4. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	2.94	0.0016	99.84
5. Provides Electronic Data Interchange (EDI) Capabilities	2.94	0.0016	99.84
6. Provides Manufacturing Cost Information	2.94	0.0016	99.84
7. Provides Quality Control Performance Information	3.00	0.0013	99.87
8. Performs Research and Development on its Products	3.01	0.0013	99.87
9. Performs Research and Development on its Processes	3.01	0.0013	99.87
10. Provides Technical Field Services	3.07	0.0011	99.89
11. Provides Repair Services	3.08	0.0010	99.90
12. Has Productivity Improvement Potential	3.08	0.0010	99.90
13. Offers a Family of Products	3.08	0.0010	99.90
14. Provides Information on Finished-Goods Inventory Levels	3.15	0.0008	99.92
15. Provides Special Handling	3.15	0.0008	99.92
16. Updates Production Capacity Availability	3.23	0.0006	99.94
17. Has the Ability to Expand Production Capacity	3.23	0.0006	99.94
18. Anticipates Future Purchase Requirements	3.23	0.0006	99.94
19. Has a Capable Management Team	3.23	0.0006	99.94
20. Has Available Production Capacity	3.23	0.0006	99.94
21. Provides "On-Going" Production Status Information	3.23	0.0006	99.94
22. Adapts to Specific Needs of the Buying Firm	3.31	0.0005	99.95
23. Provides Frequent Deliveries	3.32	0.0004	99.96
24. Provides a Product Warranty	3.32	0.0004	99.96
25. Advises of Product or Item Unavailability	3.40	0.0003	99.97
26. Helps in Overcoming Buying Company Errors	3.40	0.0003	99.97
27. Provides Favorable Payment Terms	3.41	0.0003	99.97
28. Has a Cooperative Business Philosophy	3.50	0.0002	99.98
29. Provides Price Guarantees for a Relevant Time Period	3.50	0.0002	99.98
30. Has a Sound Financial Condition	3.50	0.0002	99.98
31. Helps in Emergency Situations	3.59	0.0002	99.98
32. Has Had Few In-Coming Inspection Rejections	3.60	0.0002	99.98
33. Has a Helpful Sales Force	3.60	0.0002	99.98
34. Quotes the Lowest Price	3.60	0.0002	99.98
35. Provides "Rush" Deliveries	3.70	0.0001	99.99
36. Cooperates When Unforeseen Difficulties Occur	3.70	0.0001	99.99
37. Offers the Best Possible Delivery Lead-Time	3.80	0.0001	99.99
38. Offers the Required Quality	4.05	0.0000	100.00
39. Maintains On-Time Delivery Schedules	4.05	0.0000	100.00

TABLE F-6

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A LOOSELY COUPLED SUPPLIER AT VARIOUS MODEL PARAMETERS

	Model Parameter	t Distribution Value	1-F(x)	Confidence Interval
Provides a Product Warranty	±0.003	1.99	0.0233	97.67
Provides Favorable Payment Terms	±0.003	2.04	0.0207	97.93
Provides Special Handling	±0.001	0.63	0.2643	73.57
Has a Sound Financial Condition	±0.001	0.70	0.2420	75.80
Provides Quality Control Performance Information	±0.0005	0.30	0.3821	61.79
Has a Capable Management Team	±0.0005	0.32	0.3745	62.55
Advises of Product or Item Unavailability	±0.00025	0.17	0.4325	56.75
Has a Helpful Sales Force	±0.00025	0.18	0.4286	57.14

TABLE F-7

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A TIGHTLY COUPLED SUPPLIER AT A ±0.005 MODEL PARAMETER

	t Distribution Value	1-F(x)	Confidence Interval
1. Provides Bar-Coding Capabilities	2.65	0.0040	99.60
2. Uses Statistical Process Control	2.76	0.0029	99.71
3. Maintains Plant or Warehouse Near the Buying Location	2.82	0.0024	99.76
4. Provides Electronic Data Interchange (EDI) Capabilities	2.82	0.0024	99.76
5. Offers a Family of Products	2.94	0.0016	99.84
6. Provides a Labor Relation Record Free of Strikes or Work-Stoppages	3.09	0.0010	99.90
7. Performs Research and Development on its Products	3.16	0.0008	99.92
8. Provides Repair Services	3.16	0.0008	99.92
9. Provides Manufacturing Cost Information	3.16	0.0008	99.92
10. Performs Research and Development on its Processes	3.24	0.0006	99.94
11. Provides Information on Finished-Goods Inventory Levels	3.24	0.0006	99.94
12. Provides Quality Control Performance Information	3.24	0.0006	99.94
13. Has Productivity Improvement Potential	3.24	0.0006	99.94
14. Provides Frequent Deliveries	3.24	0.0006	99.94
15. Provides Technical Field Services	3.32	0.0004	99.96
16. Provides "On-Going" Production Status Information	3.32	0.0004	99.96
17. Updates Production Capacity Availability	3.32	0.0004	99.96
18. Quotes the Lowest Price	3.32	0.0004	99.96
19. Anticipates Future Purchase Requirements	3.32	0.0004	99.96
20. Provides a Product Warranty	3.32	0.0004	99.96
21. Provides Special Handling	3.40	0.0003	99.97
22. Has the Ability to Expand Production Capacity	3.50	0.0002	99.98
23. Has Available Production Capacity	3.50	0.0002	99.98
24. Helps in Overcoming Buying Company Errors	3.50	0.0002	99.98
25. Provides Favorable Payment Terms	3.51	0.0002	99.98
26. Has a Sound Financial Condition	3.60	0.0002	99.98
27. Advises of Product or Item Unavailability	3.60	0.0002	99.98
28. Provides "Rush" Deliveries	3.70	0.0001	99.99
29. Has a Capable Management Team	3.80	0.0001	99.99
30. Offers the Best Possible Delivery Lead-Time	3.93	0.0000	100.00
31. Has a Helpful Sales Force	3.93	0.0000	100.00
32. Has Had Few In-Coming Inspection Rejections	3.93	0.0000	100.00
33. Adapts to Specific Needs of the Buying Firm	4.05	0.0000	100.00
34. Provides Price Guarantees for a Relevant Time Period	4.18	0.0000	100.00
35. Has a Cooperative Business Philosophy	4.32	0.0000	100.00
36. Cooperates When Unforeseen Difficulties Occur	4.80	0.0000	100.00
37. Helps in Emergency Situations	4.80	0.0000	100.00
38. Maintains On-Time Delivery Schedules	4.99	0.0000	100.00
39. Offers the Required Quality	4.99	0.0000	100.00

TABLE F-8

RANKING OF CONFIDENCE INTERVAL ESTIMATES OF SOURCE SELECTION CRITERIA IMPORTANCE WHEN EVALUATING A TIGHTLY COUPLED SUPPLIER AT VARIOUS MODEL PARAMETERS

	Model Parameter	t Distribution Value	1-F(x)	Confidence Interval
Provides Frequent Deliveries	±0.002	1.30	0.0968	90.32
Provides Favorable Payment Terms	±0.002	1.40	0.0808	91.92
Provides Favorable Payment Terms	±0.001	0.70	0.2420	75.80
Has the Ability to Expand Production Capacity	±0.001	0.70	0.2420	75.80
Performs Research and Development on its Products	±0.0005	0.32	0.3745	62.55
Provides Special Handling	±0.0005	0.34	0.3669	63.31
Provides Price Guarantees for a Relevant Time Period	±0.00025	0.21	0.4168	58.32
Has a Cooperative Business Philosophy	±0.00025	0.22	0.4129	58.71

TABLE F-9

CONFIDENCE INTERVAL ESTIMATES FOR MEANS OF PERCENTAGES OF LOOSELY AND TIGHTLY COUPLED RELATIONSHIPS AT A ±0.001 MODEL PARAMETER

	t Distribution Value	1-F(x)	Confidence Interval
Loosely Coupled Buyer/Seller Relationships Currently Used	2.07	0.0192	98.08
Loosely Coupled Suppliers Used	2.25	0.0122	98.78
Loosely Coupled Dollar Expenditures	2.81	0.0025	99.75
Tightly Coupled Buyer/Seller Relationships Currently Used	2.07	0.0192	98.08
Tightly Coupled Suppliers Used	2.25	0.0122	98.78
Tightly Coupled Dollar Expenditures	2.81	0.0025	99.75

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