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JUST-IN-TIME PURCHASING AND THE BUYER-SUPPLIER RELATIONSHIP:  
PURCHASING PERFORMANCE IMPLICATIONS USING A  
TRANSACTION COST ANALYTIC FRAMEWORK

DISSERTATION

Presented to the Graduate Council of the  
University of North Texas in Partial  
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

Stuart H. Warnock, B.S.  
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The just-in-time purchasing literature resoundingly endorses long-term, cooperative buyer-supplier relationships. Significant anecdotal and descriptive evidence indicates that such relationships are rare in practice, raising questions as to the performance consequences of this gulf between theory and practice.

Using an accepted theoretical model of the buyer-supplier relationship, transaction cost economics, this study examined the purchasing performance implications of the nature of the buyer-supplier relationship under just-in-time exchange. The focal purpose of the study was to examine the performance consequences of crafting long-term, cooperative relationships.

The research design employed was a cross-sectional field study, involving a static-group comparison, implemented through the use of a mail survey. A dual-stage cluster sample of eight hundred purchasing managers and

professionals employed in the two digit Standard Industrial Classification (SIC) Code 36, Electronic and Other Electrical Equipment and Components, was provided by the National Association of Purchasing Management (NAPM).

The questionnaire was pretested and the substantive validity of the measurement scales assessed. Scales were purified via correlational and reliability analyses. Criterion-related and construct validity were established via correlational, exploratory factor, and confirmatory factor analyses.

The three hypotheses of the study, involving extant tests of the association between the nature of the buyer-supplier relationship and purchasing performance (i.e., as reflected by transaction costs), were tested via analysis of covariance (ANCOVA) models. All three hypotheses were supported by the data to varying degrees.

The confirmation of the theoretical model of the study provides empirical evidence to researchers and practitioners as to the superiority, in exchange efficiency terms, of cooperative relationships under conditions of just-in-time exchange. It may not be presumed, however, that cooperative exchange will enhance efficiency in all exchange environments.

## TABLE OF CONTENTS

	Page
<b>LIST OF TABLES</b>	ix
<b>LIST OF ILLUSTRATIONS</b>	xiii
<b>Chapter</b>	
<b>I. INTRODUCTION</b>	1
The Just-In-Time Manufacturing Revolution . . .	1
The Just-In-Time Purchasing Revolution:	
Potential Unrealized? . . . . .	3
Statement of the Problem . . . . .	7
Purpose of the Study . . . . .	10
Theoretical Development . . . . .	10
Transaction Cost Economics . . . . .	11
Governance Structure	
Descriptive Dimensions of	
the Exchange	
Transaction Costs and	
Their Minimization	
Theoretical Linkages in the Model	
Just-In-Time Purchasing . . . . .	18
Just-In-Time and the Descriptive	
Dimensions	
Just-In-Time and the Governance	
Structure	
Research Question . . . . .	21
Summary of the Method and Results . . . . .	21
Significance of the Study . . . . .	24
Contribution to the Operations	
Management Literature . . . . .	24
Contribution to the	
Purchasing Literature . . . . .	25
Contribution to the Transaction	
Cost Economics Literature . . . . .	27
Significance to Practitioners . . . . .	28
Summary . . . . .	30
Organization . . . . .	31
<b>II. LITERATURE REVIEW, THEORETICAL MODEL,</b>	
<b>AND HYPOTHESES</b> . . . . .	33
Introduction . . . . .	33
Just-In-Time Purchasing . . . . .	35

Just-In-Time Purchasing Methods . . . . .	35
Just-In-Time Purchasing	
Implementation . . . . .	41
Antecedents to Successful Just-	
In-Time Purchasing	
Implementation	
Measurement of Just-In-Time	
Purchasing Implementation	
Summary . . . . .	48
Models of the Buyer-Seller Relationship . .	48
The Discrete Transaction Model . . . .	49
The Dyadic Interaction Paradigm . . . .	50
The Resource Dependence View . . . . .	51
Transaction Cost Economics . . . . .	52
Assumptions of the Theory	
Minimizing Transaction Costs	
The Governance Structure	
Descriptive Dimensions of Exchange	
Choosing a Governance Structure	
Measurement of Transaction Cost	
Economics Constructs	
Descriptive Dimensions of	
the Exchange	
Governance Structure	
Summary . . . . .	82
Purchasing Performance . . . . .	82
The Performance Assessment Process . .	83
The Measurement of Individual	
Performance . . . . .	84
Measurement of Purchasing Function	
Performance . . . . .	84
Purchasing Performance Measurement in	
the Just-In-Time Environment . . . .	88
Purchasing Performance from the	
Transaction Cost Perspective . . . .	90
Summary . . . . .	94
Linkages Between Just-In-Time Purchasing,	
the Buyer-Supplier Relationship, and	
Purchasing Performance . . . . .	95
Just-In-Time Purchasing and the Buyer-	
Supplier Relationship . . . . .	95
Distinguishing Characteristics of	
Just-In-Time Exchange	
Relationships	
Descriptive Evidence	
Empirical Evidence	
Contradictory Evidence Concerning	
Just-In-Time Exchange	
Relationships	

Summary	
Just-In-Time Purchasing and Purchasing Performance	113
Descriptive Evidence	
Empirical Evidence	
Summary	
The Nature of the Buyer-Supplier Relationship and Purchasing Performance	124
Transaction Cost Analysis Studies	
Just-In-Time Purchasing Studies	
The Remaining Studies	
Summary	
Section Summary	140
Theoretical Model and Hypotheses	141
State of the Just-In-Time Purchasing Literature	142
Benefits of a Theoretical Model	143
Just-In-Time Purchasing and the Descriptive Dimensions of the Exchange	146
Descriptive Dimensions of the Exchange and the Prevailing Governance Structure	150
The Research Proposition: Just-In-Time Purchasing and the Prevailing Governance Structure -- Linkages to Purchasing Performance	152
The Theoretical Model	157
Summary	160
Chapter Summary	161
III. METHODOLOGY	163
Introduction	163
Step 1 - Delineation of Constructs and their Instrumentation	165
Scale Reliability and Unidimensionality	166
Just-In-Time Purchasing Implementation	168
Governance Structure	173
Purchasing Performance	184
Demographics	187
Content Validity	190
Summary	191
Step 2 - Pretest of the Measurement Instrument	193
Step 3 - Data Collection	196

Target Population . . . . .	196
Selection of the Sampling Frame . . . . .	197
The Key Informant Method	
Sample Size . . . . .	203
Rationale for the Mail Survey . . . . .	206
Survey Methodology . . . . .	207
Summary . . . . .	208
Step 4 - Refinement of Measurement Scales . . . . .	209
Correlational Analysis . . . . .	209
Potential for Common Method Variance	
Reliability Analysis . . . . .	211
Summary . . . . .	212
Step 5 - Assessment of the Validity of the Measures . . . . .	213
Criterion-Related Validity and Its Assessment . . . . .	213
Construct Validity and Its Assessment . . . . .	215
Establishing Discriminant Validity	
Establishing Convergent Validity	
Nomological Validity and Its Assessment . . . . .	222
Summary . . . . .	223
Step 6 - Data Analysis and Hypothesis Testing . . . . .	223
Preliminary Data Manipulation and Profiling . . . . .	224
Respondent Qualification . . . . .	224
Testing for Nonresponse Bias . . . . .	227
Controlling for Moderating Variables . . . . .	228
Hypothesis Testing . . . . .	230
Constructing the Congruence Factor	
Controlling for Moderating Variables	
Tests of Hypotheses	
Post-Hoc Power Analysis	
Summary . . . . .	
Section Summary . . . . .	237
Step 7 - Identification of Limitations and Interpretation of the Results . . . . .	238
The Research Design Categorized . . . . .	239
Types of Validity . . . . .	242
Specific Threats to Validity . . . . .	244
Threats to Internal Validity	
Threats to External Validity	
Threats to Statistical Conclusion Validity	
Threats to Construct Validity	
Summary . . . . .	253
Chapter Summary . . . . .	256

IV. RESULTS	259
Introduction	259
Characteristics of the Respondents	259
Response Rate	260
Sample Profile	260
Nonresponse Bias	266
Assessment of Measures	267
Scale Purification	267
Evidence of Validity	272
Content Validity	
Criterion-Related Validity	
Construct Validity	
Evidence of Discriminant Validity	
Evidence of Convergent Validity	
Summary	
Empirical Evaluation of the Theoretical Model	283
Development of the Congruence Factor	284
Tests of Hypotheses	288
Possession Costs	
Acquisition Costs - Proportion of Late Deliveries	
Acquisition Costs - Proportion Nonconforming	
Summary	
Chapter Summary	295
V. DISCUSSION	297
Introduction	297
Summary of the Results	297
Just-In-Time Purchasing and the Governance Structure -- Congruence Confirmed	297
Just-In-Time Purchasing/Governance Structure Congruence and Purchasing Performance	299
Length of Relationship and Performance	299
Inconsistent Findings	300
Just-In-Time Purchasing and the Length of Contract	
Product Importance	
Possession Costs	
Significance of the Findings	304
Contributions to the Academic Literature	304
Contributions to Managers	305

Limitations of the Research . . . . .	307
Inherent Weaknesses of the Design . . .	307
Statistical Conclusion Validity . . . .	308
Threats to Internal Validity . . . . .	309
The Selection Threat	
The Mortality Threat	
Selection Interaction Threats	
Threats to Construct Validity . . . . .	310
Threats to External Validity . . . . .	311
Implications for Future Research . . . . .	312
Refinements in Method . . . . .	312
Compelling Directions . . . . .	313
Chapter Summary . . . . .	314
APPENDIX A . . . . .	315
APPENDIX B . . . . .	320
BIBLIOGRAPHY . . . . .	325

## LIST OF TABLES

Table		Page
1	References to Just-In-Time Purchasing Methods . . . . .	40
2	Antecedents to Successful Just-In-Time Purchasing Implementation . . . . .	42
3	Just-In-Time Purchasing Implementation Sequence . . . . .	43
4	Just-In-Time Purchasing Methods from Templin (1988) . . . . .	44
5	Just-In-Time Purchasing Methods from Chun (1991) . . . . .	45
6	Just-In-Time Purchasing Methods from Fawcett & Birou (1993) . . . . .	46
7	Just-In-Time Purchasing Items from Waller (1993) . . . . .	47
8	Characteristics of Bilateral Exchange . . . . .	63
9	Relationalism Scale Items from Heide & John (1990) . . . . .	70
10	Relationalism Scale Items from Noordewier, John, & Nevin (1990) . . . . .	72
11	Reciprocal Cooperation and Extendedness Scaling from Heide & Miner (1992) . . . . .	75
12	Relationalism Scale Items from Metcalf, Frear, & Krishnan (1992) . . . . .	78
13	Relationalism Scale Items from Gilbert, Young, & O'Neal (1994) . . . . .	81
14	Individual Purchasing Performance Criteria . . . . .	85
15	Purchasing Function Performance Criteria . . . . .	87
16	Elements of Total Cost . . . . .	89

17	Comparison of Market, Relational, and Just-In-Time Exchange Relationships from Frazier, Spekman, & O'Neal (1988) . . . . .	99
18	Changes in the Buyer-Supplier Relationship Attributed to Just-In-Time Purchasing . . . . .	101
19	Chanal (1990) Survey of Industrial Buyers and Suppliers . . . . .	110
20	Results of Survey of Manufacturing and Logistics Professionals Concerning Just-In-Time . . . . .	112
21	Just-In-Time Benefits from Giunipero (1989) . . . . .	116
22	Results of Just-In-Time Purchasing Implementation from Dion, Blenkhorn, & Banting (1992) and Dion et al. (1992) . . . . .	117
23	Just-In-Time Purchasing Benefits from Ansari & Modarress (1990) and Freeland (1991) . . . . .	118
24	Research Design . . . . .	164
25	Just-In-Time Purchasing Scale Items . . . . .	172
26	Summary of Past Operationalizations of Relationalism . . . . .	175
27	Suggested Elements of Relationalism . . . . .	179
28	Governance Structure/Relationalism Scale Items . . . . .	181
29	Purchasing Performance (Transaction Costs) Items . . . . .	187
30	Demographic Items . . . . .	188
31	Summary of the Instrumentation . . . . .	192
32	Industry Classification of Firms Using Just-In-Time Purchasing . . . . .	199
33	Products/Materials Sourced Using Just-In-Time Purchasing . . . . .	200
34	Required Sample Sizes Based on Previous Studies . . . . .	205

35	Response Rates from Similar Research . . . . .	206
36	Summary of Response Rates . . . . .	261
37	Sample Demographics . . . . .	262
38	Tests of SRJITP Demarcation . . . . .	264
39	Crosstabulation of SRJITP and Length of Contract . . . . .	265
40	Chi-Square Tests for Nonresponse Bias . . . . .	266
41	Initial Multiple Item Scales . . . . .	269
42	Item-Total and Item-Scale Correlations . . . . .	270
43	First Factor Analysis - QUARTIMAX Rotation Factor Matrix . . . . .	277
44	Second Factor Analysis - QUARTIMAX Rotation Factor Matrix . . . . .	279
45	Final Multiple Item Scales . . . . .	280
46	Test of JITP Scale Demarcation . . . . .	285
47	Test of RELATION Scale Demarcation . . . . .	287
48	Categorization of Respondents on JITP and RELATION . . . . .	287
49	Inventory Turnover Means and Standard Deviations . . . . .	290
50	Possession Costs ANCOVA Results . . . . .	291
51	Possession Costs One-Way ANOVA Results . . . . .	291
52	Proportion of Late Deliveries -- Means and Standard Deviations . . . . .	292
53	Acquisition Costs (Proportion of Late Deliveries) ANCOVA Results . . . . .	293
54	Proportion of Nonconforming Material -- Means and Standard Deviations . . . . .	294

55	Acquisition Costs (Proportion of Nonconforming Material) ANCOVA Results . . . . .	295
56	Summary of Results of Hypothesis Tests . . . . .	298

## LIST OF ILLUSTRATIONS

Figure	Page
1 Conceptual Model of the Literature Review . . . . .	33
2 Sheth's Model of the Discrete Industrial Purchasing Transaction . . . . .	49
3 IMP Interaction Model . . . . .	66
4 Conceptual Model of Literature Concerning Just-In-Time Purchasing and the Buyer-Supplier Relationship . . . . .	96
5 Conceptual Model of Literature Concerning Just-In-Time Purchasing and Purchasing Performance . . . . .	114
6 Conceptual Model of Literature Concerning the Nature of the Buyer-Supplier Relationship and Purchasing Performance . . . . .	125
7 Conceptual Model Integrating Just-In-Time Purchasing, the Nature of the Buyer-Supplier Relationship, and Purchasing Performance . . . . .	142
8 The Theoretical Model . . . . .	158
9 The Congruence Construct . . . . .	159
10 Scree Plot - First Exploratory Factor Analysis . . . . .	276
11 Scree Plot - Second Exploratory Factor Analysis . . . . .	278
12 Scree Plot - Maximum Likelihood Factor Analysis . . . . .	282

## CHAPTER I

### INTRODUCTION

Over the past three years, we have helped a variety of North American and European companies implement lean-production techniques and have studied many others that have adopted the approach. We've seen numerous examples of amazing improvements in a specific activity in a single company. But these experiences have also made us realize that applying lean techniques to discrete activities is not the end of the road. If individual breakthroughs can be linked up and down the value chain to form a continuous value stream, . . . the performance of the whole can be raised to a dramatically higher level. We think that value-creating activities can be joined, but this effort will require a new organizational model: the lean enterprise.

Womack & Jones, *From Lean Production to the Lean Enterprise*

That beast is the 'value-adding partnership' - a set of independent companies that work closely together to manage the flow of goods and services along the entire value-added chain.

Johnston & Lawrence, *Beyond Vertical Integration - the Rise of the Value-Adding Partnership*

### The Just-In-Time Manufacturing Revolution

In 1990, a global research initiative, coordinated by the Massachusetts Institute of Technology, resulted in the publication of the book The Machine That Changed the World (Womack, Jones, & Roos, 1990). This book reported on a radical paradigm shift, termed lean production, in traditional manufacturing philosophy that has overturned the

assumptions and practices of mass production embraced for nearly a century.

Advocates of lean production vaunt dramatic operational improvements such as striking reductions in effort, space, time, and expense concurrent with increases in flexibility and responsiveness to customers (Womack & Jones, 1994). Blackburn (1991) views lean production, or just-in-time manufacturing, as the competitive strategy of time-compression applied in a manufacturing context, and asserts that the speed with which a firm brings a product or service to market is the primary determinant of competitiveness in contemporary markets.

Few would dispute the tremendous advantages associated with just-in-time manufacturing as widely documented in the practitioner and academic literature. For instance, a worldwide survey of manufacturers concluded that throughput-time reduction was the single best predictor of labor productivity gain; and this positive relationship was confirmed for 555 out of 555 plants surveyed (Schmenner, 1991).

While few would quibble over the general success of just-in-time manufacturing, some question the extent to which these benefits have been realized outside the realm of manufacturing. According to Blackburn:

By most measures, the Just-In-Time revolution of the 1980s has been successful. Many leading U.S. firms . . . became 'lean and mean' manufacturing firms. . . . Manufacturing, however, is but one

link in the value-delivery chain. . . . Although Just-In-Time has been a potent force in revolutionizing worldwide manufacturing, only a fraction of its potential has been realized. Outside the factory walls, JIT is in its infancy. Significantly greater benefits will accrue to those firms that apply the JIT philosophy to other parts of the value-delivery chain. (1991: 18, 24)

The Just-In-Time Purchasing Revolution:  
Potential Unrealized?

Once viewed solely as an internal service or support function, the prominence of the modern purchasing function has been elevated because of the recognition of the importance of its role as a boundary spanner across the organizational interface between buyer and seller firms (Leenders, Nollett, & Ellram, 1993). Purchasing is generally the function with chief responsibility for coordinating upstream relationships in the supply or value-delivery chain; a critical task in the just-in-time environment.

It is the purchasing function that has the primary responsibility for integrating the activities of the internal factory (i.e., manufacturing) with that of the external factory (i.e., suppliers) (Hall, 1987). The efficacy of the purchasing function in this role has profound implications on the efficiency with which goods and services flow across the organizational interface.

Purchasing philosophy and practice transformed. In order to accommodate the radical changes occurring on the factory floor due to just-in-time manufacturing, purchasing

philosophy and practice in the United States was characterized by significant change during the decade of the 1980's. Most notable was the development of just-in-time purchasing, or lean supply, philosophy and methods.

According to Lammimg:

It was immediately clear that lean production . . . would require a different approach to purchasing and supply; it would not be possible to conduct relationships with suppliers in traditional adversarial ways. (1995: 123)

A new relationship paradigm. The academic and practitioner literature on just-in-time purchasing initially focused on describing the philosophies and methods deployed under the just-in-time purchasing system (e.g., Hahn, Pinto, & Bragg, 1983; Hall, 1983; Schonberger & Gilbert, 1983). Probably the most controversial of these new philosophies, and the one most counter to traditional practice, was the prescribed nature of relationships with suppliers under just-in-time exchange. According to Metcalf, Frear, and Krishnan:

Critical to the success of JIT systems is the supplier-customer inter-organizational exchange. Success requires that mutual cooperation between buyer and seller replace the traditional mode of buyer-seller interaction. (1990: 27)

Resistance to the new paradigm. Traditional purchasing philosophy in the United States could have scarcely been more antithetical to this new relationship paradigm. An atmosphere characterized by distrust and adversarialism between buyers and suppliers was commonly fostered by

practices such as multiple sourcing, an emphasis on price to the exclusion of almost all else, manipulation of suppliers, the withholding of critical information, and numerous other practices inimical to the new paradigm. Nonetheless, the consensus in the literature was resounding; firms must craft and maintain long-term, cooperative relationships with their suppliers.

A contradiction between theory and practice. Were one to judge the progress of firms in adopting this new relationship paradigm by the volume and tone of material related to this topic in the popular literature, it would have to be concluded that the conversion had been widely successful. Regarding the optimism evidenced in the literature, Pilling and Zhang assert that there is "a tendency to overstate the movement toward cooperative relationships when compared with actual practice" (1992: 3).

In fact, recent reports have illuminated a general failure to adopt the new relationship paradigm. For example, Lamming (1995) concludes that the progress toward cooperative purchasing relationships in the United States has been "limited". Hendrick and Ellram (1993) assert that there is a wide gulf between the rhetoric of supplier partnership programs and the way in which they are implemented. Based on their findings, these authors concluded that true partnerships existed with less than one percent of the total supplier base of their sample.

Likewise, Joag (1995) concluded that only about six percent of all suppliers in his sample could be considered bona-fide partners.

A problematic contradiction. Findings such as the above are disturbing given that the development of cooperative relationships is so widely asserted to be critical to the effective operation of just-in-time. If this relational prescription is indeed valid, then the potential of just-in-time is likely being squandered because of the reluctance of firms in the United States to enter into cooperative relationships with suppliers.

Focus on performance needed. While significant attention has been focused on describing the avowed benefits of long-term cooperative relationships, little research has focused on actual experiences with such relationships; especially on the performance implications of these relationships. According to Noordewier, John, and Nevin:

One of the most critical . . . gaps is the lack of empirical research pertaining to how buyer purchasing performance is affected by the organizational form of the vendor interface. (1990: 80)

In summary, there appears to be a significant divergence between theory and practice as it relates to the new just-in-time purchasing relationship paradigm. Furthermore, the purchasing performance implications of this discrepancy are unknown. Hence, the literature is at a juncture that presents a need for empirical examination,

utilizing a purchasing performance focus, of this new relationship paradigm.

Thus, the fundamental question underlying this study arises. Do firms using just-in-time purchasing that develop long-term, cooperative relationships with suppliers exhibit superior purchasing performance? To answer this question, the purchasing performance consequences of conforming to the prescription of the new relationship paradigm were examined.

#### Statement of the Problem

The problem that was addressed in this study is whether or not firms engaged in just-in-time purchasing exchange realize higher exchange efficiency (i.e., purchasing performance) via the conception and maintenance of long-term, cooperative relationships with just-in-time suppliers. This is the prevailing wisdom for which there is a lack of explicit empirical confirmation in the literature. At issue is a basic cost-benefit paradox.

Price considerations. The creation and maintenance of long-term, cooperative relationships results in certain marginal costs. First, under such relationships, the importance attached to the negotiation of price diminishes. Thus, prices may increase, at least in the short-term, as a result of the adoption of such relationships.

Relationship support costs. Secondly, cooperative relationships are characterized by a significant increase in the volume and intensity of interaction and a concomitant

increase in the expenditure of resources to support affiliated activities. For example, consider the costs associated with electronic data interchange, a communication method commonly deployed in a just-in-time exchange relationship. Frequent visitation of supplier facilities by buyer personnel is yet another example cited in the literature.

Balance of power. Increased dependence on suppliers is another consequence of long-term, cooperative relationships. The theoretical rationale for traditional supplier management practices was rooted in resource dependence theory (Pfeffer & Salancik, 1978). According to this theory, the power exercised over an exchange partner is inversely related to dependence upon the partner. Thus, traditionally, firms sought to minimize dependence on trading partners via the use of multiple sourcing and competitive bidding practices.

Specific investment. The final category of costs associated with long-term, cooperative relationships is that of specific investment. That is, such relationships are characterized by significant modifications in tooling, equipment, procedures, and systems rendered to facilitate the relationship. Furthermore, specific investment induces risk, given that the salvage value of these assets may be negligible were the exchange relationship terminated. The entirety of the above represents the marginal costs

associated with entering into a long-term, cooperative relationship.

Benefits of cooperative relationships. Touted benefits of long-term, cooperative relationships include decreased or managed uncertainty, leveraged technical competence, social satisfaction, and the avoidance of "switching costs" associated with the termination of a buyer-supplier relationship. However, the primary marginal benefit claimed for long-term, cooperative relationships is increased exchange efficiency (Han, Wilson, & Dant, 1993). Widely reported examples of such efficiencies include dramatically reduced inventories, increased quality, increased delivery reliability, and compressed procurement lead-times.

Costs versus benefits. One can say with a degree of certainty that some or all of the above enumerated marginal costs will be encumbered by firms entering into cooperative relationships with suppliers. If it cannot be established that these firms enjoy greater exchange efficiency to offset those costs, then the logic of entering into such relationships is suspect. Certainly, it has been maintained by some that the costs of cooperation might exceed the benefits, and disingenuous attempts at cooperation may result in far more harm than good (Cox, 1995; Donaldson, 1995; Kamath & Liker, 1994).

### Purpose of the Study

Two purposes were served by this study. The first purpose was to use an accepted theoretical model to explain just-in-time purchasing phenomena. To date, the just-in-time purchasing literature has not been characterized by the use of formal theory. The second and focal purpose was to provide an extant test of the performance implications of the new buyer-supplier relationship paradigm. That paradigm prescribes that firms using just-in-time purchasing create and maintain long-term, cooperative relationships with just-in-time suppliers.

### Theoretical Development

One of the most serious shortcomings of the early literature on just-in-time was its failure to adequately distinguish between just-in-time manufacturing and just-in-time purchasing (e.g., Cook, 1984; Sepehri, 1985). The scant literature focused exclusively on just-in-time purchasing was characterized by the use of the case study method and small samples (e.g., Ansari, 1986; Reich, 1987).

Subsequently, literature appeared involving empirical tests of formal hypotheses and the use of larger samples (e.g., Chun, 1991; O'Neal, 1989). However, this category of work was characterized by reliance on ill-constructed theoretical frameworks. Only recently have just-in-time purchasing studies appeared that utilize an accepted theoretical model (Gilbert, Young, & O'Neal, 1994;

Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995). These studies represent the exception rather than the rule in the just-in-time purchasing literature.

Noting the paucity of accepted theoretical models in the operations management literature at large, Ghosh asserts:

To advance the knowledge frontier in both the theory and practice of our profession, and more importantly to avoid the pitfalls of doing poor research using empirical data, we must strengthen our skills in developing good theory. (1995: 8)

As the focal purpose of this study was to examine the performance implications of the nature of the buyer-supplier relationship under just-in-time exchange, prudence dictated that an established theoretical model of the buyer-supplier relationship be used.

#### Transaction Cost Economics

While several competing theoretical models of the buyer-supplier relationship are reviewed in chapter II, one stands apart in its level of acceptance as reflected by the volume of literature dedicated to the theory. That theory is transaction cost economics (Williamson, 1979, 1981, 1985).

Origins of the theory. Falling under the rubric of institutional economics, transaction cost economics represents an amalgamation of economic, legal, and organizational theory. Congruous with the multi-disciplinary nature of this theory is the variety of

literature that has featured its application. The most rigorous empirical tests of the theory have appeared in the marketing literature. Other applications of this theoretical model have appeared in the purchasing, logistics management, general management, management science, and economics literature.

Constructs of the theory. Major constructs in the transaction cost economics model fall into three categories. The form of the relationship between buyer and seller is referred to as the governance structure. The frequency with which transactions recur, uncertainty in the exchange environment, and the degree to which specific investment is required to minimize cost represent the descriptive dimensions of the exchange environment. Finally, transaction costs and their minimization are the raison d'etre for the theory. The components of the model: (1) governance structure, (2) descriptive dimensions of the exchange, and (3) transaction costs are discussed in that order below.

#### Governance Structure

In practice, the governance structure options available for the industrial procurement of intermediate parts and materials are make (i.e., vertical integration or "hierarchy") or buy (i.e., open market bargaining or "market"). While hierarchies and markets represent discreet categories, the market category is actually comprised of a

continuum of market exchange ranging from the extremes of the one-time spot market contract to ongoing, cooperative or "bilateral" exchange. Thus, bilateral exchange is yet another option to hierarchy and pure market exchange.

Exchange relationships on the market continuum differ in their relational characteristics such as the flexibility of exchange partners in accommodating the other party's requirements, the degree to which information is freely exchanged, the degree to which exchange partners share joint responsibility for duties and activities, the intensity of expectation that the relationship will endure, and the extent to which the performance of the partners is monitored and feedback is provided (Gilbert, Young, & O'Neal, 1994; Heide & John, 1990; Heide & Miner, 1992; Metcalf, Frear, & Krishnan, 1992; Noordewier, John, & Nevin, 1990). Most of the research that has been conducted involving the measurement of governance structure has focused on measuring the presence, or absence, of these relational elements (i.e., the degree of "relationalism" or bilateralism).

#### Descriptive Dimensions of the Exchange

The three descriptive dimensions of the exchange environment are frequency, exchange uncertainty, and asset specificity. Each of these descriptive dimensions is discussed in turn.

Frequency of exchange. Frequency of exchange has traditionally been operationalized by considering the

frequency with which parts and materials, or "product" is exchanged. However, according to the International Marketing and Purchasing (IMP) Project Group (1982), inter-firm exchange episodes involve not only the exchange of product, but also non-product intangibles such as services, information, social exchange, and of course, financial exchange.

Exchange uncertainty. Buyer-supplier exchange uncertainty refers to "unanticipated changes in relevant factors surrounding the exchange relationship" (Williamson, 1979: 254). The exchange uncertainty construct has been operationalized by measuring factors such as the volatility of demand, the availability of product in the market, the rate of technological change, the accuracy of forecasts, and the ease with which the performance of exchange partners can be verified.

Asset specificity. Finally, asset specificity refers to the degree to which investment, specific to the exchange relationship, must be made in order to realize lowest total cost. Examples of such investments would be alterations in plant and equipment such as the relocation of a supplier facility closer to the buyer. Another example would be investment by the supplier in tooling and equipment to be used to produce output unique to a given buyer.

The alteration of systems and procedures would be another form of specific investment. The adoption of

statistical process control by a supplier in order to meet the quality requirements of a given buyer would be a good example. Another example would be the elimination of receiving documentation from a given supplier (e.g., bill of lading, invoice) in order to speed the flow of incoming material.

#### Transaction Costs and Their Minimization

Analysis in transaction cost economics is focused on the notion of transactions and their affiliated coordination costs. A transaction occurs when a good or service is transferred across an organizational interface. Williamson asserts:

With a well-working interface, as with a well-working machine, these transfers occur smoothly. In mechanical systems we look for frictions: do the gears mesh, are the parts lubricated, is there needless slippage or other loss of energy? The economic counterpart of friction is transaction cost: do the parties to the exchange operate harmoniously, or are there frequent misunderstandings and conflicts that lead to delays, breakdowns, and other malfunctions? (1981: 552)

Transaction costs have seldom been measured explicitly. Rather, the theory has been used primarily to explain or predict the type of governance structure predominant in a particular exchange environment. In one instance where transaction costs were measured explicitly, measures such as inventory turns, the quality of incoming material, and delivery reliability were used as transaction cost indicators (Noordewier, John, & Nevin, 1990).

Interestingly, these measures are also three of the most commonly used purchasing performance metrics in the just-in-time purchasing environment.

#### Theoretical Linkages in the Model

Transaction cost economics is a normative model that prescribes the most efficient form of governance structure (i.e., market, bilateral, hierarchy) for a given buyer-supplier exchange scenario. The selection of the appropriate governance structure is based on a consideration of the descriptive dimensions of the exchange environment (i.e., frequency, exchange uncertainty, asset specificity). According to Williamson, the object is to "match governance structures to the attributes of transactions in a discriminating (i.e., transaction cost-economizing) way" (1981: 553).

According to the theory, the objective of boundedly rational firms is to create "efficient boundaries" by minimizing the sum of production costs and transaction costs. Thus, in any situation where there is a production cost advantage of buying in the market and when transaction costs are not prohibitive, the market alternative will be selected over hierarchy. When transaction costs become prohibitively large, the firm will choose to vertically integrate.

Conditions for market exchange. In exchange environments characterized by low frequency of transaction,

high supply certainty, and low asset specificity, the pure market governance structure, typified by the spot market contract, will be the most transaction cost economizing. At this extreme, it is most efficient to craft explicitly delimited contracts.

Conditions for bilateral exchange. As frequency of exchange, exchange uncertainty, and asset specificity increase, bilateral exchange becomes increasingly efficient. This is due to the fact that in the face of increased frequency and exchange uncertainty, it becomes increasingly costly and decreasingly feasible to negotiate contracts that provide for every possible contingency. Furthermore, the longer duration of bilateral exchange relationships is a necessary condition to entice exchange partners to engage in specific investment. Unfortunately, bilateralism also effects increases in the costs of "planning, adapting, and monitoring task completion" (Williamson, 1981: 553) -- transaction costs increase.

Conditions for hierarchy. At some point, transaction costs become prohibitively large. Thus, at the extreme characterized by high frequency of transaction, high exchange uncertainty, and idiosyncratic product/service requirements (requiring significant specific investment), vertical integration becomes the norm. At this extreme, hierarchy is the most transaction cost economizing as

coordination/transaction costs begin to outweigh production cost efficiencies available in the open market.

#### Just-In-Time Purchasing

Satisfactory definitions of just-in-time purchasing are difficult to identify. Most definitions are tautological in that they specify the philosophies and methods (e.g., frequent deliveries, single sourcing, cooperative relationships) commonly associated with just-in-time purchasing. Measures of just-in-time purchasing implementation have typically entailed assessing the degree to which a number of these methods are deployed.

#### Just-In-Time and the Descriptive Dimensions

Just-in-time purchasing implementation, as described in the literature, impacts the descriptive dimensions of the exchange environment of frequency, exchange uncertainty, and asset specificity.

Frequency of exchange. With respect to frequency of exchange, increased frequency of exchange of product (i.e., frequent deliveries of small lots) is the characteristic cited most frequently in descriptions of just-in-time purchasing. Increased frequency of interaction between buyer and supplier personnel is another characteristic of just-in-time purchasing noted in the literature.

Exchange uncertainty. In regard to exchange uncertainty, high environmental uncertainty has been

empirically linked with just-in-time purchasing practices (Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995). Handfield asserts that the implementation of just-in-time purchasing is a response to high uncertainty. Firms seek to manage uncertainty by increasing their level of flexibility and responsiveness via the deployment of just-in-time purchasing methods.

Asset specificity. Finally, the implementation of just-in-time purchasing effects numerous increases in asset specificity. The literature notes that suppliers frequently locate or relocate facilities closer to buyers with whom they have a just-in-time exchange relationship. The literature also cites the modification of tooling and equipment to improve quality and reduce lead times as being commonly associated with just-in-time exchange. Other examples of increased asset specificity cited in the literature would include the use of specialized delivery containers and the use of private carriers and equipment for just-in-time deliveries.

#### Just-In-Time and the Governance Structure

The way in which just-in-time purchasing has been described in the literature also has implications with respect to the selection of an appropriate form of governance structure. It has been posited that the just-in-time purchasing relationship is a new form of exchange

relationship characterized by extremely high levels of bilateralism (Frazier, Spekman, & O'Neal, 1988; Joag, 1995).

Firms employing the bilateral governance structure should exhibit superior performance to firms utilizing an alternative form of governance structure when exchange frequency, exchange uncertainty, and asset specificity are elevated. Noordewier, John, and Nevin assert:

TCA is a normative model, which implies that firms following its prescriptions will perform better (in the sense of having lower transaction costs) than other firms. Basically the theory proposes that performance will be enhanced when there is congruence (or a 'match') between the governance structure employed and the underlying dimensions of exchange. (1990: 82)

Just-in-time/governance structure congruence. The transaction cost economics model predicts greatest exchange efficiency for the bilateral governance structure under conditions of heightened frequency of exchange, exchange uncertainty, and asset specificity. Based on the descriptions of just-in-time purchasing in the literature, these conditions appear to be concomitant with just-in-time exchange.

Thus, there is agreement between the prescription of transaction cost economics and that of the just-in-time purchasing relationship paradigm. Firms implementing just-in-time purchasing methods should create and maintain long-term, cooperative (i.e., bilateral) relationships with suppliers. Following this prescription should precipitate greater exchange efficiency.

### Research Question

The literature on just-in-time purchasing provides ample evidence that exchange frequency, exchange uncertainty, and asset specificity are elevated in the just-in-time exchange environment. Moreover, the transaction cost economics model maintains that performance is determined by matching the form of governance structure to the exchange environment vis-a-vis these descriptive dimensions of the exchange.

Firms that are engaged in just-in-time purchasing exchange have many options with respect to the nature of relationships that they choose to build and maintain with their suppliers. These relationships may be of the traditional arms-length, adversarial variety. Conversely, they may be long-term and cooperative, or bilateral in nature. Regardless of which option is exercised, the nature of these relationships should have a bearing on performance. Thus, the research question addressed by this study was:

- Q:     **What are the consequences of the nature  
         of the buyer-supplier relationship,  
         under just-in-time purchasing exchange,  
         on purchasing performance?**

### Summary of the Method and Results

The research design employed in this study may be categorized as a cross-sectional field study, involving a static-group comparison, implemented through the use of a mail survey. The first step of the research design was to

delineate, define, and operationalize the constructs. This was accomplished via a thorough review of the relevant literature.

The questionnaire. Once the constructs were defined, they were operationalized in the form of a questionnaire. The questionnaire was pretested in order to establish that the instrument was unambiguous and understandable to potential respondents, and to assess the substantive validity of the measures as an indicator of their content validity.

The sample. The questionnaires were mailed to a sample of 800 purchasing managers and agents obtained from the National Association of Purchasing Management (NAPM). The entire sample was drawn from the two digit Standard Industrial Classification (SIC) Code 36, Electronic and Other Electrical Equipment and Components; an industry where there is evidence of widespread just-in-time purchasing usage. The sample was selected using a dual-stage cluster sampling procedure, and Dillman's (1978) Total Design Method guided the conduct of the mail survey.

Measurement purification. Once data was collected, measurement scales were purified via correlational and reliability analyses. Correlational analyses were employed to evaluate the appropriateness of the assignment of measurement items to scales. An evaluation of the potential for common method variance was made, and steps taken to

preempt it. Reliability analysis followed to ensure that the measurement scales were reliable.

Criterion-related validity was established for the just-in-time purchasing scale via a correlational approach. Unfortunately, an appropriate criterion measure was available only for this one measurement scale.

The establishment of construct validity was necessary for the governance structure/relationalism scale, as it had been significantly modified from past operationalizations. Construct validity was assessed through the use of exploratory and confirmatory factor analyses. The construct validity of the just-in-time purchasing scale was assumed, as the scale had been previously validated.

Analysis of data. Data analysis and hypothesis testing followed scale purification. Respondent qualification and testing for nonresponse bias were performed using accepted methodology. Subsequently, three hypotheses relating to the research question of the study were tested via analysis of covariance (ANCOVA) models. A post-hoc power analysis was conducted on the one hypothesis test that failed to reach an acceptable level of statistical significance.

Results. All hypotheses of the study were confirmed to varying degrees. Taken collectively, these confirmations supported the contention that purchasing performance is influenced by the nature of the buyer-supplier relationship in just-in-time exchange relationships.

### Significance of the Study

The study made contributions in a number of areas. This section begins with a summary of the contributions to the operations management and purchasing literature. Subsequently, the contribution of the study to the transaction cost economics literature is addressed. Finally, the significance of the study to practitioners is addressed.

#### Contribution to the Operations Management Literature

With respect to the operations management literature in general, Fawcett et al. assert:

The field of Operations Management is now approaching a critical stage in its development. In the past, the focus of much of the research undertaken . . . dealt with problem solving . . . However, recently, the focus of research has begun to change. Researchers and managers are now beginning to recognize the strategic importance of manufacturing strategy. They are also recognizing the need for more empirically based research that is directed primarily at theory building as compared to the problem-solving orientation of the past. (1994: 26)

Correspondingly, this study involved an extension of an accepted theoretical model.

A focus on performance. Adams and Swamidass (1989) noted shortcomings in the operations strategy literature. Two of these shortcomings were addressed by this study: (1) just-in-time has not been integrated into the operations strategy literature, and (2) tests of strategy should be based on actual performance.

A choice of governance structures. The author would assert that firms have a choice as to the governance structure that will be employed when engaging in just-in-time purchasing exchange. While the character of many relationships may develop by means of chance, the option of strategic choice cannot be denied.

The governance structure impacts performance. This study focused on the performance outcomes of the governance structure decision. The confirmation of the theoretical model of the study implies that firms may use the form of relationship that they maintain with suppliers to strategically influence performance outcomes.

#### Contribution to the Purchasing Literature

In a review of purchasing strategy literature, Ellram and Carr (1994) note that most of the purchasing literature is either conceptual in nature or is based on a small number of case studies. In the limited number of studies that use large samples, the authors note an underutilization of statistical methods and formal theory. These shortcomings were addressed in this study through the use of a large sample, a rigorous research design and statistical methods, and an accepted theoretical model.

Ellram and Carr also assert that two important strategic issues confronting the purchasing function are:

- (1) the type of supplier relationship that should be used in

a given situation, and (2) the ways in which the purchasing function can support the competitive strategy of the firm.

Choosing the form of relationship. Little guidance is given in the literature concerning the choice of an appropriate form of buyer-supplier relationship. Heidi & John contend:

Though causal empiricism and industry accounts hint that different types of relationships are useful in different circumstances . . . the lack of theory-based investigations leaves one unable to begin to assess their potential properly. This weakness is critical given the nontrivial level of risk and resources potentially involved in setting up purchasing arrangements. (1990:24)

Handfield (1993) and Landeros and Monczka (1989) also call for research that identifies the factors that influence the choice of an appropriate buyer-supplier relationship. The transaction cost economics model offers such insight by identifying contingency variables (i.e., exchange frequency, exchange uncertainty, asset specificity) that may be used in selecting a suitable form of relationship in a given exchange scenario.

Supporting the competitive posture of the firm. The second of Ellram and Carr's issues was also addressed by this study. A fundamental premise introduced in this chapter was that time compression has been successfully effected in manufacturing, but that the purchasing function has been remiss in implementing time compression via the injudicious management of relationships with suppliers.

The findings of this study support prescriptions concerning the strategic performance implications of properly managing relationships with suppliers. Expressly, it was found that cooperation/bilateralism with just-in-time suppliers was associated with enhanced purchasing performance.

#### Contribution to the Transaction Cost Economics Literature

The literature is characterized by inconsistency with respect to the operationalization of some of the transaction cost economics constructs. Moreover, the transaction cost economics theoretical model has been underutilized in examining just-in-time exchange relationships.

Advancing the measurement of constructs. Surprisingly, transaction costs have been explicitly measured in only one study of which this author is aware (Noordewier, John, & Nevin, 1990). Thus, this study contributed to the literature through the explicit measurement of transaction costs.

The measurement of governance structure has suffered from inconsistencies. Governance structure has been operationalized by measuring the degree to which relational elements are present in a market exchange relationship. These relational elements have differed across several studies, at times with undesirable results (e.g., Gilbert, Young, & O'Neal, 1994).

The study at hand contributed to the literature by identifying and using those relational elements that have appeared consistently across several works. Replication is needed, however, to build evidence regarding the validity of the operationalization of this study.

Evidence of external validity. The study contributed to the literature by providing yet another validation of the transaction cost economics theoretical model. The model was confirmed in a just-in-time purchasing context, adding credence to claims of external validity. Likewise, the performance orientation of this study provided additional evidence of the normative validity of the transaction cost economics model.

#### Significance to Practitioners

The significance of this research to practitioners is three-fold. First, the study provided an extant test of the just-in-time purchasing relationship paradigm. Secondly, the theoretical model may be extended by considering contingency variables used to identify situations where cooperation is beneficial, and other situations where cooperation may be very inefficient. Likewise, these same variables may prove useful in determining the conditions under which just-in-time exchange is appropriate.

Concrete evidence for practitioners. As previously noted, the creation and maintenance of long-term, cooperative relationships results in certain marginal costs.

To date, practitioners have been admonished to enter into such relationships based on a description of the alleged benefits of cooperation.

Evidence concerning the reluctance or failure of practitioners to enter into such relationships is abundant. It is likely that many practitioners doubt the veracity of the claimed benefits of cooperative relationships and/or are not willing to make the necessary leap of faith. This study answers the skeptics because it has provided empirical confirmation of the performance benefits of adhering to the new relationship paradigm.

Cooperation not always efficient. The theoretical model of this study has other implications concerning the prescribed nature of buyer-supplier relationships. The literature broadly discusses the benefits of cooperative exchange. In exchange relationships characterized by low frequency of transaction, low exchange uncertainty, and low asset specificity, however, such cooperation or bilateralism should prove most inefficient. Thus, the universal acceptance of the benefits of cooperative partnerships in the literature is flawed.

Use of just-in-time purchasing. The theoretical framework of transaction cost economics holds the potential for identifying situations in which just-in-time purchasing exchange is possibly beneficial. Currently, practitioners are offered little guidance in determining when just-in-time

purchasing exchange is appropriate. Some practitioners may naively believe that just-in-time exchange is appropriate in all situations.

Product importance and continuity of demand are two considerations, identified in the literature, for determining the appropriateness of just-in-time exchange. There is agreement in the literature that important, high value-added parts or materials should be sourced on a just-in-time basis. Moreover, items for which there is a stable and continuous pattern of usage are appropriate (Ansari & Modarress, 1988; Blackburn, 1991; Dobler, Burt, & Lee, 1990). Outside of these considerations, a discussion of other factors to be considered in the decision to source on a just-in-time basis could not be identified.

The confirmation of the theoretical model of this study has implications with respect to other relevant contingency variables to be used in the just-in-time sourcing decision. Namely, supply uncertainty and asset specificity are two factors that should potentially be considered in determining whether a given part, component, or material should be sourced on a just-in-time basis. Additional research on this issue is needed, however, before any definitive judgements may be proffered in this regard.

#### Summary

An overview of the rationale for the study, the basic theory underlying the study, the research question to be

answered by the study, an outline of the method and results of the study, and the reasons why the study is significant have been examined. The basic premise underlying the study was that the application of time compression across organizational boundaries is being hampered by the reluctance and failure of firms to enter into cooperative purchasing relationships with suppliers. According to just-in-time purchasing philosophy, these relationships are necessary to facilitate the efficient exchange of product and services across the organizational interface.

The validity of the just-in-time purchasing relationship paradigm was tested by examining the exchange efficiency of firms that adhere to its prescription. The transaction cost economics theoretical model was the vehicle by which this paradigm was tested. Indeed, the findings of the study have confirmed the just-in-time purchasing relationship paradigm and the theoretical linkages in the transaction cost economics model.

### Organization

A review of the relevant literature is presented in chapter II. The nature of just-in-time purchasing and its measurement, competing models of the buyer-supplier relationship, the measurement of purchasing performance, and the interrelationships between just-in-time purchasing, the nature of the buyer-supplier relationship, and purchasing performance is discussed. Finally, the formal theoretical

model, research proposition, and hypotheses of the study are presented.

Chapter III is dedicated to detailing the method that was employed. Issues of instrumentation, sampling methodology, measurement purification, and data analysis and hypothesis testing are discussed at length. Chapter III concludes with a discussion of the threats to validity and the limitations of the study.

The results of the study are presented in chapter IV. The sample is profiled, evidence of nonresponse bias discussed, and evidence of the reliability and validity of the measures is scrutinized. Chapter IV concludes with a presentation of the results of hypothesis testing and post-hoc analysis.

A discussion of the meaning and significance of the results is presented in chapter V. Results contrary to expectation are discussed and potential causes enumerated. The limitations of the study are reiterated, and chapter V concludes with an exploration of implications for future research.

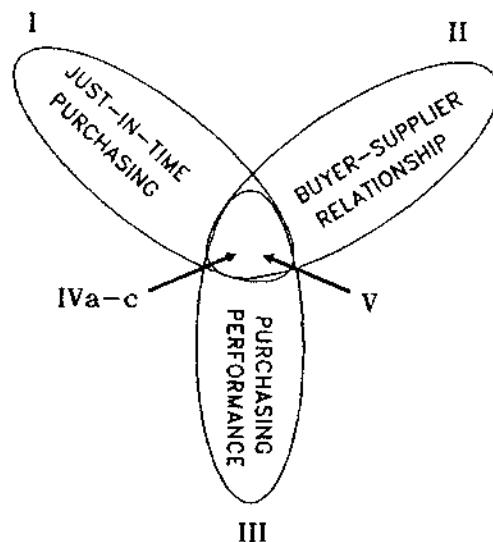
## CHAPTER II

### LITERATURE REVIEW, THEORETICAL MODEL, AND HYPOTHESES

#### Introduction

The stated purpose of this study was to examine the linkage between the use of just-in-time purchasing, the nature of the buyer-supplier relationship, and purchasing performance. Thus, three bodies of literature provided the foundation for the development of the theoretical framework of the study. Figure 1 relates these three bodies of literature in a conceptual model of the literature review.

Figure 1  
Conceptual Model of the Literature Review



Each of the five major sections of the literature review is signified by a roman numeral in figure 1. The first section of this chapter is dedicated to the literature pertaining to just-in-time purchasing. The second section presents theoretical models of the buyer-supplier relationship, with particular emphasis placed upon transaction cost economics. The third section contains a review of the literature concerning the measurement of purchasing performance.

The fourth section is comprised of three subsections respectively pertaining to: (1) the connection between just-in-time purchasing and the nature of the buyer-supplier relationship, (2) the relationship between just-in-time purchasing and purchasing performance, and (3) the connection between the nature of the buyer-supplier relationship and purchasing performance. While literature was identified corresponding to each of these three enumerated categories, the author was unable to find any study interrelating just-in-time purchasing, the nature of the buyer-supplier relationship, and purchasing performance.

This study remediates the fragmentation of the literature by developing a theoretical model that integrates the use of just-in-time purchasing, the nature of the buyer-supplier relationship, and consequent implications on purchasing performance. The theoretical model is presented

in the fifth section. Finally, specific hypotheses are advanced based on the theoretical model.

#### Just-In-Time Purchasing

Manoochehri defines just-in-time purchasing as "frequent deliveries of small lots of high quality parts, with delivery geared precisely to the buying firm's production schedule" (1984: 18). Just-in-time purchasing, and its associated methods, is a subset of the larger manufacturing philosophy of just-in-time manufacturing (Schonberger, 1982a).

Often misunderstood, just-in-time manufacturing is simply a philosophy of manufacturing that focuses on continuous improvement in the pursuit of the elimination of waste -- waste of resources such as time, materials, space, energy, and human capital (Blackburn, 1991; Macbeth, 1987). The principal objective of just-in-time purchasing is to provide the right material, at the right place, in the right quantity, of acceptable quality, at precisely the time when it is needed; any deviation from these conditions results in waste (Frazier, Spekman, & O'Neal, 1988; O'Neal, 1987).

#### Just-In-Time Purchasing Methods

In order to accomplish the objectives of just-in-time purchasing, a number of methods are deployed. Some of the methods and characteristics noted most frequently in the literature are enumerated below.

Reduction in the supplier base. The number of suppliers used to source any given part is dramatically reduced, accompanied by an increased use of single sourcing (Ansari & Modarress, 1988; Dion, Banting, & Hasey, 1990; Hall, 1987; Newman, 1988a; Nydick & Hill, 1992; O'Neal, 1987). For example, during the 1980's, Xerox reduced its supplier base from over 5,000 to approximately 400 (Fram, 1995). In 1981, Xerox purchased parts for the Marathon high-speed copier from more than 2,000 suppliers. By 1986, the number of suppliers had decreased to fewer than 350 (Bertrand, 1986a).

Atkinson (1989) reports that among over 200 firms surveyed, the average reduction in supplier base was more than 70 percent. Likewise, Dion, Blenkhorn, and Banting (1992) relate that 70 percent of respondents to their survey cited a "significant" decrease in the supplier base due to just-in-time purchasing implementation.

In a survey of auto-manufacturer suppliers, Helper (1991) reports that the average number of rival suppliers providing a given part to an auto-manufacturer declined 17 percent over the 1984-1989 survey period. And recently, Ford has announced plans to pare their supplier base from 52,000 to 5,000; a move estimated to save them \$1.6 billion annually (Fram, 1995).

Modification of inbound logistics methods. The most widely reported change in this area is that firms that use

just-in-time purchasing receive more frequent deliveries of smaller lots (Dion, Banting, & Hasey, 1990; Giunipero, 1986; Hahn et al., 1983; O'Neal, 1987; Schonberger, 1982b).

Changes in inbound logistics methodology are designed to smooth and speed the flow of incoming material. Examples of these modifications include increased reliance on quality inspections by the supplier and the curtailment of inspections of incoming material, the use of standardized containers and packaging, the use of privately controlled carriers or contract carriers rather than common carriers, and a reduction in paperwork and streamlining of administrative procedures associated with the receiving of incoming material (Ansari, 1986; Ansari & Modarress, 1988; Fawcett & Birou, 1993; Hall, 1987; Newman, 1988b; Schonberger & Gilbert, 1983).

Emphasis on supplier quality. Just-in-time purchasing demands higher quality from suppliers. It has been estimated that in many U.S. firms, 50 percent or more of all quality problems could be traced to poor supplier quality (Crosby, 1982; Ebrahimpour & Mangiameli, 1990). Many reports of dramatic improvements in supplier quality are attributed to buyer efforts to assist suppliers in improving their quality (Ansari & Modarress, 1988; Dion, Blenkhorn, & Banting, 1992; Merli, 1991; Morgan & Zimmerman, 1990; Newman, 1989; O'Neal, 1987).

One survey of supplier CEO's asked questions about their customers' efforts at improving supplier quality management. The majority of respondents indicated that their customers were working jointly with them to improve quality, and that there was a rising tide of expectations concerning quality. Furthermore, the suppliers indicated that they are almost universally rated on quality in formal supplier evaluations (Purchasing, 1992).

Long-term contracts and cooperation. Increasing awareness and acceptance of just-in-time purchasing philosophy is credited in part for the observed trend toward long-term relationships and collaboration in industrial markets (Spekman, 1988a; Wilson & Mummalaneni, 1986). In a survey of auto-manufacturer suppliers, it was reported that the average contract length almost doubled during the 1984-1989 period from 1.2 years in 1984 to 2.3 years in 1989 (Helper, 1991).

Increased cooperation has been manifest in the trend toward better communication between buyers and sellers. The increasingly widespread adoption of electronic data interchange among firms using just-in-time purchasing has facilitated this improvement (Dion, Blenkhorn, & Banting, 1992; Hall ,1987). In addition, many authors note the development of other cooperative mechanisms, such as joint buyer-supplier problem solving teams, to solve differences such that the trading relationship is maintained to the

mutual benefit of both buyer and seller (Ansari, 1986; Nydick & Hill, 1992; Spekman 1988b).

Another manifestation of the trend toward more cooperative relationships is the involvement of suppliers in nontraditional roles such as actively participating in product and process design (Han, Wilson, & Dant, 1993; Metcalf, Frear, & Krishnan 1990; Newman, 1988a; Rosenberg & Campbell, 1985; Spekman, 1988a). Ansari (1986), in a survey of twenty-one U.S. firms that used just-in-time purchasing, cites supplier involvement in the design phase as a key antecedent to improved quality. Ninety-five percent of the survey respondents agreed that just-in-time purchasing efforts were doomed to failure without the early and extensive involvement of suppliers.

Frequently cited methods. Table 1 contains a summary of methods commonly associated with just-in-time purchasing and references made to said methods from nine eminent works. The nine works were selected based on the judgement of the author that they are among the most substantive of the descriptive literature on just-in-time purchasing.

Methods cited less frequently. Other just-in-time purchasing methods that were mentioned in the literature with less frequency, and thus precluded from table 1, include the use of loosely stipulated specifications (Ansari & Modarress, 1988; Chun, 1991; Schonberger & Gilbert, 1983), joint buyer-supplier value analysis activities (Hahn, Pinto,

Table 1  
References to Just-In-Time Purchasing Methods

METHOD	Source:	1	2	3	4	5	6	7	8	9
Reduction in the supplier base		X	X	X	X	X	X	X		X
Emphasis on supplier quality		X	X	X	X	X		X	X	X
Use of long-term contracts/partnerships		X	X	X	X	X	X	X	X	X
Supplier involvement in design activities		X				X	X	X	X	
Better forecasts/stable schedules				X	X				X	X
Frequent deliveries of small quantities		X	X	X	X	X	X	X	X	X
Simplified receiving/standard containers		X		X	X	X		X	X	X
Local/geographically close suppliers		X	X	X	X	X		X	X	X
Close/continuous communication system		X		X		X			X	X
Controlled transportation system		X		X	X	X	X		X	X

Note: X indicates that the source discusses the particular method.

Sources

- |                                |                             |
|--------------------------------|-----------------------------|
| 1. Schonberger, 1982b          | 6. O'Neal, 1987             |
| 2. Hahn, Pinto, & Bragg, 1983  | 7. Ansari & Modarress, 1988 |
| 3. Hall, 1983                  | 8. Newman, 1988b            |
| 4. Schonberger & Gilbert, 1983 | 9. Fawcett & Birou, 1993    |
| 5. Giunipero, 1986             |                             |

& Bragg, 1983; Newman, 1988b; Schonberger & Gilbert, 1983), and the use of blanket orders and minimized paperwork (Ansari & Modarress, 1988; Reich, 1987; Schonberger & Gilbert, 1983). Additional just-in-time purchasing methods,

also cited less frequently, include an insistence on exact delivery quantities (Ansari & Modarress, 1988; Reich, 1987; Schonberger & Gilbert, 1983) and an elevation of total cost over price as an evaluation criteria in supplier evaluation (Frazier, Spekman, & O'Neal, 1988; Macbeth et al., 1988).

#### Just-In-Time Purchasing Implementation

Research relating to the implementation of just-in-time purchasing falls into the categories of works propounding the factors giving rise to successful just-in-time purchasing implementation and those dealing with the measurement of the extent of just-in-time purchasing implementation.

#### Antecedents to Successful Just-In-Time Purchasing Implementation

Drawing upon the descriptive literature on just-in-time purchasing implementation, table 2 contains a summary of the major factors cited as antecedents to successful just-in-time purchasing implementation. While the sources from table 2 enumerate characteristics associated with successful just-in-time purchasing implementation, neither indicates the sequence in which implementation activities should proceed. Giunipero (1989) concluded, based on the results of a survey of one hundred members of the Association for Manufacturing Excellence that had implemented just-in-time purchasing, that the proper implementation sequence is that shown in table 3.

Table 2  
Antecedents to Successful Just-In-Time  
Purchasing Implementation

<b>Ansari, 1986</b>	<b>Frazier, Spekman, &amp; O'Neal, 1988</b>
<p>1. Organization of human resources:</p> <ul style="list-style-type: none"> <li>→ Top management commitment and leadership</li> <li>→ Human resources familiarization, training, and readiness</li> <li>→ Union leader's support</li> </ul> <p>2. Organization of operational factors:</p> <ul style="list-style-type: none"> <li>→ New purchasing philosophy - small lot sizes/frequent deliveries, reduction in supplier base, long-term relationships, supplier involvement and support</li> <li>→ Controlled transportation system</li> <li>→ Efficient receiving and materials handling</li> <li>→ Firm schedules for suppliers</li> <li>→ Standardized containers</li> </ul>	<p>1. The JIT exchange agreement must be formalized, oriented toward self-regulation, and fair.</p> <p>2. The buyer and supplier must have realistic expectations concerning roles, responsibilities, and outcomes.</p> <p>3. Each party must use power in a noncoercive, problem-solving way.</p> <p>4. A large number of personnel from both firms must be involved.</p> <p>5. Role performance of both parties must be high or improving.</p> <p>6. Positive norms of conduct should be developed.</p> <p>7. High levels of cooperation should be present.</p> <p>8. Conflict should be openly and effectively resolved.</p> <p>9. High levels of trust should develop.</p>

Adapted from: Ansari, A. 1986. Strategies for the Implementation of JIT Purchasing. International Journal of Physical Distribution and Materials Management, 16(7): 5-12.

Frazier, Gary L., Spekman, Robert E., & O'Neal, Charles R. 1988. Just-In-Time Exchange Relationships in Industrial Markets. Journal of Marketing, 52: 52-67.

Table 3  
Just-In-Time Purchasing Implementation Sequence

<u>Implementation Sequence from Giunipero (1989)</u>	
1.	Obtain top management approval.
2.	Establish a JIT task force.
3.	Train personnel about JIT.
4.	Make the necessary internal changes (e.g., quality improvement programs, modifying accounting system, etc.).
5.	Change manufacturing operations (e.g., setup time reduction, batch size reduction, etc.).
6.	Establish JIT in purchasing.

Adapted from: Giunipero, Larry C. 1989. Just-In-Time Purchasing: An AME Research Report. Wheeling, IL: Association for Manufacturing Excellence.

Giunipero also concluded that it is particularly important to fully implement just-in-time production methods internally before attempting to induce the supplier base to adopt these methods in their operations. This particular conclusion is one that has been forcefully asserted by other authors as well (Ansari & Modarress, 1990; Blackburn, 1991; Schonberger & Gilbert, 1983; Schorr, 1992; Willis, Huston, & Aby, 1989).

#### Measurement of Just-In-Time Purchasing Implementation

There have been relatively few attempts to systematically operationalize and measure the implementation of just-in-time purchasing (Chun, 1991; Fawcett & Birou,

1993; Templin, 1988; Waller, 1993). Some authors have claimed to measure the effects of just-in-time purchasing implementation without delineating methods for its measurement (e.g., Dion, Banting, & Hasey, 1990; O'Neal, 1987; O'Neal, 1989).

Templin (1988) measured the extent of just-in-time purchasing implementation using seven-point Likert scales anchored by the statements "none" and "total". Respondents were asked to rate the degree of implementation of the just-in-time purchasing methods shown in table 4.

Table 4  
Just-In-Time Purchasing Methods from Templin (1988)

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**Respondents asked to rate the implementation of:**

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1. Supplier total quality control
  2. Supplier incorporation of just-in-time internally
  3. Reduction of supplier base
  4. Long-term supplier partnerships
  5. Single sourcing of suppliers
  6. Local/geographically close suppliers
  7. Supplier just-in-time deliveries
  8. Minimization of receiving requirements
  9. Reduction of administrative/paperwork requirements
- 

Adapted from: Templin, Carl R. 1988. The Effect of Contracting Requirements on JIT Implementation in a Defense Contracting Environment. Ph.D. dissertation, Arizona State University.

Of the nine just-in-time purchasing methods in table 4, only items two, four, seven, and eight had first principal component coefficients in excess of  $\pm 0.30$  when subjected to principal components analysis. No information concerning

the reliability of this scale was reported and the first principal component was simply used as an index of just-in-time purchasing implementation.

Chun (1991) also measured just-in-time purchasing implementation by asking respondents to rate the degree to which they had implemented the just-in-time purchasing methods shown in table 5. Seven-point Likert scales were used, anchored with the statements "not at all" and "very intensively".

Table 5  
Just-In-Time Purchasing Methods from Chun (1991)

---

**Respondents asked to rate the degree of implementation of:**

1. Reduction in the supplier base
  2. Reduction in the use of competitive bidding
  3. Small purchase lot sizes
  4. Use of a supplier certification program
  5. Providing estimated requirements to suppliers
  6. Use of freight consolidation for inbound materials
  7. Providing flexible design specifications to suppliers
  8. Use of reusable containers
  9. Use of long-term contracts
  10. Encouraging suppliers to invest in physical assets
  11. Assisting suppliers to develop their JIT capabilities
  12. Single point pricing (no quantity discounts)
- 

Adapted from: Chun, Dal-Young 1991. The Impact of "Just-In-Time" Systems on Industrial Firms' Competitive Advantage: Toward an Integration of Marketing and Manufacturing Strategies. Ph.D. dissertation, University of Alabama.

Chun purified his scale using widely accepted methodology involving the computation of item-to-total correlations followed by factor analysis (Sarah, Benson, &

Schroeder, 1989). Based on the results, Chun concluded that there were two dimensions latent in the scale items that together accounted for 47.0 percent of common variance. He named these dimensions "purchasing performance criteria" and "inbound delivery strategies". The reliabilities of these two scales were reported as 0.76 and 0.73 respectively.

Likewise, Fawcett and Birou (1993) measured the degree of just-in-time purchasing implementation through the use of seven-point Likert scales. The scales were anchored by the statements "not implemented" and "fully implemented." Respondents were asked to rate their adoption of the just-in-time purchasing methods listed in table 6 using these scales.

Table 6  
Just-In-Time Purchasing Methods from Fawcett & Birou (1993)

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**Respondents asked to rate their adoption of:**

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1. Long-term, partnership relationships
  2. Blanket orders/minimal release paperwork
  3. Supplier qualification/certification
  4. Use of delivery time window
  5. Supplier development
  6. Supply base reduction
  7. Use of local, nearby suppliers
  8. Small, frequent deliveries to point of use
  9. Firm schedule, steady production rate
  10. Controlled transportation system
  11. Minimal buying specifications
  12. Value analysis
  13. Exact quantities/standardized containers
  14. EDI interface with suppliers
- 

Adapted from: Fawcett, Stanley E., & Birou, Laura M. 1993.  
Just-In-Time Sourcing Techniques: Current State of Adoption

and Performance Benefits. Production and Inventory Management Journal, 34(1): 18-24.

Unfortunately, Fawcett and Birou reported no data on the validation of this scale. It is, thus, assumed that no formal validation was conducted.

Finally, Waller (1993) used a different approach to measuring just-in-time purchasing implementation. Specifically, each respondent in his sample was asked to respond to the specific questions shown in table 7.

Table 7  
Just-In-Time Purchasing Items from Waller (1993)

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**Questions asked of respondents:**

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1. How many suppliers does your company use for the component in question?
  2. What is the length of the contract with the supplier of this component?
  3. How frequently does your company share its production schedule information with the supplier of this component?
  4. How many of the following does your company use in selecting suppliers?

a. Delivery performance	e. Geography
b. Financial Resources	f. Engineering
c. Quality	g. Cooperation
d. Price	
  5. How often are deliveries received from this supplier?
- 

Adapted from: Waller, Matthew A. 1993. The Effects of Supply Management Strategies on Manufacturing Quality: A Covariance Structure Model. Ph.D. dissertation, The Pennsylvania State University.

Rather than aggregating the responses to the five questions to arrive at a summated score representing the level of just-in-time purchasing implementation, each of these questions was assumed to represent an independent dimension of just-in-time purchasing. Since each item represented a single item scale, scale reliability was not an issue.

#### Summary

Just-in-time purchasing and the methods that it subsumes have been examined in this section. Issues related to just-in-time purchasing implementation have also been examined. Finally, the measurement of just-in-time purchasing implementation was discussed. Next, the focus of the literature review turns to alternative models of the buyer-supplier relationship.

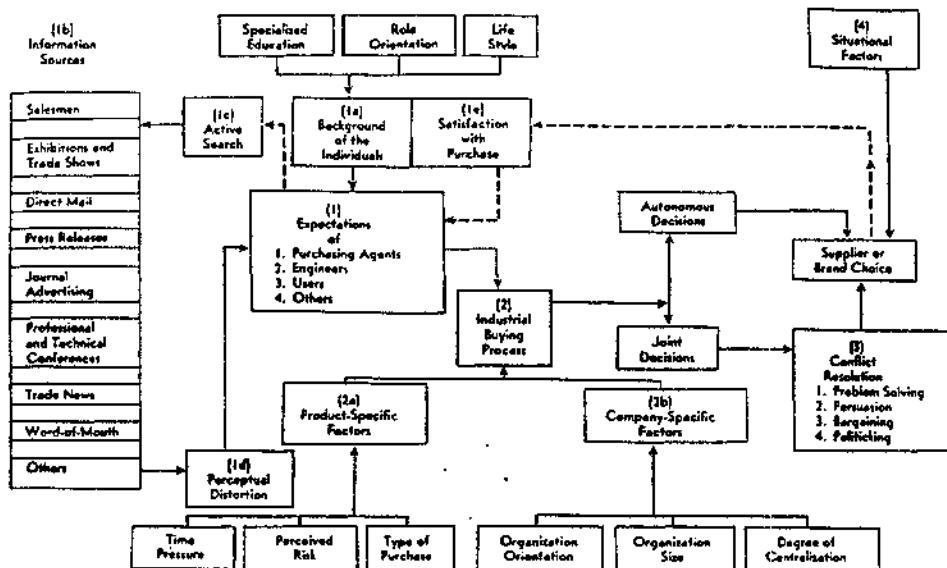
#### Models of the Buyer-Seller Relationship

The development and interrelation of the various theoretical models of the buyer-seller relationship are detailed in this section. First, a model of the discrete purchasing act is presented, followed by a discussion of the dyadic interaction paradigm, the resource dependence view, and finally, transaction cost economics. Special emphasis is placed upon transaction cost economics as it provided the foundation for the theoretical model advanced in this study.

### The Discrete Transaction Model

Early industrial purchasing models tended to focus on the discrete purchasing act and the events leading to it. In the discipline of economics, this orientation is referred to as the "discrete-transaction paradigm" (Williamson, 1979). In the discipline of marketing, Sheth (1973) was among the first to advance an integrative model of the industrial purchasing process (see figure 2) framed from the discrete transaction view. Inspection of figure 2 supports the observation that this theoretical view of the buyer-supplier relationship was focused on the level of the firm in isolation, and on the singular transaction.

Figure 2  
Sheth's Model of the Discrete Industrial Purchasing Transaction



Adapted from: Sheth, Jagdish N. 1973. A Model of Industrial Buyer Behavior. Journal of Marketing, 37: 50-56.

By the decade of the 1980's, the discrete transaction view was widely discredited because of its lack of emphasis on the relationship between buyer and seller (Ford, 1980; IMP Project Group, 1982; Parkinson, 1985). It should be noted that the contribution of the discrete transaction model was significant in that researchers, recognizing the limitations of the discrete transaction focus, subsequently shifted their focus away from the discrete transaction toward a focus on a series of interactions over time (i.e., relationship) between buyer and seller. Future models would be based upon this interaction focus.

#### The Dyadic Interaction Paradigm

Subsequent research on industrial purchasing was characterized by a focus on the ongoing interaction between buyer and seller. Wilson (1975) views the buyer-seller relationship as a dyadic (i.e., two individuals/firms) interaction. This conceptualization was based on the propositions that:

1. The buyer enters the interaction seeking to obtain a number of product-, company-, or salesperson-specific tangible and psychological attributes from the seller.
2. The buyer-seller relationship develops over time.

Furthermore, the nature of the interaction between buyer and seller changes as the relationship matures.

The second of these propositions is especially important because it implies that analysis should be focused

on a stream of interaction over time rather than on a singular discrete transaction. From the dyadic perspective, both buyer and seller shape the behavior of the other over time through action, reaction, and mutual adjustment to events in the interaction process (Bonomo, Bagozzi, & Zaltman, 1978). In this mutual adjustment process, Bagozzi (1975) asserted that the interaction of the dyad is characterized by an attempt to maintain equality, especially in repeated exchanges, and a quid-pro-quo notion (i.e., something of value in exchange for something of value).

The significance of the dyadic interaction paradigm was that it rejected the notion of the existing discrete transaction paradigm with its focus on analysis at the level of the individual firm and the singular transaction (Bonomo, Bagozzi, & Zaltman, 1978). The dyadic interaction paradigm instead focused the analysis on the interaction between firms and on a series of interactions over time.

#### The Resource Dependence View

Resource dependence theory is significant because it provided part of the foundation upon which subsequent models of the buyer-supplier relationship would rest. According to the resource dependence view, the supply environment is characterized by scarce resources. These scarce resources consist of the information and materials that sundry buyers and sellers share and compete for. Moreover, the principal concern of the resource dependence view revolves around the

distribution of power between trading partners and the need to control dependence on other parties in the quest for these scarce resources (Aiken & Hage, 1968; Pfeffer & Salancik, 1978).

Resource dependence is determined by the importance of the resources in question, the availability of the resources from multiple suppliers, and the degree of substitutability among resources. As trading relationships are specialized, "fit" with the buyer's specific needs ensues; a desirable outcome. But, as trading relationships specialize, the number of potential suppliers is reduced and substitutability is also diminished; leading to supply vulnerability.

Consequently, at the core of the resource dependence view is a balancing act between fit and vulnerability. The procurement strategy problem is thus to achieve a reasonable balance between product/service need fit and supply vulnerability (Pfeffer & Salancik, 1978).

#### Transaction Cost Economics

Williamson (1979, 1981, 1985) presented a theoretical model of the buyer-seller relationship that is characterized both by an emphasis on the dyadic relationship between firms and on the specialization, thus dependence, in that dyadic relationship. As such, the theory incorporates elements of both the dyadic interaction paradigm and the resource dependence view. The transaction cost economics theoretical

model and associated constructs are discussed in detail as this theoretical model provided the foundation for the theoretical model advanced in this study.

#### Assumptions of the Theory

Transaction cost analysis operates under the assumptions that:

1. Human agents are subject to bounded rationality (i.e., they are intendedly rational and operate within the limits of their cognitive ability and the information available to them).
2. At least some agents are given to opportunism. Opportunism can take many forms including distortion or withholding of information, reneging on explicit or implicit promises, or shirking from expected duties.

#### Minimizing Transaction Costs

Transaction cost economics is based on the notion of transaction costs. A transaction occurs when a good or service is transferred across an organizational interface. Transaction cost analysis focuses on the conditions under which transactions are performed most efficiently via the choice of a specific institutional framework that governs the interaction.

#### The Governance Structure

This institutional framework is referred to as the "governance structure". According to Williamson, parties to

the interaction (i.e., buyer and supplier) exercise a choice as to which of the various governance structures will regulate their interaction.

The market option. One extreme of governance structure is the pure market discrete (i.e., "market") transaction which is characterized by Williamson as ". . . sharp in by clear agreement; sharp out by clear performance" (1979: 235). The duties, risks, and rewards of both parties are clearly specified under the market governance structure, and negotiations tend to focus on the determination of an equilibrium price.

The hierarchy option. The opposite extreme of governance structure is the hierarchical arrangement created by vertical integration (i.e., "hierarchy"). The hierarchy governance structure is characterized by unilateral ownership of the means of production and, thus, a high degree of control over those assets. Hierarchy also results in a unilateral assumption of risk imposed by asset inflexibility. This is in contrast to the market governance structure where there is independent ownership of the means of production and a negotiated sharing of risk between the independent parties.

The bilateral option. Between these two extremes of governance structure lies the "bilateral" governance structure. This structure entails a series of ongoing negotiations and adaptations, and is characterized by a

generally cooperative atmosphere. The emergent nature of the process of ongoing negotiation is most efficient when it is infeasible for all contingencies to be fully and clearly negotiated in advance. This is in stark contrast to the market governance structure where expectations and outcomes are specified a priori to the interaction. The bilateral governance structure also differs from hierarchy in that there is bilateral rather than unilateral control of productive assets and a negotiated sharing of risk.

#### Descriptive Dimensions of Exchange

The critical dimensions required for describing transactions are:

1. The frequency with which transactions recur (i.e., "frequency")
2. Uncertainty in the exchange environment (i.e., "exchange uncertainty")
3. The degree to which transaction-specific investments must be made in order to realize minimum cost (i.e., "asset specificity")

According to Williamson, asset specificity is the most critical descriptive dimension since specialized investments dictate that prohibitive costs will be associated with the termination of the relationship. Due to the specialized nature of relationship specific investments, the salvage value of these investments is relatively low, resulting in high "switching costs" to both parties. In practical terms,

this means that the buyer has limited supply alternatives and that the seller would experience difficulty in trying to sell specialized output to another buyer.

For instance, Wilson and Mummalaneni (1986) estimated that it would take DuPont Chemical and Burlington Mills approximately seven years to disconnect all inter-organizational ties and systems, given a decision to sever their relationship. Clearly, such a decision would entail significant switching costs.

#### Choosing a Governance Structure

Transaction cost economics is a normative theory that prescribes the most efficient, in terms of transaction costs, governance structure (i.e., market, bilateral, hierarchy) based on a consideration of the critical dimensions used to describe the interaction environment (i.e., frequency, exchange uncertainty, asset specificity).

Market conditions. Under one extreme set of circumstances where there is low frequency of transaction, high exchange certainty (i.e., a large number of acceptable suppliers), and low asset specificity, the spot market contract is commonly relied upon. The market governance structure is the most transaction cost economizing under these circumstances.

Conditions for hierarchy. At the opposite extreme, where there is high frequency of transaction, high exchange uncertainty, and idiosyncratic product/service requirements,

thus high asset specificity, vertical integration is the norm. The hierarchy governance structure is the most economical under this set of circumstances.

Conditions for bilateralism. Between the two extreme sets of circumstance described above, bilateralism may prevail as the most economical form of governance structure. Given the market option, increasing levels of frequency of exchange, exchange uncertainty, and asset specificity will render the bilateral governance structure increasingly attractive in exchange efficiency terms.

#### Measurement of Transaction Cost Economics Constructs

Transaction cost economics constructs fall into three categories: (1) descriptive dimensions of the exchange, (2) governance structure, and (3) transaction costs. The measurement of the first two of these categories of transaction cost economics constructs is discussed in the following sections. Discussion of the measurement of transaction costs is presented in the section on purchasing performance and its measurement.

##### Descriptive Dimensions of the Exchange

The first of the three categories, descriptive dimensions of the exchange, consists of the three components of frequency of exchange, exchange uncertainty, and asset specificity. Each of these components will be described

briefly as their measurement was not central to the purpose of this study.

Frequency. Frequency of exchange is the most straightforward of the three descriptive dimensions of the exchange to operationalize. Surprisingly, to the author's knowledge, there has only been one study to date involving an application of transaction cost economics that has explicitly measured frequency of exchange (Noordewier, John, & Nevin, 1990). Moreover, Noordewier, John, and Nevin (1990) only used frequency of exchange as a control variable; as the primary descriptive dimension of interest in the study was exchange uncertainty.

Noordewier, John, and Nevin operationalized the frequency of exchange construct through the use of a single item. Respondents were asked: "On average, how many orders (or releases) for bearings are issued annually from this supplier?". Frequency of exchange has also been measured in a small number of just-in-time purchasing studies by asking respondents to indicate the frequency with which materials/components were delivered from suppliers with which they used just-in-time purchasing methods (Freeland, 1991; O'Neal, 1987; Waller, 1993).

Exchange uncertainty. Exchange uncertainty refers to "unanticipated changes in relevant factors surrounding the exchange relationship" (Williamson, 1979: 254).

Balakrishnan and Wernerfelt (1986) reviewed the different

and conflicting ways in which the uncertainty construct has been operationalized. They concluded that the construct should be narrowly framed and operationally defined for the specific purposes at hand.

A number of studies have framed the uncertainty construct explicitly to measure the uncertainty surrounding the buyer-supplier exchange relationship (Heide & John, 1990; John & Weitz, 1988; Noordewier, John, & Nevin 1990; Tullous & Munson, 1991; Waller, 1993). Measures of exchange uncertainty from these studies have focused on the volatility of demand, the availability of product in the market, the rate of technological change, the accuracy of forecasts, and the ease with which the performance of exchange partners can be verified.

Asset Specificity. According to Williamson (1979, 1981, 1985), asset specificity may arise through one or all of three ways. Site specificity is a ". . . cheek-by-jowl relation to each other so as to economize on inventory and transportation expenses" (1981: 555). Physical asset specificity occurs when modification of process or tooling is made to facilitate the interchange. Finally, human asset specificity is created through organizational learning and the acquisition of transaction-specific knowledge and technology.

The "linkage" system employed by the Haggard and Wrangler companies serves as a good example of the

adaptation that gives rise to asset specificity. Using the linkage system, interaction with suppliers is facilitated through the elimination of redundant quality inspections and the consolidation and joint use of warehouse facilities (Sriram & Mummalaneni, 1990).

Other examples of specific assets cited in the literature include railcars modified to haul one brand of automobile (Palay, 1984), specialized software that communicates with only one firm's computers (Jackson, 1985), and dedicated production equipment (Monteverde and Teece, 1982). While such anecdotal evidence is cited in the literature, studies involving extant measurement of asset specificity are scant (Heide & John, 1988; Heide & John, 1990; John & Weitz, 1988; Sriram & Mummalaneni, 1990). In addition, the studies that have explicitly measured asset specificity have focused on physical asset and human asset specificity to the exclusion of site specificity.

#### Governance Structure

The next major category of transaction cost economics constructs is that of governance structure. According to Williamson (1979, 1981, 1985), governance structures may be categorized into two discrete alternatives -- hierarchies and markets (i.e., make versus buy). As has been noted previously, the nature of the exchange relationship between buyer and supplier differs dramatically under the hierarchy and market governance structures. Given that the focus of

this study was on just-in-time purchasing exchange relationships between independent firms, attention was fixed upon the market alternative, where buyer and supplier maintain separate organizational identity and ownership. Thus, the emphasis of this review is on the market alternative.

While the market governance structure may be considered a discrete alternative to hierarchy, the market alternative actually consists of a continuum of governance structure ranging from the purely discrete spot market contract to ongoing bilateral, or "relational" exchange (Kaufmann & Dant, 1992). Acknowledging the notion of this market-relationalism continuum, Heide and John (1990) assert:

. . . at a basic level, our theoretical argument is that the establishment of a closer relationship corresponds to a shift away from market-based exchange toward more bilateral governance." (1990:24)

Thus, with the market alternative, it is not appropriate to dichotomize exchange relationships into categories of purely market or purely bilateral. Rather, the task is to discern where on the continuum of relationalism a particular relationship lies. Hence, the research that has been conducted involving the extant measurement of governance structure has focused on measuring the extent of bilateralism/relationalism present in an exchange relationship (Gilbert, Young, & O'Neal, 1994; Heide & John, 1990; Heide & Miner, 1992; Metcalf, Frear, & Krishnan, 1992; Noordewier, John, & Nevin, 1990).

Rationale for bilateral exchange. Ford (1980) asserts that firms will develop increasingly bilateral relationships when it is perceived that cost savings or increased revenues will arise as a direct result of a closer relationship. These benefits are realized when interacting firms specifically tailor resources to accommodate the relationship (i.e., asset specificity). Benefits of relational exchange noted in the literature include reduced uncertainty, managed dependence on trading partners, exchange efficiency, social satisfaction, and the avoidance of high switching costs (Dwyer, Schurr, & Oh, 1987; Han, Wilson, & Dant, 1993; Spekman, Strauss, & Smith, 1985)

Characteristics of bilateral exchange. Commonly cited characteristics of bilateral exchange relationships include close collaboration between exchange partners, non-adversarialism and cooperation, a long-term orientation, mutual trust, repeated interaction, sharing of information, and joint long-term planning (Dwyer, Schurr, & Oh, 1987; IMP Project Group, 1982; Sriram & Mummalaneni, 1990; Sriram, Krapfel, & Spekman, 1992). Table 8 contains a summary of the literature on the characteristics of bilateral exchange.

While the literature referenced in table 8 describes characteristics of bilateral exchange (i.e., relationalism), the IMP Project Group (1982) has advanced a comprehensive model (see figure 3) of bilateral exchange relationships

Table 8  
Characteristics of Bilateral Exchange

<b>Author(s)</b>	<b>Characteristics Cited</b>
Dwyer, Schurr, & Oh (1987)	<ul style="list-style-type: none"> <li>1. Relationships evolve over time, based on a number of transactions</li> <li>2. Trust and mutual planning based on implicit and explicit assumptions regarding the exchange partner</li> <li>3. Institution of formal mechanisms for collaborating and resolving conflict</li> <li>4. Performance metering involving the ongoing monitoring of characteristics of the interacting parties such as satisfaction, outcome priorities, role requirements and expectations, and perceived opportunities for growth</li> </ul>
Landeros & Monczka (1989)	<ul style="list-style-type: none"> <li>1. A supply pool of one or a few preferred suppliers</li> <li>2. A credible commitment to the relationship</li> <li>3. Joint problem-solving efforts</li> <li>4. An exchange of information</li> <li>5. Joint adjustments to changing conditions</li> </ul>
Heide & John (1990)	<ul style="list-style-type: none"> <li>1. Focal activities are carried out in a coordinated or cooperative manner</li> <li>2. A long-term orientation characterized by a bilateral expectation of continued interaction</li> <li>3. Ex ante verification (i.e., qualification) efforts by the buyer to determine whether the supplier can perform as expected</li> </ul>

Table 8 (continued)  
Characteristics of Bilateral Exchange

<b>Author(s)</b>	<b>Characteristics Cited</b>
Noordewier, John, & Nevin (1990)	<ol style="list-style-type: none"> <li>1. Supplier flexibility in meeting buyer-requested adjustments</li> <li>2. Suppliers provide assistance to the buyer for which there is no immediate compensation or reward</li> <li>3. Nontraditional information such as long-term forecasts, proprietary information, product design information, and production schedules is provided to suppliers</li> <li>4. Ongoing monitoring of supplier performance</li> <li>5. An expectation concerning the continuity of the relationship</li> </ol>
Metcalf, Frear, & Krishnan (1992)	<ol style="list-style-type: none"> <li>1. An exchange of technical and commercial information</li> <li>2. Trust resulting from the development of personal relationships between members of the buying and selling firms</li> <li>3. Cooperation arising from the coordination of work</li> <li>4. Adaptations and investments made to support the relationship</li> </ol>
Sriram, Krapfel, & Spekman (1992)	<ol style="list-style-type: none"> <li>1. A recognition of mutual interdependence</li> <li>2. Open sharing of information</li> <li>3. Joint future planning</li> <li>4. A constructive problem-solving approach to conflict resolution</li> <li>5. A building of trust in the trading partner</li> </ol>

Adapted from: Dwyer, F. Robert, Schurr, Paul H., & Oh, Sejo 1987. Developing Buyer-Supplier Relationships. Journal of Marketing, 51: 11-27.

Heide, Jan, & John, George 1990. Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships. Journal of Marketing Research, 27: 24-36.

Landeros, Robert, & Monczka, Robert M. 1989. Cooperative Buyer/Seller Relationships and a Firm's Competitive Posture. Journal of Purchasing and Materials Management, 25(3): 9-18.

Metcalf, Lynn E., Frear, Carl R., & Krishnan, R. 1990. Buyer-Seller Relationships: An Application of the IMP Interaction Model. European Journal of Marketing, 26(2) 27-46.

Noordewier, Thomas G., John, George, & Nevin, John R. 1990. Performance Outcomes of Purchasing Arrangements in Industrial Buyer-Vendor Relationships. Journal of Marketing, 54: 80-93.

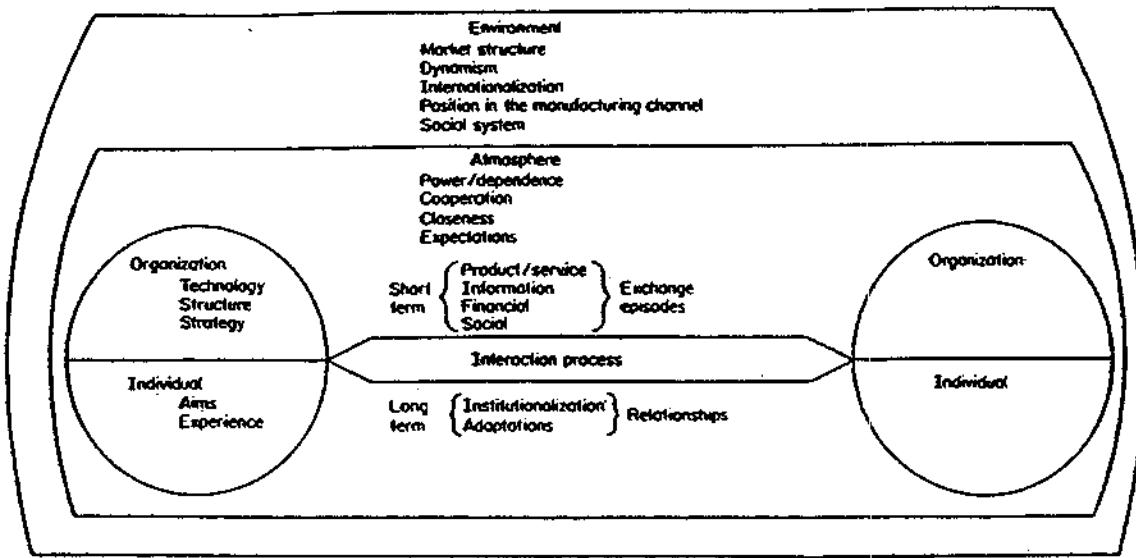
Sriram, Ven, Krapfel, Robert, & Spekman, Robert 1992. Antecedents to Buyer-Seller Collaboration: An Analysis From the Buyer's Perspective. Journal of Business Research, 25: 303-320.

derived from case studies of some three hundred European industrial firms. The IMP Interaction Model is based on the following assumptions:

1. Both buyer and seller are active participants in the market with complementary needs and a joint recognition of their dependence on the resources of the other.
2. The relationship between buyer and seller is frequently long-term and is facilitated by a number of intra- and inter-firm interactions.
3. Both buyer and seller must frequently adapt their procedures, products, physical plant, and human

resources to meet the needs of the other, resulting in high levels of both cooperation and conflict.

Figure 3  
IMP Interaction Model



Adapted from: IMP Project Group 1982. International Marketing and Purchasing of Industrial Goods, Chichester, England: John Wiley & Sons.

The authors of the IMP Interaction Model maintain that the character of the buyer-supplier relationship is determined by the process by which the parties interact, the organizational participants interacting, the macro environment in which the interaction takes place, and the existing atmosphere or quality of the relationship.

The interaction process consists of short-term exchange episodes. In these exchange episodes, the nature of the product or service exchanged, the nature and mode of

information exchanged, the financial exchange, and social exchange all have a bearing on the relationship. In the long-term, exchange episodes are routinized into a set of roles and expectations; a relationship is thus formed.

Characteristics of the interacting parties also influence the nature of the buyer-supplier relationship.

The respective production technologies (e.g., batch, process, etc.) of the parties must be considered.

Organizational characteristics such as size, structure, and strategy also play a role. Experience in interacting with other parties and the personalities and motivations of the individuals that interact are other characteristics which exert an influence on the buyer-supplier relationship.

Elements of the interaction environment such as the market structure (e.g., monopoly, etc.), dynamism, internationalization of the market, and the position of buyer and seller in the logistical chain all act upon the buyer-seller relationship. In addition, the social systems of the interacting firms, with accompanying norms and prevailing attitudes, can influence the relationship between buyer and seller.

Finally, the existing atmosphere of the relationship must be considered. Explicitly, power-dependence issues, conflict and cooperation experiences, distance (e.g., geographical, cultural, etc.) of the relationship, and

existing expectations will all act to influence the future quality of the buyer-supplier relationship.

Measurement of relationalism. Surprisingly, research on the validity of the prescriptions of transaction cost economics has seldom involved direct measurement of governance structure. In many cases, the purpose of the research has been to predict the type of governance structure (i.e., hierarchy versus market) that would be most transaction cost economizing in a particular situation. For example, transaction cost analysis has been used to:

1. Explain make versus buy decisions in the automobile industry (Monteverde & Teece, 1982)
2. Predict whether the custom in a particular industry would be to integrate the sales function or to rely on independent sales agents (Anderson, 1985; Anderson, 1988)
3. Predict whether manufacturers of industrial goods would use direct (i.e., direct sales to final consumers) or indirect (i.e., distributors, wholesalers, etc.) distribution channels (John & Weitz, 1988)
4. Explain the level of vertical integration (i.e., hierarchy) observed within a given industry (Stuckey, 1983)

The limited research involving the extant measurement of governance structure has concentrated on measuring the presence, or absence, of the elements of bilateral exchange

inherent in a buyer-seller relationship (Gilbert, Young, & O'Neal, 1994; Heide & John, 1990; Heide & Miner, 1992; Metcalf, Frear, & Krishnan, 1992; Noordewier, John, & Nevin, 1990).

According to Heide and John (1990), bilateral purchasing arrangements may vary along the dimensions of:

1. Joint action is the ". . . degree of interpenetration of organizational boundaries" (1990: 25). Joint action results when the key activities of the relationship are performed in a coordinated and cooperative manner.
2. Continuity is the bilateral expectation that the relationship will continue in the future.
3. Supplier verification refers to the extent of efforts by the buyer to establish ex ante that the supplier has the capability to perform in an adequate manner.

These three dimensions of relationalism were operationalized via the use of seven-point Likert scales; presented in table 9. The reported reliability coefficients of the joint action, continuity, and supplier verification scales were 0.70, 0.88, and 0.67 respectively.

It should be noted that Heide and John did not mathematically combine the above elements to render an index of relationalism. Rather, hypothesized relationships between these relationalism subconstructs were explored, along with hypothesized relationships of the subconstructs

Table 9  
Relationalism Scale Items from Heide & John (1990)

Dimension	Scaling		Items
Joint Action	"Minimal Joint Effort" to "Extensive Joint Effort"	1. 2. 3.	Component testing/prototyping Long-range planning Forecasting component requirements
Continuity	"Strongly Disagree" to "Strongly Agree"	1. 2.	The parties expect this relationship to last a long time. The parties make plans not only for the terms of the individual purchase, but also for the continuance of the relationship.
Supplier Verification	"Minimal Evaluation of Supplier" to "Extensive Evaluation of Supplier"	1. 2. 3.	Engineering capability Manufacturing capability Personnel/management resources

Adapted from: Heide, Jan, & John, George 1990. Alliances in Industrial Purchasing: The Determinants of Joint Action in Buyer-Supplier Relationships. Journal of Marketing Research, 27: 24-36.

with other transaction cost economics constructs (e.g., uncertainty and asset specificity).

Noordewier, John, and Nevin (1990) contend that bilateral exchange relationships may vary in their degree of the following:

1. Supplier flexibility is the willingness of suppliers to accommodate changes requested by the buyer.
2. Supplier assistances refers to the willingness of the supplier to render assistance to the buyer (e.g., notifying buyers of delivery problems, recommending stock substitutes for shortages).
3. Information provided to the supplier refers to the types and quantity of information provided to suppliers. Relational exchange relationships involve communication of greater quantities of information, and of proprietary and other forms of nontraditional information.
4. Monitoring of the supplier consists of the efforts by the buyer to monitor the performance of the supplier during the execution of the exchange agreement.
5. Expectation of continuity refers to the expectation of future exchange.

Noordewier, John, and Nevin contend that these five dimensions, taken collectively, represent a syndrome of relationalism. The five dimensions were operationalized via the use of five-point Likert scales anchored at the extremes by the statements "strongly agree" and "strongly disagree". The scale items used to represent each of the five dimensions of relationalism are presented in table 10.

Confirmatory factor analysis was used to substantiate that each of the five scales was indeed unidimensional.

Table 10  
Relationalism Scale Items from  
Noordewier, John, & Nevin (1990)

Dimension	Respondents asked for reaction to following statements:
Supplier Flexibility	<ol style="list-style-type: none"> <li>1. Supplier is flexible in response to requests we make.</li> <li>2. Supplier can readily adjust its inventories to meet unforeseen needs that might occur.</li> <li>3. Supplier handles changes well.</li> <li>4. Supplier can provide emergency deliveries.</li> </ol>
Supplier Assistances	<ol style="list-style-type: none"> <li>1. Supplier calls in advance to advise us of shipment (delivery) problems.</li> <li>2. Supplier makes an effort to help us during emergencies.</li> <li>3. Supplier recommends stock substitutes when delivery troubles develop.</li> <li>4. Supplier helps us in value analysis ideas, cost reductions, problem solving, etc.</li> <li>5. Supplier advises us of potential problems in meeting our needs.</li> </ol>
Information Provided to Supplier	<ol style="list-style-type: none"> <li>1. We give supplier usage information to help him plan for our needs.</li> <li>2. We keep our supplier informed of production plans.</li> <li>3. We regularly provide supplier with long-range forecasts of supply requirements.</li> <li>4. We inform supplier in advance of impending design changes.</li> </ol>
Monitoring of Supplier	<ol style="list-style-type: none"> <li>1. We advise supplier of its performance in relation to that of other suppliers.</li> <li>2. We monitor supplier's inventory levels.</li> <li>3. We assess supplier's performance through a formal vendor evaluation program.</li> <li>4. In this arrangement, supplier must provide summary usage reports, tally sheets, or some similar kind of report.</li> <li>5. We conduct quality training for vendor personnel.</li> <li>6. The relationship we have with supplier makes use of many controls.</li> </ol>

Table 10 (continued)  
Relationalism Scale Items from  
Noordewier, John, & Nevin (1990)

<u>Dimension</u>	<u>Respondents asked for reaction to following statements:</u>
Expectation	1. We expect our relationship with supplier of to last a long time.
Continuity	2. The relationship we have with supplier is essentially "evergreen". 3. Renewal of relationship with supplier is virtually automatic.

Adapted from: Noordewier, Thomas G., John, George, & Nevin, John R. 1990. Performance Outcomes of Purchasing Arrangements in Industrial Buyer-Vendor Relationships. Journal of Marketing, 54: 80-93.

Then, using LISREL, a second-order model was employed in which the five dimensions of table 10, representing five first-order factors, were combined in a weighted additive model (i.e., utilizing estimated second-order factor loadings) to form the second-order construct of relationalism. The reported reliability coefficient of the second-order construct was 0.74; no reliability coefficients were reported on the five first-order scales.

Heide and Miner (1992) did not use the term relationalism per se, but the dependent variable used in their study was a "pattern of reciprocal cooperation" between two organizations. They defined four domains in which cooperative behavior between firms might manifest itself. The four domains included:

1. Flexibility refers to the degree to which behavior is adjusted to accommodate the exchange partner.
2. Information exchange is reflected by the degree to which information that facilitates the exchange partner's activities is disclosed.
3. Shared problem solving is signified by the degree to which exchange partners share the responsibilities of maintaining the relationship and resolving emergent problems.
4. Restraint in the use of power refers to the degree to which exchange partners refrain from exploiting each other.

In addition to the dependent variable of reciprocal cooperation, Heide and Miner measured an independent variable that they termed "extendedness of the relationship"; or the degree to which exchange partners anticipate that their relationship will continue indefinitely. In a regression analysis, extendedness was found to be significantly positively related ( $p < 0.01$ ) to the four domains of cooperation previously described.

A summary of the scaling representing the four domains of reciprocal cooperation and the extendedness construct is presented in table 11. Each item in table 11 was scaled with anchors of "1 = completely inaccurate description" and "7 = completely accurate description".

Table 11  
Reciprocal Cooperation and Extendedness Scaling  
from Heide & Miner (1992)

<u>Dimension</u>	<u>Items</u>
Flexibility	<ol style="list-style-type: none"> <li>1. Flexibility in response to requests for changes is a characteristic of this relationship.</li> <li>2. When some unexpected situation arises, the parties would rather work out a new deal than hold each other to the original terms.</li> <li>3. It is expected that the parties will be open to modifying their agreements if unexpected events occur.</li> <li>4. Changes in "fixed" prices are not ruled out by the parties, if it is considered necessary.</li> </ol>
Information exchange	<ol style="list-style-type: none"> <li>1. In this relationship, it is expected that any information that might help the other party will be provided to them.</li> <li>2. Exchange of information in this relationship takes place frequently and informally and not only according to a prespecified agreement.</li> <li>3. It is expected that the parties will provide proprietary information if it can help the other party.</li> <li>4. It is expected that we keep each other informed about events or changes that may effect the other party.</li> </ol>
Shared problem solving	<ol style="list-style-type: none"> <li>1. In most aspects of this relationship the parties are jointly responsible for getting things done.</li> <li>2. Problems that arise in the course of this relationship are treated by the parties as joint rather than individual responsibilities.</li> <li>3. The parties in this relationship do not mind owing each other favors.</li> <li>4. The responsibility for making sure that the relationship works for both us and this supplier is shared jointly.</li> </ol>

Table 11 (continued)  
 Reciprocal Cooperation and Extendedness Scaling  
 from Heide & Miner (1992)

<u>Dimension</u>	<u>Items</u>
Restraint in the use of power	<ol style="list-style-type: none"> <li>1. The parties feel it is important not to use any proprietary information to the other party's disadvantage.</li> <li>2. A characteristic of this relationship is that neither party is expected to make demands that might be damaging to the other.</li> <li>3. The parties expect the more powerful party to restrain the use of his power in attempting to get his way.</li> </ol>
Extendedness of relationship	<ol style="list-style-type: none"> <li>1. The parties expect this relationship to last a lifetime.</li> <li>2. It is assumed that the renewal of agreements in this relationship will generally occur.</li> <li>3. The parties make plans not only for the terms of individual purchases, but also for the continuance of the relationship.</li> <li>4. The relationship with this supplier is essentially "evergreen".</li> </ol>

Adapted from: Heide, Jan, & Miner, Anne S. 1992. The Shadow of the Future: Effects of Anticipated Interaction and Frequency of Contact on Buyer-Seller Cooperation. Academy of Management Journal, 35(2): 265-291.

Heide and Miner subjected the reciprocal cooperation construct to confirmatory factor analysis and reported adequate evidence of the unidimensionality of the four scales representing the four domains of the construct. No information concerning the unidimensionality of the extendedness scale was reported. Surprisingly, no information concerning the reliability of these five scales was reported either.

Metcalf, Frear, and Krishnan (1992), drawing on the work of the IMP Project Group (1982), defined the following elements of close buyer-seller relationships:

1. Product importance represents the saliency of a purchased input to the goals of the purchasing organization.
2. Information exchange involves the exchange of technical and commercial information.
3. Social exchange refers to interpersonal relationships between members of the buyer and seller firms.
4. Cooperation is reflected by the coordination of the work of buyer and seller.
5. Adaptation is the degree to which substantial investments are made in the relationship.

Each of the above elements were operationalized through the use of Likert scales. The product importance scale was operationalized through the use of a four-point scale anchored by the statements "neither important nor unimportant", "important", "very important", and "absolutely essential". The remaining scales were five-point scales anchored at the extremes by the statements "strongly agree" and "strongly disagree". The scale items are shown in table 12.

Confirmatory factor analysis was used to substantiate that each of the five scales was indeed unidimensional. Reported reliability coefficients for the product

Table 12  
Relationalism Scale Items from  
Metcalf, Frear, & Krishnan (1992)

<u>Dimension</u>	<u>Respondents asked for reaction to following statements:</u>
Product Importance	<p>1. In terms of the success of the engine under consideration in this study, this casting is . . .</p> <p>2. In terms of the success of the engine under consideration in this study, technical assistance is . . .</p> <p>3. In terms of the success of the engine under consideration in this study, product quality is . . .</p> <p>4. In terms of the success of the engine under consideration in this study, product service is . . .</p> <p>5. In terms of the success of the engine under consideration in this study, product reliability is . . .</p> <p>6. In terms of the success of the engine under consideration in this study, timely delivery is . . .</p>
Information Exchange	<p>1. Buyer/seller usually provides technical documentation in substantial detail.</p> <p>2. The technical information supplied by buyer/seller is often inadequate.</p>
Social Exchange	<p>1. We like dealing with buyer/seller.</p> <p>2. Buyer/seller has a good understanding of our problems as buyers/sellers.</p> <p>3. We have full confidence in the information provided to us by buyer/seller.</p> <p>4. Buyer/seller generally has a poor understanding of how our company operates.</p> <p>5. It is difficult to make personal friends with purchasing people/salespersons and technical people from the buyer's/seller's company.</p>

Table 12 (continued)  
 Relationalism Scale Items from  
 Metcalf, Frear, & Krishnan (1992)

<b>Dimension</b>	<b>Respondents asked for reaction to following statements:</b>
Cooperation	<ol style="list-style-type: none"> <li>1. Purchasing/marketing people from buyer's/ seller's company cooperate closely with us.</li> <li>2. Purchasing people/salespersons from buyer's/seller's company frequently contact us.</li> <li>3. Purchasing people/salespersons quickly respond to our requests for a call.</li> <li>4. Buyer/seller is particularly interested in following up on how the seller's products are used.</li> </ol>
Adaptation	<ol style="list-style-type: none"> <li>1. Buyer/seller is often interested in joint product development activities.</li> <li>2. Buyer/seller often is receptive to/offers us new technical solutions.</li> <li>3. Buyer/seller often suggests that we jointly coordinate our production plans.</li> </ol>

Adapted from: Metcalf, Lynn E., Frear, Carl R., & Krishnan, R. 1992. Buyer-Seller Relationships: An Application of the IMP Interaction Model. European Journal of Marketing, 26(2) 27-46.

importance, information exchange, social exchange, cooperation, and adaptation scales were 0.84, 0.76, 0.80, 0.67, and 0.67 respectively.

Metcalf, Frear, and Krishnan did not combine the elements of relationalism into an index. Rather, in a fashion similar to that of Heide and John (1990), hypothesized relationships between the elements of relationalism were tested.

Gilbert, Young, and O'Neal (1994) did not offer a formal operational definition of relationalism, however, they describe relational exchange as a "marriage" between the buyer and supplier. These authors contended that relational exchange relationships are characterized by the following elements:

1. Duration is the perceived time horizon of the relationship.
2. Frequency is reflected by the number of interactions, per time unit, between the manufacturer and supplier.
3. Diversity is indicated by the number of interconnections between the manufacturer and supplier.
4. Symmetry refers to similarity in the interconnections between the manufacturer and supplier.
5. Facilitation is reflected by efforts to mutually promote the relationship.

Each of the above elements of relationalism was operationalized through the use of multiple five-point Likert scale items. The scales were anchored in the extremes with "very likely" and "very unlikely", and respondents were asked to rate how likely they were to engage in the behaviors reflected in the statements shown in table 13.

Confirmatory factor analysis was used to substantiate that each of the five scales from table 13 was indeed unidimensional. The reliabilities of the five scales, in

Table 13  
Relationalism Scale Items from  
Gilbert, Young, & O'Neal (1994)

<b>Dimension</b>	<b>Respondents asked for reaction to following statements:</b>
Duration	<ol style="list-style-type: none"> <li>1. Enter a relationship with a supplier for a long period of time.</li> <li>2. Make plans with a supplier for the continuance of the relationship.</li> <li>3. Establish a long-term relationship with a supplier even if it did not offer the lowest price.</li> <li>4. Establish a sole-sourcing relationship with a supplier.</li> </ol>
Frequency	<ol style="list-style-type: none"> <li>1. Engage in frequent one-on-one meetings with supplier personnel.</li> <li>2. Have top level management frequently visit the supplier firm.</li> </ol>
Diversity	<ol style="list-style-type: none"> <li>1. Include a supplier in component testing and prototyping programs.</li> <li>2. Discuss your long-range production plans with a supplier.</li> <li>3. Depend upon a supplier to help forecast production material needs.</li> <li>4. Engage in joint production ventures with a supplier.</li> <li>5. Depend on supplier to help with engineering design of finished products.</li> </ol>
Symmetry	<ol style="list-style-type: none"> <li>1. Arrange communication so that any member of the supplier's firm can easily contact any member of your firm.</li> <li>2. Arrange communication so that any member of your firm can easily contact any member of the supplying firm.</li> </ol>
Facilitation	<ol style="list-style-type: none"> <li>1. Accommodate a supplier when requested (payment, delivery, size of shipment).</li> <li>2. Ask a supplier for help in prevention of production problems.</li> <li>3. Form a cooperative relationship with the supplier (mutual benefits).</li> <li>4. Help a supplier reduce its level of unacceptable defective products.</li> </ol>

Adapted from: Gilbert, Faye W., Young, Joyce A., & O'Neal, Charles R. 1994. Buyer-Seller Relationships in Just-In-Time Purchasing Environments. Journal of Business Research, 29(2): 111-120.

order of their appearance in table 13, were 0.72, 0.64, 0.70, 0.88, and 0.65.

Then, using LISREL, the five dimensions, representing five first-order factors, were combined to form the second-order construct of relationalism. No reliability coefficient for the second-order construct was reported.

#### Summary

In this section, theoretical models of the buyer-supplier relationship were presented. Particular emphasis was placed on transaction cost economics as this study involved an application of that theoretical model. The transaction cost constructs of descriptive dimensions of the exchange and governance structure were discussed in detail. Next, the literature review focuses on purchasing performance and its measurement. Of particular interest is the measurement of purchasing performance from a transaction cost perspective.

#### Purchasing Performance

The purchasing function has evolved from a routine or clerical function to one that helps shape the strategic direction and outcomes of organizations. Thus, organizational endeavor directed at the measurement, reward,

and control of purchasing performance has significantly escalated as a result (Incentive, 1989; Leenders & Blenkhorn, 1988; Monczka, Trent, & Callahan, 1993).

A review of the literature on the measurement of purchasing performance is presented in this section. The domain of this literature includes works on the nature of the performance assessment process itself and works pertaining to the measurement of performance at various levels of analysis; including the purchasing function in aggregate and at the disaggregated level of individuals within the purchasing function.

The review begins with an overview of the literature pertaining to the assessment process itself, and to the measurement of the performance at the individual level. The focus then shifts to an examination of the assessment of the purchasing function in aggregate. Special emphasis is placed on performance measurement in a just-in-time purchasing environment, and particularly on the measurement of purchasing performance from a transaction cost perspective.

#### The Performance Assessment Process

Conceptual models of the purchasing performance assessment process have been advanced in the literature (Adams & Niebuhr, 1985; Anderson & Chambers, 1985; van Weele, 1984). According to these models, purchasing performance is measured by organizations via the use of

measurement indices constituting the operationalization of purchasing performance. These measurement indices usually focus on tangible purchasing outcomes such as price and quality (Anderson & Chambers, 1985). Observations of behavioral performance surrogates such as "negotiating skills" or "rapport with internal customers" may also be used to determine the performance of individuals within the purchasing function (Corey, 1978; Monczka, 1974).

#### The Measurement of Individual Performance

Anderson and Chambers assert that:

. . . the reward/measurement process is the most fundamental and enduring influence on the behavior of buying center members across all types of organizational settings. (1985: 17)

Managers use performance assessments to shape the behavior of individuals as they seek the extrinsic rewards associated with favorable ratings (Dumond, 1991).

Myriad authors have enumerated the criteria to be used in evaluating the performance of individuals in the purchasing organization (Davies, 1985; Hendrick & Ruch, 1988; Kostishack & South, 1973; Monczka, 1974). Table 14 details the criteria outlined by two of these sources.

#### Measurement of Purchasing Function Performance

Numerous authors have delineated criteria for measuring the performance of the purchasing function in aggregate (Croell, 1980; Davies, 1985; Incentive, 1989; van Weele,

Table 14  
Individual Purchasing Performance Criteria

<b>Hendrick &amp; Ruch (1988)</b>	<b>Kostishack &amp; South (1973)</b>
1. Making purchases that arrive on time	1. Personal appearance
2. Making purchases that pass incoming QA inspection	2. Interpersonal relations
3. Meeting target costs	3. Independence and resistance to work pressures
4. Knowledge of commodities in the area of responsibility	4. Innovativeness
5. Ability to control purchase order cycle time	5. Personal insight - people
6. Ability to cultivate qualified suppliers	6. Work follow-up
7. Ability to perform work with a minimum of errors	7. Communications - speaking and writing
8. Ability to determine the bottom price a supplier will take	8. Product-market-price knowledge
9. Complexity of commodities in area of responsibility	9. Ethics and morals
10. Providing timely responses to inquiries from suppliers and internal customers	10. Rules and policy adherence
	11. High work output - purchase orders/dollar volume
	12. Knowledgeable interdepartmental communication
	13. Professional development

Adapted from: Hendrick, Thomas E., & Ruch, William A. 1988. Determining Performance Appraisal Criteria for Buyers. Journal of Purchasing and Materials Management, 24(3): 18-26.

Kostishack, J. Douglas, & South, John C. 1973. The Composition of Industrial Buyer Performance. Journal of Purchasing, 9(August): 50-63.

1984). In table 15, representative criteria from two of these works are enumerated.

Traditionally, the criterion of price has been the paramount factor considered by organizations in determining purchasing function performance. Deming (1986) speaks to this practice in the fourth of his famous fourteen points when he admonishes firms to: "End the practice of awarding business on the basis of price tag alone. Instead, minimize total cost . . ." (1986: 31).

Price minimization is no longer widely considered to be the primary driving force behind effective procurement (Macbeth et al., 1988; Spekman, 1988b). This shift away from emphasis on price is embodied by the "Total Cost of Ownership" approach that considers all costs assumed by the buyer in a transaction; price being only a component of total cost. Ellram defines the Total Cost of Ownership as "all costs associated with the acquisition, use, and maintenance of a good or service" (1993: 3).

Noordewier, John, and Nevin (1990) assert that hidden inventory and administrative costs are frequently greater than purchase price. Thus, total cost, which explicitly considers hidden costs, has been advocated as a superior measure of purchasing performance (Ellram, 1993; Ellram & Siferd, 1993; Giunipero, 1990; Merli, 1991; Monczka & Trecha, 1988). A summary of the components of total cost,

Table 15  
Purchasing Function Performance Criteria

<u>Incentive, 1989</u>	<u>van Weele, 1984</u>
1. Service level, or percentage of time an item is available when needed	1. Purchasing materials costs/prices → materials costs/prices → coordination → transportation
2. Acceptable quality levels of supplier shipments	2. Quality of purchased materials → rejects/returns → rework → production stops
3. Dollar value of the average inventory	3. Purchasing logistics → lead times → order quantity → inventories → delivery timing
4. Money spent on scrapping or salvaging substandard items	4. Purchasing organization → workload/orders → procedures → information system → expertise
5. Timeliness of order fulfillment, awarding contracts, etc.	
6. Telephone expenses	
7. Number of complaints from operating areas of the firm	
8. Number of cost-saving ideas from suppliers	
9. Percentage of delivery promises met	
10. Approval percentage on an annual survey of internal customers and/or suppliers	

Adapted from: Incentive. 1989. Sizing Up Purchasing Agents. April: 62 -64.

van Weele, Arjan J. 1984. Purchasing Performance Measurement and Evaluation. Journal of Purchasing and Materials Management, 20(3): 16-22.

beyond purchase price, as enumerated by Merli (1991) and Ellram (1993) is presented in Table 16.

#### Purchasing Performance Measurement in the Just-In-Time Environment

There is evidence that the way in which purchasing performance is measured may be changing due to the widespread implementation of just-in-time purchasing arrangements. The literature examining the precise form of this transformation is scant (Giunipero, 1989; Dion, Banting, & Hasey, 1990).

Freeland (1991) found quality to be the most important evaluation criterion for parts purchased on a just-in-time basis. Ansari and Modarress (1988) assert that firms that use just-in-time purchasing emphasize quality, delivery performance, cooperation, geographical proximity, and price in selecting and evaluating suppliers.

Helper (1991), conducted surveys of automotive suppliers in 1984 and 1989. She found that the average reported importance level of on-time delivery performance, price, supplier financial resources, quality, and supplier engineering capability increased in the five years between successive administrations of the survey. Unfortunately, these increases could not be linked explicitly to the use of just-in-time purchasing based on Helper's survey methodology.

Table 16  
Elements of Total Cost

<b>Author</b>	<b>Cost Component</b>	<b>Constituent Elements</b>
Merli (1991)	Quality Cost	<ul style="list-style-type: none"> <li>→ Inspection and testing</li> <li>→ Buffer stock</li> <li>→ Scrap and rework</li> <li>→ Litigation</li> <li>→ Warranties, complaint handling</li> <li>→ Loss of image</li> </ul>
	Costs Related to Delivery Reliability	<ul style="list-style-type: none"> <li>→ Buffer stock</li> <li>→ Production interruptions</li> <li>→ Schedule delays</li> <li>→ Loss of sales</li> </ul>
	Supply Lead Time Costs	<ul style="list-style-type: none"> <li>→ Planning and scheduling</li> <li>→ Buffer stock</li> </ul>
	Large Lot Size Costs	<ul style="list-style-type: none"> <li>→ Excess inventory</li> <li>→ Risk of obsolescence</li> </ul>
	Costs Linked to Lack of Improvement	<ul style="list-style-type: none"> <li>→ Lack of reduction in quality costs</li> <li>→ Lack of increase in contribution margins</li> </ul>
Ellram (1993)	Pre- Transaction Components	<ul style="list-style-type: none"> <li>→ Identifying need</li> <li>→ Investigating sources</li> <li>→ Qualifying sources</li> <li>→ Adding supplier to internal system</li> <li>→ Educating supplier &amp; firm about each other's operations</li> </ul>
	Transaction Components	<ul style="list-style-type: none"> <li>→ Price</li> <li>→ Order placement/preparation</li> <li>→ Delivery/transportation</li> <li>→ Tariffs/duties</li> <li>→ Billing/payment</li> <li>→ Inspection</li> <li>→ Return of parts</li> <li>→ Follow-up and correction</li> </ul>
	Post- Transaction Components	<ul style="list-style-type: none"> <li>→ Line fallout</li> <li>→ Defective finished goods rejected before sale</li> <li>→ Field failures</li> <li>→ Repair/replacement in field</li> <li>→ Customer goodwill/reputation of firm</li> <li>→ Cost of repair parts</li> <li>→ Cost of maintenance &amp; repairs</li> </ul>

Adapted from: Merli, Giorgio 1991. Co-makership: The New Supply Strategy for Manufacturers. Cambridge, Massachusetts: Productivity Press.

Ellram, Lisa 1993. Total Cost of Ownership: Elements and Implementation. International Journal of Purchasing and Materials Management, 29(4) : 2-11.

Giunipero (1990) examined the impact of just-in-time purchasing on purchasing performance measurement systems. His sample consisted of one hundred materials managers, purchasing managers, and manufacturing managers employed by firms actively involved in implementing just-in-time purchasing. Giunipero concluded that the traditional criteria of cost savings, price per unit, purchase price variance, and end-of-month shipments all play a diminished role in performance assessment in a just-in-time environment. Performance criteria enjoying an elevated role in the just-in-time purchasing environment included supply base reduction, lead time reduction, supplier quality improvement, supplier delivery improvement, inventory turnover improvement, and inventory reduction.

#### Purchasing Performance from the Transaction Cost Perspective

Ellram (1993) acknowledges transaction costs as being an important component of the Total Cost of Ownership. Nonetheless, very few studies have involved the extant measurement of transaction costs (Sriram, Krapfel, & Spekman, 1992; Walker & Poppo, 1993; Noordewier, John, &

Nevin, 1990) The majority of studies utilizing the transaction cost economics theoretical model operate on the assumption that the prevalent governance structure observed in a particular industry is the one that is the most transaction cost economizing (Anderson, 1985; Anderson, 1988; Stuckey, 1983; Walker & Poppo, 1993).

This "dominant form" assumption is justified on theoretical grounds rooted in the tenets of Darwinian economics and the population ecology view of organizational theory. Both of these theories assert that the bulk of firms that survive in a particular industry will be those whose form is appropriate for the environment of the industry (Hannan & Freeman, 1977; Hirshleiffer, 1977; Lilien, 1979). Thus, most studies involving transaction cost economics have not emphasized the explicit measurement of transaction costs.

Of the studies that have explicitly measured transaction costs, two have operationalized transaction costs by measuring the perceptions of respondents concerning the negotiation process. Sriram, Krapfel, and Spekman (1992) asked respondents to estimate the costs of the negotiation process itself and of activities related to the ongoing monitoring of the agreement. Walker and Poppo (1993) asked respondents to rate the degree of difficulty encountered in negotiating adjustment costs (i.e., transfer

prices) between divisions of a decentralized multidivisional firm.

Certainly there are other costs, exclusive of negotiation costs, that are influenced by the efficacy of the purchasing function. In spite of this, to the author's knowledge, only one study has explicitly operationalized transaction costs using a framework that considers anything other than the negotiation process and related costs (Noordewier, John, & Nevin, 1990).

Noordewier, John, and Nevin (1990) maintain that all purchasing costs may be categorized as invoice costs, possession costs, or acquisition costs. Purchasing performance is determined by the effectiveness of the purchasing organization in minimizing these three costs. While invoice costs are simply represented by purchase price, possession and acquisition costs are more difficult to operationalize.

Possession and acquisition costs arise because of imperfect information and represent ". . . costs (losses) due to imperfect coordination between buyers and sellers attempting to transact in an imperfect world" (Noordewier, John, & Nevin, 1990: 81). Possession and acquisition costs are subject to significant variation among relationships with different suppliers, as according to Ellram and Siferd: "The purchasing function has long been aware that some suppliers . . . are easier to do business with, thereby

reducing the firm's internal efforts and expenditures" (1993: 165).

Possession costs are incurred by carrying inventory; acquisition costs arise from purchasing activities such as the processing of requisitions, receiving and editing invoices, expediting, and following up on inaccurate and late deliveries. Noordewier, John, and Nevin operationalized possession costs (i.e., costs incurred by carrying inventory) via the use of the inventory turnover ratio -- the ratio of dollar purchases to average inventory per time period. Respondents were simply asked to provide the annualized inventory turnover ratio for the component being studied.

According to Noordewier, John, and Nevin, acquisition costs (i.e., costs arising from sundry purchasing activities) may not be found directly in traditional accounting records. Ellram and Siferd give an example of why this is the case in the following scenario:

For example, if materials shortages shut down a production line, and the line employees are still paid, the firm will experience an unfavorable direct labor variance . . . if the shortage was due to poor supplier performance, should not the excess costs associated with the shortage be charged against the cost of that material from that supplier, so that the firm has a valid record of the cause of the shortage? Such an expense is truly a cost of doing business with that particular supplier . . . However, in most firms, the variance would appear as a direct labor variance . . . The true cost of doing business with a particular supplier is thus lost in the accounting system of the firm. (1993: 168)

Thus, Noordewier, John, and Nevin argued for the use of a surrogate for acquisition costs obtained by measuring the events giving rise to acquisition costs. Lateness of deliveries and the extent of nonconforming items were used as surrogates for acquisition costs. To measure lateness of deliveries, respondents were asked to indicate the percentage of deliveries of the component in question that were late. Likewise, respondents were asked to indicate the percentage of the components that were nonconforming upon delivery.

Each of these three measures of transaction costs (i.e., one measure of possession and two measures of acquisition costs) were then treated as dependent variables in a regression analysis. Since each measure represented a single item scale, no reliability coefficients were reported.

#### Summary

The literature concerning the measurement of purchasing performance was reviewed in this section. Specifically, the performance assessment process and the assessment of performance at the individual and purchasing function level was discussed. Purchasing performance measurement issues germane to this study such as the effect of just-in-time purchasing on performance assessment and performance assessment from the transaction cost perspective were addressed. In the next section, the interrelationships

between just-in-time purchasing implementation, the nature of the buyer-supplier relationship, and purchasing performance are explored.

Linkages Between Just-In-Time Purchasing,  
the Buyer-Supplier Relationship,  
and Purchasing Performance

The literature review, to this point, has focused on the three areas of just-in-time purchasing, the buyer-supplier relationship, and purchasing performance in isolation. A review of the literature concerning the interrelationships between these three areas is presented in this fourth section. As has been noted, there is a dearth of literature that integrates all three of these areas.

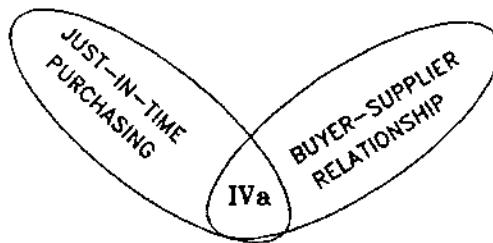
Thus, this section is divided into three subsections, each of which is devoted to the overlap between two of the three areas respectively. First, literature relating to the implementation of just-in-time purchasing and its impact on the nature of the buyer-supplier relationship is explored. Next, the effects of just-in-time purchasing on purchasing performance is investigated. Finally, the connection between the nature of the buyer-supplier relationship and purchasing performance is examined.

Just-In-Time Purchasing and the  
Buyer-Supplier Relationship

This section is dedicated to the literature concerning the impact of just-in-time purchasing on the buyer-supplier relationship. The reader will recall that figure 1 (p. 33)

was a model of the overall literature review. Figure 4 is a conceptual representation of the content of this subsection, and it is presented to orient the reader as to the direction that the literature review is taking.

Figure 4  
Conceptual Model of Literature Concerning Just-In-Time Purchasing and the Buyer-Supplier Relationship



Traditional purchasing philosophy has been characterized by practices such as the maintenance of a large base of suppliers, limited sharing of information concerning production plans and schedules, modification of schedules with little thought given to the impact on suppliers, manipulation of suppliers to gain price concessions, allocation of business to keep suppliers "in-line", and reliance on short-term contracts (Dumond & Newman, 1990; Ramsay, 1990; Tonkin, 1989). With the expanding popularity of just-in-time purchasing, a new partnership model has emerged that advocates the development of long-term partnerships founded on collaboration and trust (Ellram, 1991; Krapfel, Salmond, & Spekman, 1991; Lyons, Krachenberg, & Henke, 1990; Monczka, Trent, & Callahan,

1993; Morris & Holman, 1988; Willis, Huston, & Aby, 1989).

According to Spekman:

It has become obvious to many manufacturers that their ability to become world-class competitors is based to a great degree on their ability to establish high levels of trust and cooperation with their suppliers. (1988a: 77)

There is widespread acknowledgement that the creation of a cooperative atmosphere is critical to the development of the just-in-time exchange relationship. Consider that all of the sources cited in table 1 (p. 40) identified the development of long-term, cooperative partnerships as a key characteristic of just-in-time purchasing. In spite of this emphasis on the relationship between buyer and seller in the just-in-time purchasing environment, research explicitly focused on the effects of just-in-time purchasing on the nature of the buyer-supplier relationship is limited.

#### Distinguishing Characteristics of Just-In-Time Exchange Relationships

The nature of just-in-time purchasing and the methods that it subsumes has been discussed. In that discussion, it was noted that just-in-time purchasing relationships are characterized by long-term, cooperative affiliations with a small number of suppliers, frequent interaction between buyer and supplier, a greater sharing of information, and the engagement of suppliers in nontraditional roles such as participating in new product development.

Notably, all of the preceding characteristics are reflective of bilateral exchange. Many of the characteristics of relationalism cited in table 8 (p. 63) share commonality with characteristics mentioned in the discussion of the nature of just-in-time purchasing. In fact, it has been asserted that the just-in-time purchasing relationship is a new form of exchange relationship characterized by extremely high levels of relationalism (Frazier, Spekman, & O'Neal, 1988; Joag, 1995). Frazier, Spekman, and O'Neal (1988) contrast traditional market exchange, relational exchange, and just-in-time exchange on the exchange characteristics shown in table 17.

#### Descriptive Evidence

To date, research on just-in-time purchasing has seldom been focused explicitly on the effects of just-in-time purchasing on the relationship between buyer and seller. Most studies have focused on the benefits of just-in-time purchasing implementation at large; asking a limited number of questions about beneficial changes in the relationship between buyer and seller wrought by just-in-time purchasing implementation (Ansari & Modarress, 1990; Dion, Banting, & Hasey, 1990; Dion, Blenkhorn, & Banting, 1992; Freeland, 1991; Giunipero, 1989). Table 18 reports descriptive statistics gleaned from this group of nonempirical studies on just-in-time purchasing.

Table 17  
Comparison of Market, Relational, and Just-In-Time Exchange Relationships from Frazier, Spekman, & O'Neal (1988)

<b>Characteristics of Exchange</b>	<b>Market Exchange</b>	<b>Relational Exchange</b>	<b>Just-In-Time Exchange</b>
Time horizon of exchange	Short-term	Moderate to long-term	Long-term
Focus of exchange	Price of core product	Emphasis on core product, with some attention to value-added services	Joint emphasis on core product and value-added services
Number of inter-organizational linkages	Few	Moderate	A tangled web of relations across functional areas
Frequency of communication	Low; tends to be formal only	Moderate; both formal and informal	High; both formal and informal
Nature of information exchanged	Limited to transaction	Transaction and some long-term planning	Joint product-, production-, and logistics-related; much long-term planning
Frequency of shipments	Low and irregular	Moderate and regular	High, and subject to revision
Problem-solving orientation	After the fact and reactive	Largely reactive	Proactive and oriented toward prevention

Table 17 (continued)  
 Comparison of Market, Relational, and Just-In-Time Exchange  
 Relationships from Frazier, Spekman, & O'Neal (1988)

<b>Characteristics of Exchange</b>	<b>Market Exchange</b>	<b>Relational Exchange</b>	<b>Just-In-Time Exchange</b>
Number of suppliers	Many	Moderate number	Sole-sourcing in its ideal form
Transaction costs	Low	Moderate	High
Specialized investments	Low, if any at all	Moderately low	Moderate to high
Functional interdependence	Low and limited to delivery system	Moderate and involves only a few functional areas	Very high and extends to many functional areas
Level of risk	Low	Moderate	High

Adapted from: Frazier, Gary L., Spekman, Robert E., & O'Neal, Charles R. 1988. Just-In-Time Exchange Relationships in Industrial Markets. Journal of Marketing, 52: 52-67.

#### Empirical Evidence

There is a small group of empirical studies that have focused on changes in the buyer-supplier relationship precipitated by just-in-time purchasing implementation (Gilbert, Young, & O'Neal, 1994; Handfield, 1993; O'Neal, 1987; O'Neal, 1989). O'Neal (1987), employing a sample of buyers from twenty-seven automotive industry firms, tested six hypotheses concerning the effect of just-in-time purchasing implementation on elements of the buyer-supplier

Table 18  
Changes in the Buyer-Supplier Relationship  
Attributed to Just-In-Time Purchasing

<b>Author(s)</b>	<b>Findings</b>
Ansari & Modarress (1990)	→ 63% of respondents reported that relationships were either "much improved" or "very much improved" as a result of just-in-time purchasing implementation.
Dion, Banting, & Hasey (1990)	→ 80% of buyers surveyed reported reducing the supplier base. → Over 80% of buyers report sharing confidential information with suppliers.
Dion, Blenkhorn, & Banting (1992)	→ 20% of suppliers relocated closer to the buyer. → 70% of buyers reported reducing the number of suppliers. → 50% of buyers reported the establishment of electronic data interchange (EDI) links. → 80% of buyers reported an increase in the sharing of confidential information with suppliers. → 90% of buyers reported the sharing of sales projections with suppliers.

relationship. The six hypotheses advanced in the study were:

- H1: Just-in-time purchasing results in supply source reduction.
- H2: Just-in-time purchasing results in the involvement of more functional areas with suppliers.
- H3: Just-in-time purchasing results in more frequent interaction between buyer and supplier.

Table 18 (continued)  
 Changes in the Buyer-Supplier Relationship  
 Attributed to Just-In-Time Purchasing

<b>Author(s)</b>	<b>Findings</b>
Freeland (1991)	<p>→ Respondents reported much greater sharing of information under just-in-time purchasing. For example, 89% share production schedule information with suppliers for JIT purchases versus 48% for non-JIT purchases. Quality control data is shared with suppliers by 89% of respondents for JIT purchases versus 70% for non-JIT purchases. The supplier's cost data is shared by 37% of suppliers for JIT purchases versus 19% for non-JIT purchases.</p>
Giunipero (1989)	<p>→ Buyers reported an average reduction in the number of suppliers of 67% in the five years following just-in-time purchasing implementation.</p> <p>→ An improved relationship with suppliers was the most frequently reported benefit associated with single sourcing, a major component of just-in-time purchasing.</p>

Adapted from: Ansari, A., & Modarress, Batoul 1990. Just-In-Time Purchasing. New York: The Free Press.

Dion, Paul A., Banting, Peter M., & Hasey, Loretta M. 1990. The Impact of JIT on Industrial Marketers. Industrial Marketing Management, 19: 41-46.

Dion, Paul A., Blenkhorn, David L., & Banting, Peter M. 1992. Buyer Experiences with JIT: Some New Roles for Buyers. Mid-Atlantic Journal of Business, 28(2): 113-123.

Freeland, J. R. 1991. A Survey of Just-In-Time Purchasing Practices in the United States. Production and Inventory Management Journal, 32(2): 43-49.

Giunipero, Larry C. 1989. Just-In-Time Purchasing: An AME Research Report. Wheeling, IL: Association for Manufacturing Excellence.

H4: Just-in-time purchasing results in a reduction in the finished goods inventories of suppliers.

H5: Just-in-time purchasing results in an increased frequency of delivery.

H6: Just-in-time purchasing results in a shift to the use of faster, more responsive transportation modes.

All six of the above hypotheses were supported by the data.

O'Neal (1989), using a sample of 168 automotive industry suppliers, examined the impact of just-in-time purchasing on the buyer-supplier relationship from the perspective of the supplier. The six hypotheses advanced in the study were:

H1: Just-in-time purchasing results in longer-term relationships with those customers selected to serve.

H2: Just-in-time purchasing results in greater care being exercised in the choice of industrial customers to be served.

H3: A more extensive marketing center, involving more functional areas of the firm, is developed as a result of just-in-time purchasing.

H4: Just-in-time purchasing results in a higher degree of interaction between the marketing center and the customer's buying center.

H5: Just-in-time purchasing results in a greater degree of openness in communications with the customer's buying center.

H6: Just-in-time purchasing results in a higher level of customer support activities.

The data supported each of the six hypotheses except for the third, where the results were mixed. With respect to the third hypothesis, the functional areas of quality assurance, materials management, and production reported playing an expanded role in the marketing center as a result

of just-in-time purchasing. On the other hand, the functional areas of marketing, customer service, and design engineering reported no significant change in participation.

In a cross-industry study of forty make-to-order manufacturers using just-in-time purchasing, Handfield (1993) advanced, among other hypotheses not related to the buyer-supplier relationship, the following two hypotheses of interest:

- H1: Increased information sharing between purchasing organizations and their suppliers is an antecedent to supply base reduction.
- H2: Increased information sharing between purchasing organizations and their suppliers is an antecedent to just-in-time purchasing.

Both of these hypotheses were supported by the data, indicating that increased information sharing is associated with supply base reduction, a common element of just-in-time purchasing. Increased information sharing was also found to be associated with just-in-time purchasing explicitly.

Gilbert, Young, and O'Neal (1994) conducted a cross-industry survey of some 107 manufacturers located in six Southern states. Respondents were classified, using discriminant analysis, into the groups of "actively engaged in JIT" and "developing or not using JIT"; with sixty-eight and thirty-nine respondents falling in each category respectively.

The purpose of the study was to examine differences in relational characteristics between these two groups. In

addition, the "JIT" group was also asked to respond concerning their relationships with suppliers with whom they used just-in-time purchasing versus suppliers with whom they did not use just-in-time purchasing. It was posited by the authors that the elements of the relationship that would be influenced by just-in-time purchasing were:

1. Duration -- just-in-time purchasing relationships should have a longer duration.
2. Frequency -- just-in-time purchasing should result in increased frequency of inter-organizational communication.
3. Diversity -- just-in-time purchasing should result in an increase in the diversity of inter-organizational activities.
4. Symmetry -- just-in-time purchasing should result in greater symmetry in interorganizational communications.
5. Facilitation -- just-in-time purchasing should result in greater efforts to facilitate the mutual relationship.

The authors advanced two hypotheses relating to these relational elements. Those hypotheses were:

- H1: Manufacturers that are actively engaged in JIT production systems will exhibit the five relational characteristics with suppliers as compared to those which are in the early stages or not engaged in the process.
- H2: Manufacturers will exhibit a stronger relational commitment with JIT suppliers when compared to non-JIT suppliers as reflected by the five relational characteristics.

Both hypotheses were supported by the data. The first hypothesis was supported in the case of duration, diversity, symmetry, and facilitation at a significance level of much less than 1 percent ( $p << 0.01$ ), and at a significance level of 5 percent for the frequency characteristic. The second hypothesis was supported by the data for all five relational characteristics at a significance level of much less than 1 percent ( $p << 0.01$ ).

In summary, this study provided evidence that relational characteristics differed significantly among firms that used just-in-time purchasing relative to those developing its use or not using just-in-time purchasing. Furthermore, with respect to the firms that used just-in-time purchasing, relational characteristics differed significantly between the relationships with those suppliers with whom they used just-in-time purchasing versus those suppliers with whom they did not use just-in-time purchasing.

#### Contradictory Evidence Concerning Just-In-Time Exchange Relationships

While evidence certainly indicates that the nature of the buyer-supplier relationship is altered by just-in-time exchange, there is insufficient evidence at this time to conclude that all just-in-time relationships are characterized by higher levels of relationalism. Being a relatively new phenomena, many just-in-time relationships

are in their infancy, and there has been little systematic study of these relationships.

In spite of this, there has been broad discussion in the popular literature of the movement toward cooperative relationships and an implicit acceptance of the notion that just-in-time exchange relationships are indeed closer and more cooperative. But, according to Pilling and Zhang, there is ". . . a tendency to overstate the movement toward cooperative relationships when compared with actual practice" (1992:3).

In fact, there is significant evidence that numerous problems have been encountered as buyers and suppliers have modified their relationships to fit the new paradigm of partnership (Spekman 1988b). To compound matters, the opportunity for abuse in the just-in-time exchange relationship is attenuated by increased levels of dependence. Frazier, Spekman, and O'Neal (1988) assert that just-in-time relationships are commonly characterized by significant power asymmetry. Thus, such relationships may be particularly vulnerable to the potential for opportunistic behavior.

Regrettably, many early adopters of just-in-time purchasing behaved opportunistically. They misunderstood the philosophical underpinnings of just-in-time and sought to implement just-in-time purchasing methods solely for the purpose of capitalizing on the inventory reductions that

were being touted as a primary outcome of just-in-time.

According to Schorr:

Unfortunately, when these tools first became available, many companies began to reduce purchase inventory, reduce purchase lot sizes, and increase frequency of supplier deliveries, while at the same time expecting their suppliers to ship defect-free product without first implementing the tools at their own facilities. These companies did not provide the suppliers with valid schedules, nor did they level production schedules, internally reduce lot sizes or lead times, stabilize product design, or implement a quality program. Not surprisingly, since the suppliers ended up carrying the inventory and all the extra costs, many of the early programs failed. And to add salt to the wounds, many of the suppliers involved became cynical about . . . JIT . . . programs. (1992: 173)

The literature contains numerous anecdotal examples of abuse and of lingering attitudes counter to those supportive of a cooperative just-in-time purchasing relationship. In addition, some have even questioned the integrity of cooperative just-in-time supplier networks in Japan; frequently held forth in the literature as a model of buyer-supplier cooperation. Consider the following illustrative examples.

Cooperative supplier networks in Japan. Ramsay (1990) declares that the touted cooperative supplier networks of Japan, allegedly run on egalitarian rules so commonly associated with just-in-time purchasing philosophy, are a myth. He contends that in fact, many of these relationships are tilted heavily in the buyer's favor and that manipulation of suppliers is common.

Kamath and Liker (1994) concur and note that true partnerships in Japan are rare and that they are reserved only for "suppliers that have outstanding technology, sophisticated management, and global reach" (1994: 158). Likewise, van Weele (1995) asserts that the majority of buyer-supplier relationships in Japan are characterized by the use of multiple sourcing, the domination of the relationship by the buyer, a strong control-orientation with an emphasis on cost, and by the dumping of business risk on lower-tier suppliers.

Another article adds credence to these claims. Data from a Harvard Business Review World Leadership Survey indicated that American respondents led their Japanese counterparts by a significant margin in involving suppliers in new product design, in providing training to their suppliers, and in sharing strategic information with suppliers (Peters, 1991).

Skeptical suppliers. According to Helper's (1991) survey of auto-manufacturer suppliers, nearly 50 percent of respondents believed that just-in-time transfers responsibility for inventory from buyer to supplier. In fact, more than half of the responding suppliers reported producing in lot sizes larger than their corresponding delivery lot sizes.

Chanal (1990) reported the results of a survey of industrial buyers and their suppliers. While both groups

felt that buyer-supplier relationships are trending toward a partnership model, suppliers remained more skeptical of the progress than their buyer cohorts. A summary of the results of this survey is presented in table 19.

Table 19  
Chanal (1990) Survey of Industrial Buyers and Suppliers

Question	Response	Buyers	Suppliers
How has the nature of your relationship changed?	Has Improved	55%	38%
	No Change	30%	42%
	Has Worsened	14%	17%
How much do you trust each other?	A Great Deal	35%	29%
	Somewhat	58%	63%
	Not At All	2%	8%

Adapted from: Chanal, Debra 1990. Buyers and Vendors: Breaking Barriers. The Discount Merchandiser, 30 (July): 28-36.

Stuart and McCutcheon (1995) reported the results of a two-phase survey of buyers and suppliers. Exemplary suppliers were identified by 142 Midwestern purchasing executives. Only suppliers with whom the buyer firm had a high perceived alliance were included. A survey of these suppliers resulted in seventy-four responses.

The suppliers were likewise asked to rate the degree of alliance. Twenty-eight of the seventy-four suppliers, roughly 38 percent, rated the alliance as being low. And

these were suppliers that had been identified as both exemplary and high in alliance by the buyer!

Persistent perceptions and attitudes. Pilling and Zhang (1992), in an analysis of the attitudes of purchasing professionals in the aerospace, electronics, and defense contracting industries, found significant resistance to the implementation of cooperative purchasing arrangements. These authors concluded that even when there is a clear awareness of the benefits of cooperation, constraints such as past experience and attitudes, government contract requirements, and perceived supply vulnerability frequently dissuade the purchasing organization from entering into bona-fide cooperative partnerships.

Apparently, these attitudes are not confined to one nation or industry. In a recent report on the nature of buyer-supplier relationships in the automotive industry in the U.K., Lamming concluded:

The mistrust which is in evidence is the result of many years of broken promises, abuse of confidence, and general acrimony within the industry . . . In developing new working agreements with their suppliers most vehicle manufacturers still appear to deal more in rhetoric than reality. (1994: 5)

Finally, a recent survey highlights the differences in perception between manufacturing and logistics professionals regarding the intended purposes and actual outcomes of just-in-time (Spencer, Daugherty, & Rogers, 1994). Surveys were received from 273 members of APICS, The Educational Society

for Resource Management, and 250 surveys were received from members of the Council of Logistics Management (CLM). Respondents were asked to indicate their agreement with a number of statements using seven-point Likert scales; with higher values indicating greater levels of agreement. Those statements of interest, on which there was considerable disagreement between the two groups, are summarized in table 20.

Table 20  
Results of Survey of Manufacturing and Logistics Professionals Concerning Just-In-Time

Statement	APICS mean	CLM mean	p-value
JIT is a management philosophy whose goal is to eliminate all waste (non-value-added activities) throughout an organization.	5.78	4.61	0.0018
Using JIT, quality improvements can be obtained in any organization.	5.28	4.26	0.0079
Under JIT it can be expected that most inventory will be pushed from one business entity to another - such as from a manufacturer to a supplier.	2.69	4.31	0.0001
JIT is largely an inventory reduction policy for manufacturers.	3.25	4.07	0.0487

Adapted from: Spencer, Michael S., Daugherty, Patricia J., and Rogers, Dale S. 1994. Towards a Deeper Understanding of JIT: A Comparison Between APICS and Logistics Managers. Production and Inventory Management Journal, 35(3): 23-28.

### Summary

To date, there is descriptive and empirical evidence to indicate that the nature of the buyer-supplier relationship is altered significantly by just-in-time purchasing implementation. In spite of this, the majority of the research has focused on this transformation in only a secondary or cursory manner.

Specifically, the limited evidence indicates that use of just-in-time purchasing results in longer-term alliances with a reduced number of suppliers. Furthermore, the association between buyer and supplier is characterized by a greater sharing of information, more frequent and intensive interaction, and in the expanded participation of various functional areas in the buyer-supplier interchange.

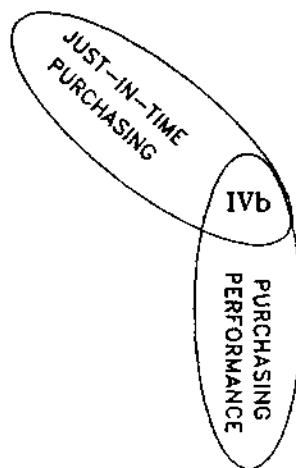
There is also evidence to indicate that the transformation in the relationship between buyer and seller created by just-in-time purchasing implementation is not without its difficulties. What is not clear is how universal or uniform these changes are across different dyadic exchange relationships. Moreover, questions arise as to what impact this relational transformation has on the efficiency of exchange between buyer and seller, if any.

### Just-In-Time Purchasing and Purchasing Performance

This subsection of the literature review concerns the impact of just-in-time purchasing on purchasing performance.

Drawing upon the conceptual model of the overall literature review (figure 1, p. 33), figure 5 is a conceptual recapitulation of the content of this subsection. It is included here to clarify, for the reader, the purpose of this part of the literature review.

Figure 5  
Conceptual Model of Literature Concerning Just-In-Time Purchasing and Purchasing Performance



The reader will recall that purchasing performance is a multidimensional construct that is operationalized via the use of various measurement indices. Commonly measured dimensions of purchasing performance include price or cost, quality, delivery performance, and inventory levels. There is evidence in the literature, albeit mainly descriptive in nature, that these elements of purchasing performance are dramatically altered by just-in-time purchasing implementation.

Descriptive Evidence

Numerous case studies include reports of significant improvements in purchasing performance attributable to the use of just-in-time purchasing. Benefits reported in several studies in common include increased purchase material turnover, improved product quality and decreased scrap cost, and significant reductions in raw material and work-in-process inventories resulting in decreased inventory costs (Ansari & Modarress, 1987; Celley et al., 1988; Cook, 1984; Schonberger & Gilbert, 1983; Sepehri, 1985).

Giunipero (1989), in a survey of one hundred Association for Manufacturing Excellence members that used just-in-time purchasing, inquired as to the benefits associated with just-in-time purchasing implementation. Respondents rated each benefit using a four point scale anchored by "1 = significant improvement" and "4 = no improvement". The results of the survey are summarized in table 21.

Those benefits from table 21 related to purchasing performance would include raw material inventory reduction, product quality improvements, and reduced indirect costs. When asked specifically about the magnitude of improvement, respondents indicated that inventory turns had increased by an average of 235 percent, and overall inventories consequently fell an average of 51 percent. Moreover, supplier quality had risen to an average of 99 percent

Table 21  
Just-In-Time Benefits from Giunipero (1989)

<b>Statement</b>	<b>Mean Response</b>
Reduced production cycle time	1.60
Work-in-process inventory reduction	1.65
Raw material inventory reduction	1.80
Reduced space requirements	1.85
Product quality improvements	1.89
Increased worker involvement	1.95
Increased productivity levels	2.14
Reduced indirect costs	2.19
Reduced production process variability	2.27
Finished goods inventory reduction	2.28

Adapted from: Giunipero, Larry C. 1989. Just-In-Time Purchasing: An AME Research Report. Wheeling, IL: Association for Manufacturing Excellence.

defect-free, and defect rates had fallen from an average of 20,000 ppm to 4,000 ppm.

Dion, Blenkhorn, and Banting (1992) and Dion et al. (1992) conducted interviews with forty and sixty purchasing managers respectively, in firms believed to have adopted just-in-time purchasing methods. The most significant of their findings, related to purchasing performance outcomes, are summarized in table 22.

Ansari and Modarress (1990) and Freeland (1991), utilizing similar methodology, inquired as to the benefits of just-in-time purchasing implementation. Respondents were asked to provide information about the status of specific purchasing performance indicators both pre-just-in-time purchasing implementation and at the time of the survey. A

Table 22

Results of Just-In-Time Purchasing Implementation from Dion, Blenkhorn, & Banting (1992) and Dion et al. (1992)

<u>Significant Purchasing Performance Outcomes</u>	
→	25% believed prices were lower for goods purchased under just-in-time.
→	67% report significantly higher quality of input purchased under just-in-time.
→	Respondents reported no change in materials handling costs.
→	Respondents reported a reduction in order lead-times averaging 50-55%.
→	Respondents reported an average reduction of 40% in damaged products received.
→	A mean reduction of 25% in the number of complaints about inputs bought using just-in-time was reported.
→	The average reduction in the number of back orders was reported to be 25-30%.

Adapted from: Dion, Paul A., Blenkhorn, David L., & Banting, Peter M. 1992. Buyer Experiences with JIT: Some New Roles for Buyers. Mid-Atlantic Journal of Business, 28(2): 113-123.

Dion, Paul A., Banting, Peter M., Picard, Sharon, & Blenkhorn, David L. 1992. JIT Implementation: A Growth Opportunity for Purchasing. International Journal of Purchasing and Materials Management, 28(3): 32-38.

summary of the results of these studies is contained in table 23.

#### Empirical Evidence

Surprisingly, there has been little empirical research on the benefits of just-in-time purchasing. Most of the evidence is either anecdotal, based on case studies, or

Table 23  
Just-In-Time Purchasing Benefits from Ansari  
& Modarress (1990) and Freeland (1991)

<b>Study</b>	<b>Element</b>	<b>Pre-JITP</b>	<b>Current</b>
Ansari & Modarress (1990)	Scrap cost as a percentage of total purchase dollars	9.7	5.9
	→ Item inventory as a percentage of total purchase dollars	46.5	32.1
	→ Purchase material turns per time period	6.7	13.2
	→ Percentage of delivery promises met	67.4	82.7
	→ Average delivery lead time in days	77.0	64.0
	→ Stockroom inventory in days	24.4	9.2
Freeland (1991)	→ Delivery lead time in days	46.0	24.4
	→ Percentage of delivery promises met	74.7	93.8

Adapted from: Ansari, A., & Modarress, Batoul 1990. Just-In-Time Purchasing. New York: The Free Press.

Freeland, J. R. 1991. A Survey of Just-In-Time Purchasing Practices in the United States. Production and Inventory Management Journal, 32(2): 43-49.

consists only of descriptive statistics. Merely a handful of works have formally tested hypotheses concerning the alleged benefits of just-in-time purchasing implementation (Chun, 1991; Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995; Waller, 1993).

Chun (1991). Chun tested hypotheses concerning the effects of just-in-time purchasing implementation on performance. Unfortunately, Chun operationalized performance through the use of a construct that he named "marketing capabilities". This construct was originally conceptualized as consisting of the four distinct subdimensions of trust/certainty, transportation/ordering costs, customer service/responsiveness, and inventory carrying costs; the latter three of which are clearly purchasing performance indicators.

There proved to be significant multicollinearity between these subdimensions, thus, marketing capabilities was operationalized as the composite of twenty-three items originally intended to represent the four distinct subdimensions. Hence, some of these twenty-three items are clearly representative of purchasing performance (e.g., lower ordering costs, reduced inventory carrying costs, reduced total transportation costs), while others are relational in character (e.g., a strong spirit of fairness in the relationship with the supplier, equitably distributed benefits between buyer and supplier).

Hypotheses advanced. Recall that Chun operationalized just-in-time purchasing implementation with a scale consisting of the two distinct subdimensions of purchasing performance criteria and inbound delivery strategies. The two hypotheses of interest advanced by Chun were:

- H1: Purchasing performance criteria improvements are positively related to marketing capabilities.
- H2: The use of inbound delivery strategies is positively related to marketing capabilities.

The first hypothesis was marginally supported by the data at a 10 percent significance level, but the second hypothesis was not supported. The lack of support for the second hypothesis may have indeed been caused by an absence of the hypothesized relationship. An equally plausible argument is that the failure to find significance could be a product of excessive measurement error, as the marketing capabilities construct was imprecisely defined and operationalized.

Handfield (1993). Handfield examined the relationship between supply base reduction, just-in-time purchasing, and transaction uncertainty. Handfield did not offer a clear operational definition of transaction uncertainty, however, it was represented by the three items of: (1) the extent to which incoming inspection was used, (2) the extent to which electronic data interchange was used, and (3) the average inventory level of the material/component being studied.

Handfield asserted that the use of incoming inspection reflects uncertainty about the level of product quality that the supplier is able to provide. He further asserted that the use of electronic data interchange results in decreased transaction uncertainty owing to the timely exchange of information. Finally, inventory reflects a buffer against

uncertainty, thus, higher average inventories would reflect greater transaction uncertainty.

Hypotheses. The following hypotheses of interest were advanced by Handfield:

H1: Supply base reduction is negatively related to transaction uncertainty.

H2: The outcome of just-in-time purchasing is reduced transaction uncertainty.

Both of these hypotheses were supported by the data at a 1 percent significance level. Consequently, the results indicated that supply base reduction, a key element of just-in-time purchasing, and just-in-time purchasing implementation itself serve to reduce transaction uncertainty.

Discussion of findings. It may be argued that two of Handfield's three indicators of transaction uncertainty are also purchasing performance metrics. That is, if Handfield's argument is valid that the use of incoming inspection is reflective of the supplier's quality capability, then it could likewise serve as a surrogate for the quality of purchased inputs. Furthermore, the average inventory level of the purchased inputs was another indicator of transaction uncertainty. As discussed previously, both the quality of purchased inputs and inventory levels are commonly used purchasing performance metrics in the just-in-time purchasing environment.

Waller (1993). Waller, in a survey of 248 purchasing managers in the fabricated metals industry, analyzed the connection between five just-in-time purchasing elements (table 7, p. 47) and the product quality experienced by the buyer organization. Product quality was operationalized by measuring scrap and rework levels and the amount of process variability in the processes receiving the purchased inputs studied.

Hypotheses advanced. Waller advanced the following hypotheses of interest:

- H1: Scrap and rework levels are positively related to the number of suppliers.
- H2: Scrap and rework levels are negatively related to the length of contract between the buyer and supplier.
- H3: Scrap and rework levels are negatively related to the frequency with which production schedule information is shared between the buyer and supplier.
- H4: Scrap and rework levels are negatively related to the level of selectiveness of buyers in choosing a supplier.
- H5: Scrap and rework levels are negatively related to the frequency of deliveries from the supplier.
- H6: Process variability is positively related to the number of suppliers.
- H7: Process variability is negatively related to the length of contract between the buyer and supplier.
- H8: Process variability is negatively related to the frequency with which production schedule information is shared between the buyer and supplier.
- H9: Process variability is negatively related to the level of selectiveness of buyers in choosing a supplier.
- H10: Process variability is negatively related to the frequency of deliveries from the supplier.

Hypothesis six was supported at a significance level of 1 percent, hypotheses two and seven at a significance level of 5 percent, and hypothesis ten at a significance level of 10 percent. None of the other hypotheses were supported by the data.

Summary of findings. To summarize, the length of contract was consistently positively related to quality, while the results were mixed for the number of suppliers and frequency of delivery. The sharing of production schedule information and the selectivity exercised by the buyer in choosing suppliers were not related to the level of quality experienced by the buyer organization.

Kekre, Murthi, and Srinivasan (1995). Finally, Kekre, Murthi, and Srinivasan, in an analysis of Profit Impact on Marketing Strategies (PIMS) data on some 1,078 industrial goods manufacturers, explored the connection between supplier availability and product quality. Supplier availability was operationalized by a dichotomous variable connoting either a restricted number of suppliers or numerous supply alternatives. Quality was operationalized by computing the difference between the percentage of the firms' sales accounted for by products superior in quality to the competition's products and the percentage of the firms' sales accounted for by products inferior to the competition's products.

The hypothesis. Relating to product quality, the following hypothesis of interest was advanced:

H1: Reduced availability of suppliers is positively associated with higher product quality.

This hypothesis was supported by the data at a 5 percent level of significance. Thus, as did Handfield (1993), this study concluded that supply base reduction and quality are positively associated.

### Summary

Anecdotal information and descriptive statistics alike indicate that purchasing performance indicators (e.g., quality of purchased inputs, delivery performance, inventory levels, etc.) are impacted by the implementation of just-in-time purchasing methods. Empirically-based, formal theoretical explanations of these effects are rare.

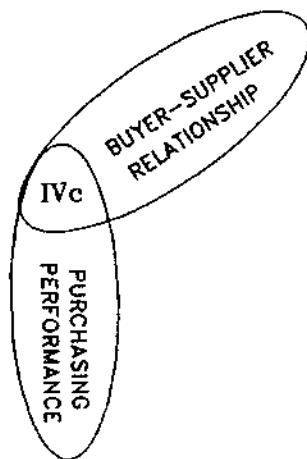
Based on the empirical data available, few definitive conclusions may be drawn. It may be concluded that the elements of just-in-time purchasing: (1) supply base reduction, (2) increased length of contract with the supplier, and (3) increased frequency of delivery, have all been found to be empirically linked to purchasing performance indicators.

### The Nature of the Buyer-Supplier Relationship and Purchasing Performance

This subsection of the literature review is focused on the connection between the nature of the buyer-supplier

relationship and purchasing performance. Drawing once more upon the conceptual model of the overall literature review (figure 1, p. 33), figure 6 graphically summarizes the content of this subsection. It is included to clarify the purpose of this part of the literature review.

Figure 6  
Conceptual Model of Literature Concerning the Nature of the Buyer-Supplier Relationship and Purchasing Performance



To review, the transaction cost economics theoretical model categorizes relationships into the discreet classifications of hierarchies and markets. As has been noted, the focus of this study was on the market alternative.

The market alternative is composed of a continuum of bilateralism along which numerous relational elements may vary. Relational elements noted consistently in the literature include the flexibility of exchange partners in accommodating each other's needs or requirements, the degree

to which information is freely exchanged between exchange partners, the degree to which the exchange partners share joint responsibility for duties and activities, the intensity of expectation that the exchange relationship will endure, and the extent to which the performance of the exchange partners is monitored and feedback is provided (Gilbert, Young, & O'Neal, 1994; Heide & John, 1990; Heide & Miner, 1992; Metcalf, Frear, & Krishnan, 1992; Noordewier, John, & Nevin, 1990).

There is a limited body of research that analyzes the theoretical linkages between these elements of the relationship and purchasing performance. The first category of research is represented by two studies that have explicitly examined relationship-performance linkages using transaction cost analysis (Heide & John, 1988; Noordewier, John, & Nevin, 1990).

The second category includes four studies that have examined the impact of relational elements on performance in the context of just-in-time exchange relationships (Chun, 1991; Handfield, 1993; Richeson, Lackey, & Starner, 1995; Waller, 1993). The third and final category consists of two studies that could not be categorized with any of the other studies.

#### Transaction Cost Analysis Studies

Heide and John (1988) studied the impact of asset specificity on performance. Unfortunately, performance was

operationalized in very general terms and did not connote purchasing performance per se. Data were provided by 199 manufacturer's agents in the electrical/technical and process equipment industries. The manufacturer's agents were independent sales firms that represented the manufacturer's (i.e., the principal) products.

Constructs defined. The constructs of interest in the study were specific investments made by the agent in the principal's line (i.e., asset specificity), "offsetting" investments made by the agent, the "replaceability" of the principal (i.e., switching costs), and performance. Asset specificity was measured by assessing the degree to which the agent had developed product knowledge and had cultivated a customer base specific to the principal's product line.

In the industries studied, short-term contracts between manufacturer and agent were the norm. Thus, it was posited that agents would make offsetting investments to protect their specific investments in a principal's line. These offsetting investments took the form of building a close personal relationship with customers so that in the event that the principal's product line were lost, the customer base would still remain loyal to the agent.

The replaceability of the principal was appraised by assessing the ease with which the products of the principal could be substituted by those of a competitor, the ease with which unrelated products could mitigate the loss of the

principal's products, the impact of the loss of the principal's products on sales of other existing products, and an estimate of the potential loss of income overall. Certainly, all of these indicators appear to be analogous to switching costs. Finally, performance was operationalized as the ratio of field selling costs to commissions.

Propositions advanced. The following propositions were advanced in the study:

- P1: When asset specificity is high, agents will make offsetting investments in order to protect the value of the specific investments in the relationship.
- P2: Offsetting investments will increase the replaceability of the principal (i.e., diminish switching costs).
- P3: When asset specificity is high, increased replaceability of the principal will result in higher performance of the agent.

Propositions one and three were marginally supported by the data at a 10 percent significance level, while proposition two was supported at the 5 percent level of significance.

Interpretation of findings. The implications of these findings may not be immediately clear. In this study, the interchange of the exchange partners was not regulated by a relational governance structure per se. To the contrary, the specific investments of the agents were not protected by a relational governance structure founded on a long-term contractual agreement.

Thus, agents reacted by creating a surrogate for the protections of the relational governance structure by making offsetting investments in their relationships with

customers; thereby reducing switching costs and mitigating the risk associated with asset specificity. The first two propositions relate to this strategy.

The third proposition is of the greatest relevance as it relates asset specificity to performance. In essence, this study provided evidence that transactions are performed most efficiently (i.e., highest performance) under the oversight of the relational governance structure, or some reasonable surrogate therefore, when the exchange relationship requires high levels of asset specificity.

Noordewier, John, and Nevin (1990). Noordewier, John, and Nevin performed a more explicit test of the transaction cost economics theoretical model, based on data collected from 140 purchasers of ball and roller bearings. Fortuitously, their operationalization of performance involved measures of purchasing performance explicitly.

Constructs defined. The major constructs of interest in this study were the transaction cost economics mainstays of descriptive dimensions of the exchange (i.e., uncertainty and frequency), governance structure (i.e., degree of relationalism), and transaction costs (i.e., purchasing performance). The descriptive dimensions of the exchange measured in this study were uncertainty and frequency. Asset specificity was not measured as the authors asserted that ball bearings are commodities and that their

manufacture requires little in the way of specific investment.

Governance structure was operationalized by measuring the degree of relationalism inherent in the exchange relationship. The measurement of relationalism by these authors has been discussed in detail (table 10, p. 72).

Finally, purchasing performance was operationalized by items related to the transaction cost categories of possession costs and acquisition costs. The reader will recall that inventory turns were used as a surrogate for possession costs, and delivery lateness and incoming quality measures were used as surrogates for acquisition costs.

The research proposition. The study tested only one proposition concerning the fit between the descriptive dimensions of the exchange and governance structure, and resultant effects on performance. Asset specificity was asserted to be trivial for the sample and frequency was used as a control variable, leaving uncertainty as the paramount descriptive dimension of the exchange to be considered. Thus, the proposition relating the fit between uncertainty and the governance structure to purchasing performance was as follows:

P1: When environmental uncertainty is high, buyer inventory and administrative performance is enhanced by effecting a corresponding increase in the relational content of the governance structure.

The above proposition was supported for the acquisition cost indicators of delivery performance and quality at the 5

percent significance level. The proposition was not supported for the possession cost indicator of inventory turns.

#### Just-In-Time Purchasing Studies

Four studies, albeit indirectly, have examined the impact of relationalism on performance in the context of just-in-time exchange relationships (Chun, 1991; Handfield, 1993; Richeson, Lackey, & Starner, 1995; Waller, 1993). To begin, Chun (1991) tested hypotheses concerning linkages between elements of the exchange relationship and performance.

Operationalization of constructs. Relational elements were operationalized using multiple item measurement scales that fell into three dimensions constructed via factor analysis. The first dimension, cooperation and communication, consisted of six items related to the degree that proprietary information was shared, the frequency with which the personnel of the buyer and supplier interacted, and the degree to which planning and coordination activities were performed in a joint and cooperative manner.

The second dimension, long-term relationships, was operationalized via three items relating to the length of contract and the extent to which the relationship was the focus rather than the singular transaction. The third dimension, commitments, was operationalized through the use of two items relating to the involvement of suppliers in

product design and the use of electronic data interchange.

Finally, the reader will recall that performance was operationalized through the use of the marketing capabilities construct; an amalgamation of twenty-three items, some clearly related to purchasing performance, most only tenuously related.

Hypotheses advanced. Three hypotheses of interest, advanced by Chun, were:

- H1: Strong cooperation and open communications in JIT exchange relationships will be positively related to improvements in marketing capabilities.
- H2: Long-term relationships in a JIT environment will be positively related to improvements in marketing capabilities.
- H3: Credible commitments such as supplier involvement in design activities and investments in ordering systems will be positively related to improvements in marketing capabilities.

The first hypothesis was supported by the data at a 5 percent level of significance, while the second and third hypotheses were not supported. Again, the same observation that was advanced about this study previously must be reasserted. It is conceivable that the failure to achieve statistical significance for the second and third hypotheses is a product of excessive measurement error in the marketing capabilities construct rather than a lack of the hypothesized relationship.

Handfield (1993). As has been discussed previously, Handfield found that supply base reduction and just-in-time purchasing are antecedents to reduced transaction

uncertainty. Recall that transaction uncertainty was operationalized via three items relating to the use of electronic data interchange, the degree of use of acceptance sampling, and the amount of buffer inventory maintained. Moreover, it was asserted by this author that the last two of these items are reasonable facsimiles of purchasing performance indicators.

Inclusion of a relational element. Handfield also measured a construct that is relational in nature. This construct, information sharing, was operationalized via four items relating to the degree to which financial information was shared, the frequency with which buyer and supplier visited each other's sites, the extent to which there was joint training of buyer and supplier personnel on design issues, and the degree to which production schedules were shared.

Hypotheses advanced. The following hypotheses, relating to information sharing, were advanced by Handfield:

- H1: Increased information sharing is an antecedent to supply base reduction.
- H2: Increased information sharing between purchasing organizations and their suppliers is an antecedent to just-in-time purchasing.

Hypothesis one was supported by the data at a 5 percent significance level, while the second hypothesis was supported at a 1 percent level of significance.

Interpretation of results. The results indicated that information sharing, a key relational element, is an

antecedent to both supply base reduction and just-in-time purchasing. Furthermore, it was established that both supply base reduction and just-in-time purchasing implementation were antecedents to reduced transaction uncertainty; arguably a plausible surrogate for purchasing performance.

Waller (1993). Waller examined the connection between just-in-time purchasing elements and product quality. The reader will recall that the five just-in-time purchasing elements examined (table 7, p. 40) were the size of the supply base, the frequency of delivery, the length of contract, the frequency of schedule information exchange, and the selectiveness of the buyer in selecting a supplier; the latter three of these elements overlapping with elements of relationalism cited in the literature. Also recall that product quality was operationalized by measuring scrap and rework levels and the amount of process variability in the processes receiving the purchased inputs.

The hypotheses. Concerning these three just-in-time purchasing/relational elements, Waller hypothesized that:

- H1: Scrap and rework levels are negatively related to the length of contract between the buyer and supplier.
- H2: Scrap and rework levels are negatively related to the frequency with which production schedule information is shared between the buyer and supplier.
- H3: Scrap and rework levels are negatively related to the level of selectiveness of buyers in choosing a supplier.

- H4: Process variability is negatively related to the length of contract between the buyer and supplier.
- H5: Process variability is negatively related to the frequency with which production schedule information is shared between the buyer and supplier.
- H6: Process variability is negatively related to the level of selectiveness of buyers in choosing a supplier.

Hypotheses one and three were supported at a significance level of 5 percent. None of the other hypotheses were supported by the data. Thus, it may be concluded that the only relational element that had an impact on quality was the length of contract between buyer and supplier.

Richeson, Lackey, and Starner (1995). Finally, Richeson, Lackey, and Starner examined the impact of the quality of communication between buyer and supplier, in a just-in-time purchasing environment, on measures of performance. A cross-industry sample of 218 purchasing personnel, employed by firms using just-in-time purchasing, was employed.

The constructs. Respondents were asked to rate the degree to which just-in-time purchasing had impacted performance in four key areas. Eight-point Likert scales were used anchored in the extreme by the statements "not at all" and "to a great extent". Three of the four areas of performance were comprised of multiple items and responses on the items were summed to arrive at a performance score for each of the four areas of performance. Those

performance areas and their constituent elements were as follows:

1. Cost -- lower cost, lower ordering cost, lower carrying cost
2. Quality -- decreased scrap, improved quality, improved supplier quality
3. Delivery -- reduction in supplier lead time
4. Overall effectiveness -- inventory reduction, enhanced competitiveness, increased profit

Furthermore, the respondents were asked to rate the quality of communication by their firm and by the supplier firm. Seven-point Likert scales anchored by the statements "strongly disagree" and "strongly agree" were used. The quality of purchaser communication consisted of four items and the quality of supplier communication consisted of six items.

Again, responses were summed across the multiple items to arrive at a score representing the quality of purchaser communication and quality of supplier communication. The items representing each were:

1. Quality of purchaser communication -- purchaser's openness with supplier, purchaser promotes free exchange of information and opinions, purchaser commits to what it promises supplier, purchaser provides more information to JIT suppliers than to other suppliers

2. Quality of supplier communication -- supplier's openness, reliability of information provided by supplier, usefulness of information provided by supplier, timeliness of information provided by supplier, accessibility of supplier, overall communication with supplier is very good

Results. The authors did not advance formal hypotheses, however, they did correlate the quality of purchaser communication score and the quality of supplier communication score with the cost, quality, delivery, and overall effectiveness scores. All correlations were positive and significant at the 1 percent level of significance, thereby indicating a positive association between the quality of communication and performance in the just-in-time purchasing environment.

#### The Remaining Studies

The last two studies stand alone in that their focus was not on firms using just-in-time purchasing, nor did these studies utilize the transaction cost economics theoretical model. Carter and Miller (1989) and Carter and Ellram (1994) examined the impact of communication structure on quality.

Both studies reported data from the same field study. This field study involved two manufacturing areas of a plant that produced mechanical seals (i.e., Dynamic Seals). One of the manufacturing areas in the plant was focused on the

production of seals for one customer (i.e., United Aircraft), while the other manufacturing area produced similar seals, but for a variety of different customers.

Constructs of the studies. Dynamic Seal's focused manufacturing area used a parallel communication structure to communicate with its one customer. That is, personnel in the various functional areas of Dynamic Seals were allowed to establish direct contacts with the personnel of United Aircraft. The unfocused manufacturing area utilized the traditional serial communication structure; where all communication from Dynamic Seals was centrally routed from their marketing function to the purchasing function of the buyer firm.

Quality was operationalized by measuring the percentage defective in production lots where at least one nonconforming unit had been found. An exception report was generated whenever a defect was found, thus, these reports were scrutinized to find the percentage nonconforming for the lot.

The hypothesis. Using the date of physical separation of the focused and unfocused manufacturing areas as a baseline, the following hypothesis of interest was advanced:  
H1: The rate of improvement in percent defective for lots from the focused manufacturing area will be greater than that of lots from the unfocused manufacturing area

The above hypothesis was supported by the data at a significance level of 5 percent. These authors asserted

that the parallel communication structure advanced quality improvement because it better facilitated the process of sorting out high priority quality improvement areas for attack.

#### Summary

Studies relating elements of the buyer-supplier relationship to purchasing performance were reviewed in this section. The first two studies reviewed were framed using the transaction cost economics theoretical model, and both supported the propositions of that model. It was found that the relational governance structure provided greater exchange efficiency (i.e., higher performance) under conditions of high asset specificity (Heide & John, 1988), and under conditions of high uncertainty (Noordewier, John, & Nevin, 1990).

The next category of studies examined the connection between elements of the buyer-supplier relationship and purchasing performance in the context of the just-in-time purchasing exchange relationship. Cooperation and openness in communication between buyer and seller (Chun, 1991), information sharing (Handfield, 1993), the length of contract between buyer and supplier (Waller, 1993), and the quality of communication between buyer and supplier (Richeson, Lackey, & Starner, 1995) were all found to be empirically linked to one or more indicators of purchasing performance; or some facsimile thereof.

The final two studies involved neither the transaction cost economics theoretical model nor a just-in-time purchasing context. They did, however, establish an empirical link between the nature of buyer-supplier communication and quality (Carter & Ellram, 1994; Carter & Miller, 1989).

#### Section Summary

Those works relating to the interconnections between just-in-time purchasing, the nature of the buyer-supplier relationship, and purchasing performance were scrutinized in this fourth major section of the literature review. Unfortunately, the author was unable to identify literature fully integrating all three of these areas.

In summary, it may be asserted that the implementation of just-in-time purchasing has profound effects both on the nature of the buyer-supplier relationship and on purchasing performance indicators. Furthermore, it may be declared that the nature of the buyer-supplier relationship also has purchasing performance consequences.

What remains unclear is whether there is a systematic connection between the form of the buyer-supplier relationship (i.e., governance structure) under just-in-time purchasing and purchasing performance. Certainly, it has been widely maintained in the conceptual and descriptive literature that just-in-time purchasing exchange relationships should be close and cooperative in nature.

Notwithstanding, the penalty, in purchasing performance terms, for failing to heed this advice is not clear.

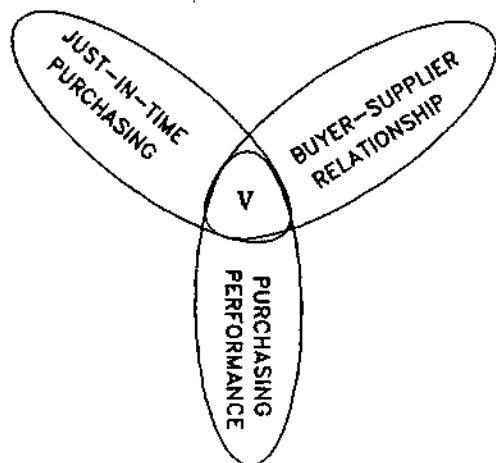
It is entirely possible that any such penalty is trivial, if one exists at all. Conversely, it may be that the failure of the buyer-supplier dyad to adopt a governance structure that is appropriate for the just-in-time purchasing exchange relationship may have profound performance consequences.

In the fifth and last section of the literature review, a theoretical model is advanced that provides an integrative framework for systematically addressing the preceding concerns. A research proposition will be advanced based on the theoretical model, and specific hypotheses will cascade from the proposition.

#### Theoretical Model and Hypotheses

This section integrates the three areas of just-in-time purchasing, the nature of the buyer-supplier relationship, and purchasing performance. Drawing one final time upon the conceptual model of the overall literature review (figure 1, p. 33), figure 7 graphically summarizes the content of the fifth section. It is included solely as a guide to the reader.

Figure 7  
Conceptual Model Integrating Just-In-Time Purchasing,  
the Nature of the Buyer-Supplier Relationship,  
and Purchasing Performance



This section of the literature review begins with an overview of the current state of the literature on just-in-time purchasing. The rationale for relying on accepted theory follows.

As the theoretical model of this study involved an extension of the transaction cost economics theoretical model, elements of that model are discussed in a just-in-time purchasing context. Having provided the necessary background, a research proposition is advanced and specific hypotheses are formulated to test the research proposition. Finally, the theoretical model of the study is presented and its constructs discussed.

#### State of the Just-In-Time Purchasing Literature

The research that has been conducted on just-in-time purchasing has been primarily conceptual or descriptive in

nature. Of the descriptive literature, most is based on the findings of case studies or studies involving small samples (e.g., Cook, 1984; O'Neal, 1987; Schonberger, 1982a; Sepehri, 1985).

There has been a call for research involving the use of empiricism and large samples, and a limited number of studies have appeared that meet these parameters (e.g., Chun, 1991; Dion, Blenkhorn, & Banting, 1992; O'Neal, 1989; Waller, 1993). Only a few studies have gone to the next level by using an accepted theoretical framework to analyze and explain just-in-time purchasing phenomena (Gilbert, Young, & O'Neal, 1994; Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995). The literature is at a juncture that demands theory-based inquiry.

#### Benefits of a Theoretical Model

At the outset, it is necessary to define a theory, or theoretical model. According to Kerlinger:

A theory is a set of interrelated constructs (concepts), definitions, and propositions that present a systematic view of phenomena by specifying relations among variables, with the purpose of explaining and predicting the phenomena . . . a theory explains phenomena. It does so by specifying what variables are related to what variables and how they are related, thus enabling the researcher to predict from certain variables to certain other variables. (1973: 9)

Drawing from this definition, the benefits of a theoretical model to the researcher are threefold. First, a

theoretical model provides a summary of constructs and their definitions.

Well defined constructs. Reliance on established constructs and definitions is imperative to avoiding confusion and redundancy. The reader should be aware of the conflicts that have arisen during the literature review with respect to the definition of certain constructs.

Eisenhardt (1989) contends that the final two steps of the theory building process are enfolding literature by comparing research with similar and conflicting research, and reaching closure (i.e., "theoretical saturation"). This process requires the integration of research findings, which proves to be a daunting task when constructs are operationalized in ambiguous, inconsistent, and conflicting ways in the literature.

Clarified relationships. The second benefit of a theoretical model is that it specifies relationships between variables. Without a theoretical framework to guide them, researchers frequently naively enumerate all possible combinations of relationships between constructs being studied. The objective is thoroughness, but what results is a statistical fishing expedition and spurious significance created by unchecked Type I error (Cook & Campbell, 1979).

The research of Chun (1991) and Waller (1993) may be representative of this tendency. Neither study used an accepted theoretical framework, and both advanced a large

number of hypotheses. What was lacking in each case was a concise theoretical theme or story. Apparently, this shortcoming is common, as according to Ghosh:

A substantial number of recent empirical-based work in Operations Management seems to employ a rote application of statistical methodology to survey data without adequate conceptualization of the problem . . . Without a theoretical framework of the underlying concepts and relationships pertaining to the problem environment, post hoc explanations of the results are weak and cannot adequately address the scientific reasoning behind the hows and whys, or develop new theory. (1995: 8)

Theory structures phenomena. The final benefit of a theoretical model is that it explains or predicts phenomena. It allows the researcher to predict from one set of variables to another, or across contexts. According to Van de Ven (1989), "nothing is quite so practical as a good theory."

Van de Ven asserts that theory advances knowledge by focusing research toward critical questions. Applying an accepted theoretical model in a new context or setting is beneficial because the model provides a stable theoretical structure from which new hypotheses may be extended. Without the structure provided by the theory, the researcher is left at his or her own devices in formulating hypotheses.

Transaction cost economics. The benefits of using established theory are too significant to be ignored. Thus, this study will use the transaction cost economics theoretical model as the foundation upon which the

theoretical model of the study will rest. The main theoretical elements of transaction cost economics are discussed below in a just-in-time purchasing context.

#### Just-In-Time Purchasing and the Descriptive Dimensions of the Exchange

The literature review has provided significant evidence, both anecdotal and empirical, that the environment in which the buyer-supplier exchange transpires is dramatically altered by the implementation of just-in-time purchasing. Specifically, the literature provides broad support for the contention that elevated levels of frequency of exchange, exchange uncertainty, and asset specificity characterize just-in-time exchange environments.

Frequency of exchange. Frequent delivery of material is the most widely cited characteristic of just-in-time purchasing (Ansari & Modarress, 1988; Fawcett & Birou, 1993; Giunipero, 1986; Hahn, Pinto, & Bragg, 1983; Hall, 1983; Newman, 1988b; Schonberger, 1982b; Schonberger & Gilbert, 1983). For example, respondents to the survey of Dion et al. (1992) reported that delivery frequency increased an average of 200 percent following just-in-time purchasing implementation. O'Neal (1987) likewise presented empirical support with respect to increased delivery frequency under just-in-time exchange.

Yet, interfirm exchange is not limited to the exchange of material alone. According to the IMP Interaction Model,

other objects of exchange include services, information, social exchange, and financial exchange (IMP Project Group, 1982). O'Neal (1987, 1989) and Gilbert, Young, and O'Neal (1994) have reported statistically significant increases in the frequency of interaction between the personnel of the buyer and supplier due to just-in-time purchasing implementation. Hall notes:

. . . most companies maintain some form of regular contact involving more people than just those in customer purchasing or supplier sales. Engaging a supplier over the long run in the problem-solving mode increases this interaction. (1986: 137)

Exchange uncertainty. High environmental uncertainty has been empirically linked with just-in-time purchasing practices (Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995). Handfield asserts that the implementation of just-in-time purchasing is a response to high uncertainty. Firms seek to manage uncertainty by increasing their level of flexibility and responsiveness via the deployment of just-in-time purchasing methods.

This strategy involves a reduction of the supplier base and a consolidation of purchases with small, flexible suppliers. Kekre, Murthi, and Srinivasan (1995) have likewise found an empirical linkage between uncertainty and supply base reduction.

Site specificity. One example of increased site specificity involves the use of geographically close suppliers; a characteristic of just-in-time purchasing cited

frequently in the literature (Fawcett & Birou, 1993; Giunipero, 1986; Hahn, Pinto, & Bragg, 1983; Hall, 1983; Newman, 1988b; Schonberger & Gilbert, 1983). Dion et al. (1992) relate that 20 percent of responding suppliers reported relocating a facility in order to be closer to a buyer with whom they had a just-in-time purchasing relationship. Furthermore, Ansari and Modarress (1988) and Ellram (1991) assert that supplier proximity is a key selection criteria used by buyers that use just-in-time purchasing.

Physical asset specificity. Physical asset specificity is commonly increased as a result of just-in-time purchasing implementation. Just-in-time purchasing forces buyers and suppliers to cooperate to refine process capabilities and modify equipment and tooling in order to increase flexibility and reduce lead times (Hall, 1987; Newman, 1988b).

Anecdotal evidence of increased physical asset specificity abounds. Examples include railcars modified to haul one brand of automobile (Palay, 1984), specialized software that communicates with only one firm's computers (Jackson, 1985), and dedicated production equipment (Monteverde and Teece, 1982). Investment in electronic data interchange is also commonly reported (Dion, Blenkhorn, & Banting, 1992; Hall, 1987; Macbeth, 1987).

Increased physical asset specificity is also manifest in the modification of inbound logistics methods. The use of standardized containers for moving material between supplier and buyer is widely reported (Ansari & Modarress, 1988; Fawcett & Birou, 1993; Giunipero, 1986; Hall, 1983; Newman, 1988b; Schonberger, 1982b; Schonberger & Gilbert, 1983).

The use of private carriers is also cited in the literature. In a survey of automotive original equipment manufacturers, over 60 percent of respondents believed that suppliers would increasingly provide deliveries using privately owned equipment, and approximately 47 percent believed that their firms would invest in additional equipment to increase the amount of material picked up from suppliers (O'Neal, 1987).

Human asset specificity. Finally, human asset specificity is increased as a result of just-in-time purchasing implementation. As new systems and procedures are created to facilitate the just-in-time purchasing exchange relationship, significant learning must occur. According to Hall:

Educating people is very important, but easy to neglect. Not only purchasing agents, but everyone who has reason to contact the supplier should be well acquainted with JIT methodology. (1986: 136)

O'Neal (1987, 1989) found that under just-in-time purchasing, purchasing personnel tend to specialize in their knowledge of a few key suppliers rather than dealing with

numerous suppliers. Other reported changes in purchasing operations include increased time spent by purchasing agents in investigating potential just-in-time suppliers and an increased role for the buyer in the design of production processes (Dion et al., 1992).

#### Descriptive Dimensions of the Exchange and the Prevailing Governance Structure

There is significant empirical support in the literature for the tenets of transaction cost economics (Anderson, 1985; Heide & John, 1988; John & Weitz, 1988; Noordewier, John, & Nevin, 1990; Walker & Poppo, 1991). One such tenet is that the descriptive dimensions of the exchange determine the type of governance structure that will be the most transaction cost economizing in a particular situation. According to the theory, increasing levels of exchange frequency, exchange uncertainty, and asset specificity will correspond to the increasing efficiency of the bilateral governance structure.

Frequency and the governance structure. Frequency of exchange has been explicitly measured in only a few studies (Gilbert, Young, & O'Neal, 1994; Heide & Miner, 1992; Noordewier, John, & Nevin, 1990). Albeit scant, there is empirical support for the frequency-governance structure linkage. Heide and Miner (1992) established an empirical link between frequency of exchange and the relational elements of flexibility and shared problem solving.

Uncertainty and the governance structure. Heide and John (1990) examined the connection between various forms of uncertainty and relational elements. Performance ambiguity (i.e., uncertainty stemming from difficulty in measuring the compliance of the exchange partner) was found to be positively related with supplier verification efforts; a relational indicator. Heide and Miner (1992) also found performance ambiguity to be positively related to the relational element of flexibility.

Asset specificity and the governance structure. Heide and John (1990) examined the connection between specific investments (i.e., asset specificity) by buyers and suppliers and relational elements. Both buyer and supplier specific investment were found to be significantly related to the relational element of joint action. In addition, supplier specific investment was found to be related to expectations of continuity, and buyer specific investment was found to be related to supplier verification efforts; both relational elements.

Heide and Miner (1992) examined the relationship between switching costs and elements of the relationship. While switching costs are not asset specificity per se, the two are theoretically related; higher asset specificity begets higher switching costs. Switching costs were found to be positively associated with the relational elements of flexibility and shared problem solving.

The Research Proposition: Just-In-Time Purchasing and  
the Prevailing Governance Structure --  
Linkages to Purchasing Performance

Empirical support has been presented concerning the changes in the descriptive dimensions of the buyer-supplier exchange wrought by just-in-time purchasing implementation. In addition, empirical support for the connection between the descriptive dimensions of the exchange and the governance structure choice has been established.

Indeed, if just-in-time purchasing influences the descriptive dimensions of the exchange as described in the literature, and the descriptive dimensions of the exchange in turn determine the most economical form of governance structure, then it should be possible to prescribe the form of exchange relationship best suited (i.e., in purchasing performance terms) for buyers and sellers interacting via just-in-time exchange. Thus, the research proposition is:

P: Purchasing performance (as reflected by transaction costs) is influenced by the congruence between the extent of implementation of just-in-time purchasing methods and the governance structure in operation (i.e., the degree of relationalism).

Measuring purchasing performance. According to Noordewier, John, and Nevin (1990), purchasing performance is reflected by the degree to which transaction costs are minimized. Recall that transaction costs are comprised of invoice costs, possession costs, and acquisition costs. Of these, possession and acquisition costs are the most direct indicators of buyer-supplier exchange efficiency.

Moreover, Noordewier, John, and Nevin assert that the inventory turnover ratio may be used as a reasonable surrogate for possession costs. Acquisition costs may be adequately represented by the surrogates of the proportion of late deliveries and the proportion of nonconforming incoming material.

Consequently, the three hypotheses stemming from the research proposition, are:

- H1: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower possession costs (i.e., higher inventory turnover) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H2: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of late deliveries) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H3: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of nonconforming incoming material) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).

Existing evidence. As literature examining the impact of the nature of the buyer-supplier relationship on purchasing performance, in a just-in-time exchange context, is scarce, evidence relating to the above hypotheses is sketchy. One study empirically linked purchasing performance outcomes, in the case of lower acquisition costs, to the congruence between the operative governance

structure (i.e., level of relationalism) and the descriptive dimension of the exchange of uncertainty (Noordewier, John, & Nevin, 1990). But, the sample of the study did not consist of just-in-time purchasing users; though there may have incidentally been just-in-time purchasing users in the sample. The study did, however, provide important empirical support for the prescriptions of the transaction cost economics theoretical model.

Just-in-time studies. To the author's knowledge, the transaction cost economics model has not been employed in a just-in-time purchasing study focused on performance outcomes. Several authors have examined, albeit at times indirectly, the connection between relational elements and purchasing performance indicators (Chun, 1991; Handfield, 1993; Kekre, Murthi, & Srinivasan, 1995; Richeson, Lackey, and Starner, 1995; Waller, 1993).

Chun (1991). Chun found that strong cooperation and open communication in just-in-time exchange relationships was positively associated with marketing capabilities. The reader will recall that the measurement of marketing capabilities involved some clear purchasing performance metrics and is, therefore, an arguably crude surrogate for purchasing performance.

Handfield (1993). Handfield empirically linked information sharing, a relational element, to supply base reduction and the use of just-in-time purchasing.

Furthermore, supply base reduction and just-in-time purchasing were empirically linked as antecedents to a construct that Handfield referred to as transaction uncertainty. The reader will recall that two of the three measurement items that represented transaction uncertainty are arguably reasonable surrogates for the purchasing performance metrics of the quality of incoming material and the level of inventory maintained.

Waller (1993). Waller empirically linked the length of contract with a supplier, representing the relational element of continuity, to the scrap and rework levels associated with material received from the supplier. Again, this was done in the context of firms engaged in just-in-time exchange.

Richeson, Lackey, and Starner (1995). The connection between the quality of communication between buyer and seller in a just-in-time purchasing context and measures of performance was explored. The authors found a positive association between quality of communication and the performance indicators of cost, quality, delivery, and overall effectiveness.

Kekre, Murthi, & Srinivasan (1995). These authors examined the relationship between a reduced supplier base and product quality, and a strong positive relationship was found. While the article made reference to just-in-time purchasing, no assessment of the degree of use of just-in-

time purchasing methods was made. It is, thus, uncertain to what degree the sample had implemented just-in-time purchasing.

A lack of integration. In all of the above cited just-in-time purchasing studies, the associations between isolated elements of relationalism (e.g., cooperation, communication) and purchasing performance were examined. In most cases, however, the examination of these associations was not the primary purpose of the study. Moreover, none of these studies focused explicitly on assessing the governance structure (i.e., degree of relationalism); only limited elements of relationalism were examined.

A similar criticism may be made with respect to the measurement of purchasing performance. Two of the studies did not measure purchasing performance explicitly (Chun, 1991; Handfield, 1993). Of the remaining studies, two focused on quality to the exclusion of all other purchasing performance metrics (Kekre, Murthi, & Srinivasan, 1995; Waller, 1993).

One study did take an integrative perspective by explicitly assessing the exchange environment (i.e., frequency, etc.), the governance structure (i.e., degree of relationalism), and purchasing performance (Noordewier, John, & Nevin, 1990). Unfortunately, the study did not involve a sample of firms that used just-in-time purchasing.

Thus, this study filled a gap in the literature by integrating the explicit assessment of the degree of just-in-time purchasing usage, the governance structure (i.e., degree of relationalism), and purchasing performance. This integrative focus is reflected in the theoretical model of the study.

#### The Theoretical Model

The research question advanced in chapter I was:

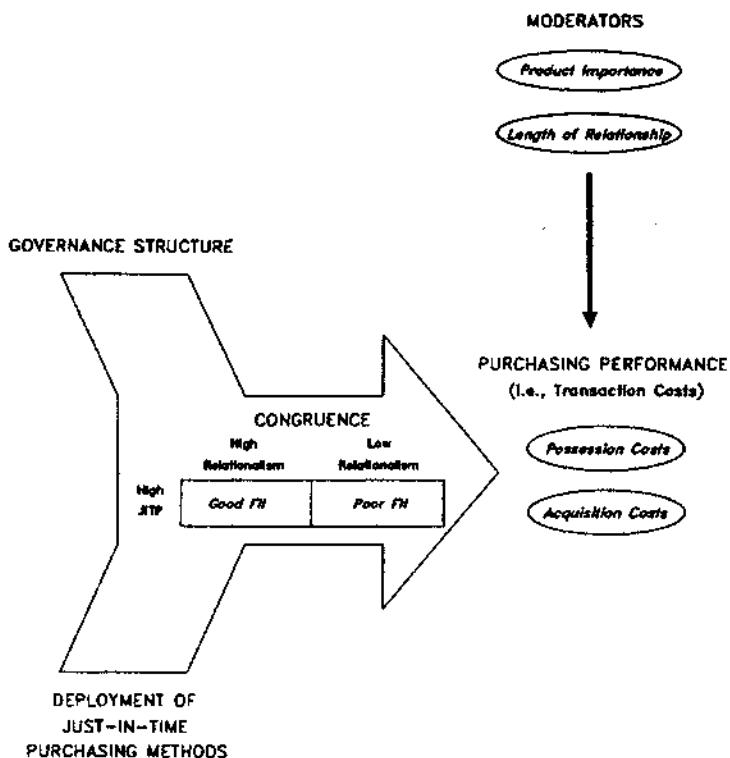
- Q: What are the consequences of the nature of the buyer-supplier relationship, under just-in-time purchasing exchange, on purchasing performance?

In order to answer this question, a formal theoretical model was advanced. The theoretical model is an extension of the transaction cost economics theoretical model and is presented in figure 8. There are five major constructs represented in the theoretical model.

Just-in-time purchasing implementation. The first construct, deployment of just-in-time purchasing methods, reflects the degree to which the various just-in-time purchasing methods have been implemented, and was operationalized by measuring the same.

Governance structure. The second construct, prevailing governance structure, describes the nature of the institutional framework that governs the interchange between buyer and supplier. The prevailing governance structure was

Figure 8  
The Theoretical Model



operationalized by assessing the prevalence of the elements of relationalism in the exchange relationship.

Congruence. The third construct, congruence, was determined by the convergence of the just-in-time purchasing implementation and governance structure constructs. Transaction cost economics is a normative theory that prescribes the most appropriate governance structure for a given exchange scenario. As has been discussed, both the transaction cost economics model and the just-in-time purchasing relationship paradigm prescribe the bilateral

governance structure as being most efficient under the conditions of just-in-time exchange.

Thus, high congruence (i.e., a "good fit") was achieved when firms advanced in just-in-time purchasing implementation also exhibited high levels of relationalism. Conversely, low congruence (i.e., a "poor fit") resulted when firms advanced in just-in-time purchasing implementation exhibited low levels of relationalism. The categories of the congruence construct are illustrated in figure 9.

Figure 9  
The Congruence Construct

	High Relationalism	Low Relationalism
High JITP	High Congruence (Good Fit)	Low Congruence (Poor Fit)

Moderating variables. Moderators represented the fourth construct. Moderating variables are extraneous variables that may influence the behavior of the response variable. Moderators are measured and their influence is removed via statistical means. The importance of the product being exchanged (i.e., the proportion of value of the finished item) and the length of the relationship between buyer and supplier served as moderating variables in the model.

Purchasing performance. The fourth and final construct, purchasing performance, connoted the efficiency of the exchange between buyer and supplier. Purchasing performance was operationalized by measuring transaction costs.

Transaction costs may be categorized as possession costs or acquisition costs. The inventory turnover ratio served as the possession costs indicator, and the proportion of late deliveries and proportion of nonconforming incoming material served as acquisition costs indicators.

#### Summary

The fifth and final major section of the literature review began with an overview of the state of the just-in-time purchasing literature and a discussion of the benefits accruing from the use of an explicit theoretical model.

Much of the literature on just-in-time purchasing is flawed precisely because past inquiry has not been founded on such a model.

The section then presented support from the literature concerning the relationship between just-in-time purchasing implementation and the descriptive dimensions of the exchange. Additional support for the linkages between the descriptive dimensions of the exchange and the choice of the appropriate form of governance structure was then presented.

Based on the evidence, a research proposal relating the congruence between just-in-time purchasing implementation

and the governance structure to purchasing performance was advanced. Three research hypotheses were formulated from the proposition, corresponding to the three transaction cost indicators of inventory turns, proportion of late deliveries, and the proportion of nonconforming material.

Next, the theoretical model of this study, an extension of the transaction cost economics theoretical model, was presented. The five major constructs involved were duly noted. Those constructs were the implementation of just-in-time purchasing methods, the prevailing governance structure (i.e., the degree of relationalism), and the congruence between the degree of just-in-time purchasing implementation and the extent of relationalism. The fourth construct was composed of variables that moderate the relationship between congruence and performance, and the fifth construct was purchasing performance (i.e., transaction costs in the form of possession costs and acquisition costs).

#### Chapter Summary

This chapter contained a review of the relevant literature. The first three sections of the literature review were devoted to the issues of just-in-time purchasing, the buyer-supplier relationship, and purchasing performance. Each of these three areas were discussed in isolation.

The fourth section of the literature review focused on the interrelationship between these three bodies of

literature. Given the fragmented nature of the literature, however, the fourth section was divided into three subsections; each dealing with the overlap of two of the three areas.

In the fifth section, a theoretical model was presented that integrated the implementation of just-in-time purchasing and the nature of the buyer-supplier relationship with consequent implications on purchasing performance. Theoretical support for the model was considered, and a research proposition and three hypotheses were generated in light of the evidence. Finally, the major constructs of the theoretical model were discussed.

Having provided the necessary theoretical background, the focus now turns to the research design that provided the basis for formally testing the three hypotheses. The next chapter provides a detailed description of the research design and its affiliated methodology.

## CHAPTER III

### METHODOLOGY

#### Introduction

The research design and its affiliated methodology is presented in this chapter. A research design is an agenda that specifies the means and tactics needed to structure and resolve research questions (Kerlinger, 1973). The research design of this study may be categorized as a cross-sectional field study, involving a static-group comparison, implemented through the use of a mail survey.

The research design represents an amalgamation and a refinement of procedures gleaned from the methodological frameworks advanced by other researchers (Churchill, 1979; Gerbing & Anderson, 1988; Sarah, Benson, & Schroeder, 1989; Spector, 1992; Waller, 1993). Table 24 contains a step-by-step summary of the proposed research design accompanied by a brief description of the method(s) to be employed at each step and the desired outcome(s). Table 24 will serve as a template that will structure the content of this chapter, as each major section of the chapter discusses a specific step in the research design.

Table 24  
Research Design

<b>Step</b>	<b>Description</b>	<b>Method(s)</b>	<b>Desired Outcome(s)</b>
1	Definition of constructs and formulation of hypothesized relationships	Review of the literature	Theoretical model, research instrument, and evidence of content validity
2	Pretest of the measurement instrument	Pilot survey administered to a small sample	Evidence of the adequacy of the instrument and of substantive validity
3	Data collection	Mail survey administered to the full sample	Data ready for statistical analysis
4	Refinement of measurement scales	Correlational and reliability analyses	Evidence that items are properly assigned to scales and that scales are reliable
5	Assessment of the validity of the measures	Correlational and factor analyses	Evidence of the criterion and/or construct validity of the scales
6	Data analysis and hypothesis testing	Kruskal-Wallis One-Way ANOVA, ANCOVA	Evidence of nomological validity and support for the theoretical model advanced in this study
7	Identification of limitations and interpretation of the results	Analysis of the threats to the internal and external validity of the study	Caveats concerning the potential limitations of the study

Step 1 - Delineation of Constructs  
and their Instrumentation

A discussion of the literature germane to this study was presented in chapter II. In that literature review, a discussion of each construct and its measurement by other researchers was presented. However, a critique of the manner in which the constructs were operationalized has been reserved for this chapter.

In this section, the operationalization of each construct will be discussed critically and methods outlined for the measurement of each construct based on that critique. In order to interpret the critique, the reader should be aware of some accepted guidelines regarding multiple item measurement scale reliability and unidimensionality. This section begins with a review of the basics.

A discussion of the measurement of the just-in-time purchasing implementation construct is followed by a discussion of the measurement of governance structure, purchasing performance, and demographics. Two important points concerning the measurement of constructs should be noted.

First, measurement of the congruence construct will not be discussed in this section. This is because congruence is not measured directly. Rather, congruence will be established at two levels (i.e., high and low) based on values of the just-in-time purchasing implementation and

governance structure measures for each respondent. A discussion of the method of construction of the congruence levels will be deferred until other pertinent information has been presented.

The second important point concerns moderating variables. Because moderators represent extraneous variables, they do not warrant specific attention and, thus, have been grouped in with demographic variables. The moderating variables will simply be identified in the discussion of demographics.

A discussion of the purification of each of the measures is reserved for step 4 of the research design. Finally, this section ends with a discussion of the significance and evaluation of the content validity of the measures.

#### Scale Reliability and Unidimensionality

Reliability refers to the internal consistency of a set of measurement items. Cronbach's (1951) coefficient alpha ( $\alpha$ ) is the most widely reported of the various reliability measures (Carmines & Zeller, 1979). Ranging between extreme values of zero and one, Nunnally (1978) recommends minimum values for coefficient alpha of 0.70 for established scales and 0.60 for exploratory work.

Unidimensionality of scales. The use of multiple item factor scales raises another important issue; that of unidimensionality. Unidimensionality refers to the degree

to which a set of measurement items represents a single construct (Gerbing & Anderson, 1988). While it is possible to perform a hypothesis test concerning unidimensionality using a large sample chi-square test, the results of this test are frequently deemed unreliable because reality commonly dictates violations of the test's assumptions.

Thus, it is recommended that the chi-square statistic be used as an index of fit rather than as an explicit test statistic, especially when sample size is large (Joreskog & Sorbom, 1981; Long, 1983). A useful rule-of-thumb is that the ratio of the chi-square statistic to degrees of freedom should be less than two (Bentler & Bonett, 1980).

An alternative fit index, that is reported more frequently in the literature, is the goodness-of-fit index (GFI). This index indicates the relative amount of variance/covariance in the measurement items explained by a factor model. The goodness-of-fit index is generally preferred because it possesses greater statistical robustness compared to the chi-square statistic (Anderson & Gerbing, 1984).

Since the sampling distribution of the goodness-of-fit index is unknown, explicit hypothesis testing and the computation of p-values is not possible. Most authors tend to be somewhat noncommittal when reporting the magnitude of this index and discussing its implications. With possible values between zero and one, a value of the index in excess

of 0.90 is a commonly used rule-of-thumb for determining adequate fit to a unidimensional model (Bentler & Bonett, 1980).

#### Just-In-Time Purchasing Implementation

Most measures of just-in-time purchasing implementation have shared similar characteristics. In all cases but one, respondents were asked to rate their level of implementation of methods commonly associated with just-in-time purchasing using seven-point Likert scales (Chun, 1991; Fawcett & Birou, 1993; Templin, 1988). Of these operationalizations, only Chun (1991) offered adequate evidence of reliability and validity.

Templin (1988). Templin asked respondents to rate their level of implementation of nine just-in-time purchasing methods (table 4, p. 44). The responses were subjected to principal components analysis and the first principal component was used as an index of just-in-time purchasing implementation. The first principal component accounted for only roughly 25 percent of the variation in the nine items.

Four of the items (i.e., the second, fourth, seventh and eighth items from table 4) had first principal component coefficients of 0.55, 0.38, 0.46 and 0.59 respectively. None of the coefficients of the remaining five items exceeded 0.11, and most were very close to zero. Templin

did not compute a reliability coefficient for the scale, nor did he test for the unidimensionality of the scale.

Fawcett and Birou (1993). Likewise, Fawcett and Birou asked respondents to rate their degree of implementation of the fourteen just-in-time purchasing methods shown in table 6 (p. 46). The authors made no mention of any attempt at scale validation, nor was any reliability or validity information reported.

Waller (1993). Waller asked respondents questions about the size of the supplier base, the length of contract, frequency of information sharing, use of supplier qualification criteria, and frequency of delivery (table 7, p. 47). Each of the five questions was asserted to represent an independent dimension of just-in-time purchasing that do not, taken together, represent a single scale.

Waller justified his method by contending that firms are not likely to use either a "pure just-in-time purchasing strategy" or a "pure traditional supply management strategy". Rather, Waller asserted that most firms will in fact use a mix of just-in-time purchasing and traditional approaches.

While Waller's contention may have merit, it does not by itself rule out the use of a summated scale representing the degree of just-in-time purchasing implementation. That is, if each item is indeed an independent indicator of just-

in-time purchasing implementation, then a summated scale of these items would fail to pass a test of unidimensionality when subjected to confirmatory factor analysis; a task that could have been conducted by Waller.

Furthermore, Waller offers no rationale as to why the five items he used were selected over the numerous other characteristics that are cited in the literature as being commonly associated with just-in-time purchasing. Finally, Waller's method, involving the use of five scales versus one summated scale, increased the number of hypothesis tests performed by five-fold, thereby compounding the risk of Type I error and threatening statistical conclusion validity.

Chun (1991). Chun asked respondents to rate their level of implementation of twelve just-in-time purchasing methods (table 5, p. 45). Chun computed item-to-total correlations on the twelve items from table 5 and deleted items with correlations less than 0.30 (i.e., the tenth and eleventh items). The remaining items were then subjected to a principal components factor analysis followed by a VARIMAX rotation.

The resultant factor pattern led Chun to conclude that there were two factors latent among the variables in table 5. The two factors accounted for 47.0 percent of common variance and Chun named these two factors "purchasing performance criteria" and "inbound delivery strategies". The purchasing performance criteria factor accounted for

12.9 percent of common variance and consisted of the first, second, and third items and an additional item from a quality scale that stated "Emphasizing product quality and on-time delivery rather than low price". The reliability coefficient reported for the resulting scale was 0.76.

The inbound delivery strategies factor accounted for 34.1 percent of common variance and consisted of the fourth through eighth items, the twelfth item, and an additional item from the same quality scale mentioned previously that stated "Elimination of inspections of material from qualified suppliers". The reliability of the items comprising this scale was reported to be 0.73.

Just-in-time purchasing instrumentation. Given the evidence of reliability and validity associated with Chun's operationalization, it was replicated in this study with only slight modifications in item wording. Respondents were asked to indicate their degree of implementation of the eleven just-in-time purchasing methods shown in table 25.

The instrumentation used in this study consisted of two summated scales representing the two dimensions of just-in-time purchasing implementation. The first scale, representing just-in-time purchasing performance criteria (JITPPC), consisted of the first four items in table 25. The second scale, representing just-in-time purchasing coordination methods (JITPCM), consisted of the fifth through eleventh items in table 25.

Table 25  
Just-In-Time Purchasing Scale Items

	Not At All	At All	Very Intensivly
1. A reduction in the supplier base	1	2	3
2. A reduction in the use of competitive bidding	1	2	3
3. A reduction in purchase lot sizes	1	2	3
4. Emphasizing quality and on-time delivery rather than low price	1	2	3
5. Use of supplier certification	1	2	3
6. Providing estimated requirements to suppliers	1	2	3
7. Providing flexible design specifications to suppliers	1	2	3
8. Use of standardized/reusable containers	1	2	3
9. Single point pricing (i.e., no quantity discounts)	1	2	3
10. Use of freight consolidation ("milk runs") for inbound materials	1	2	3
11. Elimination of inspections of material from qualified suppliers	1	2	3

The responses for all items on the two scales were summed to render an index of just-in-time purchasing implementation (JITP). It was assumed that the summated data was of an ordinal nature, and that increasing summated values represented increasing levels of just-in-time purchasing implementation.

#### Governance Structure

To review, Williamson (1979, 1981, 1985) contends that exchange relationships may be dichotomized into the categories of hierarchy (i.e., make) or market (i.e., buy). Since the focus of this study was on the nature of the exchange relationship between independent firms (i.e., inter-firm exchange) that use just-in-time purchasing methods to coordinate the exchange of material, the market alternative was the focus of this study to the exclusion of hierarchy.

With respect to the market alternative, recall that this alternative is comprised of a continuum over which the degree of bilateralism in an exchange relationship may vary. The research that has been conducted involving the extant measurement of governance structure has focused on measuring the extent of bilateralism present in an exchange relationship by measuring the presence, or absence, of the elements of relational exchange (i.e., relationalism) inherent in the exchange relationship (Gilbert, Young, & O'Neal, 1994; Heide & John, 1990; Heide & Miner, 1992;

Metcalf, Frear, & Krishnan, 1992; Noordewier, John, & Nevin, 1990).

Summary of prior instrumentation. All of these studies have posited elements of relational exchange and have operationalized the construct through the use of summated scales consisting of multiple Likert scale items. Table 26 summarizes these five studies, the elements of relationalism proposed in each, and evidence concerning the reliability and unidimensionality of the scaling used.

Examination of table 26 leads to the conclusion that prior operationalizations of the relationalism construct have shown evidence of acceptable levels of reliability and unidimensionality of the scaling. However, two troubling findings also arise. First, while the five studies share some consistencies in their operational definitions of relationalism, there are also stark differences. Secondly, the five studies used somewhere between seventeen and twenty-two items to measure relationalism. This is problematic when relationalism is but one of many constructs to be measured.

Thus, the instrumentation used in this study was formulated based on the two guiding principles of parsimony and representativeness. The principle of parsimony simply says that less is more (Spector, 1992). That is, it is desirable to operationalize the construct with the bare minimum number of items possible. However, too few items

Table 26  
Summary of Past Operationalizations of Relationalism

study	Elements of Relationalism	Evidence of Reliability	Evidence of Uni- dimensionality
Heide & John (1990) . . . see table 9 (p. 70)	Joint Action (9 items) Continuity (4 items)  Supplier Verification (8 items)	$\alpha = 0.88$ $\alpha = 0.70$ $\alpha = 0.67$	GFI = 0.95   C = 0.07   C = 0.03
Noordewier, John, & Nevin (1990) . . . see table 10 (p. 72)	Supplier Flexibility (4 items) Supplier Assurances (5 items)  Information Provided to Supplier (4 items)  Monitoring of Supplier (6 items)  Expectation of Continuity (3 items)	Each element was represented by a first-order factor scale for which no reliability coefficients were reported. A second-order factor scale, composed of the weighted first-order scales, was constructed with $\alpha = 0.74$ .	Note: The Continuity and Supplier Verification scales used a Rasch latent trait model necessitating the use of the Cohen Index (C) fit statistic.  Uni-dimensionality for the overall second-order model was assessed with a reported GFI of 0.83.

Table 26 (continued)  
Summary of Past Operationalizations of Relationalism

Study	Elements of Relationalism	Evidence of Reliability	Evidence of Uni- dimensionality
Heide & Miner (1992) . . . see table 11 (p. 75)	Flexibility (4 items) Information Exchange (4 items) Shared Problem Solving (4 items) Restraint in the Use of Power (3 items) Extendedness of Relationship (4 items)	$\alpha = 0.88$ $\alpha = 0.79$ $\alpha = 0.79$ $\alpha = 0.68$ $\alpha = 0.88$	A multiple factors measurement model, comprised of the first-order factors of Flexibility, Information Exchange, Shared Problem Solving, and Restraint in the Use of Power, was assessed for unidimensionality with a reported GFI of 0.89. The unidimensionality of the Extendedness of Relationship scale was not assessed.
Metcalf, Frear, & Krishnan (1992) . . . see table 12 (p. 78)	Product Importance (6 items) Information Exchange (2 items) Social Exchange (5 items) Cooperation (4 items) Adaptation (3 items)	$\alpha = 0.84$ $\alpha = 0.76$ $\alpha = 0.80$ $\alpha = 0.67$ $\alpha = 0.67$	A multiple factors measurement model, comprised of the first-order factors of Product Importance, Information Exchange, Social Exchange, Cooperation, and Adaptation, was assessed for unidimensionality with a reported GFI of 0.82.

Table 26 (continued)  
Summary of Past Operationalizations of Relationalism

<b>Study</b>	<b>Elements of Relationalism</b>	<b>Evidence of Reliability</b>	<b>Evidence of Uni- dimensionality</b>
Gilbert, Young, & O'Neal (1994) . . . see table 13 (p. 81)	Duration (4 items)  Frequency (2 items)  Diversity (5 items)  Symmetry (2 items)  Facilitation (4 items)	$\alpha = 0.72$  $\alpha = 0.64$  $\alpha = 0.70$  $\alpha = 0.88$  $\alpha = 0.65$	A multiple factors measurement model, comprised of the first-order factors of Duration, Frequency, Diversity, Symmetry, and Facilitation was assessed for uni- dimensionality with a reported GFI of 0.84.

would render the content validity of the operationalization suspect.

The principle of representativeness also relates to content validity. In order to argue for the content validity, as is done subsequently in this chapter, of the governance structure/relationalism scale, it is necessary to establish that the operationalization is fully representative of all aspects of the construct described in the literature.

Thus, the existing operationalizations were analyzed for the elements of relationalism that appeared consistently among them. Based on that analysis, it is suggested that

there are five elements of relationalism that appear consistently in the literature. Those five elements are summarized in table 27.

Governance structure instrumentation. Items were either adapted from past operationalizations or formulated to represent each of the five suggested elements of relationalism. The resultant scaling may be found in table 28.

The first through third items from table 28 represented the element of flexibility (FLEX) and were a combination of items from Noordewier, John, and Nevin (1990) and Heide and Miner (1992). The fourth through sixth items represented the element of information exchange (INFOX). The fourth and fifth items were very close in wording to items from Heide and Miner (1992), while the sixth item was a combination of items from Noordewier, John, and Nevin (1990) and Heide and Miner (1992).

The element of collaboration (COLLAB) was represented by the seventh through ninth items from table 28. The seventh and ninth items were a combination of items from Heide and John (1990) and Metcalf, Frear, and Krishnan (1992); while the eighth item was taken directly from Heide and Miner (1992). The element of continuity (CONTINU) was represented by the tenth through twelfth items, which were taken directly from Heide and John (1990), Noordewier, John, and Nevin (1990) and Heide and Miner (1992).

Table 27  
Suggested Elements of Relationalism

<b>Proposed Elements of Relationalism</b>	<b>Corresponding Operationalizations</b>
Flexibility - the degree to which the parties to the relationship are flexible and willing to accommodate the other party	<ul style="list-style-type: none"> <li>→ Supplier Flexibility, Supplier Assists - Noordewier, John, &amp; Nevin (1990)</li> <li>→ Flexibility - Heide &amp; Miner (1992)</li> <li>→ Cooperation - Metcalf, Frear, &amp; Krishnan (1992)</li> <li>→ Facilitation - Gilbert, Young, &amp; O'Neal (1994)</li> </ul>
Information - Exchange  the degree to which information, both sensitive and non-sensitive, is exchanged with the other party	<ul style="list-style-type: none"> <li>→ Information Provided to Supplier - Noordewier, John, &amp; Nevin (1990)</li> <li>→ Information Exchange - Heide &amp; Miner (1992)</li> <li>→ Information Exchange - Metcalf, Frear, &amp; Krishnan (1992)</li> <li>→ Symmetry - Gilbert, Young, &amp; O'Neal (1994)</li> </ul>
Feedback -  the extent to which the performance of the parties is assessed and feedback is openly communicated	<ul style="list-style-type: none"> <li>→ Supplier Verification - Heide &amp; John (1990)</li> <li>→ Monitoring of Supplier - Noordewier, John, &amp; Nevin (1990)</li> </ul>

Table 27 (continued)  
Suggested Elements of Relationalism

<u>Proposed Elements of Relationalism</u>	<u>Corresponding Operationalizations</u>
Collaboration - the degree to which the parties to the relationship share joint responsibility for duties and activities	<ul style="list-style-type: none"> <li>→ Joint Action - Heide &amp; John (1990)</li> <li>→ Shared Problem Solving - Heide &amp; Miner (1992)</li> <li>→ Adaptation - Metcalf, Frear, &amp; Krishnan (1992)</li> <li>→ Diversity - Gilbert, Young, &amp; O'Neal (1994)</li> </ul>
Continuity - the expectation that the relationship will endure for the foreseeable future	<ul style="list-style-type: none"> <li>→ Continuity - Heide &amp; John (1990)</li> <li>→ Expectation of Continuity - Noordewier, John, &amp; Nevin (1990)</li> <li>→ Extendedness of Relationship - Heide &amp; Miner (1992)</li> <li>→ Duration - Gilbert, Young, &amp; O'Neal (1994)</li> </ul>

Finally, the element of feedback (FBACK) was represented by the thirteenth through fifteenth items, of which the thirteenth and fourteenth were taken from Noordewier, John, and Nevin (1990). The fifteenth item was an original item added to include a measure of supplier

Table 28  
Governance Structure/Relationalism Scale Items

	Rate the accuracy of each of the following statements by circling the appropriate response on the scale to the right. (Note: The term "parties" refers jointly to your firm and the supplier of this component.)						Completely Accurate	Inaccurate	Completely Inaccurate	
	1	2	3	4	5	6	7			
1.	Flexibility by both parties in response to requests for changes characterizes this relationship.									
2.	It is expected that both parties will be open to modifying their agreements if unexpected events require it.	1	2	3	4	5	6	7		
3.	It is common for either party to go to great lengths to accommodate the other party when emergencies arise as a result of unforeseen circumstances.	1	2	3	4	5	6	7		
4.	In this relationship, it is expected that any information that might help the other party will be shared.	1	2	3	4	5	6	7		
5.	It is expected that the parties will provide proprietary information if it can help the other party.	1	2	3	4	5	6	7		

Table 28 (continued)  
Governance Structure/Relationalism Scale Items

	Rate the accuracy of each of the following statements by circling the appropriate response on the scale to the right. (Note: The term "parties" refers jointly to your firm and the supplier of this component.)						Completely Accurate
	1	2	3	4	5	6	7
6.	My firm frequently communicates usage information (e.g., short- & long-term forecasts) to this supplier to help them plan for our needs.						
7.	The parties to this relationship jointly coordinate production plans.	1	2	3	4	5	6
8.	In most aspects of this relationship, the parties are jointly responsible for getting things done.	1	2	3	4	5	6
9.	The parties to this relationship are often interested in pursuing joint product development activities (e.g., design, prototyping, testing, etc.).	1	2	3	4	5	6
10.	The parties expect this relationship to last a long time.	1	2	3	4	5	6

Table 28 (continued)  
Governance Structure/Relationalism Scale Items

	Completely Accurate						
	Inaccurate						
	1	2	3	4	5	6	7
<b>Rate the accuracy of each of the following statements by circling the appropriate response on the scale to the right. (Note: The term "parties" refers jointly to your firm and the supplier of this component.)</b>							
11. The relationship with this supplier is essentially "evergreen".							
12. The parties plan not only for the terms of individual purchases, but also for the continuance of the relationship.	1	2	3	4	5	6	7
13. My firm assesses the performance of this supplier through a formal vendor evaluation program.	1	2	3	4	5	6	7
14. We advise this supplier of its performance relative to that of other suppliers.	1	2	3	4	5	6	7
15. The personnel of this supplier feel free to openly and honestly give feedback concerning the performance of my firm in this relationship, even if that information is negative.	1	2	3	4	5	6	7

feedback on the buyer's performance; as past emphasis had been on buyer evaluation of the supplier exclusively.

Responses on each of the items representing the five elements of relationalism were summed. The governance structure/relationalism construct (RELATION) was represented by the resulting summated score which was assumed to be ordinal in nature; with increasing values representing increasing levels of relationalism.

#### Purchasing Performance

In the literature review, it was established that purchasing performance may be assessed at different levels of analysis. The level of analysis most germane to this study is at the level of the purchasing function in aggregate. Numerous metrics may be used to evaluate purchasing function performance, but those performance indicators of greatest prominence in the just-in-time purchasing environment include quality of purchased material, on-time delivery performance (including lead times and supplier proximity) and inventory levels and/or reduction in such (Ansari & Modarress, 1988; Freeland, 1991; Giunipero, 1990).

Fortuitously, these just-in-time purchasing performance metrics also correspond to measurements of transaction costs. Recall that transaction costs are ". . . costs (losses) due to imperfect coordination between buyers and sellers . . ." (Noordewier, John, & Nevin, 1990:81).

According to Noordewier, John, and Nevin, purchasing performance is determined by the effectiveness of the purchasing organization in minimizing invoice, possession, and acquisition costs. Invoice costs are represented by purchase price and are, thus, only indirectly related to transaction costs as they are most likely little effected by the efficiency of inter-firm coordination in the short-term. This is not to say that invoice costs are not influenced at all by exchange efficiency. Rather, the linkage is more long-term in nature; invoice costs being adjusted downward as a result of increased exchange efficiency over the long-term (Ellram, 1993).

Possession costs (i.e., costs incurred by holding inventory) and acquisition costs (i.e., costs arising from purchasing activities), on the other hand, are dramatically influenced by the efficiency of inter-firm coordination. Thus, these costs are the primary focus in the measurement of transaction costs.

Possession costs have been operationalized with the inventory turnover ratio; the ratio of dollar purchases to average inventory per time period. Fortunately, the inventory turnover ratio is a commonly used performance metric in practice. Conversely, measures of acquisition costs usually may not be found directly in traditional records (Ellram & Siferd, 1993; Noordewier, John, & Nevin, 1990).

Thus, acquisition costs have been operationalized using the surrogates of lateness of deliveries and the proportion of nonconforming incoming material. Noordewier, John, and Nevin asserted that these surrogates are appropriate in that they represent events which directly lead to the initiation of purchasing activities that give rise to acquisition costs.

Since these three measures (i.e., inventory turns, proportion of late deliveries, and proportion nonconforming material) are matters of objective fact contained in conventional purchasing records, they were all measured through the use of single items requiring a simple numeric response. Thus, the use of multiple-item measurement scales and associated issues of reliability and unidimensionality were irrelevant, and no data regarding these issues was reported.

Purchasing performance instrumentation. The instrumentation used in this study was a replication of that of Noordewier, John, and Nevin (1990) and may be found in table 29. Responses to the first item in table 29 represented possession costs (PCOST). The resulting data was assumed to be ratio level in strength, with increasing values representing decreasing possession costs.

The second and third items in table 29 represented two independent indicators of acquisition costs (ACOST1, ACOST2). The responses for both items were assumed to be

Table 29  
Purchasing Performance (Transaction Costs) Items

- 
1. The annual inventory turnover for this component is \_\_\_\_\_ turns per year.
  2. The percentage of orders of this component delivered late is \_\_\_\_\_ percent.
  3. The percentage of this component that is defective, not up to specifications, the wrong item, or otherwise unacceptable upon receipt is \_\_\_\_\_ percent.
- 

ratio in strength, with increasing values representing increasing acquisition costs.

#### Demographics

Demographics were collected: (1) to profile the respondents, (2) to qualify respondents for inclusion in the ensuing analyses, (3) to serve as moderating variables, and (4) to test for nonresponse bias. The demographic items, representing a combination of demographic items from Chun (1991), Heide and Miner (1992), Waller (1993), and original items, may be found in table 30.

The first six items in table 30 were used for purposes of respondent profiling and testing for nonresponse bias (discussed in step 6 of this chapter). The seventh through ninth items were used for purposes of respondent qualification (discussed in step 6). The tenth and eleventh items, the moderating variables, were used as control

Table 30  
Demographic Items

- 
1. Your firm manufactures primarily: (Circle one only)
    - To stock
    - To customer order
    - To both stock and customer order
  
  2. Your production process consists primarily of:  
(Circle one only)
    - Manufacturing of parts from raw materials
    - Assembling component parts
    - Both manufacturing and assembling of parts
  
  3. The size of your firm (division), in number of employees, is:  
(Circle one only)
    - Less than 100
    - 100 - 250
    - 251 - 500
    - 501 - 1,000
    - 1,001 or more
  
  4. The annual dollar sales of your firm (division) for the most recent fiscal year is:  
(Circle one only)
    - Less than \$50 million
    - \$50 - \$250 million
    - \$251 - \$500 million
    - More than \$500 million
-

Table 30 (continued)  
Demographic Items

5. Other than the supplier that you have selected, how many other suppliers also supply this component?  
(Circle one only)

0 (Single Source)

1

2

3

4 or more

6. The term of the existing contract with this supplier is for \_\_\_\_\_ years and \_\_\_\_\_ months.

7. Your knowledge of and involvement with the supplier of this component is:

1	2	3	4	5	6	7
None At All				Very Comprehensive		

8. Your firm's use of just-in-time purchasing methods in the relationship with the supplier of this component is:

1	2	3	4	5	6	7
None At All				Very Comprehensive		

---

variables in a number of the statistical analyses (also discussed in step 6).

Responses to the first and second items were assumed to be nominal in strength. Responses to the third through fifth and seventh through ninth items were assumed to be ordinal in strength. Finally, responses to the sixth,

Table 30 (continued)  
Demographic Items

- 
9. Which of the following best describes the affiliation between your firm and the supplier of this component? (Circle one only)

My firm has no ownership interest in the supplier

My firm has a minor ownership interest in the supplier

My firm has a significant ownership interest in the supplier

My firm wholly owns the supplier

10. The cost of this component is approximately \_\_\_\_\_ percent of the total cost of the product into which it is assembled.

11. We have done business with the supplier of this component for \_\_\_\_\_ years and \_\_\_\_\_ months.
- 

tenth, and eleventh items were assumed to be ratio in strength.

#### Content Validity

The validity of a measure refers to the degree that it measures what is intended to be measured (Kerlinger, 1973). There are many types of validity, the most basic of which is content validity. According to Bohrnstedt:

One can imagine a domain of meaning that a particular construct is intended to measure. Content validity refers to the degree that one has representatively sampled from that domain of meaning. (1983: 98)

The content validity of a measure is not assessed empirically, rather content validity is established based on

a thorough review of the literature, and a subsequent judgement that the construct, as operationalized, is fully representative of the way in which the construct has been presented in the literature.

Content validity is contingent on the degree to which the researcher has represented the entire domain of the construct via the use of a set of measurement items. If a measure is content valid, then its measurement reflects all aspects or dimensions of the construct that it represents (Bohrnstedt, 1983; Kerlinger, 1973).

The review of the literature presented in chapter II is part of the foundation upon which a judgement of content validity was founded. Every attempt was made to incorporate the insights of the author and rectify the shortcomings of previous research. Additional evidence of content validity is discussed in the next section as part of the discussion of substantive validity.

#### Summary

In this section, the instrumentation of the study was presented construct by construct. The previous operationalizations of each construct were discussed critically. The shortcomings of prior operationalizations were discussed, and the instrumentation of this study was modified accordingly to rectify these shortcomings. A summary of the instrumentation is presented in table 31.

Table 31  
Summary of the Instrumentation

<b>Construct</b>	<b>Dimensions/ Categories</b>	<b>Number of Items</b>	<b>Level of measurement</b>
Just-In-Time Purchasing Implementation (JITP)	1) Just-in-time purchasing performance criteria (JITPPC)	n = 4	ordinal
	2) Just-in-time purchasing coordination methods (JITPCM)	n = 7	ordinal
Governance Structure/ Relationalism (RELATION)	1) Flexibility (FLEX)	n = 3	ordinal
	2) Information exchange (INFOX)	n = 3	ordinal
	3) Collaboration (COLLAB)	n = 3	ordinal
	4) Continuity (CONTINU)	n = 3	ordinal
	5) Feedback (FBACK)	n = 3	ordinal
Purchasing Performance	1) Possession costs (PCOST)	n = 1	ratio
	2) Acquisition costs (ACOST1) (ACOST2)	n = 2	ratio

Table 31 (Continued)  
Summary of the Instrumentation

<b>Construct</b>	<b>Dimensions/ Categories</b>	<b>Number of Items</b>	<b>Level of measurement</b>
Demographics	1) Respondent profiling	n = 6	nominal, ordinal, and ratio
	2) Respondent qualification	n = 3	ordinal, ratio
	3) Control variables	n = 2	ratio
	4) Testing for nonresponse bias	n = 6	all will be reduced to nominal

The questionnaire that is the embodiment of the instrumentation may be found in appendix A.

Finally, the issue of content validity and its assessment was introduced. Additional evidence of content validity is discussed in the next section of this chapter.

#### Step 2 - Pretest of the Measurement Instrument

A pretest of the measurement instrument (i.e., a pilot survey) was conducted for the purposes of assuring that all items contained therein were unambiguous and understandable to potential respondents, and to establish substantive validity. The first of these purposes was accomplished by having a convenience sample of four purchasing agents/managers review the pilot survey. There is no exact size for a pretest sample specified in the literature. This is a

decision customarily left to the discretion of the researcher, but it is generally determined by questionnaire length and complexity (Hunt, Sparkman & Wilcox, 1982).

The pretest participants were interviewed to discern those questionnaire items that were potentially flawed. The two most common errors that are rectified as a result of this process are missing alternative errors (i.e., the exclusion of a correct alternative in the set of possible alternatives) and the use of inappropriate vocabulary (Hunt, Sparkman, & Wilcox, 1982).

Initially, it had been planned to interview six practitioners as part of the pretest. The first four participants, however, were unable to identify any items that required modification. Thus, the pretest was truncated after four interviews as the author believed that the marginal benefit of additional interviews was essentially nil.

Substantive validity. The second purpose of the pretest, establishing substantive validity, is a necessary condition to support a pronouncement of the content validity of the measures. Substantive validity refers to the degree that measurement items are conceptually linked to the construct of interest (Anderson & Gerbing, 1991). As such, it is a necessary but not sufficient condition for content validity.

That is, a measure may not be content valid if its measurement items are not representative of the construct intended to be measured. However, simply because a set of items are substantively valid, that does not guarantee that they represent the entirety of the domain of the construct being measured.

Substantive validity was assessed via the computation of the coefficient of substantive validity (CSV) (Anderson & Gerbing, 1991). The methodology involved the use of a scale sort task. A sample of experts was given one sheet containing a list of each construct and its operational definition. The multiple item measurement scales were listed in random order on a separate sheet, and each expert was asked to match measurement scales to their appropriate operational definition.

As a manipulation check, additional extraneous scales and operational definitions were added to the scale sort task. In all, there were four scales and six operational definitions. Thus, not every operational definition had a corresponding scale.

The CSV was computed by taking the difference of the number of participants making the correct assignment of a scale and the highest number of assignments of that scale to any other construct. The difference was then expressed as a ratio to the total number of participants. The CSV formula is:

$$\text{CSV} = (C - GI)/n$$

Where:      C = number of correct assignments of scale  
                GI = greatest number of assignments of scale  
                  to an inappropriate construct  
                n = number of participants

A critical value of the CSV of 0.50 was used to cull measurement items with questionable substantive validity. Modelling the methodology of Waller (1993), a convenience sample of ten operations management faculty were used as the expert sample. The results of this analysis are presented in the next chapter.

### Step 3 - Data Collection

This section begins with a discussion of the target population and the selection of a sampling frame from that population. Subsequently, the issue of sample size is addressed. Given the nature of the target population, a mail survey was used for purposes of data collection. Thus, the rationale for the use of the mail survey is offered. Finally, a description of the mail survey methodology that was employed concludes this section.

#### Target Population

The target population of this study consisted of:

1. Firms that were engaged in an industrial exchange relationship where the focal object of exchange was some part, component, or material that is at an intermediate level of processing (i.e., "industrial

- exchange"; excluded were relationships where the focal object of exchange is a finished good)
2. Only cases where the parties to the exchange relationship were independent of one another to the degree that they exhibited distinct organizational identities and independent ownership of the means of production (i.e., the relationship was characterized by a market governance structure)
  3. Firms that used just-in-time purchasing methods at least to some minimal extent to coordinate the exchange between buyer and supplier

The seventh through ninth demographic items in table 30 (pp. 189-90) were used to qualify respondents with respect to the above enumerated requirements.

#### Selection of the Sampling Frame

Clearly, the objective of any researcher should be to draw a sample that is representative of the population being studied. Generally speaking, it is assumed that if a sampling frame of all elements in the population is available, a random sampling of those elements should insure representativeness (Kerlinger, 1973). The objectives and/or circumstances of a given research endeavor, however, may preclude such an approach. That was the case in the study at hand.

Infeasibility of a pure random sample. The first mitigating factor to be considered was that the target

population, as defined, consisted of firms that engage in industrial exchange, were independent of one another in terms of ownership, and used just-in-time purchasing methods, at least minimally, to coordinate the exchange between them. Clearly, a listing of all firms meeting these criteria was not available.

Secondly, this study relied on what is known as the "key informant" method, requiring that a knowledgeable individual within each firm be identified. Thus, what was desired was a method that would allow for the collection of data from informed individuals within firms meeting the target population criteria.

Meeting the target population criteria. Unfortunately, there was no source known to the author that would render information relating to the first two criteria (i.e., industrial exchange and independence of ownership). There was, however, survey data published in the literature concerning the degree of implementation of just-in-time purchasing in the U.S.

It was desired that a sample of firms, heterogeneous in its use of just-in-time purchasing methods, be drawn in order to avoid the contaminating effects of a restriction of range on this construct (Cook & Campbell, 1979; Kerlinger, 1973). Finding firms that did not use just-in-time purchasing was not a grave concern because according to Fawcett and Birou, ". . . JIT sourcing practices have not

been adopted universally by U.S. manufacturing firms" (1993:20). It was finding the firms that used just-in-time purchasing methods to a significant degree that was the concern.

Identifying promising industries. According to Fawcett and Birou, "JIT sourcing practices continue to be most frequently used in a relatively small number of industries that are representative of repetitive manufacturing" (1993:20). Thus, identifying those industries was an important step in selecting the sampling frame.

Both Giunipero (1989) and Fawcett and Birou (1993) categorized the respondents to their just-in-time purchasing surveys according to industry. These industries were defined according to two digit SIC code, a classification developed by the U.S. Department of Commerce. The results of this classification may be found in table 32.

Table 32  
Industry Classification of Firms Using  
Just-In-Time Purchasing

Study	Industry	SIC Code(s)	Percent of Firms
Giunipero (1989)	Electronics/electrical	36	30
	Scientific equipment	38, 44	15
	Machinery, except electric	35	15
	Metal products	33, 34	14
Fawcett & Birou (1993)	Transportation equipment	37	30
	Machinery, except electric	35	25
	Electronics/electrical	36	23
	Metal products	33, 34	13
	Other	?	9

Adapted from: Fawcett, Stanley E., & Birou, Laura M. 1993. Just-In-Time Sourcing Techniques: Current State of Adoption and Performance Benefits. Production and Inventory Management Journal, 34(1): 18-24.

Giunipero, Larry C. 1989. Just-In-Time Purchasing: An AME Research Report. Wheeling, IL: Association for Manufacturing Excellence.

In addition, Giunipero (1989) asked survey respondents to indicate the types of products/materials most commonly sourced using just-in-time purchasing methods. Table 33 contains a summary of the results.

Table 33  
Products/Materials Sourced Using Just-In-Time Purchasing

Category of Product/Material	Respondents Sourcing
Raw materials	103
Electronic parts and components	59
Packaging and MRO	44
Mechanical parts	20
Fabricated parts	3

Adapted from: Giunipero, Larry C. 1989. Just-In-Time Purchasing: An AME Research Report. Wheeling, IL: Association for Manufacturing Excellence.

Of the product/material categories cited in table 33, most of the categories could be expected to be sourced in all of the industries listed in table 32. Probably the only category that would be associated with a specific industry would be electronic parts and components. It would stand to reason that this category of products/materials would be

most closely associated with SIC 36, Electronic and Other Electrical Equipment and Components.

Finally, Freeland (1991) surveyed firms about the benefits that they had experienced as a result of just-in-time purchasing implementation. Responses fell into the categories of "High-JIT Benefits", "Low-JIT Benefits", and "No JIT Purchasing". Of the industries listed in table 32, only SIC 36 appeared in all three of these response categories; indicating heterogeneity of just-in-time purchasing implementation in that industry.

Consequently, the sampling frame was selected from SIC 36, Electronic and Other Electrical Equipment and Components. A single industry was targeted in order to mitigate the impact of cross-industry structural and contextual differences and the rival alternative hypotheses that they might impose. This approach was in concert with the work of other authors who have concentrated on single industries in order to avoid possible cross-industry contaminating effects (Chun, 1991; Gaski, 1986; Metcalf, Frear, & Krishnan, 1992; Waller, 1993).

#### The Key Informant Method

The key informant method was used for purposes of data collection. The key informant method has been advocated and used by numerous other authors conducting similar research (Chun, 1991; Heidi & John, 1988; Heidi & Miner, 1992; John & Reve, 1982; Noordewier, John, & Nevin, 1990; Waller, 1993).

Using this methodology, a key informant is selected within each firm to provide the required information. According to Campbell (1955), key informants must: (1) by virtue of their position be knowledgeable about the issues in question, and (2) be willing and able to communicate via the research instrument.

In this study, purchasing managers and agents were relied upon to complete the research instrument. This was a logical choice as these individuals should have been the most informed within the firm about the use of just-in-time purchasing methods, the nature of relationships with suppliers, and they should have had access to the purchasing records that contain data pertaining to the measures of purchasing performance.

Survey sanctioned by NAPM. Regarding the willingness of key informants to respond, it was the desire of the author to have the survey sanctioned by a professional organization to which the key informants belonged. This tactic has been used, for the same reason, by numerous other researchers (Fawcett & Birou, 1993; Giunipero, 1989; Sriram & Mummalaneni, 1990; White, 1990).

For that purpose, the National Association of Purchasing Management (NAPM) was contacted and agreed to provide a sampling frame of purchasing managers and agents employed in SIC 36. The sampling frame consisted of 5,274

NAPM members that had indicated that their primary business was in SIC 36.

#### Sample Size

The effect of sample size on statistical power is an important consideration that is frequently overlooked by researchers. Statistical power is simply the likelihood that a null hypothesis, that is indeed false, will be rejected. Statistical power is computed as:

$$\text{Statistical Power} = 1 - \beta;$$

Where:  $\beta$  = risk of a Type II error

Kraemer and Thiemann (1987) suggest that statistical power be in the vicinity of 0.70 to 0.90, while Cohen (1977) suggests a minimum value of 0.80.

While the risk of a Type I error is explicitly considered during hypothesis testing, via the designation of a significance level and the subsequent scrutiny of p-values, the risk of the Type II error and the imputed statistical power of the research design is commonly neglected. The reasons for this oversight are not clear, as statistical power analysis is a fairly straightforward procedure (Kraemer & Thiemann, 1987).

Statistical power is determined by the size of the statistical effect being observed (e.g., correlation,  $\beta$  coefficient, etc.), the significance level selected, the relative power efficiency of the statistical test employed, and sample size. Given a knowledge of the statistical test

performed and the resulting effect size(s) from previous research, it is a simple matter to find the sample size needed to provide a given level of statistical power using widely available tables (Cohen, 1977; Kraemer & Thiemann, 1987).

Previous effect sizes. Studies entailing tests of hypotheses involving constructs germane to this study were scrutinized. Unfortunately, not all studies reported sufficient information to accommodate a power analysis. The studies that did provide such data are summarized in table 34 along with the type of statistical test utilized, the range of effect sizes observed, and the corresponding sample size needed to achieve a statistical power of 0.80. The sample sizes were determined, based on available tables, by considering the design parameters of the studies (e.g., type of statistical test, hypothesis test -- one or two-tailed, etc.) and by employing a significance level of 0.05.

Sample size needed for factor analysis. In table 34, the largest sample size indicated was 133. But, an additional consideration was that one of the constructs involved in the study required construct validation via a factor analytic approach.

Hair, Anderson, and Tatham (1987) suggest that a conservative estimate of the sample size required for factor analysis would be four to five times as many observations as

Table 34  
Required Sample Sizes Based on Previous Studies

Study	Type of Statistic	Range of Effect Sizes Observed	Required Sample Size (Power=0.80)
Handfield (1993)	Pearson's Product-Moment Correlations	0.58 to 0.60	~18 to 22
Heide & John (1990)	Pearson's Product-Moment Correlations	0.23 to 0.57	~22 to ~133
Heide & Miner (1992)	Pearson's Product-Moment Correlations	0.23 to 0.45	35 to ~133

variables to be analyzed. In the study at hand, there were fifteen variables to be factor analyzed. Thus, a conservative estimate of the required sample size required for factor analysis was seventy-five (i.e., 15\*5). A sample of 133, previously designated, would be sufficiently large to accommodate factor analysis.

Response rate. The final consideration in the issue of sample size determination was that of response rate. If 133 observations were desired, the effect of nonresponse must be taken into account when determining the initial sample size. Table 35 presents a number of similar studies, their initial sample sizes, final number of usable observations, and consequent response rates.

Using the most conservative estimate of a 24 percent response rate, the initial sample size imputed was 555

Table 35  
Response Rates from Similar Research

<b>Study</b>	<b>Initial Sample Size</b>	<b>Usable Observations</b>	<b>Usable Response Rate</b>
Chun (1991)	400	167	42%
Heide & John (1990)	579	175	30%
Heide & Miner (1992)	579	155	27%
Waller (1993)	1,035	248	24%

(i.e., 133/0.24). Thus, to be conservative, the sample size was set at eight hundred.

Sampling method. A sample of eight hundred individuals was selected from the sampling frame of some 5,274 elements, representing roughly 15 percent of the total sampling frame. A dual-stage cluster sampling procedure was used to select the sample.

Each of the 479 clusters consisted of the names and addresses of twelve purchasing managers/agents. A total of 134 clusters were randomly selected. Then, six purchasing managers/agents were randomly selected per cluster.

#### Rationale for the Mail Survey

A large sample, such as the sample of this study, presents some significant obstacles to the researcher in terms of the time and resources required to collect such a sample. According to Fowler (1988), the use of the mail

survey is dictated by pragmatism when dealing with large samples because:

1. The mail survey may be conducted at a relatively low cost.
2. The mail survey may be conducted with minimal resources (e.g., facilities and staff).
3. The mail survey provides access to geographically dispersed samples and samples that are difficult to reach by telephone or in person.
4. The mail survey allows respondents adequate time to give thoughtful answers, to look up information, or to consult with other informed parties.

For all of these reasons, the mail survey was employed in this research.

#### Survey Methodology

The mail survey methodology used in this study was modelled after Dillman's (1978) Total Design Method. The questionnaire was constructed to conform to guidelines offered by Dillman (e.g., an illustration on the first page, no questions on the first page, etc.).

Dillman's Total Design Method utilizes a four step procedure as follows:

1. The initial mailing consists of a cover letter explaining the research, its significance, and a guarantee of confidentiality. Also included are a copy

- of the questionnaire and a self-addressed, stamped envelope.
2. The second mailing occurs one week later and consists of a postcard containing a reminder as to the importance of the respondent's participation, and a solicitation for the same.
  3. The third mailing occurs three weeks after the initial mailing and consists of another cover letter and replacement questionnaire.
  4. The final mailing comes seven weeks after the initial mailing and consists of a cover letter and a replacement questionnaire.

Copies of the text to each of the four mailings may be found in appendix B.

#### Summary

In this section, issues surrounding the collection of data were addressed. The target population was defined and the selection of a sampling frame from that target population was discussed. A sample of size eight hundred was selected in order to insure adequate statistical power, and a mail survey was used given the size of the sample. Finally, a description of the mail survey methodology was offered.

#### Step 4 - Refinement of Measurement Scales

The purpose of scale refinement was to insure that items were properly assigned to scales and that the scales were reliable. In order to accomplish this, two types of analyses were performed. Correlational analysis was used to evaluate the assignment of items to scales. Following this, reliability analysis was used to judge the internal consistency of the scales. The conduct of these analyses is discussed below, but a discussion of the results is deferred until the next chapter.

##### Correlational Analysis

Correlational analysis was used to evaluate the appropriateness of the assignment of measurement items to scales. The objective was to confirm that items were assigned with other measurement items to which they were theoretically linked. Measurement items that are indeed linked to the same construct should evidence that relationship when subjected to empirical scrutiny.

This scrutiny comes in the form of correlational analysis; measurement items related to the same construct should correlate highly with each other. Two types of correlational analyses were used to make this judgement.

Item-total correlations. The analysis of item-total correlations involved computing the correlation of each item with the total of all items. Churchill (1979) and Nunnally (1978) both recommend a minimum correlation of  $\pm 0.30$  for

this analysis. Any item exhibiting an item-total correlation of less than  $\pm 0.30$  was eliminated.

Item-scale correlations. The second form of correlational analysis involved the computation of item-scale correlations. In this analysis, each item was correlated with all scales.

If an item correlated more highly with a scale other than the one to which it was alleged to belong, especially if the item-scale correlation with its alleged scale was low, then the item was reassigned to the scale with which it was highly correlated. If an item was highly correlated with more than one scale, then the item was deleted (Nunnally, 1978; Saraph, Benson, & Schroeder, 1989).

#### Potential for Common Method Variance

The correlation of an item with the scale to which it was alleged to belong should have exceeded its correlation with any other scale by a wide margin. A narrow margin between item-scale correlations is a possible indicator of common method variance. When relying on a survey method for measuring all variables, caution must be taken to avoid common method variance (Podsakoff & Organ, 1986).

Common method variance arises because of the tendency of subjects to attempt to respond consistently to items that they perceive to be similar. This tendency can potentially result in spurious significance when subsequently testing relationships between constructs.

As a test for the potential for common method variance, the expert sample of ten operations management faculty inspected the multiple item scales for redundancy of items across scales. There was no consistent judgement among the experts of any redundancy. A second precaution for dealing with potential common method variance involved the deletion of items that correlated highly with more than one scale.

Precursor to reliability analysis. Correlational analysis is a precursor to reliability analysis (Gerbing & Anderson, 1988). Correlational analysis resulted in sets of homogeneous measurement items; a necessary condition for reliability.

#### Reliability Analysis

Kerlinger (1973) defines reliability as the accuracy or precision of a measurement scale. Reliability refers to the homogeneity or internal consistency of scale items that are used to represent a latent construct. Items that are internally consistent will vary together; a scale that is unreliable consists of items that vary unpredictably, thereby inflating measurement error. As such, reliability is a basic requirement for statistical conclusion validity, as excessive measurement error commonly results in Type II errors (Cook & Campbell, 1979).

Cronbach's alpha. While there are many alternative reliability measures, Cronbach's (1951) coefficient alpha ( $\alpha$ ) is the most commonly used (Carmines & Zeller, 1979).

Coefficient alpha may assume values between zero and one, with values converging on one connoting higher levels of reliability. As has been previously noted, Nunnally (1978) recommends minimum reliability coefficients of 0.70 for established scales and 0.60 for exploratory work.

The SPSS PC+ reliability analysis routine was used to compute coefficient alpha. This routine considers all possible combinations of items for a scale and indicates the set of items that will maximize coefficient alpha (Norusis, 1985). Thus, the output was scrutinized and items identified as candidates for deletion in order to maximize the reliabilities of the measurement scales.

Item deletion. The decision as to whether to delete an item also depended on the factor loading pattern of the item established during exploratory factor analysis. The exploratory factor analysis process is addressed subsequently in the discussion of construct validation.

#### Summary

In this section, the scale purification process was detailed. The first step of this process, correlational analysis, was performed to assure that the assignment of items to scales was appropriate and to avoid the contaminating effects of common method variance. This step was a precursor to the second step, reliability analysis. Reliability analysis established the internal consistency of the scales. This is a critical determination as reliability

has a direct impact on measurement error. As has been noted, excessive measurement error threatens statistical conclusion validity and, therefore, it is important that it be minimized through the scale purification process.

#### Step 5 - Assessment of the Validity of the Measures

Issues surrounding the assessment of the validity of the measures used in this study are discussed in this section. While methods for the assessment of validity are outlined below, the results of validity assessment are deferred until the next chapter.

To recapitulate, the validity of a measure is the degree to which it measures what is intended to be measured (Kerlinger, 1973). Content validity has already been defined and methods for assessing content validity outlined. Other types of validity include criterion-related validity, construct validity, and nomological validity. Each of these types of validity are defined in turn and methods outlined for their assessment.

##### Criterion-Related Validity and Its Assessment

The criterion-related validity of a measure refers to the ability of the measure to predict the behavior of a phenomena or criterion. There are two types of criterion-related validity that are distinguished by their time orientation. Concurrent validity refers to the ability of a measure to predict the behavior of the criterion at the same

point in time. Predictive validity refers to the ability of a measure to predict the behavior of the criterion in the future (Carmines & Zeller, 1979; Kerlinger, 1973).

Unfortunately, according to Carmines and Zeller:

. . . criterion validation procedures have rather limited usefulness in the social sciences for the simple reason that, in many situations, there are no criteria against which the measure can be reasonably evaluated. (1979: 19)

This drawback certainly applied to the study at hand. Of the measures of the study, only the measure of just-in-time purchasing implementation had a reasonable, albeit arguably weak, criterion against which to be evaluated.

Recall that the measure of just-in-time purchasing implementation consisted of a summated score of the responses on the two dimensions of just-in-time purchasing performance criteria and just-in-time purchasing coordination methods (table 31, p. 192). The reader will also recall that one of the demographic items required a self-report of the degree to which the firm had implemented just-in-time purchasing (eighth item, table 30, p. 189).

This demographic item served as the criterion.

Using a concurrent approach, scores on this demographic item were correlated with just-in-time purchasing implementation summated scores. Given the ordinal nature of both variables, Spearman's Rank Order Correlation served as the measure of correlation.

### Construct Validity and Its Assessment

According to Peter, a measure is construct valid:

- 1) to the degree that it assesses the magnitude and direction of a representative sample of the characteristics of the construct and 2) to the degree that the measure is not contaminated with elements from the domain of other constructs.

(1981: 134)

Construct validity is not evaluated directly per se, rather, a judgement of construct validity rests on evidence of convergent and discriminant validity (Peter, 1981).

The first element of the above definition of construct validity connotes convergent validity, or the degree to which different measures of the same construct relate strongly to each other. The second element of the definition corresponds to discriminant validity, or the degree to which measures of different constructs do not relate strongly to each other (Carmines & Zeller, 1992).

Campbell and Fiske (1959) provide a method for simultaneously estimating convergent and discriminant validity known as the Multitrait-Multimethod Matrix. This approach requires the simultaneous estimation of two or more traits (i.e., constructs) using two or more methods (e.g., surveys, interviews).

Pragmatic reasons (e.g., time, expense) commonly dictate that the Multitrait-Multimethod approach not be used, and such was the case in this study. Fortunately, convergent and discriminant validity may be and are most commonly established using a factor analytic approach

(Bagozzi, Yi, & Phillips, 1991; Gerbing & Anderson, 1988; Spector, 1992).

#### Establishing Discriminant Validity

Discriminant validity may be established in two ways other than via the Multitrait-Multimethod Matrix. The first method involved exploratory factor analysis (Bagozzi, Yi, & Phillips, 1991). In performing an exploratory factor analysis, a number of decisions must be made by the researcher.

The extraction method. The first decision regards the method to be used for factor extraction. Hair, Anderson, and Tatham (1987) recommend the use of the component analysis factor extraction method when the researcher has some a priori knowledge concerning the factor structure expected in the data. This author had such knowledge based on the literature review and the factor structures obtained by other authors (e.g., Chun, 1991; Noordewier, John, & Nevin, 1990).

Number of factors. The next decision regards the number of factors to be retained in the factor solution. Two methods suggested by Hair, Anderson, and Tatham (1987) were relied upon to make this determination.

Latent root criterion. The latent root criterion dictates that as many factors be retained as have eigenvalues greater than one. Thus, only factors meeting this criterion were extracted.

Scree criterion. Using the scree test criterion, factors were arrayed by decreasing eigenvalues resulting in a scree plot. The scree plot was then examined to discern the point at which there was a significant change in the slope of the plot; only factors before this significant change were retained.

Consistency of results. The use of two different methods may seem somewhat confusing. It has been asserted that the scree test is generally the preferred method in practice (Kim & Mueller, 1978b). The scree test was the method upon which this author primarily relied. However, it has been found that for large samples, the findings of the latent root and scree test criteria are commonly the same (Hakstian, Rogers, & Cattell, 1982).

Orthogonal rotations. The final decision regards the method used to rotate the factor solution to improve interpretability of the factors. Hair, Anderson, and Tatham (1987) suggest the use of an orthogonal rotation when it is desired that the original variables be reduced to a smaller set of uncorrelated variables for subsequent use in regression or other predictive models. Such was the case in this study, and the use of an orthogonal rotation was consistent with the practice of other authors engaged in similar research (Chun, 1991; Waller, 1993).

Thus, the factor solutions were subjected to VARIMAX, QUARTIMAX, and EQUAMAX rotations -- all orthogonal

rotations. The rotation yielding the clearest pattern of factor loadings was then selected. In analyzing the factor loadings, the traditional rule-of-thumb concerning factor loadings was used. This rule dictates that only factor loadings in excess of the  $\pm 0.30$  to  $\pm 0.40$  range be considered significant (Gerbing & Anderson, 1988; Gorsuch, 1974; Hair, Anderson, & Tatham, 1987).

Factor loadings. Analysis of the factor loading patterns provided evidence of discriminant validity. That is, for the scales that were theorized to consist of multiple dimensions or factors (i.e., governance structure/relationalism), the loading pattern should have shown items alleged to belong to a particular factor loading highly on that factor. Furthermore, the loadings of those items should have been low on all other factors.

Items defying the desired pattern (e.g., loading highly on numerous factors) were deleted. Also, the loading patterns of items identified as candidates for deletion during the reliability analysis were scrutinized especially carefully. Only if their loading pattern was highly desirable were these items retained.

Content validity concerns. All deletion decisions were tempered by a concern for content validity. That is, some items might have had to be retained even though they had some undesirable characteristic(s) in order to maintain content validity.

Scale-scale correlations. A second method for establishing discriminant validity was used. Using this method, all scales were correlated with every other scale. The scale-scale correlations were then compared to the scale reliabilities. If the reliability for each scale exceeded all correlations with other scales, this was construed as additional evidence of discriminant validity (Kaufmann & Dant, 1991).

#### Establishing Convergent Validity

Once the scales had been modified as a result of the correlational, reliability, and exploratory factor analyses, they were subjected to confirmatory factor analysis. The use of confirmatory factor analysis is commonly accepted as the means to providing evidence of convergent validity (Bagozzi, Yi, & Phillips, 1991; Gerbing & Anderson, 1988; Spector, 1992).

Establishing unidimensionality. The purpose of performing confirmatory factor analysis is to establish the unidimensionality of the measures. According to Gerbing and Anderson: "Unidimensionality refers to the existence of a single trait underlying a set of measures" (1988: 186). According to these authors, unidimensionality is a necessary but not sufficient condition for establishing construct validity.

A one factor model. In order to perform a confirmatory factor analysis, the number of factors underlying a data set

must be hypothesized. In the instance of a unidimensional scale, the hypothesis was that one factor underlies the observed data.

Using a maximum likelihood factor solution, this hypothesis was empirically tested. The hypothesized number of factors was stated a priori, then the factor structure of the observed data was compared to the hypothesized factor structure. A large sample chi-square goodness-of-fit test was performed to test for consistency between the observed structure of the data and the hypothesized structure. Unidimensionality implies one factor underlying the data, thus the hypotheses of interest were:

$H_0$ : The observed factor structure is consistent with a unidimensional factor structure (i.e., one factor).

$H_a$ : The observed factor structure is not consistent with a unidimensional factor structure (i.e., more than one factor).

Since the desire was to establish the unidimensionality of the measures, the preferred outcome was an insignificant value of the chi-square statistic. A failure to reject the null hypothesis did not prove that a measure was unidimensional, it simply meant that the observed structure of the data was consistent with a unidimensional structure.

However, as has been noted previously, the results of this hypothesis test should be viewed with caution. It has been shown that the chi-square statistic may reach significance even for data that shows adequate fit to a

unidimensional structure. The assumptions of the test (e.g., multivariate normality) are frequently violated in practice and the statistic is also greatly influenced by sample size, the number of factors, and the number of variables per factor (Anderson & Gerbing, 1984; Long, 1983).

Therefore, it is recommended that the chi-square statistic be treated as an index of model fit rather than relying on it explicitly as a test statistic. In the former role, smaller values of the chi-square statistic serve as an indicator of fit between the observed and hypothesized covariance structures, while large values indicate lack of model fit (Anderson & Gerbing, 1984; Joreskog & Sorbom, 1981; Long, 1983). Likewise, the rule-of-thumb

Only one subscale assessed. In the study at hand, each of the subscales of the governance structure/relationalism scale (i.e., flexibility, information exchange, collaboration, continuity, feedback) were to be tested for unidimensionality. However, following the correlational, reliability, and exploratory factor analyses, only two subscales remained. Only one of these subscales, however, had a sufficient number of items to permit a maximum likelihood factor analysis.

Examination of factor loadings. The factor loading pattern of the subscale was examined. Significant loadings of all items provided an additional indicator of the

convergent validity of the measure (Bagozzi & Phillips, 1982).

In the event that the hypothesis of unidimensionality was not sustained, or in the face of undesirable loading patterns, items would have been considered for deletion in order to rectify the problem(s). As before, the deletion decision would be moderated by the desire to maintain content validity.

#### Nomological Validity and Its Assessment

Nomological validity refers to the way in which measures (i.e., representations of constructs) relate to each other as prescribed by the underlying theory (Peter, 1981). Churchill (1979) refers to the totality of relationships between constructs in a theoretical model as a "nomological net". Churchill asserts that nomological validity has to do with the degree to which constructs behave as expected in the context of the nomological net.

Nomological validity is really an extension of, or the final destination of establishing construct validity. Acknowledging this, Gerbing and Anderson assert: "The goal of most research projects is not just to develop unidimensional and reliable measurement scales, but to build and test theory" (1988: 191).

Because establishing nomological validity requires the testing of theorized relationships, the demarcation between establishing nomological validity and the hypothesis testing

process is blurred. Hypothesis testing provides the evidence upon which a judgement of nomological validity is founded. For that reason, the discussion of establishing nomological validity will end at this juncture, deferring to the discussion of hypothesis testing in the next section of this chapter.

#### Summary

The process of establishing the validity of the measures was discussed in this section. Criterion-related validity was defined and its assessment discussed. Unfortunately, only the just-in-time purchasing implementation construct had a reasonable criterion upon which criterion-related validity could be assessed.

Construct validity was defined and methods outlined for its assessment via the evaluation of discriminant and convergent validity. Discriminant validity was judged via the use of exploratory factor analysis and the analysis of scale-scale correlations. Confirmatory factor analysis was used to establish convergent validity. Finally, nomological validity was defined and its assessment deferred to the next section as part of the discussion of hypothesis testing.

#### Step 6 - Data Analysis and Hypothesis Testing

The data analysis procedures, including the statistical methodology that was employed to test the hypotheses advanced in this study, are discussed in this section. The

results of data analysis and hypothesis testing are deferred until the next chapter.

To begin, the process of data transformation, analysis of response rates, and respondent profiling are discussed. Statistical analysis of respondent profile data provided the basis for respondent qualification and testing for nonresponse bias, thus, these issues are discussed in turn.

The issue of controlling for the effects of potential moderating variables is discussed and methodology outlined toward that end. Finally, the hypotheses advanced in chapter II are reformulated to accommodate the moderating variables. The research hypotheses are then restated as statistical hypotheses, to facilitate testing, and the discussion focuses on the statistical methods that were utilized to test each hypothesis.

#### Preliminary Data Manipulation and Profiling

Scale transformations and summations were performed, followed by a scrutiny for outliers and data entry errors. Once the data had been prepared for analysis, response rates were computed. Following this, a demographic profile of respondents was prepared based on frequency distributions of the first six demographic items (table 30, pp. 188-89).

#### Respondent Qualification

The seventh through ninth items from table 30 (pp. 189-90) were used for purposes of respondent qualification.

These items were scrutinized in order to insure that respondents met the target population criteria (pp. 196-97).

Knowledge of supplier. The seventh item from table 30 (p. 189) inquired as to the knowledge of the respondent concerning the supplier that had been selected. As the selection of the component and supplier of reference was at the respondent's discretion (see cover page of questionnaire in appendix A), it is logical to assume that few respondents would have selected a supplier with whom they had little or no familiarity. Nonetheless, those respondents that indicated a response with a value of less than four on this scale were assumed to have an inadequate knowledge of the supplier and were disqualified from the sample.

Use of just-in-time purchasing. The eighth item from table 30 (p. 189) inquired as to the degree to which just-in-time purchasing was used in the relationship with the selected supplier. The reader will recall that one of the criteria for the target population was that it consists of firms that use just-in-time purchasing at least to some minimal extent. The operational definition of this qualification was not offered a priori. Rather, the frequency distribution for the eighth item was scrutinized in order to identify natural groupings of respondents.

Once identified, the integrity of these groupings was assessed. This assessment was based on an analysis of the summated scores on the just-in-time purchasing

implementation (JITP) scale. Given the ordinal nature of this summated scale, the Kruskal-Wallis one-way analysis of variance (ANOVA) by ranks was employed for purposes of this analysis.

The Kruskal-Wallis one-way ANOVA by ranks assumes only that the data is at least of an ordinal nature (Siegel & Castellan, 1988). Based on the visual analysis of the frequency distribution for the eighth item, two natural groupings were formed. Using the Kruskal-Wallis one-way ANOVA by ranks, the hypotheses of interest were:

$H_0$ : The two groupings came from a population with the same median just-in-time purchasing (JITP) summated score.

$H_a$ : The two groupings came from different populations with different median just-in-time purchasing (JITP) summated scores.

Obviously, the desire was to reject the null and conclude that the two groupings had been drawn from populations exhibiting different levels of just-in-time purchasing usage (i.e., as reflected by the just-in-time purchasing implementation summated score).

Subsequently, the first group of respondents, representing firms that did not use just-in-time purchasing or used it to only a trivial degree, were disqualified from the sample.

Independence of ownership. Finally, the ninth item from table 30 (p. 190) required the respondent to indicate any ownership interest in the supplier by the respondent's

firm. The reader will recall that another criteria of the target population is independence of ownership of the buyer and supplier firms. Thus, respondents giving a response indicating any ownership interest in the supplier firm were disqualified from the sample.

#### Testing for Nonresponse Bias

Armstrong and Overton (1977) recommend that the characteristics of early respondents be compared to the characteristics of late respondents in order to test for nonresponse bias. These authors allege that late respondents are more similar to nonrespondents than are early respondents. Thus, any significant difference between early and late respondents could be an indicator of potential differences between respondents and nonrespondents.

The demarcation between early and late response was established after the first mailing or "wave" of the survey. Respondents were categorized as having responded to the first wave, or to the second or a later wave.

Chi-square tests of independence were conducted on the first six demographic items of table 30 (pp. 188-89), that were used to profile the sample, in order to test for significant differences between the early and late respondent groups. The relevant hypotheses were:

$H_0$ : There is no difference, in the observed frequencies across the demographic variable

response categories, between the early and late respondent groups.

H<sub>a</sub>: There is a difference, in the observed frequencies across the demographic variable response categories, between the early and late respondent groups.

Clearly, the desire was that all six chi-square tests prove insignificant. This would indicate that there was no significant difference in the profile of characteristics of early versus late respondents.

#### Controlling for Moderating Variables

A moderating variable influences or regulates the relationship between two other variables (Arnold, 1982).

Kerlinger terms this type of variable an "extraneous" variable and recommends that; ". . . influences of independent variables extraneous to the purposes of the study (be) minimized, nullified, or isolated" (1973: 309).

The effect of an extraneous variable may be minimized, isolated, or nullified by: (1) selecting a sample that is homogenous on that variable, (2) pure randomization in selection, or (3) building the variable into the design as an independent variable (Kerlinger, 1973). In the study at hand, the effect of moderating variables was isolated via the third option. Moderating variables were explicitly measured and their influence controlled for via statistical means.

The literature was reviewed to identify potential moderating variables. Product importance (i.e., the importance of the component/material being studied to the overall product) and the length of the relationship with the supplier are two moderating variables that have proven to be significant in analyses performed by researchers conducting similar research (Handfield, 1993; Heide & John, 1990; Noordewier, John, & Nevin, 1990; Waller, 1993).

Employing the first of the options mentioned above, Handfield (1993) and Waller (1993) used a strategy of selecting only major suppliers of high value-added components/materials for their studies. Utilizing the third option, Heide and John (1990) and Noordewier, John, and Nevin (1990) used various measures of product importance as independent variables in regression/ordinary least squares models.

The measure of product importance that consistently reached statistical significance in these models was the percentage of the end product's value represented by the component/material being studied. Thus, this measure of product importance was utilized as a control variable in this study and is represented by the tenth demographic item from table 30 (p. 190).

Heide and John (1990) also used the length of relationship with the supplier as an independent control variable and found it to be statistically significant.

Thus, length of relationship will also be used as a control variable in this study and is represented by the eleventh demographic item from table 30 (p. 190). The treatment of these control variables is discussed specifically in the ensuing discussion of hypothesis testing.

#### Hypothesis Testing

The research proposition of the study concerned the purchasing performance (i.e., in transaction cost terms) implications of the congruence between the degree of implementation of just-in-time purchasing methods and the governance structure (i.e., degree of relationalism) observed in operation. That research proposition is:

P: Purchasing performance (as reflected by transaction costs) is influenced by the congruence between the extent of implementation of just-in-time purchasing methods and the governance structure in operation (i.e., the degree of relationalism).

#### Constructing the Congruence Factor

The method for identifying firms at varying levels of use of just-in-time purchasing has already been addressed in the discussion of respondent qualification (pp. 225-226). In that discussion, it was noted that firms that did not use just-in-time purchasing or used it to a trivial degree were eliminated from the sample.

Advanced just-in-time purchasing usage. The remaining cases, representing firms that used just-in-time purchasing, were scrutinized to identify the group that exhibited the

most advanced level of usage of just-in-time purchasing methods. The same methodology was used, and the integrity of the two resulting groupings (i.e., JITP and advanced JITP usage) was tested via a Kruskal-Wallis one-way ANOVA by ranks. Only the advanced just-in-time purchasing users were retained for further analysis.

Advanced relationalism. The governance structure/relationalism scores of respondents were analyzed in the same manner. First, two groups were identified graphically (i.e., high relationalism and low relationalism). Then, the integrity of the grouping was tested using the Kruskal-Wallis one-way ANOVA by ranks.

Categorization of respondents. Jointly considering the levels of just-in-time purchasing implementation and governance structure/relationalism, respondents were codified into the categories of the congruence factor shown in figure 9 (p. 159).

Only respondents whose firms were advanced in just-in-time purchasing usage were considered. Furthermore, these respondents were categorized as being either high or low in relationalism.

High congruence (i.e., a good fit) resulted when firms advanced in the implementation of just-in-time purchasing were also high in relationalism. Low congruence (i.e., a poor fit) resulted when firms advanced in just-in-time purchasing usage were low in relationalism.

### Controlling for Moderating Variables

In the case of the research proposition and its related hypotheses, variation in the purchasing performance construct was explained by the congruence between the level of deployment of just-in-time purchasing methods and the nature of the governance structure that regulates the relationship between buyer and supplier. It was important to identify variables that have the potential for moderating this proposed relationship.

Product importance. Irrespective of the congruence issue, it is hardly controversial to assert that rational firms will devote higher levels of managerial attention and effort to the management of material/components of a critical nature. Indeed, this fact has been asserted by other authors (Heide & John, 1990; Noordewier, John, & Nevin, 1990).

A logical corollary to this is that increased attention to the management of such critical material/components should be reflected in improved performance metrics. Thus, the performance (i.e., in transaction cost terms) of firms exhibiting both high and low levels of congruence should vary in proportion to the importance of the material/component being studied.

Length of relationship. Theoretical models founded on the notion of dyadic exchange emphasize the significance of repeated interactions over time. It is through repeated

interactions that relationships are formed (IMP Project Group, 1982).

In just-in-time purchasing exchange environments, the development of coordination between buyer and supplier is especially difficult and critical, given the conditions imposed by frequent interaction, high uncertainty, and frequent and ongoing adaptation. The synchronization of the internal factory with the external factory cannot be achieved instantaneously; it is the product of repeated interaction -- repeated trial-and-error.

Thus, it follows that exchange efficiency, in part, will be determined by the learning that has occurred as a result of repeated interaction. Moreover, the number of interactions should be roughly proportional to the time frame that buyer and seller firms have been interacting. "Practice makes perfect" may be an overused cliche, yet it is difficult to deny the veracity of this statement.

Controlling for moderators. In the situations just described, the behavior of a response variable (i.e., purchasing performance in the form of transaction costs) is to be explained via a categorical variable (i.e., low vs. high congruence between the use of just-in-time purchasing and the degree of relationalism) known as a factor.

Additionally, the response variable varies in proportion to other variables (i.e., product importance and length of relationship) known as covariates. Thus, an

analysis of covariance (ANCOVA) was used to control for the effect of these covariates on the response variable.

ANCOVA assumptions. The use of ANCOVA presumes that the response variable is a continuous variable, that the factor is measured on a nominal basis consisting of k categories or levels, and that the covariate is a continuous variable that is linearly related to the response variable. It is also assumed that the response variable is normally distributed and that there is homogeneity of variance between the levels of the factor. The F-test used in ANCOVA, however, is quite robust to departures from the last two assumptions (Hair, Anderson, & Tatham, 1987).

In the case at hand, three separate ANCOVA's were conducted. The use of ANCOVA is justified due to the fact that purchasing performance, represented by transaction costs, was measured using three surrogate variables (i.e., inventory turns, proportion of late deliveries, proportion of nonconforming material) that were assumed to be ratio in strength. Furthermore, the factor of congruence was measured at two levels (i.e., high congruence/good fit, and low congruence/poor fit). Finally, product importance and length of relationship, the covariates, were assumed to be ratio in strength as well. Thus, the necessary assumptions were met to justify the use of ANCOVA.

Tests of Hypotheses

Through the use of ANCOVA, the effect of the covariates was nullified and the resulting hypothesis tests concerned the equality of means of the response variable across the k levels of the factor. Stated in generic terms, the relevant statistical hypotheses were:

$$H_0: \mu_1 = \mu_2 = \dots = \mu_k$$

$$H_a: \mu's \text{ are not all equal}$$

The three research hypotheses derived from the research proposition were:

- H1: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower possession costs (i.e., higher inventory turnover) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H2: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of late deliveries) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H3: Firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of nonconforming incoming material) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).

These hypotheses were revised to reflect the strategy of controlling for the moderating effects of product importance and the length of relationship. The modified hypotheses were:

- H1: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower possession costs (i.e., higher inventory turnover) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H2: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of late deliveries) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).
- H3: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of nonconforming incoming material) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).

Finally, the research hypotheses were converted to statistical hypotheses to facilitate testing. The statistical hypotheses were:

$$H1_o: \mu_{PCOST} \text{ for "good fit"} \geq \mu_{PCOST} \text{ for "poor fit"}$$

$$H1_a: \mu_{PCOST} \text{ for "good fit"} < \mu_{PCOST} \text{ for "poor fit"}$$

$$H2_o: \mu_{ACOST1} \text{ for "good fit"} \geq \mu_{ACOST1} \text{ for "poor fit"}$$

$$H2_a: \mu_{ACOST1} \text{ for "good fit"} < \mu_{ACOST1} \text{ for "poor fit"}$$

$$H3_o: \mu_{ACOST2} \text{ for "good fit"} \geq \mu_{ACOST2} \text{ for "poor fit"}$$

$$H3_a: \mu_{ACOST2} \text{ for "good fit"} < \mu_{ACOST2} \text{ for "poor fit"}$$

#### Post-Hoc Power Analysis

A post-hoc power analysis was performed for hypothesis tests that were nonsignificant or only marginally

significant. The sample size needed to achieve a level of statistical power of 80 percent was determined using a significance level of 5 percent; assuming a one-tailed hypothesis test.

#### Summary

The discussion of hypothesis testing began with a restatement of the research proposition. The construction of the congruence factor was outlined, moderating variables identified, and the statistical tests to be used and their associated assumptions were detailed. Finally, the research hypotheses were restated, modified to reflect the strategy of controlling for moderating variables, and then restated as statistical hypotheses.

#### Section Summary

This section of the methodology has enumerated the statistical methods to be employed in the analysis of data and hypothesis testing. First, procedures for the transformation and preparation of the data for analysis were outlined. A discussion of respondent qualification procedures and a test for nonresponse bias followed.

The topic of moderating variables was introduced and discussed. This issue played an important role in the ensuing discussion of hypothesis testing. The research proposition was restated and potential moderating variables identified. The specific statistical tests to be used in

testing the hypotheses were outlined followed by a statement of the research hypotheses to be tested. The research hypotheses were then restated to reflect the strategy of controlling for the effects of the moderating variables and finally restated as statistical hypotheses.

The next and final section of this chapter turns to the issue of the interpretation of the results. Issues of statistical conclusion validity, internal validity, and external validity are addressed. As part of this discussion, the potential limitations of this study are emphasized.

Step 7 - Identification of Limitations  
and Interpretation of the Results

The final step in the research design was to consider the potential threats that would undermine the validity of the findings of the study. By having identified these threats a priori, the deleterious effects of some were mitigated via careful thought and design. The impact of the remaining threats that could not be controlled or mitigated must formally be recognized as limitations of the study. So acknowledged, the reader must correspondingly temper any interpretation of the findings of this study.

In order to identify the relevant threats to the validity of the study, it is first necessary to categorize the research design employed. Subsequently, the various types of validity are defined. The threats germane to each

type of validity, specific to the research design used, are then detailed and possible remedies outlined. Where remedies were unavailable or infeasible, the limitations of the study are stipulated.

#### The Research Design Categorized

This study was a cross-sectional field study that employed a static-group comparison. The study was cross-sectional in that all measurements were taken at one point in time. According to Spector:

Cross-sectional designs are especially attractive in field studies where control over subjects is quite difficult to acquire . . . The cross-sectional approach is quite useful in determining if two or more variables are related, and often establishment of relationships is the extent of a research question (1981: 32-33)

The above definition is significant in two regards; the first concerns a lack of experimental control and the second relates to the purpose of the research design. Relative to the first point, Buckley, Buckley, and Chiang (1976) note that field studies are characterized by the deployment of an experimental design, but a lack of experimental control.

A lack of control. In the study at hand, experimental control over subjects was not feasible. That is, it would have been an insurmountable challenge to find participants that would be willing to allow this author to manipulate the use of just-in-time purchasing methods and the nature of the relationship between the firm and its suppliers.

Furthermore, it is absurd to think that constructs such as

relationalism could have been manipulated by a researcher, even if willing participants were available.

Association versus causation. With respect to the purpose of the research design, the hypotheses of this study were carefully framed to simply test for associations between constructs as specified in the transaction cost economics theoretical model. The purpose was to establish whether the transaction cost economics model is an appropriate framework for studying just-in-time purchasing relationship phenomena.

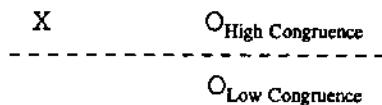
Causality has not been inferred, nor should it be presumed by the reader. The research design employed would not support such a conclusion, nor would it be appropriate at this juncture to attempt to establish causality before having established that the transaction cost economics model is instrumental in the study of just-in-time purchasing exchange relationships. The scientific method is characterized by studied incrementalism. Unfortunately, the integrity of many studies is jeopardized by naive attempts to play "theoretical leapfrog".

Schematic of the research design. The research design of this study may further be categorized as a static-group comparison (Campbell & Stanley, 1963) or as a posttest-only design with nonequivalent groups (Cook & Campbell, 1979). To understand this design, an X will be used to refer to the exposure of a group to an experimental event.

In this study, the event of interest was the implementation of just-in-time exchange and the subsequent development of a relationship to facilitate that exchange. According to Cook and Campbell, the static-group comparison/posttest-only design with nonequivalent groups is useful when the ". . . treatment is implemented before the researcher can prepare for it, and so the research design is worked out after the treatment has begun" (1979: 98).

Further, an O is used to represent a measurement. In this study, measurements of purchasing performance (i.e., transaction costs) were taken for two groups. Both groups consisted of firms that were advanced in their implementation of just-in-time purchasing methods. The relationships of one group, however, were characterized by high levels of relationalism (i.e., high congruence), while the relationships of the other group were characterized by low levels of relationalism (i.e., low congruence).

The static-group comparison design was used to determine the effect of X, or the impact of the congruence between the use of just-in-time purchasing methods and relationalism, on purchasing performance. Diagrammatically, this design appears as follows:



Unfortunately, the static-group comparison design is considered pre-experimental. That is, the design is flawed

to the degree that causality may not be inferred (Campbell & Stanley, 1963; Cook & Campbell, 1979). Thus, the association between congruence and performance has been confirmed by the results of this study, but this may be taken only as evidence of support for the proposition of the study which was stated with respect to associations, not causality.

Such evidence is a necessary but not sufficient condition for establishing causality. That is, if congruence and performance are indeed causally linked, then the association between them should be empirically evident. However, simply establishing the association does not prove causality.

The failure of the static-group comparison design to support judgements of causality has to do with the threats to the validity of this design. In the next part of this section, the various types of validity are discussed, then the specific threats to the validity of the static-group comparison design are enumerated.

#### Types of Validity

Campbell and Stanley (1963) originally defined two basic types of validity -- internal and external validity. According to Cook and Campbell, internal validity is:

. . . the approximate validity with which we infer that a relationship between two variables is causal or that the absence of a relationship implies the absence of cause. (1979: 37)

Furthermore, external validity is:

. . . the approximate validity with which we can infer that the presumed causal relationship can be generalized to and across . . . different types of persons, settings, and times. (1979: 37)

Cook and Campbell have further subdivided internal and external validity into the additional categories of statistical conclusion validity and construct validity. Statistical conclusion validity is a necessary condition for internal validity and construct validity is a necessary condition for external validity.

Internal validity. Internal validity relates to establishing relationships of cause and effect between variables. Variables that are causally linked will covary. Statistical conclusion validity, then, has to do with those threats that can lead to the drawing of false conclusions about covariation. One may either falsely conclude that covariation exists when it does not (i.e., Type I error), or that it does not exist when indeed it does (i.e., Type II error).

External validity. External validity has to do with generalizing results to different people, settings, and times. According to Cook and Campbell, construct validity is critical to establishing external validity because it is the mechanism by which: ". . . we can make generalizations about higher-order constructs from research operations" (1979: 38).

That is, in the conduct of research, abstract constructs must be operationalized or reduced to a form that is meaningful and manageable in practice. However, this process may result in parts of meaning of the construct being lost in the translation (i.e., the basis of convergent validity), or in the inclusion of elements superfluous to the construct (i.e., the basis of discriminant validity).

Thus, in order to ensure generalizability, these errors of omission and/or inclusion must be minimized. Otherwise, the interpretation of and/or reaction to operationalizations of constructs may differ across persons, contexts, or temporal settings due solely to errors in operationalization and not to reasons of cause and effect.

#### Specific Threats to Validity

Each type of research design has particular strengths and weaknesses in terms of protecting against the threats to validity. Campbell and Stanley (1963) enumerate the threats to internal and external validity specific to the static-group comparison design. While Cook and Campbell (1979) outline the generic threats to statistical conclusion and construct validity, this author has highlighted those threats germane to the research design of this study.

#### Threats to Internal Validity

The threats to internal validity that are problematic with the static-group comparison design are selection,

mortality, and the interaction of selection with other threats such as maturation and history (Campbell & Stanley, 1963).

Selection threat. The selection threat refers to the possibility that observed differences between groups could be attributed to the process of recruitment of individuals for the groups and not to the effect of the experimental treatment. In this study, this potentially means that differences in purchasing performance between the high congruence (i.e., good fit) and low congruence (i.e., poor fit) groups may be attributable to something other than congruence.

For example, the low congruence group might have exhibited inferior purchasing performance relative to the high congruence group prior to the implementation of just-in-time purchasing, and any observed difference is just a perpetuation of existing differences. A way to remedy this threat would have been to select groups that were equivalent in purchasing performance terms prior to just-in-time purchasing implementation, an infeasible requirement.

Nonresponse bias. Another possibility with respect to the selection threat has to do with nonresponse bias. The method employed in this study relied on the self-selection of respondents in that individuals chose to respond or not to respond.

Perhaps the characteristics of the nonrespondents were different from those of the respondents. For example, perhaps a disproportionate number of firms low in congruence yet high in purchasing performance chose not to respond. Toward the goal of protecting against this threat, the reader will recall that methodology was employed to test for nonresponse bias.

Key informant. Reliance on the key informant method was yet another potential contributor to the selection threat. The measurement of many of the constructs of this study relied upon the subjective judgement of the respondent. Thus, reliance on one key informant per firm raises the possibility of effects created by the perceptual bias of the key informant.

Nonetheless, John and Reve (1982) argue in favor of the use of the key informant method and have demonstrated that, indeed, key informants can provide reliable and valid data. Heide and John (1990), conducting research similar to this study, used key informants from both buyer and supplier firms to subjectively assess asset specificity and found those assessments to be highly correlated. Flawed or not, the use of key informants is the norm in research akin to this study (e.g., Chun, 1991; Dion, Blenkhorn, & Banting, 1992; Heide & John, 1988; Monteverde & Teece, 1982; Walker & Poppo, 1991; Waller, 1993).

Mortality. Mortality is another threat to the internal validity of the static-group comparison design. The mortality effect manifests itself when constituents of the experimental groups drop out at a disproportionate rate.

For example, perhaps firms that were high in congruence and low in purchasing performance have gone out of business at a higher rate than firms low in congruence and low in purchasing performance. This phenomena would leave the high congruence group with a larger proportion of high purchasing performance firms relative to the low congruence group, thereby creating the illusion of higher performance on the part of high congruence firms. Unfortunately, there was no remedy known to the author for this threat.

Selection interactions. The interaction of selection and other threats is also problematic to the internal validity of the static-group comparison design. In particular, the selection-maturation and selection-history threats are potentially troublesome.

The selection-maturation effect manifests itself when experimental groups mature at different rates. In the context of this study, the rate of development of the relational characteristics of the buyer-supplier relationship should be roughly proportional to the number of interaction episodes. Furthermore, the number of interaction episodes should be related to the length of the relationship between the buyer and supplier firms. Thus,

this particular threat should not have proven problematic because the reader will recall that the length of relationship was treated as a control variable.

Finally, selection-history interaction refers to the phenomena where the experimental groups are drawn from settings with disparate histories. For example, one of the measures of purchasing performance was inventory turns. It is possible that a disproportionate number of low congruence firms are concentrated in sectors of the industry where inventory levels are more sensitive to the business cycle.

Thus, in a time of sluggish demand, the inventory turns reported by these firms might be unusually low relative to their high congruence counterparts. However, this difference might not be due to low congruence, but to the differential effect of the business cycle. The observed difference would thus be an artifact created by the selection-history threat. Unfortunately, the author knew of no feasible remedy for this threat to internal validity.

#### Threats to External Validity

Selection-treatment interaction is the sole threat to the external validity of the static-group comparison design (Campbell & Stanley, 1963). When an experimental group is exposed to a treatment, the effects of the treatment are observed and noted. However, due to selection-treatment interaction, questions arise as to whether the results obtained may be extended beyond the group(s) initially

selected. In the specific context of this study, the deleterious effects of selection-treatment interaction may have been intensified by nonresponse bias and the selection of a sample from a single industry.

Nonresponse bias. Nonresponse bias proves problematic because it is uncertain that relationships established for a respondent group would necessarily apply to nonrespondents as well. Again, nonresponse bias and methods for assessing it have already been discussed.

Single industry sample. The use of a single industry sample also has the potential for creating selection-treatment interaction problems. That is, it is uncertain whether relationships established using firms in a particular industry would hold for firms in other industries. Obviously, the use of a multi-industry sample would mitigate such difficulties.

Unfortunately, the use of a multi-industry sample would present other threats to internal validity. In particular, the use of firms from multiple industries would attenuate the selection-history interaction threat; such an approach would increase the likelihood of observed effects being created by cross-industry differences.

Because internal validity is the minimum requirement for the results of an experiment/field study to have any meaning, it would be foolish to threaten internal validity in order to attempt to increase external validity. Thus,

there is little that may be done to mitigate this particular source of selection-treatment interaction.

Cook and Campbell (1979) assert that the best way to mitigate the selection-treatment interaction threat is to make participation in the experiment/field study as convenient as possible. Thus, the author took great pains to keep the questionnaire at a minimum length and to make all questions straightforward and easy to answer.

#### Threats to Statistical Conclusion Validity

According to Cook and Campbell (1979), the threats to statistical conclusion validity, applicable to this study, include low statistical power, violated assumptions of statistical tests, fishing and the error rate problem, low measurement reliability, random irrelevancies in the experimental setting, and restricted heterogeneity of respondents. The research design offered protections against all of these threats with the exception of irrelevancies in the experimental setting.

Statistical power and assumptions. The reader will recall that the threat of low statistical power was explicitly addressed as part of the determination of the sample size. With respect to the violation of test assumptions, the assumptions of each statistical test were outlined and it was established that the proposed design provides for the satisfaction of those assumptions.

Possible exceptions were the assumptions of normality and homogeneity of variance associated with ANCOVA. It was also pointed out, however, that the F-test used in ANCOVA is quite robust to deviations from these two assumptions (Hair, Anderson, & Tatham, 1987). Moreover, a test for homogeneity of variance was performed for all ANCOVA models.

Spurious significance. The fishing and error rate problem was addressed in the presentation of the theoretical model. Research propositions and hypotheses were economically crafted to test the major properties of the transaction cost economics theoretical model. The author was guarded in the generation of hypotheses in order to protect against the possibility of spurious significance created by a theoretical fishing expedition.

Measurement error. The assessment and maximization of measurement reliability was discussed in some detail. And, the reader will recall that the rationale for the selection of the sampling frame was founded on the objective of providing heterogeneity in the level of just-in-time purchasing usage among respondents.

Random irrelevancies. The threat for which no formal means of protection was employed is that of random irrelevancies in the experimental setting. This threat manifests itself when environmental variables, other than the treatment, influence the dependent variable. The result

of this threat is an inflation in error variation and a subsequent increase in the risk of Type II error.

For instance, it is possible that just prior to completing the survey instrument, a key informant might have had a rather unpleasant confrontation with his or her boss. This event might have caused the key informant to be in a negative frame of mind and thereby bias his or her evaluations when completing the survey instrument. Unfortunately, there was no means known to the author for measuring or controlling for this particular source of error variation.

#### Threats to Construct Validity

Most of the threats to construct validity identified by Cook and Campbell (1979) are not germane to the study at hand, as most apply primarily to laboratory experimentation. Those threats that were pertinent to this study are the inadequate explication of constructs and mono-method bias.

Inadequate explication. The inadequate explication of constructs threat occurs when the operationalization of a construct does not include all essential features of the construct. The author attempted to be thorough in the review of the literature and in the subsequent formulation of the instrumentation of this study. Content validity has been discussed and methodology for verifying the content validity of the measures through the assessment of substantive validity was deployed.

Mono-method bias. Finally, mono-method bias occurs when all measurements are made using the same method. If this is the case, then the method of measurement can itself introduce irrelevancies. The solution is to use multiple methods of measurement in order to assess the effect of the mode of measurement.

In this study, surveys represented the sole method of measurement and, thus, presented a potential mono-method bias threat. However, this approach is commonly dictated by pragmatic concerns, as is the case in this study, as the use of multiple modes of measurement is very resource intensive. Also, the measurement scales of this study were evaluated by an expert sample for redundancy, but none was found.

#### Summary

In this section of the chapter, threats to the validity of the findings of the study were delineated. Without an understanding and explicit consideration of these threats, any interpretation of the findings of this study would be rendered meaningless. While most of the threats have been controlled or mitigated via the research design, there remain threats that could not be remedied. As such, these threats represent the formal limitations of the study.

Statistical conclusion validity threats. Statistical conclusion validity is a necessary condition without which internal validity cannot exist. With respect to the statistical conclusion validity of this study, most of the

threats to statistical conclusion validity were mitigated via design. However, random irrelevancies in the experimental setting were beyond this author's control and the impact of these irrelevancies on the magnitude of error variation is unknown.

Threats to internal validity. With respect to the internal validity of the findings, the magnitude of the selection threat was unknown and could not be assessed. While the contribution of nonresponse bias was assessed, the use of the key informant method was a potential contributor to the selection threat that had unknown consequences.

The magnitude of the impact of mortality and selection-history interaction on the internal validity of this study was also unknown. For this reason, the reader must understand that the findings of this study may not be interpreted in a cause and effect context. The findings may be interpreted as evidence in support of the theoretical model advanced in this study, however, they may not be taken as definitive proof of the validity of the proposition derived from that model.

The fact that cause and effect conclusions may not be drawn was not a consequence of the sloth or folly of the author, rather, it was a consequence of the use of the static-group comparison design. While more powerful experimental designs are available, their use would not be justified at this juncture of inquiry. The current state of

the art in this area of inquiry does not support a leap to the use of such designs; assuming that their use is even feasible in practice.

Threats to construct validity. Assuming that the findings of this study are internally valid, construct validity is a bridge to the generalization of those findings beyond the context of this study and to the establishment of external validity. The inadequate explication of constructs threat is of limited concern because of the thoroughness of the literature review and subsequent instrumentation process. The impact of mono-method bias on construct validity, however, is unknown. Measures were taken to mitigate its effect.

Threats to external validity. Finally, external validity relates to the generalization of the findings beyond the setting of this study. As has been noted, the impact of nonresponse bias was assessed. However, the consequences of the use of a single industry sample on external validity is unknown. While a multi-industry sample would have mitigated this threat, it could have also compromised the internal validity of this study; a tradeoff not worth making. Thus, the reader must be cognizant of these limitations in attempting to generalize the results of this study.

### Chapter Summary

The research design of this study and its associated methodology has been presented. The research design may be categorized as a cross-sectional field study, involving a static-group comparison, that was implemented through the use of a mail survey. A seven step model of the research design was presented and served as an outline for this chapter.

The first step of the design involved the delineation, definition, and instrumentation of constructs. Assessment of the content validity of the measures was discussed. Next, pretesting of the measurement instrument was discussed. The purpose of pretesting was to establish that the instrument was unambiguous and understandable to potential respondents and to assess the substantive validity of the measures as an additional indicator of their content validity.

The third step involved the explication of the target population and the rationale for the selection of a sampling frame and sample from that population. Given the large size of the sample (i.e., eight hundred), the mail survey was the most viable means of data collection. A description of Dillman's Total Design Method ensued as this was the method used for the mail survey.

The fourth step involved a discussion of scale purification methodology. Correlational analyses were

employed to evaluate the appropriateness of the assignment of items to scales. Reliability analysis followed to ensure that the measurement scales were reliable.

The fifth step entailed a discussion of scale validation procedures. Criterion-related validity was established for the just-in-time purchasing implementation measure. Construct validity was established for the governance structure/relationalism measure through the use of exploratory and confirmatory factor analyses.

The sixth step outlined the data analysis and hypothesis testing procedures. Issues of data preparation, respondent qualification, and testing for nonresponse bias were deliberated. Then, the three hypotheses of the study were stated, reformulated to reflect the strategy of controlling for moderating variables, and finally restated as statistical hypotheses. The statistical tests, and their corresponding assumptions, were presented in concert with the hypotheses.

In the seventh and final section, the threats to the validity of the findings of the study were examined in detail. Of particular note, it was asserted that the findings of the study may not be interpreted in a cause and effect light given the shortcomings of the research design employed. Furthermore, caveats concerning the generalization of the findings were also offered.

Having presented the research design of the study, it is time to turn to the fruits of that design. Thus, in chapter IV, the research findings are presented.

## CHAPTER IV

### RESULTS

#### Introduction

The research findings are presented in this chapter. The chapter is composed of three sections, the first of which addresses issues of response rate, sample demographics, sample delimitation, and assessment of nonresponse bias.

The results of scale purification and validation are reviewed in the second section. The section begins with analyses of item-total and item-scale correlations, and reliability. In addition, evidence of the content, criterion-related, and construct validity of the measures is scrutinized. The third and final section consists of an evaluation of the theoretical model of the study vis-a-vis an analysis of the tests of hypotheses.

#### Characteristics of the Respondents

Surveys were sent to eight hundred purchasing managers and agents employed in the two digit Standard Industrial Classification (SIC) Code 36, Electronic and Other Electrical Equipment and Components. The sample, representing 13.9 percent of the sampling frame of 5,274 National Association of Purchasing Management (NAPM) members

employed in this industry, was selected via a dual-stage cluster sampling procedure.

#### Response Rate

Of the eight hundred surveys sent, eighteen were returned undeliverable, and twenty-one surveys were returned by individuals identifying themselves as ineligible to participate. These twenty-one individuals were retired, unemployed, or had been reassigned to an area outside of purchasing. Finally, 139 usable surveys were returned.

Sample delimitations. Responses were considered qualified only if: (1) the respondent had sufficient knowledge of the supplier in question, (2) the respondent's firm had no ownership interest in the supplier, and (3) the respondent's firm used just-in-time purchasing methods to at least a minimal extent. Survey items related to these three qualifications were analyzed, and twelve respondents were disqualified, leaving a qualified sample of 127. Table 36 summarizes the resultant response rates.

#### Sample Profile

The sample was profiled on characteristics such as the type of manufacturing strategy employed, firm size, firm sales, number of alternate suppliers, and contract term with the supplier of reference. Table 37 contains descriptive statistics concerning these sample characteristics.

Table 36  
Summary of Response Rates

<u>Category</u>	<u>Number</u>	<u>Percent</u>
Initial Sample Size	800	N/A
Undelivered Surveys	20	N/A
Respondents Self-disqualified	18	N/A
Effective Sample Size	761	100.0
Unqualified Responses	12	1.6
Qualified Responses	127	16.7
Total Usable Responses	139	18.3

From an inspection of table 37, it may be concluded that almost all of the respondents (90 percent) worked for firms that manufacture either to order exclusively (40 percent) or to both stock and order (50 percent). In addition, about two-thirds (65 percent) of the respondents' firms were involved in both fabrication and assembly.

The respondents' employers were relatively large establishments. More than two-thirds of these firms employed more than 250 people (72 percent) and had annual sales in excess of fifty million dollars (72 percent).

Use of just-in-time purchasing. One of the sample delimitations was a requirement of at least minimal use of just-in-time purchasing methods. The demarcation between firms using just-in-time purchasing to at least a minimal extent and those not using it, or using it to a trivial

Table 37  
Sample Demographics

<b>Characteristic</b>	<b>Category</b>	<b>Number</b>	<b>Percent</b>
Manufacturing Strategy - 1	To Stock	10	7.9
	To Order	51	40.2
	Both Stock & Order	63	49.6
	Missing	3	2.4
Manufacturing Strategy - 2	Fabricating Parts	6	4.7
	Assembling Parts	33	26.0
	Fabricating/Assembling	82	64.6
	Missing	6	4.7
Number of Employees	< 100	12	9.4
	100-250	24	18.9
	251-500	22	17.3
	501-1,000	20	15.7
	> 1,000	49	38.6
Sales	< \$50 MM	32	25.2
	\$50-250 MM	34	26.8
	\$251-500 MM	22	17.3
	> \$500 MM	35	27.6
	Missing	4	3.2
Alternate Suppliers	Single Source	52	40.9
	1	20	15.7
	2	17	13.4
	3	16	12.6
	4 or More	22	17.3
Contract Term	< 1 Year	12	9.5
	1 Year	45	35.4
	1 < Years < 3	21	16.5
	3 Years or More	35	27.6
	Missing	14	11.0

extent, was determined based upon an analysis of the responses. Namely, a seven-by-fifty-one cell contingency table was constructed, with seven columns representing

response categories of the demographic item requesting a self-report of the use of just-in-time purchasing (SRJITP). The fifty-one rows of the contingency table represented the range of summated scores on the just-in-time purchasing implementation scale (JITP).

The median summated score of the JITP scale was computed. For each of the seven columns, representing a point on the SRJITP scale, the ratio of respondents below the median JITP score to respondents above the median JITP score was computed.

A significant change in these ratios was noted between the second and third response categories of the SRJITP scale. Thus, the demarcation on the self-reported use of just-in-time purchasing scale was established between the second and third response categories. Respondents reporting a value on the self-reported use of just-in-time purchasing scale of two or less ( $SRJITP \leq 2$ ) were disqualified from the sample.

Integrity of the demarcation. The integrity of this demarcation was tested by analyzing summated scores on the just-in-time purchasing implementation scale, the number of alternate suppliers, and the reported length of contract with the supplier of reference. A Kruskal-Wallis one-way analysis of variance (ANOVA) by ranks was used with the just-in-time purchasing implementation summated scale, and two one-way ANOVA's were used for the number of alternate

suppliers and length of contract. In each ANOVA, the self-reported use of just-in-time purchasing served as the factor and was measured at two levels (i.e., SRJITP  $\leq 2$  and SRJITP  $\geq 3$ ). Table 38 summarizes the results of these tests.

Table 38  
Tests of SRJITP Demarcation

Response Variable	SRJITP $\leq 2$ Mean	SRJITP $\geq 3$ Mean	Test Statistic	p-value
JITP Summated Score	38 (Rank)	72 (Rank)	$\chi^2 = 19.58$	0.000
Alternate Suppliers	2.03	1.33	$F = 4.91$	0.028
Length of Contract	1.09	1.01	$F = 0.21$	0.650

For the tests of the summated just-in-time purchasing implementation scale and the number of alternate suppliers, the means exhibited the expected pattern across the two levels of the factor. In addition, the tests of the just-in-time purchasing implementation summated score ( $p < 0.01$ ) and number of alternate suppliers ( $p < 0.05$ ) were both significant.

The results concerning the length of contract produced surprising results. The firms that did not use just-in-time purchasing, or used it to a trivial extent, reported a lower mean length of contract as expected. This result must be

viewed with caution, however, because the difference was statistically nonsignificant ( $p = 0.65$ ).

To further analyze the relationship between the self-reported use of just-in-time purchasing (SRJITP) and the length of contract term, a contingency table of these two variables was constructed. Table 39 displays the observed and expected frequencies (expected frequencies in parentheses) of the contingency table.

Table 39  
Crosstabulation of SRJITP and Length of Contract

Length of Contract	SRJITP $\leq$ 2 Mean	SRJITP $\geq$ 3 Mean
Less than 1 year	4 (2.9)	8 (9.1)
1 year	7 (10.8)	38 (34.2)
More than 1, but less than 3 years	7 (5.0)	14 (16.0)
3 years or more	9 (8.4)	26 (26.6)

Examination of table 39 reveals that there are no major deviations in any cell between the frequencies observed and those expected. But, an interesting result is that a larger proportion of firms that used just-in-time purchasing utilized a contract term of one year or less ( $46/86 \approx 53$  percent) relative to firms that did not use just-in-time purchasing, or used it to a trivial extent ( $11/27 \approx 41$  percent). Given the descriptive literature on just-in-time

purchasing, the author expected that this result would be just the opposite, with more firms using just-in-time purchasing relying on long-term contracts.

#### Nonresponse Bias

Return envelopes were marked so that they could be identified with respect to the sample wave with which they were associated. The responses were then dichotomized, based on the time that they were received (RTIME), into the categories of first wave (RTIME = 1) and second wave or later (RTIME  $\geq$  2). Then, the six demographic variables, on which respondents were profiled, were analyzed with respect to the dichotomous response time variable via the chi-square test of independence. Table 40 is a summary of the results of these tests.

Table 40  
Chi-Square Tests for Nonresponse Bias

Demographic Variable	$\chi^2$	p-value
Manufacturing Strategy - 1	2.01	0.37
Manufacturing Strategy - 2	2.91	0.23
Number of Employees	4.08	0.40
Sales	5.89	0.12
Alternate Suppliers	0.26	0.88
Contract Term	0.17	0.68

Armstrong and Overton (1977) suggest that late respondents are more similar to nonrespondents than are early respondents, thus, the characteristics of early and late respondents were compared. Inspection of table 40 supports the conclusion that there were no significant differences in the characteristics of the early and late respondents of this sample. Thus, it was assumed that nonresponse bias was not an issue for this sample.

#### Assessment of Measures

Reliance on multiple item measurement scales dictates that the reliability and validity of these scales be assessed. The first step involves scale purification, followed by scale validation. Both of these processes can potentially result in the modification of scales; in the form of item deletion or reassignment. These modifications have the potential for altering content validity and reliability. Thus, it is important that content validity and reliability be considered in conjunction with both the scale purification and validation processes.

#### Scale Purification

The scale purification process entails the computation of item-total correlations, item-scale correlations, and reliability coefficients. With respect to the computation of item-total correlations, it is generally accepted practice to delete items with item-total correlations of

lower magnitude than  $\pm 0.30$ , as these items contribute little in explaining the variation of other items (Churchill, 1979; Nunnally, 1978).

With regard to item-scale correlations, it is desirable for a given item to be correlated highly with the scale to which it is conjectured to belong, and to have low correlations with all other scales. Items may be reassigned if they correlate more highly with a scale other than their intended scale. Moreover, deletion of items correlating highly with two or more scales is recommended (Nunnally, 1978; Saraph, Benson, & Schroeder, 1989).

Of course, the deletion and/or reassignment of scale items must be tempered by concerns for content validity and scale reliability. Thus, an analysis of scale reliability should accompany the analysis of item-total and item-scale correlations.

Initial multiple item scales. Two scales consisted of multiple items, just-in-time purchasing implementation and governance structure/relationalism. Table 41 recapitulates each of these constructs, their posited dimensions, and the items of which each is comprised.

Scale transformations. Items for each scale were summed to derive a summated score. Following this, all summated scores were summed to arrive at a total score (TOTAL). Since responses on the just-in-time purchasing implementation and governance structure/relationalism scales

Table 41  
Initial Multiple Item Scales

<b>Construct</b>	<b>Dimensions</b>	<b>Items</b>
Just-In-Time Purchasing Implementation (JITP)	1. Just-in-time purchasing performance criteria (JITPPC)	JITPPC1, JITPPC2, JITPPC3, JITPPC4
	2. Just-in-time purchasing coordination methods (JITPCM)	JITPCM1, JITPCM2, JITPCM3, JITPCM4, JITPCM5, JITPCM6, JITPCM7
Governance Structure/ Relationalism (RELATION)	1. Flexibility (FLEX)	FLEX1, FLEX2, FLEX3
	2. Information exchange (INFOX)	INFOX1, INFOX2, INFOX3
	3. Collaboration (COLLAB)	COLLAB1, COLLAB2, COLLAB3
	4. Continuity (CONTINU)	CONTINU1, CONTINU2, CONTINU3
	5. Feedback (FBACK)	FBACK1, FBACK2, FBACK3

were ordinal in nature, all variables and summated scores were ranked before Spearman's rank order correlations were computed.

Item-total and item-scale correlations. Table 42 is a summary of the resultant item-total and item-scale correlations, with items of concern underlined. Items of concern were designated as such because of their high correlation with more than one scale, indicating the potential for common method variance.

Table 42  
Item-Total and Item-Scale Correlations

ITEMS	TOTAL	JITP	RELATION
JITPPC1	0.5493**	0.6358**	0.4126**
JITPPC2	0.4231**	0.5467**	0.3328**
JITPPC3	0.4179**	0.5877**	0.2603*
JITPPC4	0.5180**	0.6155**	0.4383**
JITPCM1	0.4664**	<u>0.5520**</u>	<u>0.4123**</u>
JITPCM2	0.5553**	<u>0.6583**</u>	<u>0.5510**</u>
JITPCM3	0.3513**	0.5232**	0.1988
JITPCM4	0.5039**	0.6057**	0.3122**
JITPCM5	0.5028**	0.6754**	0.4226**
JITPCM6	0.4838**	0.6315**	0.2705*
JITPCM7	0.6090**	0.6976**	0.4848**
FLEX1	0.2927*	0.1882	0.3898**
FLEX2	0.3287**	0.2017	0.4942**
FLEX3	0.4800**	0.2824*	0.5364**
INFOX1	0.4651**	0.2919*	0.6148**
INFOX2	0.4440**	0.3319**	0.5666**
INFOX3	0.4553**	0.2827*	0.5995**
COLLAB1	0.5136**	0.3677**	0.6065**
COLLAB2	0.5951**	0.4430**	0.6661**
COLLAB3	0.6345**	<u>0.5258**</u>	<u>0.5946**</u>
CONTINU1	0.5965**	0.3645**	0.7080**
CONTINU2	0.6610**	0.4846**	0.7608**
CONTINU3	0.5973**	0.4372**	0.7957**
FBACK1	0.4774**	<u>0.3682**</u>	<u>0.4933**</u>
FBACK2	0.4197**	0.2766*	0.5000**
FBACK3	0.6134**	0.4106**	0.7257**

\* significant at p = 0.01                    \*\* significant at p = 0.001

Specifically, the correlations of two variables (JITPCM1, JITPCM2) from the just-in-time purchasing implementation scale were very close to their correlations with the governance structure/relationalism scale (i.e., the difference in correlations was less than 0.15). And the correlations of two variables (COLLAB3, FBACK1) from the governance structure/relationalism scale were very close to

their correlations with the just-in-time purchasing implementation scale.

Common method variance. When relying on a survey method for measuring all variables, caution must be taken to avoid common method variance (Podsakoff & Organ, 1986). Common method variance arises because of the tendency of subjects to attempt to respond consistently to items that they perceive to be similar. This tendency can potentially result in spurious significance when subsequently testing relationships between constructs.

To test for the potential for common method variance, an expert sample of ten operations management faculty inspected the just-in-time purchasing implementation and governance structure/relationalism scales for redundancy. There emerged no consistent agreement among the experts that redundancy existed.

Suspect items deleted. A reliability analysis was conducted after deleting the four suspect items. The reliability coefficients of the resultant nine item just-in-time purchasing implementation and thirteen item governance structure/relationalism scales were  $\alpha = 0.82$  and  $\alpha = 0.88$  respectively. In addition to evidence of acceptable reliability following the deletions, the author judged that the content validity of the scales would not be detrimentally effected by deleting the four items, as more

than one measurement item was retained for all posited dimensions.

#### Evidence of Validity

Evidence concerning the validity of the measures is presented in this section. Issues of content, criterion-related, and construct validity are discussed in turn.

##### Content Validity

Content validity is not established empirically, rather, it rests upon a judgement that the operationalization of a construct is representative of the entirety of the domain of the construct. Substantive validity, a necessary condition for content validity, serves to establish that measurement items are conceptually linked to the construct that they are intended to represent. Substantive validity does not by itself, however, ensure content validity, as substantively valid items may fail to represent the entirety of the domain of a construct.

The scale sort task. The substantive validity of the multiple item measurement scales of this study was assessed by having an expert sample of ten operations management faculty perform a scale sort task. Expert sample participants were required to match measurement scales to operational definitions.

As a manipulation check, additional extraneous scales and operational definitions were included. In all, there

were four scales and six operational definitions. The four scales were matched with operational definitions, leaving two operational definitions unassigned.

Substantive validity. From the resulting correct and incorrect assignments, coefficients of substantive validity (CSV's) were computed for each multiple item measurement scale. The coefficients of substantive validity for the just-in-time purchasing implementation and governance structure/relationalism scales were 0.90 and 0.80 respectively.

It is recommended that coefficients of substantive validity be in excess of 0.50 (Anderson & Gerbing, 1991). Thus, the coefficients for both of these scales were adequate to support a judgement of substantive validity.

Judgement of content validity. A review of the relevant literature was presented in chapter II. That review and the evidence of substantive validity presented here provide the foundation upon which a judgement of the content validity of the measures of this study was founded.

#### Criterion-Related Validity

Criterion-related validity refers to the ability of a measure to predict the behavior of a criterion at one point in time (i.e., a concurrent design), or over time (i.e., a longitudinal design). Unfortunately, viable criterion variables are often difficult to identify.

In this study, a reasonable criterion variable was identified only for the just-in-time purchasing implementation scale (JITP). That criterion was the response on the self-reported use of just-in-time purchasing (SRJITP) item.

Using a concurrent approach, and given the ordinal nature of both the JITP and SRJITP variables, Spearman's rank order correlation was computed. The value of the correlation was 0.54, and it was significant at a level of 0.001; offering evidence of the criterion-related validity of the just-in-time purchasing implementation measure.

#### Construct Validity

Judgement of construct validity rests on the assessment of discriminant and convergent validity. Discriminant validity connotes the degree to which measures of dissimilar constructs do not relate to each other. Convergent validity refers to the degree that dissimilar measures of the same construct do relate to each other.

Of the multiple item measurement scales deployed in this study (JITP, RELATION), the just-in-time purchasing implementation (JITP) scale represented a direct replication of a scale appearing previously in the literature, and the construct validity of the scale has been established (Chun, 1991). This author does not replicate that analysis here. On the other hand, given that the governance structure/relationalism scale (RELATION) has been significantly

modified from past operationalizations, evidence of its construct validity will be presented.

#### Evidence of Discriminant Validity

Discriminant validity was assessed through the use of exploratory factor analysis and through the examination of scale-scale correlations.

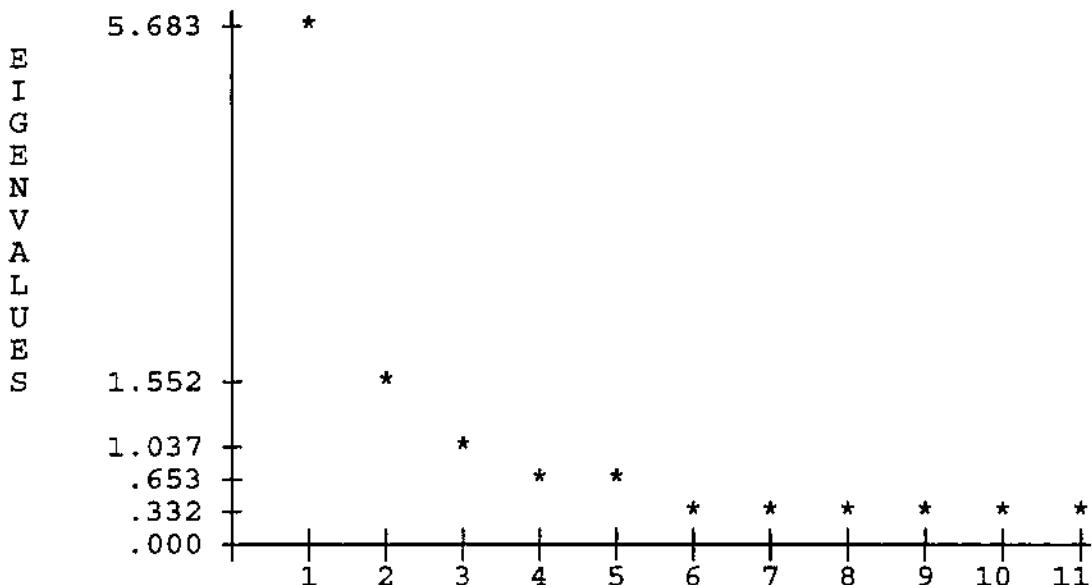
Exploratory factor analysis. Given that the just-in-time purchasing implementation scale was presumed to consist of five distinct dimensions, exploratory factor analysis was performed to see if a factor loading pattern would emerge consistent with this presumption. The principal component factor extraction method was used, followed by VARIMAX, QUARTIMAX, and EQUAMAX orthogonal rotations. The number of factors to be retained was determined via the use of the latent root (i.e., eigenvalue greater than one) and scree criteria simultaneously.

Results of the first analysis. The appropriateness of the data for factor analysis was assessed via Bartlett's Test of Sphericity and the KMO measure of sampling adequacy. The value of Bartlett's test was 805.1 ( $p << 0.001$ ), and the value of the KMO measure of sampling adequacy was 0.88; a value considered "meritorious" (Kaiser, 1974). Both of these measures indicated that a factor analysis was appropriate for the data.

Three factors, accounting for approximately 64 percent of common variance, were extracted using the latent root

criterion. An examination of the scree plot of figure 10 confirms this decision.

Figure 10  
Scree Plot - First Exploratory Factor Analysis



Of the three orthogonal rotations, the QUARTIMAX rotation yielded the clearest loading pattern. Table 43 presents the QUARTIMAX factor loading matrix sans loadings of less than magnitude  $\pm 0.4$ .

Inspection of the results of the first factor analysis did not support the presumed five factor structure. In addition, five items (INFOX1, INFOX2, CONTINU1, CONTINU2, FBACK2) loaded highly on more than one factor. Following Gerbing and Anderson's (1988) scale development guidelines, these five items were deleted.

Table 43  
First Factor Analysis - QUARTIMAX Rotation Factor Matrix

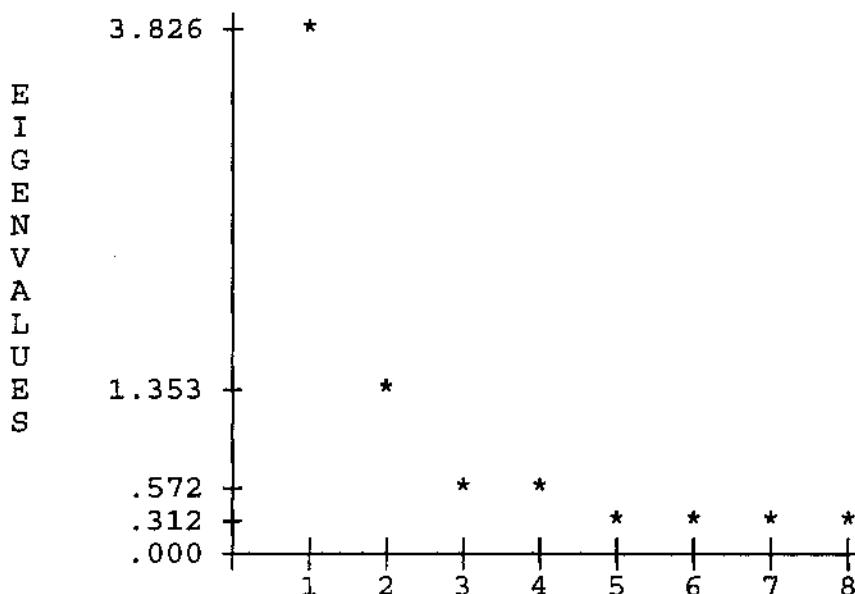
Item	Factor			Communality
	1	2	3	
CONTINU3	0.78			0.732
COLLAB1	0.78			0.610
INFOX3	0.77			0.616
FBACK3	0.72			0.538
COLLAB2	0.67			0.508
INFOX1	0.59		0.51	0.745
CONTINU2	0.56	0.47		0.668
INFOX2	0.55		0.47	0.619
FBACK2	0.51		-0.48	0.531
 FLEX2		0.78		0.688
FLEX1		0.78		0.643
FLEX3		0.66		0.602
CONTINU1	0.49	0.60	-0.42	0.772
 <b>Eigenvalue</b>	<b>5.68</b>	<b>1.55</b>	<b>1.04</b>	N/A
 <b>Percent of Variance Explained</b>	<b>43.70</b>	<b>11.90</b>	<b>8.00</b>	N/A

Before deleting the items, the impact of this course of action on content validity was considered. Of the original five dimensions, the deletions left each dimension with one or more remaining items. It was, thus, judged that the deletions would not create a significant threat to content validity.

Results following item deletion. For the second factor analysis, the value of Bartlett's test of sphericity was 414.8 ( $p < 0.001$ ), and the value of the KMO measure of sampling adequacy was 0.85; a meritorious value. Both measures indicated that a factor analysis was appropriate for the data.

Two factors, accounting for approximately 65 percent of common variance, were extracted using the latent root criterion. The pattern of the scree plot, shown in figure 11, exhibits consistency with this decision.

Figure 11  
Scree Plot - Second Exploratory Factor Analysis



As with the first analysis, the QUARTIMAX rotation yielded the clearest loading pattern of the three rotations. Table 44 is a summary of the QUARTIMAX factor loading matrix, with loadings of less than  $\pm 0.4$  deleted.

The results of the second factor analysis were consistent with a two factor model. Moreover, inspection of table 44 reveals that each item loaded highly on only one factor.

Table 44  
Second Factor Analysis - QUARTIMAX Rotation Factor Matrix

Item	Factor		Communality
	1	2	
COLLAB1	0.83		0.683
CONTINU3	0.78		0.711
INFOX3	0.78		0.620
COLLAB2	0.72		0.562
FBACK3	0.70		0.496
FLEX1		0.84	0.726
FLEX2		0.81	0.739
FLEX3		0.72	0.642
Eigenvalue	3.83	1.35	N/A
Percent of Variance Explained	47.80	16.90	N/A

The first factor was named "bilateral elements" (BILAT); its composition is summarized in table 45. The composition of the second factor, named "adaptation" (ADAPT), is also summarized in table 45. Factor scores were computed, based on the two factor model, representing the governance structure/relationalism construct (RELATION).

Final scales. Scale purification and validation resulted in the modification of the original multiple item scales. A summary of the composition of the final multiple item measurement scales is presented in table 45.

Scale-scale correlations. Other evidence concerning discriminant validity involved the scrutiny of scale-scale correlations. Discriminant validity is supported if the reliability of a scale exceeds the correlations of the scale with all other scales (Kaufmann & Dant, 1991).

Table 45  
Final Multiple Item Scales

<b>Construct</b>	<b>Dimensions</b>	<b>Items</b>
Just-In-Time Purchasing Implementation (JITP)	1. Just-in-time purchasing performance criteria (JITPPC)	JITPPC1, JITPPC2, JITPPC3, JITPPC4
	2. Just-in-time purchasing coordination methods (JITPCM)	JITPCM3, JITPCM4, JITPCM5, JITPCM6, JITPCM7
Governance Structure/Relationalism (RELATION)	1. Bilateral elements (BILAT)	COLLAB1, COLLAB2, CONTINU3, INFOX3 FBACK3
	2. Adaptation (ADAPT)	FLEX1, FLEX2, FLEX3

Reliabilities were computed on the nine item summated just-in-time purchasing implementation scale and the eight item governance structure/relationalism factor scale.

Coefficient  $\alpha$  for these scales was 0.82 and 0.83 respectively. The Spearman's rank order correlation between the just-in-time purchasing implementation and governance structure/relationalism scale was computed to be 0.48; significantly smaller than either of the scale reliabilities.

Judgement of discriminant validity. A factor loading matrix characterized by items loading highly on only one factor, as was the case in table 44, provided evidence in support of discriminant validity. The results of the

analysis of scale reliabilities versus scale-scale correlations provided yet another confirmation of the discriminant validity of the multiple item measures of this study.

#### Evidence of Convergent Validity

Evidence of convergent validity is most commonly established via the analysis of the unidimensionality of measurement scales. The unidimensionality of a measure refers to the degree that a single trait underlies the measurement items (Gerbing & Anderson, 1988). To assess unidimensionality, a maximum likelihood factor solution is employed and a large sample chi-square goodness-of-fit test is performed to assess the fit of the observed factor structure to a one factor model.

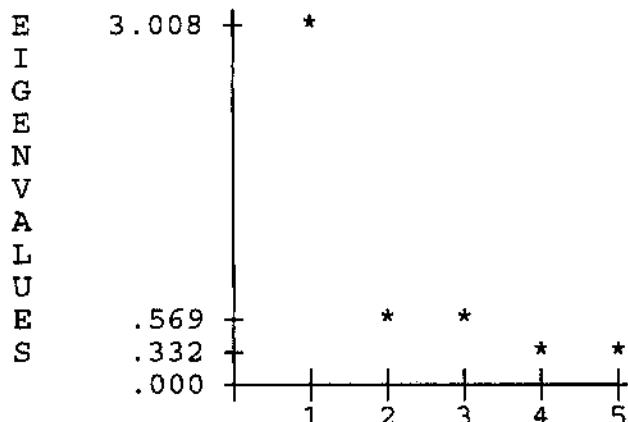
In order to provide evidence of convergent validity, the bilateral elements subscale of the governance structure/relationalism scale was subjected to a maximum likelihood factor analysis. While it would have been desirable to analyze the adaptation subscale in a like manner, this subscale was comprised of too few variables to allow adequate degrees of freedom for a maximum likelihood factor analysis.

Maximum likelihood factor analysis results. The appropriateness of factor analysis on the bilateral elements scale items was assessed via Bartlett's test of sphericity and the KMO measure of sampling adequacy. The value of

Bartlett's test was 247.1 ( $p << 0.001$ ) and the value of the KMO measure of sampling adequacy was 0.82; a meritorious value. Both of these statistics indicated that factor analysis was appropriate.

One factor was extracted via the maximum likelihood method, accounting for approximately 60 percent of common variance. The eigenvalue for the first factor was 3.01, dropping precipitously to 0.66 for the second factor that failed to meet the criteria for extraction. The pattern of the scree plot in figure 12 is consistent with a one factor solution.

Figure 12  
Scree Plot - Maximum Likelihood Factor Analysis



The chi-square goodness-of-fit test had a value of 10.37 ( $p = 0.07$ ), but was nonsignificant at the five percent level of significance. A lack of significance on this test was desired, as it indicated that the observed factor

structure was not significantly different from that of a one factor model. Thus, these results may be taken as supportive of unidimensionality and the convergent validity of this measure.

#### Summary

In this section, evidence of the reliability and validity of the multiple item measurement scales was presented. All multiple item scales have been shown to be adequately reliable. Moreover, affirmative evidence has been presented concerning the content, criterion-related, and construct validity of these measures.

#### Empirical Evaluation of the Theoretical Model

The proposition and related hypotheses of this study pertain to the relationship between congruence and performance. Explicitly, it has been hypothesized that purchasing performance is influenced by the congruence between the degree of just-in-time purchasing implementation and the governance structure in operation (i.e., degree of relationalism). Moreover, this relationship is moderated by exchange characteristics such as the importance of the product being exchanged and the length of the relationship.

This section begins with a review of the construction and verification of the categorical congruence variable, or factor. Subsequently, the results of hypothesis testing are reported.

### Development of the Congruence Factor

Drawing on the transaction cost economics theoretical model, it was asserted that under the environmental conditions associated with just-in-time purchasing exchange (i.e., high frequency of exchange, high exchange uncertainty, high asset specificity), the bilateral governance structure would be most appropriate; in the sense of minimizing transaction costs. Furthermore, the reader will recall that the measurement of governance structure rests upon the assessment of the degree to which the elements of relationalism are present in the exchange relationship.

Thus, congruence (i.e., a good fit) would be achieved when firms advanced in their implementation of just-in-time purchasing methods (JITP) also exhibit high levels of relationalism (RELATION). Low congruence (i.e., a poor fit) would result when firms advanced in their implementation of just-in-time purchasing methods exhibit low levels of relationalism.

Establishing demarcations. The congruence factor was determined by first establishing demarcations on the just-in-time purchasing implementation and governance structure/relationalism scales. These demarcations represented the point at which respondents were categorized as exhibiting high versus low levels of just-in-time purchasing implementation and relationalism respectively.

Subsequently, respondents were categorized according to these demarcations.

The JITP scale demarcation. The seven-by-fifty-one cell JITP-SRJITP contingency table, discussed earlier in this chapter (pp. 262-263), was scrutinized again. The seven columns of this table represented response categories of the self-report of the use of just-in-time purchasing (SRJITP). The fifty-one rows of the contingency table represented the range of summated scores on the just-in-time purchasing implementation scale (JITP).

Based on an analysis of the frequency data of the contingency table, the demarcation was established at a summated just-in-time purchasing implementation score of thirty-seven. A Kruskal-Wallis one-way ANOVA by ranks was used to test the integrity of this demarcation by comparing the mean rank just-in-time purchasing implementation score for observations above and below the demarcation. The results of this test are shown in table 46.

Table 46  
Test of JITP Scale Demarcation

Response Variable	JITP < 37 Mean Rank	JITP ≥ 37 Mean Rank	$\chi^2$	p-value
JITP Summated Score	24.5	88.0	88.88	<< 0.001

There was a large difference in the mean ranks between the high just-in-time purchasing implementation ( $JITP \geq 37$ ) and low just-in-time purchasing implementation ( $JITP < 37$ ) groups. In addition, the test statistic was highly significant ( $p << 0.001$ ).

The RELATION scale demarcation. The governance structure/relationalism scale was analyzed in much the same fashion. A five-by-eighty-two cell contingency table was constructed. The five columns represented increasing values of the summated just-in-time purchasing implementation scale in twenty percentile increments (e.g., 1<sup>st</sup>-20<sup>th</sup> percentile, etc.). The eighty-two rows of the contingency table represented the range of values of the governance structure/relationalism factor score.

A visual analysis of the frequency data of the contingency table revealed a clear pattern. Based on the visual analysis, the demarcation on this scale was set at a value of zero.

Again, a Kruskal-Wallis one-way ANOVA by ranks was used to test the integrity of the demarcation by comparing the mean rank governance structure/relationalism factor score for observations above and below the demarcation. The results of this test are shown in table 47.

As with the just-in-time purchasing implementation scale, there was a large difference in the mean ranks between the high governance structure/relationalism

Table 47  
Test of RELATION Scale Demarcation

<b>Response Variable</b>	<b>JITP &lt; 37 Mean Rank</b>	<b>JITP ≥ 37 Mean Rank</b>	<b><math>\chi^2</math></b>	<b>p-value</b>
RELATION Factor Score	29.5	93.0	93.80	<< 0.001

(RELATION  $\geq 0$ ) and low governance structure/relationalism (RELATION  $< 0$ ) groups. The test statistic was also highly significant ( $p << 0.001$ ).

Categorization of respondents. Utilizing the demarcations just described, respondents were categorized according to their level of just-in-time purchasing implementation and degree of relationalism. Table 48 presents the results of this categorization, showing both the frequency and percentage of respondents in each category (percentages in parentheses).

Table 48  
Categorization of Respondents on JITP and RELATION

<b>Level of RELATION</b>				
<b>Level of JITP</b>		<b>Low</b>	<b>High</b>	<b>Total</b>
High		27 (21%)	52 (41%)	79 (62%)
Low		31 (25%)	17 (13%)	48 (38%)
<b>Total</b>		58 (46%)	69 (54%)	127 (100%)

The figures in table 48 conformed to expectation concerning the congruence between the level of just-in-time purchasing implementation and the degree of relationalism observed. Roughly two-thirds of the high just-in-time purchasing implementation group were also high in relationalism ( $52/79 \approx 66$  percent). Likewise, roughly two-thirds of the low just-in-time purchasing implementation firms were also low in relationalism ( $31/48 \approx 65$  percent).

Focus on high JITP firms. The remaining analyses focused exclusively on firms that were advanced in their implementation of just-in-time purchasing methods (i.e., high JITP); thus, only the first row of table 48 was germane to the remaining analyses. Congruence was considered high (i.e., a good fit) if both the just-in-time purchasing implementation and governance structure/relationalism scale responses were in the high category. Low congruence (i.e., a poor fit) resulted if the response on the just-in-time purchasing implementation scale was in the high category and the response on the governance structure/relationalism scale was in the low category.

#### Tests of Hypotheses

A review of the formal tests of hypotheses is presented in this section. Each hypothesis test focused on the relationship between a purchasing performance metric and just-in-time purchasing implementation/governance structure congruence.

The statistical model. All hypotheses were tested using an analysis of covariance (ANCOVA) model. Congruence served as the factor, measured at two levels; good fit and poor fit. The moderating variables, product importance and length of relationship, served as covariates in each model.

Assumptions. Use of ANCOVA assumes that the response variable is normally distributed across the populations represented by each level of the factor. Fortunately, the F-test employed in ANCOVA is robust to deviations from normality (Hair, Anderson, & Tatham, 1987).

The second assumption is homogeneity of variance across the levels of the factor. This assumption is especially critical if sample sizes differ significantly across levels of the factor, as they did in this study. This assumption was tested for each ANCOVA via the use of Cochran's C and the Bartlett-Box F statistic. Nonsignificant values of these test statistics allows the assumption of homogeneity of variance to stand.

#### Possession Costs

Possession costs, represented by the annualized inventory turnover ratio, served as the response variable in the first hypothesis test. That hypothesis was:

- H1: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower possession costs (i.e., higher inventory turnover) than firms advanced in just-in-time

purchasing implementation, and low in relationalism (i.e., low congruence).

The assumption of homogeneity of variance was tested. Values of Cochran's C of 0.60 ( $p = 0.22$ ) and a Bartlett-Box F of 1.26 ( $p = 0.26$ ) allowed this assumption to stand.

The number of observations, means, and standard deviations for the levels of the congruence factor are presented in table 49. The pattern of the mean inventory turnover ratios was as expected, with high congruence firms experiencing higher inventory turnover.

Table 49  
Inventory Turnover Means  
and Standard Deviations

Congruence	n	$\bar{x}$	s
High	52	49.50	38.22
Low	27	32.96	31.37

The ANCOVA results are shown in table 50. Overall, the model was nonsignificant ( $p = 0.31$ ). In spite of this, the effect of the congruence factor was marginally significant ( $p = 0.07$ ).

Given that the covariates were highly nonsignificant ( $p = 0.60, 0.93$ ), contributing primarily to error variation, the covariates were omitted and a one-way ANOVA performed. The results of the one-way ANOVA, shown in table 51, were still only marginally significant ( $p = 0.06$ ).

Table 50  
Possession Costs ANCOVA Results

Source	Sum of Squares	d.f.	Mean Square	F	p-value
Product Importance	380	1	380	0.28	0.60
Relationship Length	11	1	11	0.01	0.93
Congruence	4,602	1	4,602	3.32	0.07
Explained	5,008	3	1,669	1.21	0.31
Residual	99,591	72	1,383		
Total	104,600	75	1,395		

Table 51  
Possession Costs One-Way ANOVA Results

Source	Sum of Squares	d.f.	Mean Square	F	p-value
Between Groups	4,860	1	4,860	3.74	0.06
Within Groups	100,105	77	1,300		
Total	104,966	78			

Post-hoc analysis. Due to the marginal significance of the possession costs models, a post-hoc power analysis was conducted. It was determined that a sample size of 139 would have been necessary to achieve significance at the 5 percent level; and the sample size of this study was only seventy-nine.

#### Acquisition Costs - Proportion of Late Deliveries

The first acquisition costs indicator, the proportion of late deliveries, served as the response variable in the second hypothesis test. The corresponding hypothesis was:

H2: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of late deliveries) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).

The assumption of homogeneity of variance was tested.

It remained unchallenged by nonsignificant values of Cochran's C of 0.52 ( $p = 0.85$ ) and a Bartlett-Box F of 0.03 ( $p = 0.86$ ).

The number of observations, means, and standard deviations for the levels of the congruence factor are presented in table 52. As with inventory turns, the pattern of the mean proportions of late deliveries was as expected, with high congruence firms experiencing a smaller proportion of late deliveries.

Table 52  
Proportion of Late Deliveries --  
Means and Standard Deviations

Congruence	n	$\bar{x}$	s
High	52	2.67%	3.02
Low	27	4.59%	3.11

The ANCOVA results are shown in table 53. Overall, the ANCOVA model was significant ( $p = 0.03$ ). The effect of the congruence factor was also significant ( $p = 0.02$ ). The length of relationship covariate was marginally significant

( $p = 0.06$ ), and the product importance covariate was highly nonsignificant ( $p = 0.99$ ).

Table 53  
Acquisition Costs (Proportion of Late Deliveries) ANCOVA Results

Source	Sum of Squares	d.f.	Mean Square	F	p-value
Product Importance	0.0	1	0.0	0.00	0.99
Relationship Length	33.2	1	33.2	3.54	0.06
Congruence	54.8	1	54.8	5.84	0.02
Explained	88.2	3	29.4	3.13	0.03
Residual	675.3	72	9.4		
Total	763.5	75	10.2		

#### Acquisition Costs - Proportion Nonconforming

The second acquisition costs indicator, the proportion of nonconforming material, served as the response variable in the third hypothesis test. The related hypothesis was:

H3: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of nonconforming incoming material) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).

As with the previous two hypothesis tests, the assumption of homogeneity of variance was unaltered. The value of Cochran's C was 0.63 ( $p = 0.10$ ), and the Bartlett-Box F statistic was 2.59 ( $p = 0.11$ ), both nonsignificant.

The number of observations, means, and standard deviations for the levels of the congruence factor are

presented in table 54. As with both inventory turns and the proportion of late deliveries, the pattern of the mean proportions of nonconforming material was as expected, with high congruence firms reporting a smaller proportion of nonconforming material.

Table 54  
Proportion of Nonconforming Material --  
Means and Standard Deviations

Congruence	n	$\bar{x}$	s
High	52	0.80%	1.08
Low	27	1.42%	1.42

The results of the third ANCOVA are shown in table 55. Overall, the ANCOVA model was significant ( $p = 0.02$ ), and the effect of the congruence factor was likewise significant ( $p = 0.05$ ). The length of relationship covariate was significant ( $p = 0.02$ ), but the product importance covariate was highly nonsignificant ( $p = 0.71$ ).

#### Summary

The results of hypothesis testing provided empirical support for the theoretical model of the study. The association between purchasing performance and just-in-time purchasing implementation/governance structure congruence was confirmed for each hypothesis.

Table 55  
Acquisition Cost (Proportion of Nonconforming  
Material) ANCOVA Results

Source	Sum of Squares	d.f.	Mean Square	F	p-value
Product Importance	0.2	1	0.2	0.15	0.71
Relationship Length	8.4	1	8.4	5.89	0.02
Congruence	6.0	1	6.0	4.17	0.05
Explained	14.9	3	5.0	3.47	0.02
Residual	103.3	72	1.4		
Total	118.2	75	1.6		

In the case of the possession costs indicator of inventory turns, the confirmation was only marginal ( $p = 0.06$ ). The confirmation for the proportion of late deliveries, the first acquisition costs indicator, was more than adequate ( $p = 0.02$ ). Finally, the confirmation for the second acquisition costs indicator, proportion of nonconforming material, was adequate ( $p = 0.05$ ).

#### Chapter Summary

The research findings were presented in this chapter. The chapter began by examining the response rate. The sample was then profiled on a number of demographic characteristics, and sample delimitations were discussed. The potential for nonresponse bias was assessed. From the evidence presented, nonresponse bias appeared not to be an issue.

The results of scale purification and validation followed. Based on these analyses, the just-in-time

purchasing implementation and governance structure/relationalism scales were revised via deletion of problematic items. The resulting multiple item measurement scales exhibited adequate levels of reliability. Evidence of the content, criterion-related, and construct validity of the measures was affirmative.

Finally, the theoretical model of the study was scrutinized via the testing of hypotheses. Overall, the theoretical model, and its associated proposition, were confirmed by the results.

The final chapter begins with an interpretation of the results and explores inconsistencies in those results. The significance of the study is reviewed, and the limitations to the findings are outlined. Finally, implications for future research are noted.

## CHAPTER V

### DISCUSSION

#### Introduction

A summary and interpretation of the results of the study are presented in this chapter. Confirmation of the theoretical model of the study is assessed. Inconsistencies in the results are addressed. The significance of the findings is reviewed, and the limitations to the findings are outlined. Finally, the implications for future research are discussed.

#### Summary of the Results

Overall, the theoretical model of the study was confirmed. The normative value of the transaction cost economics theoretical model was manifest in the results. While the degree of confirmation varied, almost all results conformed to expectation. Table 56 contains a summary of the results of the hypothesis tests.

#### **Just-In-Time Purchasing and the Governance Structure -- Congruence Confirmed**

The results of the study supported the dominant form assumption. Recall that according to the dominant form assumption, the bulk of firms that survive in a given environment will have adapted an organizational form that is

Table 56  
Summary of Results of Hypothesis Tests

<u>Hypothesis</u>	<u>Confirmation</u>
H1: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower possession costs (i.e., higher inventory turnover) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).	Yes, marginally ( $p = 0.07$ )
H2: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of late deliveries) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).	Yes ( $p = 0.02$ )
H3: Controlling for product importance and the length of relationship, firms that are advanced in the implementation of just-in-time purchasing methods and high in relationalism (i.e., high congruence) will exhibit lower acquisition costs (i.e., lower proportion of nonconforming incoming material) than firms advanced in just-in-time purchasing implementation, and low in relationalism (i.e., low congruence).	Yes ( $p = 0.05$ )

suited to that environment. Approximately two-thirds of firms in both the high and low just-in-time purchasing implementation groups displayed a governance structure, as reflected by the degree of relationalism, consistent with that predicted by theory. The high just-in-time purchasing

implementation group was characterized by higher levels of relationalism, while the low just-in-time purchasing group displayed lower levels of relationalism.

#### Just-In-Time Purchasing/Governance Structure Congruence and Purchasing Performance

All three hypotheses of the study were confirmed to varying degrees. Taken collectively, these confirmations supported the contention that purchasing performance is associated with the nature of the buyer-supplier relationship in just-in-time exchange relationships. The proposition of the study was, thus, supported.

The respondent firms that were advanced in the implementation of just-in-time purchasing methods more frequently adopted a bilateral governance structure relative to other options. This was a rational choice, as the study confirmed that this course of action was associated with higher inventory turnover, a lower proportion of late deliveries, and a lower proportion of nonconforming incoming material. These findings verified the normative propositions of the transaction cost economics theoretical model, and were also consistent with the just-in-time relationship paradigm.

#### Length of Relationship and Performance

The length of relationship, a moderating variable, was significantly associated with purchasing performance in two of the three ANCOVA models. The length of relationship was

associated with the proportion of late deliveries and the proportion of nonconforming material. This result affirms the dyadic interaction paradigm, with its emphasis on repeated interaction over time and the resultant development of the efficacy of the relationship.

#### Inconsistent Findings

Some findings defied expectations. Those inconsistencies included:

1. There was no significant difference in the length of contract between the firms disqualified because they did not use just-in-time purchasing, or used it to a trivial extent, and the firms that used just-in-time purchasing methods.
2. There was not a significant association between the covariates (length of the relationship and product importance) and possession costs.
3. The product importance covariate was not significantly associated with the two acquisition costs indicators.
4. The significance of the association between the congruence factor and possession costs was only marginally significant.

#### Just-In-Time Purchasing and the Length of Contract

The literature broadly endorses the notion that just-in-time exchange relationships are longer in term, relative to conventional exchange relationships. This proposition,

however, has seldom been subjected to empirical testing.

Gilbert, Young, and O'Neal (1994) compared contract periods between firms using just-in-time manufacturing and non-just-in-time firms. These authors, likewise, failed to find a significant difference in contract term.

Caution should be taken in interpreting this result. That is, the phenomena of interest is the term of the relationship. The surrogate for this construct is the term of contract, and this measure is perhaps flawed.

A possible explanation is that in bona-fide long-term relationships, contract renewal may be more perfunctory vis-a-vis conventional relationships. Contract renewal may remain on the traditional annual cycle, even though the orientation of the relationship is long-term. Perhaps assessing the period of the joint planning horizon would ameliorate this problem.

#### Product Importance

Contrary to the results of other researchers (e.g., Heide & John, 1990; Noordewier, John, & Nevin, 1990), product importance was highly nonsignificant for all ANCOVA models ( $p = 0.60, 0.99, 0.71$ ). A relatively simple explanation for this result exists.

Recall that in the questionnaire instructions (appendix A, p. 316), respondents were instructed to select "a critical component (a component or raw material that has a significant impact on the final product) that is used to

make a primary product (a leading product in terms of sales revenue or profit contribution)". Thus, a restriction of range with respect to product importance is a plausible explanation for the observed results.

#### Possession Costs

The expected association between possession costs and the length of relationship was not confirmed ( $p = 0.93$ ). In addition, the association between congruence and possession costs was only marginally significant ( $p = 0.06$ ). Noordewier, John, and Nevin (1990) also failed to find a significant association between congruence and possession costs; but the p-value was not reported, so the level of nonsignificance cannot be assessed.

A differential influence. A logical explanation for these results is that the influence of exchange efficiencies, created by repeated interaction (i.e., length of relationship) and the adoption of an appropriate governance structure (i.e., congruence), may be disproportionate for the possession costs surrogate relative to the acquisition costs surrogates.

Recall that inventory turnover served as the possession costs surrogate, and the proportion of late deliveries and nonconforming material were the acquisition costs surrogates. While rationality dictates that managerial actions be taken consistent with minimizing the proportion of late deliveries and nonconforming material, the same is

not necessarily true with respect to maximizing inventory turnover.

Consider that inventory turnover may be increased by lowering average inventory levels. However, policy decisions may constrain the degree to which inventory levels are reduced. The maintenance of service levels and the desire for protection against supply disruption are but two reasons for placing a lower boundary on inventory levels.

It is, thus, plausible that increased exchange efficiency could result in a pronounced decrease in the proportion of late deliveries and nonconforming material, yet the impact on inventory turnover could be muted. This would occur if the firm maintained inventory levels beyond that required by its level of exchange efficiency. While the level of exchange efficiency could accommodate even greater reductions in inventory, inventory levels would be maintained at artificially high levels in order to achieve other objectives.

Post-hoc analysis. A post-hoc power analysis was performed for the congruence factor, and it was determined that a sample of 139 would have been required for the association with possession costs to reach significance at a 5 percent level of significance. A post-hoc power analysis was not performed for product importance; as restriction of range was the likely culprit for its nonsignificance, not inadequate sample size.

Finally, a post-hoc power analysis was not performed for the length of relationship-possession costs association due to the minuscule effect size. Computing the sample size necessary for statistical significance when effect sizes are so inconsequential is an exercise in folly. Even if statistical significance could be achieved by massively increasing sample size, the practical significance of an effect size so small would still be in serious doubt.

#### Significance of the Findings

This study has contributed to both the academic and managerial communities. This section summarizes the significance of the contributions to each constituency.

##### Contributions to the Academic Literature

Critical evaluations of the operations management and purchasing literature have noted an absence of accepted theoretical models, and the lack of a performance focus. This study was founded on an accepted theoretical framework and was framed using an explicit performance orientation. As such, the study has in part filled important gaps in the literature.

Methodological advances. Methodological contributions were made through incremental advancement in the measurement of governance structure and replication of the measurement of transaction costs. Moreover, the study filled gaps in the purchasing literature through the application of

empiricism, a large sample, and a rigorous method; the purchasing literature has been judged deficient in these areas.

Theoretical contributions. The study provided support for the theoretical linkages and normative validity of transaction cost economics. In addition, the use of the theory in a just-in-time exchange context bolstered the argument for the external validity of the transaction cost economics theoretical model.

The study also advanced just-in-time purchasing theory. The findings are consistent with the contention that the purchasing function may enhance performance through supporting the strategic time compression activities of the firm via the creation and maintenance of cooperative relationships with just-in-time suppliers. As such, the study affirms the validity of the just-in-time purchasing relationship paradigm.

#### Contributions to Managers

As has been noted, the creation and maintenance of cooperative relationships results in certain marginal costs. Practitioners have been admonished to enter into such relationships based only on descriptions of the alleged benefits of cooperation. This study has provided empirical confirmation of the performance benefits of cooperation under the conditions of just-in-time exchange.

Efficiency of cooperation? While the findings of the study support contentions concerning the efficiency of cooperation in just-in-time exchange relationships, a global endorsement cannot be made. While cooperative relationships are almost universally endorsed in the literature, they may not always be appropriate.

According to transaction cost economics theory, cooperation or bilateralism in exchange relationships characterized by low frequency of transaction, low exchange uncertainty, and low asset specificity should prove most inefficient. Thus, the universal promotion of the benefits of cooperation observed in the literature is potentially in error.

Conditions for just-in-time sourcing. Transaction cost economics holds the potential for identifying situations in which just-in-time exchange is beneficial. Practitioners have been given little guidance in determining the conditions under which just-in-time purchasing is appropriate. Some practitioners may naively believe that just-in-time exchange is appropriate in all situations.

The transaction cost economics model identifies contingency variables that may be used to diagnose exchange environments. Notably, supply uncertainty and asset specificity are two additional variables that should potentially be considered in identifying parts or components to be procured on a just-in-time basis.

### Limitations of the Research

The study was designed to mitigate and/or eliminate threats to the validity of the findings. Unfortunately, some of the threats could not be controlled for and, thus, represent the formal limitations of the study. Without an understanding and explicit consideration of these threats, any interpretation of the findings of this study would be rendered meaningless.

### Inherent Weaknesses of the Design

This study was a cross-sectional field study that employed a static-group comparison. The study was cross-sectional in that all measurements were taken at one point in time. The research design may further be categorized as a static-group comparison, or as a posttest-only design with nonequivalent groups.

Performance of nonequivalent groups. In the study at hand, measurements of purchasing performance were taken for two nonequivalent groups. Both groups consisted of firms advanced in the implementation of just-in-time purchasing methods. However, the relationships of one group were characterized by high levels of relationalism (high congruence), while the relationships of the other group were characterized by low levels of relationalism (low congruence).

Association versus causation. The static-group comparison design was used to determine the impact of

congruence, between the use of just-in-time purchasing methods and relationalism, on purchasing performance. Unfortunately, the static-group comparison design is pre-experimental and is flawed to the degree that causality may not be inferred. The connection between congruence and performance has been affirmed, but may be taken only as evidence of support for the proposition of the study which was stated with respect to association, not causation.

A question of causal order. An association does not elucidate causal order. That is, congruence and performance have been shown to be associated in the study, however, the ordering of these two phenomena is unknown. It could be that the congruence between the use of just-in-time purchasing and relationalism enhances performance. Or, perhaps firms choose to develop highly bilateral relationships with suppliers that perform well.

#### Statistical Conclusion Validity

Statistical conclusion validity is a necessary condition without which internal validity cannot exist. Most of the threats to statistical conclusion validity (low statistical power, violated test assumptions, error rate problem, low reliability, limited respondent heterogeneity) were mitigated via design. However, random irrelevancies in the experimental setting were beyond the author's control. The impact of these irrelevancies on the magnitude of error variation, and consequently Type II error, is unknown.

### Threats to Internal Validity

The threats to the internal validity of the study that could not be controlled for include the selection threat, mortality, and the interaction of selection with history. Each of these threats are discussed in turn.

#### The Selection Threat

The selection threat refers to the possibility that observed differences between groups could be attributed to the process of recruitment of individuals for the groups and not to the effect of the treatment. While the contribution of nonresponse bias was assessed and deemed trivial, the magnitude of the selection threat due to the use of the key informant method is unknown.

Key informant bias. The measurement of many of the constructs of the study relied upon the subjective judgement of key informants. The perceptual biases of the key informants represent a threat to the internal validity of the study.

#### The Mortality Threat

Mortality is another threat to the internal validity of the study. Mortality manifests itself when constituents of the experimental groups drop out at a disproportionate rate. It was not possible to assess or control for mortality in this study.

### Selection Interaction Threats

The interaction of selection with maturation was controlled for via the incorporation of the length of relationship covariate. On the other hand, the selection-history interaction, created when experimental groups are drawn from settings with disparate histories, could not be controlled for. Thus, observed differences in performance between groups may have been attributable in whole or in part to the disparate histories of the groups.

### Threats to Construct Validity

Assuming that the findings of the study are internally valid, construct validity is required to generalize those findings beyond the context of this study and is a minimum requirement for external validity. The inadequate explication of constructs and mono-method bias were two potential threats to the construct validity of this study that were mitigated via design.

Inadequate explication of constructs. The inadequate explication of constructs threat is of limited concern. This statement may be proffered based on a consideration of the literature review/instrumentation process and the results of the content validity assessment.

Mono-method bias. Mono-method bias occurs when all measurements are made using the same method. A survey represented the sole method of measurement and presented a potential mono-method bias threat. Methods for controlling

common method variance were described and deployed to mitigate the mono-method bias threat.

#### Threats to External Validity

Selection-treatment interaction is the sole threat to the external validity of the design of this study.

Selection-treatment interaction raises questions concerning the degree to which the results obtained may be extended beyond the group(s) initially selected.

In the context of this study, selection-treatment interaction due to nonresponse bias was mitigated via assessment. Other potential sources of selection-treatment interaction threats include the use of a single industry sample and the process that was employed for the selection of components and suppliers referenced in the survey instrument.

Single industry sample. The use of a single industry sample has the potential for creating selection-treatment interaction problems. It is uncertain whether relationships established in this study may be generalized beyond the industry of the sample. Moreover, the industry selected was a manufacturing industry exclusively. It is not clear whether the findings may be generalized to non-manufacturing industries.

Single component/supplier data. The reader will recall that respondents chose the component and supplier of reference. Potential bias in the selection of components

and suppliers presents other threats to the generalizability of the findings of the study. The magnitude of these threats is unknown.

#### Implications for Future Research

A number of suggestions, relating to the improvement and extension of this study, can be made. The first category of suggestions has to do with refinements in methodology. The second category of suggestions concerns compelling directions that future research could take.

##### Refinements in Method

The cross-sectional nature of the data collected significantly impaired the ability to infer cause-and-effect relationships. Therefore, an obvious improvement would be to collect longitudinal data so that the relationships between the increasing use of just-in-time purchasing, the development of relationalism, and performance could be teased from the data.

Cross-industry sample. Another obvious improvement would be to collect data from multiple industries rather than relying on a single industry sample. It would be most interesting to see if the congruence-performance association would be consistent across industries.

Both buyer and supplier views. The third obvious improvement would be to collect data from both buyer and supplier personnel, rather than relying exclusively on

buyers. Associations between the consistency of responses and other constructs such as relational elements and performance would be of particular interest.

Replication of relationalism scale. The factor structure of the relationalism scale of this study differed from that of previous work. Additional study and development of the relationalism construct needs to be pursued in order to build replicable operations of this construct.

#### Compelling Directions

A number of interesting directions may be pursued from this study. These directions are outlined below.

Relational elements and performance. While the precise dimensional structure of the relationalism construct has been an elusive quarry, it is hardly controversial to state that relationalism is a multidimensional construct. One interesting direction for future research would be to explore the strength of association between the various dimensions of relationalism and performance.

For example, is it likely that all of the dimensions of relationalism are equally important in determining exchange efficiency? If not, which dimensions are the most critical to performance? Which dimensions take greater amounts of time and effort to develop?

Descriptive dimensions and just-in-time purchasing. It has already been noted that the descriptive dimensions of

the exchange of uncertainty and asset specificity may hold utility in diagnosing situations concerning the appropriateness of just-in-time exchange. Research is needed that examines these linkages.

Examination of low just-in-time purchasing firms.

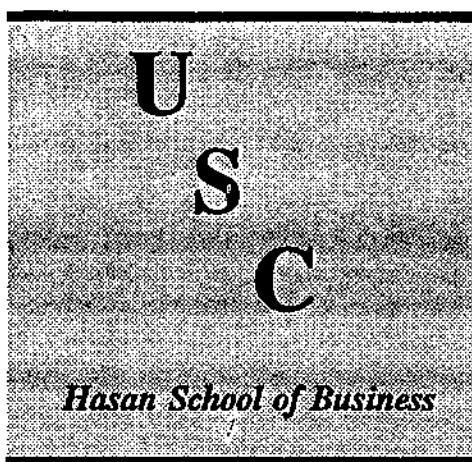
Another interesting question concerns the congruence-performance linkage for firms that are low in just-in-time purchasing implementation. Do the costs of cooperation exceed the benefits for firms that do not use just-in-time purchasing? Is exchange efficiency indeed greater for firms that are low in relationalism under conditions of minimal or no just-in-time purchasing implementation?

Chapter Summary

This chapter began with a summary and interpretation of findings. Confirmation for the theoretical model and research proposition of the study was the result. Inconsistencies in the findings were noted and potential explanations advanced.

The significance of the findings was noted and the limitations of the study reiterated. Finally, the implications for future research were enumerated.

**APPENDIX A  
QUESTIONNAIRE**



*Center for Operations and  
Materials Management*

The following questions will refer to a specific component sourced from a specific supplier. It is up to you to choose that component and its supplier. The component should be a:

<u>critical component</u> a component or raw material that has a significant impact on the final product	<b>or</b>	that is used to make a	<b>or</b>	<u>primary product</u> a leading product in terms of sales revenue or profit contribution
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Once you have selected the critical component, select one supplier of this component. The supplier should be a:

<u>primary supplier</u> a major source (i.e., in volume) of the critical component	<b>or</b>	preferably with whom you use	<b>or</b>	<u>just-in-time purchasing</u>
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*Answer all questions only with respect to the specific component and supplier that you have selected! Most questions may be answered by using your general knowledge. At most, there are three or four questions that might require a consultation of records. Resist the temptation to respond to questions in a "politically correct" fashion. Rather, give the response that you feel is the most accurate and honest, as your responses will be held in the strictest confidence.*

Below are listed a number of methods commonly associated with just-in-time purchasing. Rate the degree to which your firm has implemented the use of these methods by circling the appropriate response on the scale to the right.		Not At All		Very Intensively				
1. A reduction in the supplier base		1	2	3	4	5	6	7
2. A reduction in the use of competitive bidding		1	2	3	4	5	6	7
3. A reduction in purchase lot sizes		1	2	3	4	5	6	7
4. Emphasizing quality and on-time delivery rather than low price		1	2	3	4	5	6	7
5. Use of supplier certification		1	2	3	4	5	6	7
6. Providing estimated requirements to suppliers		1	2	3	4	5	6	7
7. Providing flexible design specifications to suppliers		1	2	3	4	5	6	7
8. Use of standardized/reusable containers		1	2	3	4	5	6	7
9. Single point pricing (i.e., no quantity discounts)		1	2	3	4	5	6	7
10. Use of freight consolidation ("milk runs") for inbound materials		1	2	3	4	5	6	7
11. Elimination of inspections of material from qualified suppliers		1	2	3	4	5	6	7

1. The annual inventory turnover for this component is _____ turns per year. (enter # of turns)
2. The percentage of orders of this component delivered late is _____ percent. (enter late %)
3. The percentage of this component that is defective, not up to specifications, the wrong item, or otherwise unacceptable upon receipt is _____ percent. (enter nonconforming %)

<b>Rate the accuracy of each of the following statements by circling the appropriate response on the scale to the right. (Note: The term "parties" refers jointly to your firm and the supplier of this component.)</b>	<b>Completely Inaccurate</b>	<b>Completely Accurate</b>
Flexibility by both parties in response to requests for changes characterizes this relationship.	1    2    3    4    5    6    7	
It is expected that both parties will be open to modifying their agreements if unexpected events require it.	1    2    3    4    5    6    7	
It is common for either party to go to great lengths to accommodate the other party when emergencies arise as a result of unforeseen circumstances.	1    2    3    4    5    6    7	
In this relationship, it is expected that any information that might help the other party will be shared.	1    2    3    4    5    6    7	
It is expected that the parties will provide proprietary information if it can help the other party.	1    2    3    4    5    6    7	
My firm frequently communicates usage information (e.g., short- & long-term forecasts) to this supplier to help them plan for our needs.	1    2    3    4    5    6    7	
The parties to this relationship jointly coordinate production plans.	1    2    3    4    5    6    7	
In most aspects of this relationship, the parties are jointly responsible for getting things done.	1    2    3    4    5    6    7	
The parties to this relationship are often interested in pursuing joint product development activities (e.g., design, prototyping, testing, etc.).	1    2    3    4    5    6    7	
The parties expect this relationship to last a long time.	1    2    3    4    5    6    7	
The relationship with this supplier is essentially "evergreen".	1    2    3    4    5    6    7	
The parties plan not only for the terms of individual purchases, but also for the continuance of the relationship.	1    2    3    4    5    6    7	
My firm assesses the performance of this supplier through a formal vendor evaluation program.	1    2    3    4    5    6    7	
We advise this supplier of its performance relative to that of other suppliers.	1    2    3    4    5    6    7	
The personnel of this supplier feel free to openly and honestly give feedback concerning the performance of my firm in this relationship, even if that information is negative.	1    2    3    4    5    6    7	

1. Your firm manufactures primarily: (Circle one only)						
To stock	To customer order	To both stock and customer order				
2. Your production process consists primarily of: (Circle one only)						
Manufacturing of parts from raw materials	Assembling component parts			Both manufacturing and assembling of parts		
3. The size of your firm (division), in number of employees, is: (Circle one only)						
Less than 100	100 - 250	251 - 500	501 - 1,000	1,001 or more		
4. The annual dollar sales of your firm (division) for the most recent fiscal year is: (Circle one only)						
Less than \$50 million	\$50 - \$250 million	\$251 - \$500 million	More than \$500 million			
5. Other than the supplier that you have selected, how many other suppliers also supply this component? (Circle one only)						
0 (Single Source)	1	2	3	4 or more		
6. The term of the existing contract with this supplier is for _____ years and _____ months. (enter number) (enter number)						
7. Your knowledge of and involvement with the supplier of this component is:						
1 None At All	2	3	4	5	6	7 Very Comprehensive
8. Your firm's use of just-in-time purchasing methods in the relationship with the supplier of this component is:						
1 None At All	2	3	4	5	6	7 Very Comprehensive
9. Which of the following best describes the affiliation between your firm and the supplier of this component? (Circle one only)						
My firm has no ownership interest in the supplier	My firm has a minor ownership interest in the supplier	My firm has a significant ownership interest in the supplier	My firm wholly owns the supplier			
10. The cost of this component is approximately _____ percent of the total cost of the product into which it is assembled. (enter %)						
11. We have done business with the supplier of this component for _____ years and _____ months. (enter number) (enter number)						

APPENDIX B  
COVER LETTERS FOR FOUR MAILINGS

[Date]

[Name]  
[Title]  
[Organization]  
[Street Address]  
[City, State, Zip]

Dear [Name] :

Does the nature of your relationships with suppliers have an impact on the performance of your purchasing function? Are long-term, cooperative relationships with suppliers always appropriate; or under what conditions are they appropriate? You hold the answer to these important questions, and your input is critical. Enclosed you will find a questionnaire that will help to answer these questions.

I am a Ph.D. candidate at the University of North Texas (UNT), and this study will complete the dissertation requirement of my program. This project has been reviewed and approved by the UNT Committee for the Protection of Human Subjects.

Your participation is especially meaningful. You have been selected to be in a national sample of purchasing professionals from your industry. Unfortunately, even if only a few individuals choose not to respond, this can mean the difference between success and failure. Please do not underestimate the importance of your participation!

I have been mindful of your busy schedule, thus, the questionnaire is easy to complete and should require only about ten minutes of your time. The data that you provide will be analyzed in aggregate and individual firms will be in no way identified. Your responses will be held in complete confidentiality. You will not be asked to identify yourself or your firm, and no one other than myself will have access to the data in any form.

In consideration of your participation, I would like to offer an executive summary of the study findings when the project is completed. If you wish to have this report, include a copy of your business card along with the completed questionnaire in the enclosed postage-paid envelope. If you have any questions concerning the study, you may contact me at (719) 549-2567. Thank you for your time and consideration.

Sincerely,

Stuart H. Warnock

[Date]

[Name]  
[Title]  
[Organization]  
[Street Address]  
[City, State, Zip]

Dear [Name] :

Last week I mailed a questionnaire to you concerning the nature of relationships with your suppliers. If you have already mailed the completed questionnaire, please accept my thanks.

If you have not yet completed the questionnaire, please take a few minutes to do so. You will find the questionnaire to be "short and sweet". Remember, your participation is instrumental to the success of this study.

If you did not receive the questionnaire or misplaced it, do not worry. I will establish contact again in a few weeks and send another copy of the questionnaire if I have not received your response. Thank you for your consideration.

Sincerely,

Stuart H. Warnock

[Date]

[Name]  
[Title]  
[Organization]  
[Street Address]  
[City, State, Zip]

Dear [Name] :

Three weeks ago I mailed a questionnaire concerning the nature of relationships between your firm and its suppliers. In the event that the questionnaire was not received or has been misplaced, I have enclosed a duplicate copy of the questionnaire and another postage-paid envelope.

Your input is very important to the success of this study. Lacking your contribution, doubt will be cast upon the applicability of the findings of the study. So please take a few moments to complete and mail the questionnaire. Please include your business card if you wish an executive summary of the study findings.

I recognize that you have a busy schedule, but understand that your collaboration on research projects such as this is the single most important contribution that practitioners, such as yourself, can make to the advancement of purchasing knowledge and practice. It is a contribution that I genuinely appreciate!

Sincerely,

Stuart H. Warnock

[Date]

[Name]  
[Title]  
[Organization]  
[Street Address]  
[City, State, Zip]

Dear [Name] :

You are too important to ignore! As you know, I have contacted you previously concerning your participation in a study of the nature of the buyer-supplier relationship. If you have already returned the questionnaire, thank you.

If you have not completed the questionnaire, please do so today. The completion of the study is approaching, and I want your input to be a part of the study ... it is that important!

In the event that previous questionnaires were misplaced, I have included another questionnaire and postage-paid envelope. Again, you will receive an executive summary of the study results if you include your business card. I anxiously await your response!

Sincerely,

Stuart H. Warnock

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