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THE UNIVERSITY OF OKLAHOMA
GRADUATE COLLEGE

TECHNOLOGICAL READINESS AND STRATEGIC INTERACTIVE FIT: DYNAMIC CAPABILITIES IMPACTING LOGISTICS SERVICE COMPETENCY AND PERFORMANCE

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

By

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NORMAN, OKLAHOMA

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AND PERFORMANCE

A DISSERTATION

APPROVED FOR THE MICHAEL F. PRICE COLLEGE OF BUSINESS

by

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– but being from the Gulf Coast -- I will leave that to Voo Doo!

"Disbelief in magic can force a poor soul into believing in government and business."
– Tom Robbins

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ABSTRACT

In today's business environment, retailers and manufacturers face increasing complexity when it comes to managing the supply chain. As complexity increases, these retailers and manufacturers often look to technology as a tool for assisting in managing supply chain flows. All too often, managers expect a given technology to improve effectiveness with little attention paid to the partner firm's readiness for technological implementation. This dissertation examines the firm readiness for technological implementation in supply chain dyads (retail-manufacturer pairs). Specifically, firm optimism, innovation, discomfort, and insecurity are examined in relation to a firm's logistics service quality and overall market and financial performance.

Based upon the theoretical model and empirical results, firm technological readiness matters for both retailers and manufacturers. The level of technological readiness has a significant and direct impact on a manufacturing firm's logistics service quality and a retailing firm's perception of the manufacturer's logistics service quality across nine dimensions. Additionally, firms with tighter strategic interactive fit – technological readiness, technological goals, and technological roles - may experience improvements in logistics service quality. Finally, the relationship between firm technological readiness and market and financial performance is mediated by a firm's logistics service quality.

TECHNOLOGICAL READINESS AND STRATEGIC INTERACTIVE FIT: DYNAMIC CAPABILITIES IMPACTING LOGISTICS SERVICE COMPETENCY AND PERFORMANCE

CHAPTER ONE

INTRODUCTION

Competitive business environments are becoming increasing difficult for firms to navigate. As competitive environments intensify, the probability of maintaining a sustainable competitive advantage may decrease. Day and Montgomery (1999) identify five specific issues contributing to market competitiveness: the importance of knowledge; globalizing, converging, and consolidating of business and industries; fragmenting of markets; empowerment of customers; and adaptation of organizations. All five of these issues blur the requirements and boundaries of strategic marketing.

Conditions in the 1980s convinced many firms and researchers that vertical integration was the strategic "magic bullet" for control and profitability. This approach soon gave way to a more relational focus of firm integration, with collaboration substituted for extremely risky capital investments. Collaborative relationships are developed and maintained through management's ability to orient the firm toward long-term relationships cemented by the development of partner trust, commitment (Morgan and Hunt 1994), and agility (Christopher 2000).

Marketing managers and marketing researchers have examined business environments to explain how firms relate to their markets. Relationship marketing scholars chronicled many changes in relationship strategy (see Sheth and Parvatiyar eds. 2001). The locus of change is explained as a shift from discrete transaction-based buying and selling to a focus on relationships and retention. This shift has had a major impact on

suppliers and channel intermediaries pressured to find new sources of revenue despite thin margins.

As firms attempt to secure new and sustainable sources of revenue, they often must reevaluate traditional business models as well as the acquisition, commitment, deployment, and use of resources (Peteraf 1993). Within the supply chain, firms analyze potential partners and their resource offerings as a make or buy decision (or some combination of make and buy). They determine if they should integrate - make the function, role, or activity. Or, alternatively they may decide to partner – buy (rent) the function, role, or activity. Specifically, firm managers analyze partner resource capabilities and relate them to competitive need. If a match can be made that is beneficial in terms of economies and service, a partnership may be developed.

SUPPLY CHAIN MANAGEMENT AS A RESEARCH DOMAIN

The importance of interorganizational relationships has received much attention in the marketing and strategic management literature over the last two decades. Advancement in the study of these relationships has resulted in the study of dyads (Anderson and Weitz 1989) and networks (Anderson, Hakansson, and Johnson, 1994). The central thesis of research in these areas is that firms possess capabilities that allow them to excel in their markets and, through relational combination, form distinctive/competitive advantage(s). The evolution of this literature groups these relationships into what is now being termed Supply Chain Management (Mentzer 2000).

Supply Chain Management, as it is now called, was originally discussed as the nature of organizational relationships in distribution channels (Forrester 1958). Over the

last 10 years, Forrester's original theoretical proposition has gained popularity and is recognized both in academic literature and practice (Cooper, Ellram, Gardner, and Hanks 1997; La Londe 1997). Thus, the traditional view of functional roles in marketing (e.g., sales, transportation, marketing research, etc.) is moving towards a more general strategic view of performance in that the once segmented areas are integrated under a firm's overall market orientation (Webster 1992). More specifically, those marketing and management areas traditionally studied independently are being grouped into a distribution driven/partnering focus.

The central focus of research in marketing is the analysis of the exchange process and the degree of customer satisfaction given some economic utility (Gist 1971). Thus, satisfaction and forms of economic utility have become traditional outcome variables for researchers and performance goals for practitioners. Supply chain managers in particular must be attuned to both issues of customer satisfaction and the impact of possession, price, time, and place based utilities. These requirements are important if the manager hopes to retain customers, thus increasing customer lifetime value and developing long-term superior market-based and financial performance.

The supply chain itself is defined as the alignment of firms that brings product to market (Cooper and Ellram 1993; La Londe and Masters 1994; Lambert, Stock and Ellram 1998). As a unit of analysis, a supply chain is considered to be three or more firms linked to facilitate channel flows. Often these relationships are studied as a pair of partnerships (i.e., the focal firm and its supplier and the focal firm and its customer) (Mentzer 2000). Traditionally, the unit of analysis studied in supply chain research was one (focal) firm. Researchers looked solely from one firm's viewpoint in defining the

success or failure of a relationship/partnership. For example, a wholesaler would be asked about the partner fit between the wholesaler and its retailer or supplier. Recently, research has called for and/or incorporated dyads and networks (Anderson and Weitz 1989; Day and Montgomery 1999; and Anderson, Hakansson, and Johanson 1994). Interorganizational research on distribution aspects of dyads and networks generally focuses on logistics, marketing channels, or (more recently) the supply chain.

Supply chain management has been defined as "the systematic, strategic coordination of the traditional business functions within a particular company and across businesses within the supply chain, for purposes of improving the long-term performance of the individual companies and the supply chain as a whole" (Cooper et al. 1997; Houlihan 1985; Jones and Riley 1985; La Londe and Masters 1994; Mentzer, DeWitt, Keebler, Min, Nix, Smith, and Zacharia 2001; Monczka, Trent, and Handfield 1998; Stevens 1989). Supply chain management research studies processes that facilitate overall business flows including five major areas: product, negotiation, ownership, information, and promotion (Vaile, Grether, and Cox 1952). In this view, the marketing channel is considered a single supply chain unit or entity rather than fragments (Houlihan 1985, Jones and Riley 1985). The links in the supply chain are connected by multiple partnerships across multiple roles, tasks, and functions (e.g., materials source, manufacturing, wholesaling, and retailing). These partnerships combine to accomplish several major activities related to superior performance (see Table 1-1)

TABLE 1-1*
SUPPLY CHAIN MANAGEMENT ACTIVITIES RELATED TO SUPERIOR PERFORMANCE

1. Coordinating Behaviors That Link Customers and Suppliers
2. Mutual Sharing of Information for Planning and Monitoring
3. Risk and Reward Sharing: Distributive Justice
4. Cooperation Through Similar, Complementary, and Coordinated Activities
5. Mutual Goals and Customer Orientation
6. Integration of Sourcing, Manufacturing, and Distribution
7. Development and Maintenance of Long Term Relationships

*Adapted from Mentzer, DeWitt, Keebler, Min, Nix, Smith, and Zacharia 2001.

TECHNOLOGY AND TECHNOLOGICAL READINESS

One strategic tool used to facilitate the management of interorganizational or supply chain partnerships is technology. As market conditions increase in complexity, managers attempt to use technology to reduce uncertainty, manage performance, and build supply chain flexibility (Mentzer 2000, p. 4). Technology is used to manage information and knowledge that is vital to the efficient and effective transfer of product across the supply chain (Bowersox, Calantone, Clinton, Closs, Cooper, Dröge, Fawcett, Frankel, Frayer, Morash, Rinehart, Schmitz 1995; Bowersox, Daugherty, Dröge, Rogers, and Wardlow 1989). Hence, research has supported information management as an important function of supply chain management (Andel 1997; Cook 1999; Daugherty, Myers, and Richey 2002). Technology is also used to assist in the physical flow of product, flow of ownership, flow of negotiation, and flow of promotions. For specific technologies related to the five flows see Table 1-2.

As firm relationships become more complex, technology is often developed to simplify the processes that are expected to facilitate efficient and effective transactions. A

partner's ability and willingness to adopt this technology (Parasuraman 2000) may have an impact on the efficiency and effectiveness of these transactions taking place across the entire supply chain. As products, finances, information, and services flow across the supply chain, trading partners measure "process completion dimensions" of performance in terms of logistics service effectiveness (Perreault and Russ 1974; Perreault and Russ 1976a; 1976b), or more precisely – in terms of logistics service quality (Mentzer, Flint, and Hult 2001). The ultimate expectation is that a firm will develop superior performance when logistics service quality is better (Bowersox et al. 1995; Perreault and Russ 1974; Perreault and Russ 1976a; 1976b). Unfortuanltely, ultimate performance is often hard to measure as financial variables tend to be "snapshot" indicators of historic performance.

Table 1-2 displays a number of the technologies being used across the supply chain. The list shows both the dynamic nature of supply chain technological choices and the supply chain flow each technology facilitates. These technologies are being developed and adapted at a rapid rate. It is therefore not surprising that some firms tend to be skeptical of new technologies. In one specific case, a national grocery wholesaler found it virtually impossible to convince business partners to update technology in the wake of a potential industry shutdown (Richey, Callahan, Huston, and Millar 1999). This is a major issue, as each partner must be willing to use a supply chain technology to facilitate the five flows. The questions arises, is the non-innovating partner ready to accept the supply chain technology? If not, does it make sense for firms to strategically ally with firms that are "more" ready for technological change?

TABLE 1-2
TECHNOLOGY AND TECHNOLOGICAL APPLICATIONS ASSISTING IN SPECIFIC SUPPLY CHAIN FLOWS

Supply Chain Flow	
Product Flow	Auto ID (Bar codes & Scanners) Automatic Forecasting Systems Automatic Replenishment Programs Automated Materials Handling Equipment Cell Phones and Pagers ERP – Legacy Systems FAX Geographic Information Systems Just in Time – Kanban LEOS - Satellite Order Selection Systems Point of Sale Radio Frequency Transportation Management Systems Vendor Managed Inventory Warehouse Management Systems
Negotiation Flow	AI Automatic Forecasting Systems Data Mining Electronic Data Interchange Extranets FAX Internet – E-commerce Smart Purchasing Systems
Ownership Flow	Electronic Data Interchange Geographic Information Systems Order Selection Systems Point of Sale Smart Purchasing Systems Transportation Management Systems Warehouse Management Systems
Information Flow	Advance Shipment Notification Systems Automatic Forecasting Systems Cell Phones and Pagers Electronic Data Interchange ERP – Legacy Systems Extranets FAX Geographic Information Systems Internet – E-commerce

	LEOS - Satellite Order Selection Systems Smart Purchasing Systems Transportation Management Systems Warehouse Management Systems
Promotion Flow	Order Selection Systems Point of Sale Extranets FAX Internet – E-commerce Smart Purchasing Systems

PARTNER FIT IN INTERORGANIZATIONAL RESEARCH

A central thesis in supply chain management is that the chain itself is only as strong as its weakest link. This being said, supply chain managers must spend significant time selecting partners with good strategic fit. In interorganizational relationships, strategic fit is defined as a high level of agreement or consistency (strategy and/or structure) between two interacting organizations (Birkinshaw, Toulan, and Arnold 2001). Strategic fit has been identified as a dynamic capability key to gaining competitive advantage (e.g., Datta 1991; Griffith and Harvey 2001; Nahavandi and Malekzadeh 1988).

When selecting supply chain partners, managers may improve fit by acquiring capabilities through the partnership itself. Focusing on the effective management of technological resources as a capability, one would expect that as the level of technological readiness of a retail partner converges with that of a manufacturing partner, fit would improve and potentially yield a partnership or dyad-based capability. This type of fit is considered strategic-interactive fit or the interaction of firm technological readiness (Drazin and Van de Ven 1985).

THEORETICAL INTRODUCTION

The overriding theoretical domain of this dissertation is the Resource Based Theory of the Firm (Wernerfelt 1984; Barney 1991) incorporating its three major literature streams – dynamic capabilities, core competencies, and firm performance (Berman, Down, and Hill 2002). The proposed model presents *Technological Readiness* as a firm specific capability and *Strategic-Interactive Fit* as the partnering dynamic capability. *Logistics Service Quality* is treated as a measure of core competence impacting performance. As firms develop the ability to process information, learn (Teece, Pisano and Shuen 1990), and deploy knowledge to specific situations (Conner and Prahalad 1996), distinct capabilities are developed leading to a competitive advantage (Peteraf 1993). In marketing and management strategy, this domain has been discussed extensively as firm specific or market based dynamic capabilities (Day 1994; Eisenhardt and Martin 2000; Zander and Kogut 1995). Thus, firms develop core competencies through capabilities that when deployed may become market based assets and propel the firm towards superior performance (Eisenhardt 1988; Vickery, Stank, Goldsby, Dröge, and Markland WP).

Two other theoretical realms are discussed complementing the resource based grounding of this study. Transaction Cost Economics is discussed as it relates to economic benefits of relational governance between firms (Heide 1994). This is important as it helps explain efficiency considerations that hold supply chain partners together. In addition, the Strategic Fit literature is discussed briefly due to its importance every day operations and long-term partnerships.

The primary core competency of interest in the dissertation is technological readiness. Technological readiness has been discussed at the individual level as an individual's propensity (or ability) to embrace and use technology to achieve goals (Parasuraman 2000). Taken to the firm level, one would expect that a firm that possesses the ability to embrace and use new technological assets offered by a partner would develop a dynamic capability over other firms that do not. This relationship has been debated in the services marketing literature resulting in support for the importance of technology to marketing relationships and transaction effectiveness (Bitner et al. 2000; Meuter et al. 2000). It is quite possible that a firm's ability to manage the usefulness of a technology is a key to competitive advantage rather than the technology itself.

Relating technological readiness to logistics service quality follows the congruence line of thinking inherent in the firm fit/congruence relationship. The congruence approach proposes that synergy (i.e., fit) of operating components maximize efficient operations (Newman and Nollen, 1996; Tosi and Slocum, 1984). Research in this area suggests that efficiency and effectiveness results from a congruence of strategic factors (Child, 1972; Doty, Glick and Huber, 1993; Miner, Crane and Vandenberg, 1994; Newman and Nollen, 1996). Alternatively, when non-congruence exists, underlying differences in operating components create barriers to operational routine efficiency and effectiveness (Doty, Glick and Huber, 1993; Fey and Beamish, 2001; Keller, 1994; Miner, Crane and Vandenberg, 1994). Thus, as firms become more congruent/less non-congruent in their technological readiness, they may also exhibit the ability to better serve the needs of their partners, or here, enhance logistics service quality and performance.

Birkinshaw and his colleagues (2001) refer to this from of strategic fit as activity configuration fit.

PURPOSE OR THE RESEARCH

Three central constructs – technological readiness, strategic-interactive fit, and logistics service quality – and how they relate to firm performance are the focus of this research. A general framework of capability ⟶ competence ⟶ performance provides the framework for understanding the relationship between the constructs.

Service level in the supply chain management impacts firm performance (Perreault and Russ 1974; 1976a; 1976b) and logistics service competency has been found to lead to competitive advantage/superiority (Bowersox, Daugherty, Dröge, Rogers, and Wardlow 1989). Additionally, firms are becoming more reliant on technology for facilitating and controlling supply chain flows that contribute to service excellence. These technologies must be adopted and managed by both source and receiver for the flow of product to be optimized. Since supply chain management focuses on channel partnerships, assessing how ready a partner firm is for advancement in technology and the level of partner strategic fit, may help predict the impact technology will have on processes and outcomes. Here, the specific supply chain based outcome is logistics service quality.

Marketing researchers, management researchers, and the leading journals in marketing management have called for studies that relate service and quality outcomes to market and financial outcomes. This is specifically the case in both the marketing (Morgan and Piercy 1998) and logistics literatures (Cavinato and Perreault 1976). This

study's approach to model completion focuses on market based outcomes. The basic factors of the Logistics Service Quality construct are routine efficiency and effectiveness outcomes. Thus, one could logically derive that Logistics Service Quality drives firm market and financial performance. This move towards market-based and financial outcomes in the study of supply chain management is supported in recent literature (Beamon 1999).

To extend previous work on supply chain strategy, this study looks to make the following contributions:

1. Discover the role of *Technological Readiness* in predicting *Logistics Service Quality.*
2. Discover the impact of *Strategic Fit* of buyer and seller (retailer and manufacturer) *Technological Readiness* in predicting *Logistics Service Quality.*
3. Relate *Logistics Service Quality* to firm *Performance* in terms of efficiency and finances.
4. Finally, present a holistic model of dynamic supply chain capabilities, competency, and outcomes.

TECHNOLOGICAL READINESS AND STRATEGIC INTERACTIVE FIT: DYNAMIC CAPABILITIES IMPACTING LOGISTICS SERVICE COMPETENCY AND PERFORMANCE

CHAPTER TWO

REVIEW OF THE LITERATURE

The purpose of this chapter is to detail the theoretical foundations supporting the conceptual model. In doing so, relevant literature is discussed as related to the model's constructs and linkages. Resource Based Theory, Transaction Cost Economics, and Strategic Fit are all discussed to develop the conceptual model. Following the summary of each theoretical domain the constructs relevant to the study are discussed as they relate to each theory. The chapter consists of two major sections: (1) A review of the conceptual framework and (2) a summary and model introduction.

Supply Chain Management is grounded in strategic distribution research (Forrester 1958). Supply Chain Management represents an area of extreme importance to business researchers and practitioners (Larson and Rogers 1998). A recent search of articles related to the domain of Supply Chain Management is presented in Table 2-1. Originally developed by Larson and Rogers (1998), the updated ABI-inform generated profile documents an explosion of research in the academic realm. Additionally, practitioners are taking notice of the importance of the strategic area as can be seen in the popular press totals.

TABLE 2-1
SUPPLY CHAIN MANAGEMENT PUBLISHED FROM 1970-2003*

Year	Peer Reviewed Journals	Popular Press Publications
1970 – 1984	0	0
1985	2	0
1986	0	0
1987	0**	0
1988	1	2
1989	3	0
1990	1	1
1991	2	3
1992	2	6
1993	7	10
1994	10	26
1995	9	35
1996	32	72
1997	24	104
1998	69	181
1999	94	235
2000	105	231
2001	143	459
2002	110	375
2003 (January Only)	3	5

*Source ABI-Inform
**The two cited originally in 1987 by Larson and Rogers (1998) are in fact duplicates of the 1985 works.

Ultimately, researchers and practitioners look to the supply chain in an attempt to discover new sources of competitive advantage (Walker, Bovet, and Martha 2000). This "demystifying" of the supply chain means understanding what processes, resources, and relationships actually add value to business operations (Metz 1998). Marketing activities such as staying customer focused, customer segmentation and customization by needs, listening to market signals, measuring performance, integrating communication, building in flexibility, and developing supply chain wide technology have all be discussed as important components of supply chain management and development.

The understanding that companies no longer compete as autonomous units fuels the importance of the issues/decisions mentioned above. In fact, competition is more likely to be network based, as entire supply chains compete against one another (Lambert, Cooper, and Pragh 1998). Thus, a key strategic initiative of the supply chain manager becomes finding the appropriate partners the can assist the supply chain in developing a distinctive advantage over other supply chains in the market. The manager must think not only about the nearest members of the supply chain, but also the partners of their partners. In total, supply chain managers must use resources effectively, control transaction costs, and manage their partners.

CONCEPTUAL FRAMEWORK

The following represents a breakdown of the major theoretical areas important to the study of technologic readiness and strategic fit in predicting logistics service quality and performance. The review includes a detailed discussion of the central theoretical grounding -- Resource Based Theory – followed by a discussion of Transaction Cost Economics that may also help explain the conceptual model.

Resource Based Theory

> "Basing strategies on differences between firms should be automatic rather than noteworthy" – Wernerfelt, 1995

Dramatic changes in markets have caused firms to become more global and more reliant on technology (Olavarrieta and Ellinger 1997). This issue has caused many researchers to look to supply chain management and logistics as a source of competitive

advantage (Achrol 1991; Day 1994; Porter 1985; Webster 1992). The Resource Based Theory of the Firm, the Resource Based View of the Firm, and the related Resource Advantage Theory[1] have been developed to explain how firms relate to their markets by defining firms within the supply chain as a collection/bundle of tangible and intangible resources.

The origins of Resource Based Theory date back to Penrose (1955 and 1959) and her internal study of firm growth. Differing from economic theories of the firm, the Resource Based Theory of the firm focuses on the ability of a firm to be a creator of core competencies through capabilities rather than an avoider of negative market conditions (Prahalad and Hamel 1990). This is apparent in that Resource Based Theory rejects the economic market assumptions of perfect information, perfect resource mobility, and resource divisibility, focusing instead on resource uniqueness and capabilities (Conner 1991).

Birger Wernerfelt revived Resource Based Theory in 1984 to analyze the firm from the resource side rather than the product/market side. Wernerfelt criticized the way economists treat the inner workings of the firm, which he termed firm resources, as a simple black box. Thus, his analysis proposed that firm resources matter to performance, resource positions build barriers to entry and competition, balance is needed between resource exploitation and development, and specific resources are transferred by acquisition (Wernerfelt 1984).

[1] Resource Based Theory and Resource the Resource Based View of the Firm are often used interchangeably. Resource Advantage Theory combines the social limitations of neo-classical economics with the traditional Resource Based framework. Thus, Resource Based Theory and Resource Advantage Theory, though resource driven, are not interchangeable (see Hunt and Morgan 1997).

Resource Based Theory or the Resource Based View of the firm has been used extensively by both management and marketing researchers to assess strategic options (Wernerfelt 1984), competitive advantage (Peteraf 1993), and alliance formulation (Eisenhardt 1996) among others issues. Researchers have also worked to incorporate Resource Based Theory into the existing organizational economic paradigms of transaction cost economics (Combs and Ketchen 1999) and market competition (Hunt and Morgan 1996). These authors suggest that the combination of complementary views of the firm will develop a more holistic understanding of how and why firms exist in terms of resource relationships (Dyer and Singh 1998) and governance structure (Ghosh and John 1999).

The Resource Based Theory of the firm assumes the following: asset/resource heterogeneity, imperfect mobility of assets, ex post limits on competition, and ex ante limits on competition (Peteraf 1993). These assumptions develop a framework for resource outcome valuation when comparing one bundle of resources to another (also known as rents). From the resource perspective, assets can be valued based on convertibility, rarity, imitability, and substitutability (Srivastava, Shervani, and Fahey 1998).

Marketing researchers use the Resource Based Theory of the firm to test the effectiveness of resource deployments as decision criteria or what has been called "resource stepping stones" (Wernerfelt 1984) as short-term antecedents to long-term effectiveness. Hence, the Resource Based Theory of the firm has encouraged marketing and accounting researchers to separate marketing activities by resources/processes for financial analysis (Srivastava et al. 1998). As such, these resources have been defined as

tangible and intangible firm assets. The hope is that correct deployment of these assets tied to firm activities will lower costs, attain premiums in price, build competitive barriers, and develop a (sustainable or differential) competitive advantage.

Resource endowments (also referred to as asset makeup and resource scarcity) are said to drive a firm's propensity to ally with others (Eisenhardt and Schoonhoven 1996). In instances of scarce resources, firms look to channel partners to fill the gaps. Special type resources termed "market based assets" are assets that link customers and partners across the supply chain (Day 1994). Market based assets are suggested to positively impact cash flow enlargement and acceleration, firm risk reduction, and improve residual value (Srivastava et al. 1998).

Resource Advantage Theory is related to the Resource Based Theory of the firm and attaches social limitations to neo-classical economic theory (Hunt and Morgan 1997). Probably the most important contribution of Resource Advantage Theory is the uncovering of knowledge as a firm specific resource. This notion is leading some researchers to propose an evolutionary Knowledge Based Theory of the Firm or Knowledge Based View of the Firm (Conner and Prahalad 1996). As early as 1966, Polanyi noted the importance of knowledge to the firm. His view claims that knowing more than one reveals or can tell can (tacitness) be a key to competitive advantage. Zander and Kogut (1995) go as far as calling this extension of Resource Based Theory the Knowledge Based View of the Firm. They point to five major dimensions that impact knowledge as a transferable resource; codifability, teachability, complexity, system dependence, and product observability. Due to the fact that Resource Advantage Theory has operational deficiencies and The Knowledge Based View is still evolving and not yet

a theory (Barney 1996), it was decided that the dissertation would focus on application of Resource Based Theory. Table 2-2 presents seminal and new works involving Resource Based Theory.

TABLE 2-2
ESSENTIAL WORKS OF THE RESOURCE BASED THEORY OF THE FIRM

AUTHOR	YEAR	FOCAL CONTRIBUTION
Penrose	1959	Firms are defined as a bundle of resources, firm growth attributed to firm based resources and constrained by managerial (or human) resources.
Lippman and Rumelt	1982	Causal Ambiguity as a requirement to superior performance
Wernerfelt	1984	Firms as bundles of resources developed in strategic management literature. Resources drive strategic options.
Barney	1986a	Link to industrial-organizational economics as market factors help determine impact on economic rents.
Barney	1986b	Organizational culture discussed as a strategic resource.
DeGregori	1987	Resources are finite: depreciate and diminish over time.
Rumelt	1987	Firms as rent seekers not maximizers, Resources that are distinct or isolate drive rents.
Day and Wensley	1988	Skills and resources related to positional superiority in market orientation.
Aaker	1989	Marketing call for strategic management to focus on firm assets and skills.
Dierickx and Cool	1989	Resource imitation barriers (e.g. causal ambiguity) and resource isolating mechanisms (e.g. interconnectedness of assets) impede imitation by other firms making markets imperfect (e.g. market failures). (Organizational capabilities stream)
Hansen and Wernerfelt	1989	Empirical evidence that firm specific resources (organizational capabilities) are more important than industry variable in explaining performance.
Prahalad and Hamel	1990	Importance of core competencies (source article) as drivers of corporate strategy and diversification. Emphasis on leveraging core competencies. Diversification should be based on core competency maximization.
Rumelt	1991	Empirical evidence that firm specific resources (organizational capabilities) are more important than industry variable in explaining performance.
Barney	1991	Four major criteria for key strategic resources as sources of competitive advantage developed: scarce, inimitatible, non-substitutable, and valuable. Physical, human and capital

		resources discussed. (VIRO Model)
Conner	1991	Historical comparison of Resource Based Theory. with other theories of the firm. Clarification of assumptions and outcomes.
Tallman	1991	Resource Based Theory. employed to multinational enterprise strategy effectiveness.
Bowersox and Daugherty	1992	Logistics efficiency and effectiveness introduced as a competitive resource (capability)
Leonard Barton	1992	Resources as a source of core rigidity.
Webster	1992	Customer relationships as key strategic resources.
Amit and Schoemaker	1993	Firm market competitiveness attributed to effective deployment of resources and capabilities. (Organizational capabilities stream)
Peteraf	1993	Conceptual framework for theory building concerning Resource Based Theory.. Four sources of superior performance (rents) are scare and efficient resources and/or power and product markets
Collis	1994	Capabilities are context dependent – threat of erosion, substitution, or replacement. (Organizational capabilities stream)
Day	1994	Marketing based firm capabilities framework for competitive advantage. Importance of organizing capabilities from an outside in strategic approach. Suggests a combination of competition orientation (market sensing) and customer orientation. Logistics service discussed as a capability. (Organizational capabilities stream)
Barney	1995	Managerial application of resource based theory.
Collis and Montgomery	1995	Strategy text discussing resource based theory, linkages, and evolution.
Olson, Orville, and Ruekert	1995	Innovation in new product development dependent on participative resource management structures
Speh and Novack	1995	Positive impact of financial resource management/deployments on logistics.
Anderson and Narus	1996	Information systems as adaptive linking resources between distribution channel members
Conner and Prahalad	1996	Knowledge based resources have negative impact on firm opportunism.
Hunt and Morgan	1997	Resource Advantage Theory – resources drive firm market position and thus have an impact on performance.
Olavarrieta and Ellinger	1997	Resource Based Theory. applied as theoretical tool in Logistics/Supply Chain Management.
Teece, Pisano, & Shuen	1997	Importance of "dynamic" (renewable) capabilities and competencies discussed. Organizational learning discussed as a resource. (Organizational capabilities stream)
Dyer and	1998	Interorganizational relationships discussed as a firm resource.

Singh		
Leiberman & Montgomery	1998	First mover advantages and disadvantages discussed as related to Resource Based Theory.
Srivastava, Shervani, and Fahey	1998	Market based assets discussed as dynamic resources relating to a firms micro-environment.
Capron and Hulland	1999	Marketing management capabilities as re-deployable resources following acquisitions.
Combs and Ketchen	1999	Empirical study that supports the proposition that managers emphasize resource deployment decisions over industry level (organizational economic) decisions.
Skjoett-Larsen, Tage	1999	Importance of Resource Based Theory. to Supply Chain Management re-visited.
Fahey, hooley, Cox et al	2000	Market orientation, positioning, and time horizon as key firm capabilities.
Srivastava, Fahey, and Christensen	2001	Call for more use of resource based theory in marketing research. Market based assets discussed as source of competitive advantage.
Anand and Delios	2002	Explanation of foreign direct investment activities using Resource Based Theory. Firms seek to acquire capabilities in FDI strategy.

The goal of effective resource based strategy is to deploy resources in a way that increases the value of the firm and its resources. Thus, the central thesis of Resource Based Theory is creation of value (Barney 2001; Priem and Butler 2001a; Priem and Butler 2001b). Bowman (2001) breaks resource-generating value into three branches – perceived value, exchange value, and total monetary value. Perceived value is the value a partner or customer places on a resource based product or service. A supply chain partner looks at a resource, product, service, or technology and defines its usefulness based on internal perceptions. When an internal perception is developed that a supply chain partner's resource(s) is useful, that partner will make a distinction as to whether a product, service or technology should be used.

Exchange value is value created as a product or service moves down the supply chain (Bowman 2001). Thus, resource suppliers pass products and services down the supply chain creating value for each exchange partner. Under conditions of effective resource deployment, e.g. use of technology developed by one partner and transferred to another, each partner may gain value or rents. The third type of value is called total monetary value and is more related to the end user and thus not specific to this study, Total monetary value is defined as price paid plus consumer surplus (Collis 1994).

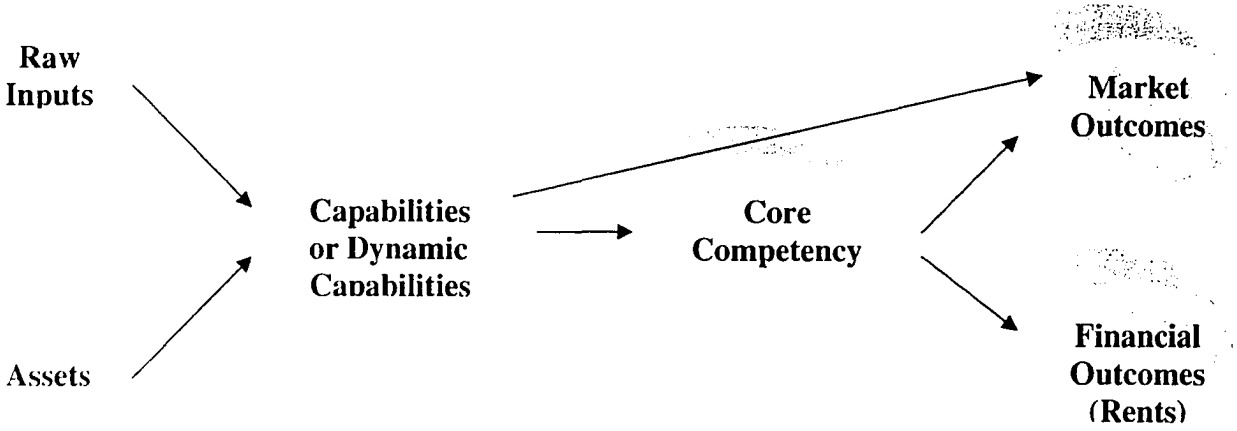
A process model of resource deployment involves combining input factors and assets to derive capabilities (Olavarrieta and Ellinger 1997). Input factors include raw factors and assets. Raw factors have been described as generic resources that can be easily acquired. In supply chains these factors may include many of the basic technologies displayed in Table 1-1. When applied to an operational situation, these inputs are transformed into assets or capabilities. These factors are available to any competitor in the market and thus cannot drive competitive advantage alone.

Assets are considered to be both visible and invisible resources controlled by a firm (Bogaert et al. 1994). When considering competitive positioning, firms often employ assets such as brand names, patents, and specific knowledge (Schultze 1994). Assets are only considered capabilities when they are taken in combination with organizational processes (i.e. managed). These complex bundles often include individual skills and knowledge that make the asset combination more firm specific (Amit and Schoemaker 1993; Day 1994). Specifically, technological ability, management of relationships, service delivery, and order fulfillment have been discussed as supply chain based capabilities. When firms develop the ability to adjust these capabilities to match the

competitive environment they become *dynamic* capabilities (Day 1994; Srivastava, Shervani, and Fahey 1998).

The next step in the resource based process model is development of core competencies. A core competency is defined as a bundle of capabilities that enables a company to develop a distinctive advantage over rivals (Hamel and Prahalad 1990, p. 199). Thus, a discrete technology or skill would not be considered a distinctive competency. Rather, it would be a set of skills that are impacted by a capability or capabilities. Thus, when logistical capabilities such as service delivery, customer satisfaction, and order fulfillment are achieved in a combined form, a higher order dynamic capability is formed and thus considered a core competency. Thus, a logistical service core competence is actually a dynamic combination of more basic logistical capabilities. When achieved, a dynamic core competency may assist the firm in developing a market based performance advantage and/or superior economic rents. A generic example of this process model is displayed in Table 2-1.

FIGURE 2-1
A RESOURCE BASED PROCESS MODEL



Transaction Cost Economics

Resource Based Theory focuses on value added through effective resource deployment. Given this focus, Resource Based Theory may lack the efficiency/cost basis to fully why and how firms interact. As discussed, it is important to deploy resources in a way the increases perceived value, but enhancing exchange value may be related more to lowering costs and increasing efficiency (Bowman 2001). Ultimately, the resources that drive competitive advantage should increase perceived value, solidifying relationships, and increase rents. Thus, some attention must be paid to minimizing the transaction costs involved in the exchange of products and services.

Transaction costs occur when exchanges take place beyond the boundary of the firm (Williamson 1975). In Coase's 1937 classic piece, he addresses economists who have traditionally viewed the firm as a "Black Box" (Coase 1937). Inside this black box managers make decisions related to resource deployments, resource acquisitions, and related transaction/production costs. The central thesis of his work is that managers must measure cost and determine whether to internalize a supply chain related process (make) or partner with another firm and allow them to manage the process (buy). When a make decision is made, efficiencies are measured as transaction costs rather than internal production costs. Thus, supply chain efficiency and performance is related to effective deployment of resources and efficient control of transaction costs. Recent supply chain research of this type has focused on factors that lead to technological alliances

(Robertson and Gatignon 1998) and sourcing and performance (Murray and Katobe 1999),

Williamson (1975) expanded on Coase's theoretical base by developing the concept of transaction specific investments and the behavioral assumptions of opportunism, and bounded rationality. Transaction specific investments create an opportunity cost for firms who choose to end a dyadic relationship, as those relationship specific assets/resources cannot be redeployed. Thus asset specificity is specifically defined as "assets used for a special purpose" (Williamson 1985). The concept of a technological transaction specific asset is self-descriptive, a special purpose technology related to an individual exchange relationship. Such assets have been shown to drive opportunism (Anderson 1988), lead to integration (Anderson and Coughlan 1987) grow commitment (Anderson and Weitz 1988; Heide and John 1990), shift control (Heide and John 1992) and mediate relational closeness. As previously discussed in the Resource Based Theory section, these assets are processed into capabilities that drive core competencies and (indirectly) impact performance.

The behavioral assumptions increase the difficulty of managing cost. Opportunism is defined as a partner's propensity to act its own (self) interest. Opportunism is a moral hazard and can be defined as pursuing self-interest with guile (Williamson 1981; 1985). Supply chain technology may assist in protecting firms from the opportunistic activities of partners. For example, effective management of automatic replenishment systems, CPFR system, and information systems may assist in the systemizing and monitoring of supply partners. Thus, effective management of supply chain technology may control costs related to opportunistic transactions.

Opportunism is sometimes affected by the level of bounded rationality (behavioral and environmental uncertainty) possessed by the firms involved in the exchange. Bounded rationality limits a firm's ability to formulate and solve dynamic problems (Simon 1957). Fortunately, effective management of supply chain technology can increase partner knowledge and reduce the negative cost impact of bounded rationality by building technological governance/monitoring mechanisms. Thus, one way partner specific risk may be minimized is though effective information processing facilitating the receiving, storing, retrieving, and transmission of information.

When partnering across the supply chain, managers often become concerned that resource deployments in the form of transaction specific assets will cause their firms to become hostages to specific relationships. The hostage model suggests that firms in exchange relationships must share a common tangible asset (or resource) for a credible commitment to arise (Williamson 1983). The action that takes place to create a binding relationship is termed "pledging a hostage." Firms may actually be forming dyads on the basis of technological deployment. The cost of development could then make them hostages to the opportunity costs of canceling that deployment. Due to this dynamic; firms often develop contracts to protect themselves from partner opportunism and bounded rationality (Macneil 1980). These contracts govern exchanges on a continuum from relational to discrete (Dwyer, Schurr and Oh 1987; Anderson and Narus 1991; Heide and John 1992). Discrete exchanges are low in communication depth and cannot exist if a relationship may develop and are thus not relevant to the study (Dwyer, Schurr, and Oh 1987). Relational exchanges transpire over time, are complex and personal, and focus on economic outcomes and non-economic outcomes, such as logistics service

satisfaction (Dwyer, Schurr, and Oh 1987). Contracts that govern relational exchanges can be explicit (hard) or non-explicit (implicit or soft) (Rousseau 1995) and are not the same constructs as discrete and relational (Lusch and Brown 1996). Thus, both explicit and implicit contracts can apply to relational exchanges. Ultimately, these contracts manage resources and define process behaviors (roles and goles) and/or outcomes.

SUMMARY

The contributions of Resource Based Theory and Transaction Cost Economics to explaining firm interactions are many. Dynamic explanations such as resource types, exchange formats, and transaction specific investments have been developed to explain why and how firms continue to exist. Yet, researchers have neglected to empirically examine the technological resource-performance relationship in a supply chain context. Such a relationship is depicted in the conceptual model presented in the next chapter. The development of the model and its hypotheses is the focus of the Third Chapter.

TECHNOLOGICAL READINESS AND STRATEGIC INTERACTIVE FIT: DYNAMIC CAPABILITIES IMPACTING LOGISTICS SERVICE COMPETENCY AND PERFORMANCE

CHAPTER THREE

CONCEPTUAL MODEL AND HYPOTHESES

Supply chain relations are often studied by looking at the interactions between two partners in a channel relationship. Much of the work in business to business/channel relationships at the macro level has focused on this type of analysis. As marketing channel relationships become more complex, firms and managers look for ways to reduce financial risk exposure, improve performance, and open new areas of creative opportunity. The use of technology and finding a partner whose technological capabilities fit the relationship are resource endowments that may positively impact overall financial and market performance.

RESEARCH HYPOTHESES

Researchers have examined technology as an asset or resource that drives or facilitates firm performance (Daugherty, Myers, and Richey 2002). Technological assets have been termed tangible, intellective/analytical, and hybrid (Brooke 1997).

Tangible technological assets are assets that can be physically measured and typically are used to facilitate the management of people, time, and money related processes. Anything from a basic conveyor system to a more advanced automated-guided vehicle system would fit into this classification as they help to automate the basic supply chain flows. These assets may cut labor costs, make exchanges more predictable, and allow the supply chain manager greater process control.

Intellective/analytical technological assets are assets that help inform the firm or managers as to the potential options in the market. These technological assets are often related to software programs such as customer database management (e.g. *Goldmine*) or advanced automatic replenishment systems that seek the most efficient transaction. Unlike physical assets, intellective assets work as direct relationship control and/or co-coordinating systems that point firms in a strategic direction and may even take partner perceptions into account. In logistical terms, these assets help improve response times, satisfaction, and market sensitivity.

Hybrid technological assets/resources are assets/resources that combine the tangible assets with intellective assets creating a technological resource at the interorganizational level (Brooke 1997, p. 117). Hybrid assets/resources include complicated global position and tracking systems, Collaborative Planning and Forecasting for Replenishment Systems (for more examples see table 1-2). These resources transform information and automate physical flows by focusing on interorganizational coordination over firm individualism. As strategic resources, these dynamic capabilities allow firms to adapt to changing market context, develop alliances, and position themselves for global expansion. The fact that hybrid resources are resources and not just assets or inputs makes them the focal application/tool in this study.

In interorganizational supply chain relationships, for firms to effectively implement boundary spanning hybrid technological resources they must find a partner who will adopt and use the technology effectively. Much of the information systems research on the selective adoption process has focused on functional itrafirm relationships (Cooper and Zmud 1990; Allen 1997). The research focusing interfirm relationships and

hybrid technological resources has mainly examined EDI and MRPII system adoption and facilitation (Attewell 1992; Sum and Yang 1993; Wright 1984). From a cross functional perspective, these researchers suggest three important dimensions that are needed for adoption to take place: practicality, trustworthiness, and fairness (Allen 1997).

The three dimensions of adoption are most relevant when partners are dependent upon one another (Allen 1997). This may help explain the similarities between these three dimensions and other grounded constructs in marketing. Practicality is discussed as the perception that an employee or business partner considers a technology useful. This means that the technology should have some bearing on work effort and process outcomes. Trustworthiness is equivalent to the relationship marketing definition of benevolent commitment. Hence, this definition of trustworthiness assesses a partner's belief that is if they have a problem with the technology, their partner will go out on a limb for them. Fairness is defined as the ability to evaluate intentions. This is similar to the equity and justice construct of supplier and vendor reputation (Anderson and Weitz 1992; Doney and Cannon 1997; Ganesan 1994). Thus firms attempt to predict procedural, distributive, and interactive risk, cost, and rent sharing related to technology.

Research in marketing has taken the study of technological adoption to another level. Parasuraman's (2000) work on customer technological readiness or the Technological Readiness Index develops a 4-dimension construct of readiness to adopt and/or use a technology. Technological readiness is defined as "people's (or in the context of this study a firm's) propensity to embrace and use new technologies for accomplishing goals" (Parasuraman 2000, p. 308). Thus, the construct measures a firm's ability to cope with the eight paradox's related to effectiveness of technology:

control/chaos, freedom/slavery, new/obsolete, competence/incompetence, efficiency/inefficiency, fulfills/creates needs, assimilation/isolation, and engaging/disengaging (Mick and Fournier 1998).

Parasuraman's technological readiness (index) construct differs from the adoption construct in that it directly measures a person's (or firm's) readiness to use a technology. The dimensions include Optimism, Innovativeness, Discomfort, and Insecurity. Each dimension is defined below.

TABLE 3-1
TECHNOLOGICAL READINESS DIMENSIONS DEFINED

TRI Dimension	Items	Dimension Definition
Optimism	10	A positive view of technology and a belief that it offers increased control, flexibility and efficiency.
Innovativeness	5	A tendency to be a technological pioneer.
Discomfort	8	A perceived lack of control over technology and a feeling of being overwhelmed by it.
Insecurity	5	Distrust of technology and skepticism about its ability to work properly

The technologic readiness index may be superior to the adoption construct in that adoption can only explain why a firm has selected the technology. The technological readiness index may help predict the benefits of adopting that technology at a dynamic level. As previously discussed, when technology is studied as an innovation itself (physical or intellective) it is not a resource. When the same technology is managed in process the asset becomes a hybrid resource due to the fact that management is driving or managing the technological asset to the best of its ability. If management is ready to manage the technology, the technological asset may be considered a deployable resource

of the firm and a potential dynamic capability. If not, the asset may very well be wasted. Since some firms and/or individuals may adopt a technology that they are not ready for may compromise management of the technological resource and ultimately the potential outcome may be negative or at best less than optimal. Thus a firm or managers readiness may be a better predictor of performance than adoption and its intention motivated dimensions.

In the context of the supply chain, technology is often used to improve operating flow and efficiency. Thus, from a resource based perspective – through effective management (input) of the technological assets one hopes to derive managerial capabilities, efficiency competencies, and ultimately superior performance. Taken individually, supply chain capabilities include common metrics of timeliness, order accuracy, order and contact quality, and order condition (Bowersox, Closs, and Cooper 2002). Core competencies have been defined as "the collective learning in the organization," especially how to coordinate diverse production skills and integrate multiple streams of technologies (Prahalad and Hamel 1990). One would expect that knowledge based management inputs combined with valuable, inimitable, rare, and organization/partner specific technological assets would create individual capabilities. Taken in sum, these capabilities may develop a core competency.

Recent research in Supply Chain Management has developed a battery of capabilities (items) that taken in sum may be considered a logistics based core competency termed the Logistics Service Quality Framework (Mentzer, Flint, Hult 2001). Mentzer and his colleagues suggest ten specific dimensions (logistics capabilities)

that impact a firm's logistical competency.[2] In the initial order placement stage, firms must create and manage personal contact quality, order release quantity correctness, information quality, and ordering procedure effectiveness. Thus, when a retailer and manufacturer employ and are ready to manage technology that assist in making the order placement process more efficient and effective, an order placement capability may arise. Additionally, the completion of the downstream logistics service process is expected to include capabilities of order accuracy, order confirmation, order quality, (cycle) timeliness, and order discrepancy handling. Thus, when a retailer and manufacturer employ and are ready to manage technology that assists in making the order receipt process more efficient and effective, an order placement capability may arise. Mentzer and his colleagues finally suggest that both the order placement capability and order receipt capability impact customer satisfaction, which is in itself considered a capability throughout the relationship marketing literature as an outcome of service and process effectiveness (see Sheth and Parvatiyar 2001, p. 390). When all these capabilities are taken in combination, the dynamic framework can be considered a core competency.

Research in management information systems has specifically studied the use of technology in service quality related to logistics. Studies have examined technology's impact on scheduling, inventory planning and management, inventory flow and facility design, and quality (see Allen 1997 – MRPII Adoption). A common finding of these studies is that the positive impact of technology on efficiency outcomes occurs during the

[2] Taken individually, each dimension of the Logistics Service Quality Framework should be considered a capability of the firm. Taken in combination, these dimensions drive the core competency of superior logistics service or logistics service quality. Thus, in some instances one capability may drive another capability without driving what is considered to be a core competency. For example a technological readiness capability may drive an information quality capability without driving a core competency. Conversely, technological readiness may drive the entire logistics service quality construct and thus a capability is driving a core competency.

implementation stage when management is actively involved in the adoption, use, supplementation, and/or replacement of the technology (Allen 1997; Cooper and Zmud 1990). As discussed above, effective management of the technology may require managers/firms to be ready for that technology to be implemented. Given this discussion, the following hypotheses are developed looking at both sides of the relational dyad.

H_1: The greater a manufacturer's technological readiness, the greater the manufacturer's logistics service quality.

H_2: The greater a retailer's technological readiness, the greater the retailer's perception of manufacturer logistics service quality.

Using resource based logic; one would expect that when a correct match is made between complementary firm resources, capabilities, and competencies, firms might become interdependent and more efficient. As discussed earlier, fit or strategic-interactive fit has been called a dynamic capability of the firm and a key to competitive advantage (Datta 1991; Drazin and Van de Ven 1985; Nahavandi and Malekzadeh 1988). Through superior fit, firms are often able to maximize operational efficiency (Newman and Nollen 1996; Tosi and Slocum 1984). When related to the impact of technology, the question becomes – are the needs and goals of the two firms congruent. Firms must have technology based needs and technology driven (service) goals for technology to have an impact on performance.

Smith and Barclay (1997) discussed fit/congruence in terms of partner goal differences. Their relationship-based research shows that evaluation of trust and effectiveness outcomes is reduced when the fit (or congruence) between partner goals is

weak. In addition, Lusch and Brown (1996) focus on congruency concerning explicit and normative roles of partners. Their research concluded with a number of findings including the importance of role identification in creating long-term relationships focused on superior performance. The strategic marketing literature suggests that when firms do not exhibit fit/congruence, conflict may arise negatively impacting efficiency and effectiveness (Jaworski and Kohli1993; Menon, Jaworski, and Kohli 1997).

In terms of technology, strategic-interactive fit may come down to having similar goals for the technology and similar understanding of the roles a firm is expected to play in the implementation and management of that technology. Incongruence in the relationship may result in a reduction in efficiency. Given this discussion, the following hypothesis is developed looking at both sides of the relational dyad.

H_3: Retailers and Manufacturers with stronger strategic-interactive fit in terms of goals, roles, and general technological readiness, will experience better logistics service quality than firms with weaker fit.

Often, researchers in marketing and management examine only relational and efficiency outcomes. Recently, researchers and practioners have been calling for more research that measures market and financial performance outcomes (Beamon 1999; Morgan and Piercy 1998). These researchers suggest that research cannot truly be considered strategic without an understanding of the firm's performance versus the market (competitors).

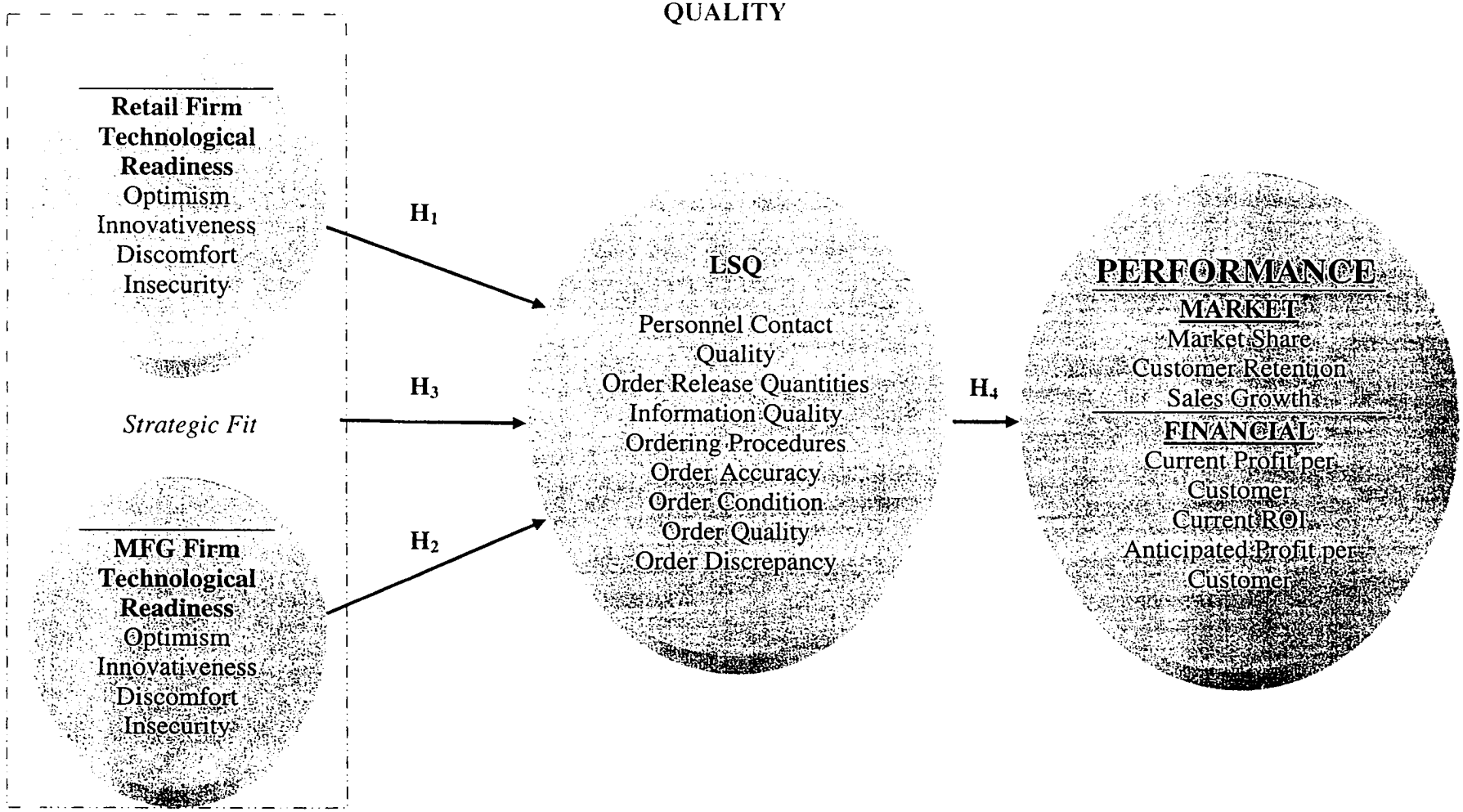
Literature in supply chain management and logistics suggests that efficiency outcomes, like logistics service quality, may contribute to a firm's market and financial

performance (Bowersox, Closs, and Cooper 2002). Additionally, it is suggested that effective use of supply chain technological resources contributes to channel efficiency and ultimately market performance (Keebler, Manrodt, Durtsche, and Ledyard 1999). An excellent example of this relationship is the fact that some firms have increased their market share through the effective management of EDI (Novack, Langley, and Rinehart 1995). Given this discussion, the following hypothesis is developed looking at both sides of the relational dyad.

H_4: The better the logistics service quality, the better market and financial performance.

The full conceptual model is present in Figure 3-1

FIGURE 3-1
SUPPLY CHAIN CAPABILITY, COMPETENCE, AND PERFORMANCE:
THE IMPACT OF TECHNOLOGICAL READINESS, STRATEGIC-INTERACTIVE FIT, AND LOGISTICS SERVICE QUALITY



CHAPTER FOUR

RESEARCH DESIGN AND MEASUREMENT

The conceptual model in Chapter Three depicts the hypothesize interrelationships between technological readiness, strategic-interactive fit, logistics service quality, and performance outcomes in a dyadic supply chain context. To test these relationships, empirical research was undertaken. Chapter Four covers an examination of methodological issues related to the testing of the hypothesized conceptual model. Specific areas addressed include the research design, preliminary qualitative research, profile of the sampling frame, development of instruments, measurement concerns, data collection, and psychometric concerns.

RESEARCH DESIGN

Three elements must be considered before conducting empirical tests on the proposed relationships. First, the model itself does not lend itself to a study using secondary data. Due to the highly perceptual nature of data related to manager technological readiness, strategic-interactive fit, and some aspects of logistics service quality, a survey method of collecting data is considered most appropriate. Second, surveys are considered the most appropriate option due to the fact that no controllable audience is available and is often considered less realistic and generalizable than field based studies (Peterson 2001). Finally, the research design will encompass a survey of paired dyads, which require a mail survey-based matching methodology of retailers to

their portfolio of principals or manufacturers to their portfolio of agents (Anderson and Weitz 1989) Combined, these factors indicate use of a written survey method and require scales to measure the focal constructs edited to fit the sample market context and dyadic position in the supply chain.

The current research method is designed to address many of the common psychometric concerns. A survey design targeted to collect primary data from manufacturers and retailers in a supply chain context is employed. This approach follows a matched pair method and utilizes previously developed and proven scales tailored for this specific context. Ten specific steps are taken to improve the validity and quality of the data analysis. These steps are presented in Table 4-1.

TABLE 4-1
A BASIC FRAMWORK FOR DATA DEVELOPEMENT

STEP	REASON
Step 1 - Field Based Case Analysis	In applied sciences, field studies help uncover issues relevant to managers and increase the likelihood of developing contributions to theory and practice.
Step 2 - Literature Review and Hypothesis Development	After the contextual arena is set, an extensive study of existing literature sets the stage for a focused examination of the problem by pinpointing relevant constructs and relationships.
Step 3 - Exploratory/Qualitative Interviews	After the theoretical model is developed, researchers move towards instrumentation. Instruments should be constructed with the target audience in mind to improve validity and reliability.
Step 4 - Initial Survey Development	The initial survey is developed using as many proven scales as possible. Scales are adapted based on step three and new scales are developed where existing scales are not available.
Step 5 - Survey Pretest	A small segment (not included in the main study) is used to test the applicability, readability, format, and time requirement.

Step 6 - Survey Revision	The survey revision helps improve construct and external validity by reducing error caused by confusion and method factors.
Step 7 - Sample Selection	The appropriate sample is selected to increase representativeness and generalizability.
Step 8 - Data Collection	Data is collect over a series of waves to improve response bias.
Step 9 - Descriptive Statistics and Data Cleaning	Sample bias, entry errors, and violations of assumptions are examined to improve reliability.
Step 10 - Factor Analysis and Construct Revision	Solidifies construct validity.

* Based on the works of the following: Anderson and Gerbing 1982; Churchill 1979; Dillman 1978; Eisenhardt 1988 and 1991; Eisenhardt and Bourgeois 1988; and Hair, Anderson, Tatham, and Black 1995.

The remainder of this chapter details these steps and concludes with a brief discuss of model estimation. These steps are followed in sequence to improve validity, reliability, and generalizability.

FIELD BASED CASE ANALYSIS

An initial examination of supply chain interactions centered on technology was performed to evaluate the dynamics of supplier-buyer relations. The context was the grocery industry focusing on Fleming (a national wholesaler of groceries) and its offering of technological upgrades to its independent channel partners (for a detailed discussion of this case analysis see Richey, Callahan, Huston, and Millar 1999). This analysis involved intensive interviews of corporate managers by a four-member team. Each interview was taped, transcribed, and discussed. Following the discussion, follow-up questions were developed and administered to each manager.

The basic conclusions of the study were that the retail group was not ready for new technology and thus was unwilling to make changes to their existing infrastructure. Additionally, there was a lack of fit in the strategic planning frame of the two partners.

The wholesaler was focused on developing and offering the technological upgrades based on a strategic or long term planning horizon, while the retailer seemed consumed by the short-term tactical operation of the business. Only relational outcomes (satisfaction, trust, and commitment) could be predicted by the study due to limited access to operational data on the wholesaler side and complete restriction from operational and financial data on the retailer side.

LITERATURE REVIEW

Following the basic understanding of the dynamics of the market, a detailed literature review was developed. Relevant literature was collected using web based search engines (ABI - inform; Infotrac; JSTOR; PSYC-Info; Search Bank; and Lexis Nexis), backtracking articles from the bibliographies of relevant works; polling experts in the field; and examining books and prior dissertations. The results of this canvassing of the literature are presented in Chapters Two and Three.

PRELIMINARY QUALITATIVE RESEACH

To refine the study, exploratory interviews were conducted. Experts from the fields of retailing, manufacturing, wholesaling, and education (academics) were contacted to examine the relevance of the research questions. Individuals contacted included business and statistics professors, retaii store managers and owners, wholesaling managers and officers, manufacturing managers and officers, and supply chain consultants from multiple industries. Based on gaps found in the literature and the

interviews conducted, it was determined that the research questions were relevant and would make a contribution to literature and practice.

INITIAL SURVEY DEVELOPMENT

The initial survey was developed using the technique discussed by Churchill (1979). First, as previously discussed a focused review of the literature was performed with emphasis placed on technology, strategic fit, logistics service, service quality, and performance. This review resulted in the identification of specific constructs that would assist in the measurement of the related phenomenon and model estimation. As tested scales exist for all the constructs studied in the analysis, some of the steps in the Churchill method were unnecessary. After the scales were selected they were adjusted to fit the context of the study. A brief discussion of each construct follows.

Technological Readiness

As discussed in Chapter Two, researchers have taken different approaches to studying technological readiness. Most of these researchers have focused on the adoption act itself and not the individual managerial perceptions of being ready for implementation of the technology itself. One study that focuses directly on studying the readiness of individuals to implement technology utilized the Technologic Readiness Index (TRI) (Parasuraman 2000). Technological readiness is defined here as, a firm's "propensity to embrace and use new technologies for accomplishing goals." The Parasuraman TRI scale captures four dimensions of readiness that may contribute to the effective management of technology. The TRI scale is focused on the individual consumer. Due to the supply

chain frame of this study, each item was adjusted to fit a firm interaction context. The adapted scales are presented in Table 4-2.

TABLE 4-2
THE TECHNOLOGICAL READINESS INDEX*

Optimism 1 (OPTI 1)	Technology gives my company more control over daily operations.
Optimism 2 (OPTI 2)	Processes and equipment that use the newest technologies are much more convenient to use.
Optimism 3 (OPTI 3)	We prefer to use the most advanced technology.
Optimism 4 (OPTI 4)	We to use technology that allows you to tailor things to fit your own needs.
Optimism 5 (OPTI 5)	Technology makes task completion more efficient.
Innovativeness 1 (INNO 1)	Other firms come to us for advice on new technologies.
Innovativeness 2 (INNO 2)	It seems that our business partners and competitors are learning less about the newest technologies than we are.
Innovativeness 3 (INNO 3)	In general, we are among the first in my industry to acquire new technology.
Innovativeness 4 (INNO 4)	We can usually figure out high tech products without the help of others.
Discomfort 1 (DISC 1)	Sometimes, we feel that technology is not developed for use by ordinary people.
Discomfort 2 (DISC 2)	When we get technical support from a provider of a high-tech product or service, we sometimes feel that we are being take advantage.
Insecurity 1 (INSC 1)	We do not consider it safe giving out our company account numbers over a computer
Insecurity 2 (INSC 2)	We do not consider it safe to do any kind of financial business online.
Insecurity 3 (INSC 3)	We worry that information you sent over the Internet will be seen by competitors.
Insecurity 4 (INSC 4)	We do not feel confident in working with a business partner that can only be reached online.
Insecurity 5 (INSC 5)	If we transmit company information electronically, we can never be sure it will get to the right place.
Insecurity 6 (INSC 6)**	If we transmit company information electronically, a terrorist may use the information against us.

* 7-Item Likert Type Scale (Strongly disagree = 1; Strongly agree = 7)
** New item added due to current macro-environmental climate.

Strategic-Interactive Fit

As previously discussed, in selecting supply chain partners, managers may improve fit by acquiring capabilities through the partnership itself. Focusing on technological resources as a capability, one would expect that as the level of technological readiness of a retail partner converges with that of a manufacturing partner, fit would improve and become a partnership-based capability. This type of fit is considered strategic-interactive fit or the interaction of firm technological readiness (Drazin and Van de Ven 1985). Thus, strategic-interactive fit looks at a firm's strategy relative to its interactions with its partners. This concept has been discussed in detail in the marketing and supply chain literatures, however rigorous measures have not been developed.

To study strategic-interactive fit, with attention paid to technology, three dimensions must be examined. First, a distinction must be made as to the ability of the firm to manage the technological resource itself. This may be accomplished by making strategic-interactive fit the latent dependent outcome of the dyadic scores of both firms in the matched pair (see Edwards 1994, 1995). This approach is grounded in examining the similarities between the two groups and has been used extensively in the human resource literature. For specific scale items see Table 4-3.

A second issue is defined by Smith and Barclay (1997) when they discuss fit/congruence in terms of partner goal differences. These items, developed by Smith and Barkley, are adapted below to correspond with the technological focus of the study.

TABLE 4-3
TECHNOLOGICAL RESOURCE DEPLOYMENT GOAL DIFFERENCES*

Goal Differences 1 (Goal 1)	Our reward systems are compatible with that of our partner.
Goal Differences 2 (Goal 2)	Our procedures for control and use of the technology are different from our partner (customer). (reverse)
Goal Differences 3 (Goal 3)	Our objective for technology is always the same as our partner (customer).
Goal Differences 4 (Goal 4)	Differences in the goals we have for our technology cause the ordering process to become inefficient. (reverse)

* 7-Item Likert Type Scale (Strongly disagree = 1; Strongly agree = 7)

In addition, Lusch and Brown (1996) focus on congruency concerning explicit and normative roles of partners. Based on their finding, a dimension to measure role identification relative to the partner and technology must be added. As mentioned in Chapter Two, the literature suggests that when firms do not exhibit fit/congruence, conflict may arise negatively impacting efficiency and effectiveness (Jaworski and Kohli 1993; Menon, Jaworski, and Kohli 1997). Lusch and Brown suggest a three-item scale for measuring (normative) roles.

TABLE 4-4
TECHNOLOGICAL RESOURCE DEPLOYMENT ROLE DIFFERENCES

Role Differences 1 (Role 1)	In dealing with our partner (customer), we have a mutual understanding of the role of each party selecting the correct technologies.
Role Differences 2 (Role 2)	In dealing with our partner (customer), we have a mutual understanding of the responsibilities of each party in maintaining the technology.
Role Differences 3 (Role 3)	In dealing with our partner (customer), we have a mutual understanding of how each party is to use the technology.

(Lusch and Brown 1996)

* 7-Item Likert Type Scale (Strongly disagree = 1; Strongly agree = 7)

Logistics Service Quality

Numerous researchers have examined logistics service and service quality. Mentzer, Flint, and Hult (2001) provide one of the most recent and complete logistics service quality batteries to date. Their scale encompasses logistics-based service activities or physical distribution customer service activities ultimately measuring the logistics core competence of the firm or firms. The scale is subdivided into the ten dimensions listed below.

TABLE 4-5
THE LOGISTICS SERVICE QUALITY INDEX*

Personnel Contact Control 1 (PC 1)	The designated contact person makes an effort to understand my situation
Personnel Contact Control 2 (PC 2)	Problems are resolved by the designated contact person
Personnel Contact Control 3 (PC 3)	The product knowledge/experience of contact personnel is adequate
Order Release Quantities 1 (ORQ 1)	Requisition quantities are not challenged
Order Release Quantities 2 (ORQ 1)	Difficulties never occur due to minimum release quantities
Order Release Quantities 3 (ORQ 1)	Difficulties never occur due to maximum release quantities
Information Quality 1 (IQ 1)	Product specific information is available
Information Quality 2 (IQ 2)	Product specific information is adequate
Ordering Procedures 1 (OP 1)	Requisitioning procedures are effective

Ordering Procedures 2 (OP 2)	Requisitioning procedures are easy to use
Order Accuracy 1 (OA 1)	Shipments rarely contain the wrong items
Order Accuracy 2 (OA 2)	Shipments rarely contain an incorrect quantity
Order Accuracy 3 (OA 3)	Shipments rarely contain substituted items
Order Condition 1 (OC 1)	Materials received from depots is undamaged
Order Condition 2 (OC 2)	Materials received from vendors is undamaged
Order Condition 3 (OC 3)	Damage rarely occurs as a result of transportation mode or carrier
Order Quality 1 (OQ1)	Substituted items work fine
Order Quality 2 (OQ2)	Products ordered meet technical requirements
Order Quality 3 (OQ 3)	Equipment and/or parts are rarely non-conforming
Order Discrepancy Handling 1 (ODH 1)	Correction of delivered quantity discrepancies is satisfactory
Order Discrepancy Handling 2 (ODH 2)	The report of discrepancy process is adequate
Order Discrepancy Handling 3 (ODH 3)	Response to quantity discrepancy reports is satisfactory
Timeliness 1 (TIME 1)**	Time between placing orders and receiving delivery is short
Timeliness 2 (TiME 2)**	Deliveries arrive on the date promised
Timeliness 3 (TIME 3)**	The amount of time a requisition is on back-order is short
Satisfaction 1* (SAT 1)**	Our relationship with this partner/customer has been a successful one.
Satisfaction 2* (SAT 2)**	Our relationship with this partner/customer has more than fulfilled our expectations.

Satisfaction 3* (SAT 3)**	We are satisfied with the outcomes from this relationship.
Satisfaction 4* (SAT 4)**	We regret the decision to work with this partner/customer.
Satisfaction 5* (SAT 5)**	If we had to do it all over again, we would still choose to work with this partner/customer.

* Adjusted from 5-Item to 7-Item Likert Type Scale (Strongly disagree = 1; Strongly agree = 7) to improve survey format.

** Adjusted from 5-Item to 7-Item Likert Type Scale (Terrible = 1; Excellent = 7) to improve survey format.

*** Adjusted from 5-Item to 7-Item Likert Type Scale (Very dissatisfied = 1; Very satisfied = 7) to improve survey format

Performance

Managerial perceptions of financial and market outcomes were used for the analysis of performance. Such an approach is recommended by Morgan and Piercy (1998). These performance measures appear in Table 4-6.

TABLE 4-6
PERFORMANCE OUTCOMES

Dimension Item	"Our _____ is much worse/better than our competitors."*
Market Performance (MKT 1)	Market Share**
(MKT 2)	Customer Retention***
(MKT 3)	Sales Growth**
Financial Performance (FIN 1)	Current Average Profits Per Customer***
(FIN 2)	Current ROI**
(FIN 3)	Anticipated Ave Profits per Customer****
(FIN 4)	Anticipated ROI****

*7-Item Likert Type Scale (Much worse = 1; Much better than competitors = 7)
**Source Gale 1994
***Source Riechland and Sasser 1990
****Morgan and Piercy 1998

PROFILE OF THE SAMPLING FRAME

In order to select the most appropriate sampling frame relevant to supply chain management buyer/seller dyads, the literature related to technological partnering, strategic fit and congruence, and matched pair/dyad methodology was consulted. Since the purpose of this research is to examine both firm specific outcomes and dyadic outcomes, it was determined from the literature that matched pair methodology would be the most effective format. Multiple industries were used to increase generalizability (Shadish, Cook, and Campbell 2002). Assuming that most technological innovations would be coordinated between retail and manufacturing establishments as manufacturers tend to have the capital to initiate such projects; these supply chain nodes were selected. For instance, Proctor and Gamble developed POS and EDI technology specifically for use with their major retail clients. It should be noted that such technology is also used and developed by wholesalers, but typically not on the same scale as a manufacturer. Over 50 different industries were included in the study.

DATA COLLECTION

A mail survey format was used to collect data. The survey was developed following an extensive review of the literature and the previously mentioned interviews. Revisions were made based on feedback received. The final survey instrument incorporated existing scales and adapted scales from previous studies.

The survey was administered using a Council of Logistics Management database. This group was selected due to the diversity of its membership across industries and environments, and its focus on the use of technology in partnering relationships. A sub-

segment of the group-wide database was selected focusing on senior marketing managers or supply chain managers in each company who indicated having familiarity with technology and operations for his or her company. The first mailing included an introduction letter, a survey tailored to that business's position in the supply chain, and a $2.00 incentive. Upon completion of the survey, the respondents were asked to identify a supply chain partner (retailers or manufactures respectively) that had adopted a supply chain related technology used to facilitate supply chain flows between the two firms. These surveys were sent to both retailers and wholesalers. One member firm of the sampling frame found the $2.00 incentive so appealing that they framed the bill after returning the survey.

The second wave of surveys was sent to the supply chain partners identified by the respondents from the first wave. Four weeks following the first survey a third wave was sent to non-respondents as a reminder. Finally, a forth wave was sent to non-respondents from the match-partner wave. Follow-up phone calls were made after each mailing.

Sawyer and Ball (1981) suggest that effect and sample size are most important in building statistical power and thus improving statistical conclusion validity. Specifically, power should exceed .80 given a Type one-error probability of 5%. Using the method discussed by Kraemer and Thiemann (1987, p. 103), it was determined that a sample of at least 60 would be needed for significant statistical power, thus validating the sample size collected. Table 4-7 presents a breakdown of responses.

TABLE 4-7
BREAKDOWN OF SURVEY RESPONDENTS

	Mailed				Received				Totals
	Initial Sample	Matched Sample	Bad Contacts*	Totals	Wave 1	Wave 2	Wave 3	Wave 4	Raw %
Manufacturers	286	36	44	278	40	5	46	21	112 40.29%
Retailers	115	19	19	115	28	2	26	11	67 58.26%
Totals	401	55	63	393	68	7	72	32	179 45.55%
Matched Totals		55		55		7		32	39 70.91%** 19.85% ***

* Surveys returned/non-deliverable
** Percent of matched pairs mailed that were received
*** Percent of sample made up of matched pairs (39 * 2 / 393)

Wave analysis employing MANOVA was used to check for non-response bias examining selected scale items from each construct (Armstrong and Overton, 1977). Each of the major survey waves was counted as a separate wave, for a total of three waves (wave two was collapsed into wave one due it its small size). Wave analysis, in the form of MANOVA, was performed covering all relevant variables and found no significant differences that would indicate non-response bias.

PSYCOMETRIC CONCERNS

To improve the quality of the statistical analysis, a detailed analysis of the specific psychometric issues was performed. This analysis was done to improve reliability and validity, and reduce bias and error. Initially the four major forms of validity or measurement accuracy are discussed. These four major forms include statistical conclusion validity, construct validity, internal validity, and external validity (Shadish, Cook and Campbell 1979; Grimm and Yarnold 1995, 2000; Hair et al. 1996; Isaac and

Michael 1997, Punnett and Shenkar 1996). Each form of validity can be broken down and discussed in relation to specific issues that, when addressed correctly, reduce different types of measurement error.

Statistical Conclusion Validity

Due to possible issues of covariation, it is often extremely difficult to infer a causal relationship between two independent constructs. This is due to the fact that intervening issues may confound the specified relationship between an antecedent and predicted outcome. These confounds can bias estimation of the model or hypothesis. Statistical conclusion validity refers to how reasonable it is to believe that covariation exists given a researcher selected and accepted probability of a Type One error (Shadish, Cook and Campbell 2002). Specifically, statistical conclusion validity accounts for both sampling and non-sampling error, with emphasis on controlling non-sampling mistakes (Assael and Keon 1982). A number of specific issues can confound statistical conclusion inference including; distributional skewness, kurtosis and outliers; low statistical power; and respondent heterogeneity (Cohen 1990, 1992; Maxwell and Delaney 1990; Hayes 1994). Improving statistical conclusion validity is under the control of the research during the design stage of the study (Farley, Lehmann, and Sawyer 1995).

To assess multivariate and univariate normality an analysis of skewness, kurtosis, and outliers was performed using Q-Q (P-P) plots and standard tests for each indicator. As most behavioral and/or perceptive data is skewed, transformations were considered where required. Fortunately, most Multivariate statistics allow for violation of one assumption with no major impact on overall results, so original values were retained

(Hair et al 1998). The Levene's test is also presented for assessment of homoscedasticity (Error variance is equal across groups is null hypothesis). Due to the limited number of instance where assumptions were violated, it was decided to retain all items as originally reported. The results of these tests are presented in Table 4-8.

TABLE 4-8
DESCRIPTIVE ANALYSIS OF INDIVIDUAL INDICATORS

Variable	Mean	S.D.	Skew	Kurtosis	Q-Q Plot	Levene's Test (t-value) ***	Trans.
OPTI 1	5.94	1.24	-1.7876*	1.940*	OK	1.183	No
OPTI 2	5.25	1.28	-.630	.094	OK	1.287	No
OPTI 3	4.93	1.48	-.641	.074	OK	.932	No
OPTI 4	5.85	1.15	-1.309	1.025	OK	.560	No
OPTI 5	5.71	1.11	-1.388	1.610	OK	1.062	No
INNO 1	3.88	1.55	-.030	-.700	OK	.344	No
INNO 2	3.84	1.17	-.307	.294	OK	.673	No
INNO 3	3.78	1.45	.072	-.400	OK	.636	No
INNO 4	3.94	1.48	.044	-.776	OK	1.076	No
DISC 1	4.44	1.34	-.460	-.129	OK	.224	No
DISC 2	3.95	1.43	-.191	-.599	OK	.834	No
INSC 1	4.44	1.78	-.181	-.998	OK	.076	No
INSC 2	3.51	1.70	.495	-.672	OK	.290	No
INSC 3	3.78	1.56	.367	-.575	OK	.571	No
INSC 4	4.39	1.80	-.098	-1.074	OK	.553	No
INSC 5	2.96	1.51	.794	-.028	OK	.500	No
INSC 6	2.66	1.44	.781	.297	OK	.334	No
GOAL 1	4.29	1.33	-.242	.086	OK	.632	No
GOAL 2 (r)	3.66	1.29	.276	.012	OK	.379	No
GOAL 3	3.98	1.29	.081	-.158	OK	.526	No
GOAL 4 (r)	4.40	1.44	.028	-.822	OK	.859	No
ROLE 1	4.84	1.32	-.554	-.128	OK	.453	No
ROLE 2	4.82	1.29	-.331	-.443	OK	.339	No
ROLE 3	4.86	1.23	-.458	.069	OK	.483	No
PC 1	5.73	0.92	-1.073	.950	OK	.350	No
PC 2	5.45	1.05	-1.200	1.016	OK	.570	No
PC 3	5.67	1.04	-.981	1.065	OK	.403	No
ORQ 1	4.67	1.53	-.403	-.480	OK	.117	No
ORQ 2	4.11	1.74	-.070	-.849	OK	1.300	No
ORQ 3	4.30	1.68	-.164	-.771	OK	.853	No
IQ 1	5.69	1.11	-.872	.641	OK	.051	No
IQ 2	5.47	1.14	-.687	.070	OK	.265	No
OP 1	5.48	1.14	-.874	.923	OK	.520	No
OP 2	5.36	1.23	-.787	.422	OK	.711	No
OA 1	5.33	1.44	-.927	.179	OK	1.076	No
OA 2	5.28	1.44	-.883	-.060	OK	1.094	No
OA 3	5.61	1.38	-1.162	.898	OK	.636	No
OC 1	5.45	1.19	-1.327	1.157	OK	.756	No
OC 2	5.11	1.52	-.919	.308	OK	.676	No
OC 3	3.75	1.72	-.152	-.814	OK	.284	No
OQ 1	5.75	1.04	-.526	-.469	OK	.325	No
OQ 2	5.42	1.19	-.560	.142	OK	.575	No
ODH 1	5.36	1.33	-.736	-.073	OK	.906	No
ODH 2	5.20	1.31	-.638	-.203	OK	.186	No
ODH 3	5.32	1.24	-.510	-.265	OK	.251	No
TIME 1	5.27	1.55	-.729	-.525	OK	1.395	No
TIME 2	5.39	1.53	-.952	.005	OK	.836	No
TIME 3	4.87	1.57	-.611	-.146	OK	.329	No

MKT 1	5.03	1.44	-.505	-.342	OK	.936	No
MKT 2	5.47	1.03	-.328	-.795	OK	.417	No
MKT 3	5.30	1.24	-.416	-.318	OK	1.211	No
FIN 1	4.97	1.28	-.126	-.642	OK	1.411	No
FIN 2	4.90	1.21	-.001	-.384	OK	.656	No
FIN 3	5.03	1.15	-.062	-.437	OK	1.347	No
SAT 1	5.95	0.96	-1.278	1.716*	OK	.571	No
SAT 2	5.46	1.10	-.816	1.268	OK	.629	No
SAT 3	5.57	1.00	-.727	2.082**	OK	.545	No
SAT 4	5.95	1.48	-1.642	-1.092	OK	.701	No
SAT 5	5.99	1.04	-1.267	-1.030	OK	1.112	No

* Significant at .10
** Significant at .05
*** Tested against standardized sales value

Construct Validity

Construct validity refers to the degree to which a construct corresponds to what its dimensions are intended to measure (Cronbach and Meehl 1955; Peter 1981). Thus, a researcher must be sure that measures/items are convergent (correlate with the other items within the construct) and are discriminant (do not correlate with items in another construct) (Campbell and Fisk 1959). The goal is to develop distinctive unidimensional scales. The most common method is through CFA (Gerbing and Anderson 1987). As this is a confirmatory study all items are set/expected to load on their intended dimension. Table 4-9 presents the result of the CFA for the *Technological Readiness* scale. Table 4-10 shows Cronbach's alpha after final purification of each dimension the scale (Cronbach 1951).

TABLE 4-9
FACTOR LOADINGS FOR THE TECHNOLOGICAL READINESS SCALE

Variable	Optimism Dimension	Innovativeness Dimension	Discomfort Dimension	Insecurity Dimension
OPTI 1	.767			
OPTI 2	.772			
OPTI 3	.604			
OPTI 4	.642			
OPTI 5	.871			
INNO 1		.689		
INNO 2		.734		
INNO 3		.817		
INNO 4		.566		
DISC 1			.742	
DISC 2			.774	
INSC 1				.671
INSC 2				.824
INSC 3				.863
INSC 4				.463
INSC 5				.786
INSC 6				.609
Eigenvalue	3.076	2.396	1.531	3.212
Total Variance Explained	18.09%	18.09%	9.01%	18.90%

As expected, all dimension of the *Technological Readiness* construct load on the expected factors using maximum likelihood estimation and Varimax rotation. Unfortunately, two of the items load below the suggested .600 cut off (Nunnally 1978). Therefore, the individual scales are tested for overall reliability. The results of this test appear in Table 4-10.

TABLE 4-10
RELIABILITY OF TECHNOLOGICAL READINESS DIMENSIONS

Variable	Item to Total Correlation	Alpha if Item Deleted	Item Dropped	Purified Scale Alpha
OPTI 1	.6131	.7959		.8163
OPTI 2	.6765	.7775		
OPTI 3	.6233	.7984		
OPTI 4	.5466	.8162		
OPTI 5	.6862	.7787		
INNO 1	.5124	.5926		.6864
INNO 2	.4856	.6209		
INNO 3	.5804	.5456		
INNO 4	.3321	.7104	X	
DISC 1	.5943	Na		.9540
DISC 2	.5943	Na		
INSC 1	.4506	.7806		.8144
INSC 2	.6920	.7806		
INSC 3	.7531	.7177		
INSC 4	.3132	.8144	X	
INSC 5	.6474	.7331		
INSC 6	.4535	.7761		
Alpha for Entire Scale				.7106

This analysis results in the dropping of two items form the overall scale (INNO 4 and INSC 4). These items also had low factor loadings in the original CFA and significant increases in reliability could be obtained by dropping each item. Next factor analysis and reliability estimation is run for the remaining three constructs. Tables 4-11 and 4-12 examine and purify the *Strategic-Interactive Fit* construct/scale. Tables 4-13 and 4-14 examine the *Logistics Service Quality* construct/scale. Finally, Tables 4-15 and 4-16 examine the Performance construct/scale.

TABLE 4-11
FACTORLOADINGS FOR THE STRATEGIC FIT SCALE

Variable	Goal Dimension	Role Dimension
GOAL 1	.688	
GOAL 2	.732	
GOAL 3	.604	
GOAL 4		.696
ROLE 1		.731
ROLE 2		.831
ROLE 3		.728
Eigenvalue	1.812	2.445
Total Variance Explained	25.88%	34.92%

Despite the fact that the CFA resulted in two distinct factors for *Strategic-Interactive Fit*, one of the items (GOAL 4) loaded on the ROLE factor. Thus, examination of item fit is tested again by examining scale reliability.

TABLE 4-12
RELIABILITY OF THE STRATEGIC FIT SCALE

Variable	Item to Total Correlation	Alpha if Item Deleted	Item Dropped	Purified Scale Alpha
GOAL 1	.3979	.5553		.6810
GOAL 2	.3525	.5381		
GOAL 3	.4163	.6277		
GOAL 4	.1651	.6810	X	
GOAL 4	.3837	.8316	X	.8316
ROLE 1	.5910	.7195		
ROLE 2	.7576	.6306		
ROLE 3	.6394	.6975		
Alpha for Entire Scale				.7935

Despite the unexpected loading of the GOAL 4 scale item on the Role factor, it is found that GOLE 4 has a detrimental impact on the reliability of both dimensions – role and goal - and thus the scale as a whole. Therefore, GOAL 4 is dropped from the construct/scale. Next the *Logistics Service Quality* construct/scale is discussed.

TABLE 4-13
FACTOR LOADINGS – LOGISTICS SERVICE QUALITY SCALE DIMENSIONS

Variable	Contact Quality	Order Release Quantities	Information Quality	Order Processing	Order Accuracy	Order Condition	Order Quality	Order Discrepancy Handling	Timeliness	Satisfaction
PC 1	.783									
PC 2	.841									
PC 3	.743									
ORQ 1		.836								
ORQ 2		.765								
ORQ 3		.824								
IQ 1			.849							
IQ 2			.767							
OP 1				.829						
OP 2				.784						
OA 1					.702					
OA 2					.761					
OA 3					.762					
OC 1					.748					
OC 2					.667					
OC 3						.782				
OQ 1							.717			
OQ 2							.870			
ODH 1								.680		
ODH 2								.766		
ODH 3								.774		
TIME 1									.693	
TIME 2									.725	
TIME 3									.649	
SAT 1										.846
SAT 2										.761
SAT 3										.783
SAT 4										.643
SAT 5										.773
Eigenvalue	2.568	2.315	1.884	1.965	3.237	1.253	1.659	2.563	2.294	3.656
Total Var.	8.86%	7.98%	6.50%	6.78%	11.16%	4.321%	5.72%	8.84%	7.91%	12.61%

The results of the confirmatory factor analysis for the *Logistics Service Quality* construct are as expected, with all items loading on expected factors with the exception of the *Order Accuracy* and the *Order Condition* dimensions. It is quite possible that respondents considered this separation to be artificial and thus consider *Order Condition* as being a part of *Order Accuracy*. A decision had to be made as to combine the two dimensions and drop the single item or drop the *Order Condition* items all together. Insight on this issues was gained by looking at scale reliability as previously discussed.

TABLE 4-14

RELIABILITY OF LOGISTICS SERVICE QUALITY DIMENSIONS

Variable	Item to total correlation	Alpha if Item Deleted	Item Dropped	Purified Scale Alpha
PC 1	.7245	.8408		.8689
PC 2	.7581	.8088		
PC 3	.7739	.7927		
ORQ 1	.5464	.7406		.7655
ORQ 2	.5815	.7063		
ORQ 3	.6732	.5968		
IQ 1	.8248	--		.9038
IQ 2	.8248	--		
OP 1	.8642	--		.9260
OP 2	.8642	--		
OA 1	.7641	.8384		.8780
OA 2	.7554	.8406		
OA 3	.6900	.8565		

OC 1	.7453	.8473		
OC 2	.6174	.8763		
OC 3	--	--	X	--
OQ 1	.5772	--		.7275
OQ 2	.5772	--		
ODH 1	.7963	.8754		.9047
ODH 2	.8195	.8555		
ODH 3	.8158	.8596		
TIME 1	.6602	.7562		.8165
TIME 2	.7893	.6209		
TIME 3	.5675	.8085		
SAT 1	.8235	.7710		.8954
SAT 2	.6940	.7975		
SAT 3	.7596	.7840		
SAT 4	.4340	.8954	X	
SAT 5	.6752	.8039		
Alpha for Entire Scale				.9251

Based on the results of the reliability analysis for the Logistics Service Quality construct/scale, most of the dimensions are retained as theoretically defined. The one exception is that the high alpha value found for the *Order Accuracy* and *Order Condition* combined dimension calls for a collapsing of these two dimensions into one and deletion of OC 3. The new dimension is titled *Order Accuracy and Condition.*

Finally the *Performance* construct/scale is tested in tables 4-15 and 4-16. Confirmatory Factor Analysis results are shown in Table 4-15.

TABLE 4-15
FACTOR LOADINGS FOR THE PERFORMANCE SCALE

Variable	Market Dimension	Financial Dimension
MKT 1	.882	
MKT 2	.648	
MKT 3	.665	
FIN 1		.828
FIN 2		.884
FIN 3		.909
Eigenvalue	1.954	2.755
Total Variance Explained	32.56%	45.92%

The performance Scale items load neatly on their expected dimensions. Next reliability assessment is provided in Table 4-16.

TABLE 4-16
RELIABILITY OF PERFORMANCE DIMENSIONS

Variable	Item to total correlation	Alpha if Item Deleted	Item Dropped	Purified Scale Alpha
MKT 1	.5508	.7304		.7525
MKT 2	.6165	.6550		
MKT 3	.6127	.6326		
FIN 1	.8412	.9081		.9283
FIN 2	.8758	.8776		
FIN 3	.8473	.9025		
Alpha for Entire Scale				.8904

The reliability analyses presented in Tables 4-10, 4-12, 4-14, and 4-16 indicate high internal consistency for each dimension and each construct studied in this analysis. All were found to have alphas in excess of .600 (Nunnally 1978).

Discriminant validity is estimated using the procedure suggested by Gaski and Nevin (1985). They suggest that a correlation between two scales that is lower than the reliability of each scale is evidence of discriminant validity. Table 4-17 these results.

TABLE 4-17
CORRELATION MATRIX OF MAJOR CONSTRUCTS

Pearson Correlation (Cronbach's Alpha)	**Technological Readiness** (α = .7106)	**Strategic-Interactive Fit** (α = .7935)	**Logistics Service Quality** (α = .9251)	**Performance** (α = .8904)
Technological Readiness	1.000			
Strategic-Interactive Fit	.039	1.000		
Logistics Service Quality	-.027	.427*	1.000	
Performance	-.007	.016	.028	1.000

* Correlation is significant at $p < .01$

The results of the correlation analysis support that discriminate validity exists between the constructs. Furthermore, the confidence interval of each pairwise correlation between constructs did not include the value of one, thus supporting the results of the correlation analysis (Anderson and Gerbing 1987).

Internal Validity

Peter (1979, 1981) relates internal validity to reliability of measures or the degree to which measures actually measure constructs. Internal validity has been broken down into four specific areas: history; maturation; instrumentation; and non-response (Isaac and Michaels 1997). History biases are caused due to changes in the environment over the course of the study. As data collected in this study spanned only two months, history biases are not a concern. Maturation bias occurs when subjects are repeatedly exposed to measures and research questions. As this will be a one time study, maturation bias should not be an issue.

Instrumentation bias has also been related to face and content validity in that multiple item constructs appear to be related to what they should measure (Narver and Slater 1990, Nunnally 1978). To reduce the impact of instrumentation bias, the method suggested by Churchill (1979) was employed and existing/proven scales were used. Also, as mentioned earlier, non-response bias (bias related to differences in responses between the collected sample and those who elected not to respond) was tested using the method developed by Armstrong and Overton (1977) and found to not be a factor.

External Validity

External validity is simply the degree to which research findings can be generalized to a population (Lynch, Calder, Phillips, and Tybout 1982). Thus external validity is important for research to make a significant contribution to the supply chain management literature. To improve external validity the survey was pre-tested, subjects

were selected at random, a single setting was not used, and subject were exposed to multiple treatments/items.

CHAPTER FIVE

The first four chapters of this dissertation developed a model for study using theory and insight from practice, developed a research process for data collection, and redefined the data for effective data analysis with bias and error reduced as much as possible. Chapter Five presents the results of the statistical analysis used to evaluate the overall model. First, a basic profile of the respondents is discussed. Second, direct effect hypothesis testing using Multivariate General(ized) Linear Modeling or General Linear Modeling (Gill 2001) is performed to evaluate the hypothesized relationships to between constructs. Third, mediating effect(s) will be examined using the method discussed by Baron and Kenny (1986), verifying non-significant correlations between non-specified relationships. Finally, Strategic-Interactive Fit between manufacturers and retailers is examined using distance scores (and cluster analysis) as suggested in a recent article (Cable, Aiman-Smith, Mulvey, and Edwards 2000) and employed in the past (Bonett and Woolsey 1993).

RESPONDENT DEMOGRAPHICS

As mentioned earlier, a CLM database was used as the source of respondents. This group of managers comes form a very diverse set of industries. Using NIACS classification standards, like industries were grouped together. Over 35 different

industries at two levels are reported, thus it is assumed that industry bias is not an issue in this analysis. Results of the classification are presented in Table 5-1.

TABLE 5-1
RESPONDENT BY INDUSTRY AND SUPPLY CHAIN POSITION

Industry	MFG	Retail	Total	Industry	MFG	Retail	Total
Automotive	3	3	6	Jewelry & Gifts	0	3	3
Baby Clothing and Products	1	0	1	Medical Equipment & Supplies	3	1	4
Beer, Wine, & Liquor	4	2	6	Paint & Painting Supplies	1	1	2
Bicycles	1	1	2	Paper & Pulp	3	0	3
Biotechnology	2	0	2	Pet Food & Pet Supplies	5	0	5
Books and Publishing	1	3		Pharmaceuticals	5	1	6
Bottling (Soft Drinks & Water)	1	1	2	Printing & Support	2	1	3
Building Materials and Construction	8	3	11	Restaurant & Food	1	1	2
Chemicals and Plastics	6	1	7	Robotics	1	0	1
Clothing & Apparel	2	5	7	Rubber & Tires	1	1	2
Computers and Computer Peripherals	6	1	7	Semiconductors & Industrial Electronics	3	1	4
Consumer Electronics	9	5	14	Signs & Signboards	1	0	1
Department Store	NA	7	7	Stationary & Office Supplies	2	2	4
Floral	1	1	2	Telecommunications	3	0	3
Furniture	1	2	2	Tobacco	1	0	1
Grocery & Consumer Package Goods	25	13	38	Toys	0	1	1
Health & Beauty	4	1	5	Travel Information	1	0	1
HVAC	3	4	7	No Industry Reported	1	1	2
				Total	**112**	**67**	**179**

To ensure the survey tool reached the proper subjects, the initial members of the sample frame were asked to forward the survey to the most appropriate person. Due to this and the fact that matched pair methodology allows initial subjects to redefine the sample profile as they select their paired partners, one would expect the sample to contain

a potpourri of titles. The titles of respondents in the sample ranged from sales representatives and purchasing agents to owners, CEOs, and Presidents. The results of a cross-tabulation of title versus position in the supply chain are presented in Table 5-2. It should be noted that due to confidentiality, the majority of the managers did not include their titles for publication.

TABLE 5-2
RESPONDENT TITLES

Industry	MFG	Retail	Total	Industry	MFG	Retail	Total
Account Manager	1	0	1	Merchandising Manager	1	2	3
Business Development Manager	1	0	1	Owner	0	6	6
Chairman and/or CEO	2	3	5	Planning Manager	1	0	1
Customer Service Manager	2	2	4	Plant Manager	2	0	2
Director of Logistics	4	1	5	President	4	5	9
Director of Materials Management	0	1	1	Purchasing Manager/Agent	5	1	6
Director of Supply Chain Management	0	2	2	Quality Assurance Manager	1	0	1
Facility Manager	2	0	2	Sr. VP of Operations	2	0	2
General Manager	2	3	5	Supply Chain Manager	2	0	2
Logistics Manager	2	1	3	Team Manager	1	0	1
Marketing Director	1	1	2	No Title Reported	76	39	115
				Total	**112**	**67**	**179**

Only respondents that reported the use of at least one technology were considered to be appropriate for the study. Surprisingly, all respondents reported the use of two or more technologies in their supply chain partnerships. As expected, the most common technology used is EDI (Electronic Data Interchange), 60% of respondent companies, which is often an industry standard for managing information transfer (Daugherty, Myers, and Richey 2002, and Stank, Daugherty, and Ellinger 1996). Newer technologies

such as Geographic Information Systems (5 %) and Intelligent Agent Purchasing Systems (3%) were reported as being used much less than the other technologies studied. It should also be noted that only 28% of the sample reports the use of E-commerce in their business relationships backing up recent claims by ISM research claiming firm supply chain initiatives employing e-commerce has declined significantly since Y2K and 911 (see Forrester Report 4/2002). This refutes arguments made by many researchers and consultants reporting the domination of e-commerce as given in marketing systems (see *The Journal of the Academy of Marketing Science*, Special Issue, 2003). Finally, it should be noted that respondents were allowed to write in an "other" technology if they had an additional technology not included in the list. None of the respondents chose to write in an additional category, so it may be assumed that the technologies included in the survey instrument and presented below in Table 5-3 are representative of the most commonly used supply chain technologies.

TABLE 5-3
RESPONDENT TECHNOLOGIES

Technology	MFG	Retail	Total	Technology	MFG	Retail	Total
Automated Materials Handling Equipment	22	12	34	Intelligent Agent Purchasing Systems	4	2	6
Automatic Replenishment Systems (ARS)	19	11	30	Internet/Extranets	55	34	89
Capacity Resource Planning (CRP)	22	2	24	Manufacturing Resource Planning (MRP or MRP II)	44	6	50
Customer Relationship Management Systems (CRM)	16	8	24	Network Management Systems	15	10	25
Customer Replenishment Planning Systems (CRP)	17	5	22	Order Management Systems (OMS)	58	28	86
Distribution Resource Planning (DRP)	21	4	25	Physical Distribution Management Systems (PDM)	18	11	29
Electronic Data Interchange (EDI or EFT)	68	39	107	Point of Sale (POS)	36	34	70
Enterprise Resource Planning (ERP)	30	6	36	Scanners - Bar Codes – UPC	56	32	88
E-Commerce (EC)	31	19	50	Transportation Management Systems (TMS)	37	22	59
Geographic Information Systems (GIS)	5	4	9	Warehouse Management Systems (WMS)	51	25	76

Respondents were also asked to report who managed their partner-based technology. Specifically they were asked to rate what the percentage of the management of technology could be attribute to their own firm, their business partner, or the technology itself. Retailers reported that they took on the majority of the responsibility for managing the technology, while manufacturers took on less of the responsibility and the technology managed itself a small portion of the time. Manufacturers reported similar figures with the manufacturer managing the majority of technology and the retailer and technology trailing. It is interesting to note that this disagreement in who is taking on the most responsibility may have an impact on relationship outcomes. Specifically, when one

firm feels they are doing more of the work, but are receiving less of the benefits conflict will most likely occur (Morgan and Hunt 1994). These figures and the totals are reported in Table 5-4.

TABLE 5-4
DISTRIBUTION OF MANAGEMENT OF TECHNOLOGIES

	Firm's Management of Technology				Partner's Management of Technology				Technology Manages Itself			
SC Function Responses	Mean %	Median %	Min %	Max %	Mean %	Median %	Min %	Max %	Mean %	Median %	Min %	Max %
Retailer 43	48.6	50.0	10.0	100.0	31.4	30.0	0.0	60.0	23.9	15.0	0.0	100.0
MFG 74	42.3	40.0	2.0	100.0	30.9	30.0	0.0	90.0	26.5	20.0	0.0	85.0
Total	44.6	45.0	2.0	100.0	31.0	30.0	0.0	90.0	25.6	17.5	0.0	100.0

HYPOTHESIS TESTING

General Linear Modeling (GLM) was chosen as the technique for hypothesis testing due to its explanatory power driven by combining components of Multiple Regression (MR) and Multivariate Analysis of Variance/Covariance (MANOVA/MANCOVA) (Gill 2001). Thus, difference can be tested across multiple dependents variables, while variance is maximized across groups and error escalation is controlled (Hair et. Al. 1999). Additionally, effect sizes are generated useful in both prediction of outcomes and explanation of univariate relationships.

Much like other multivariate techniques, numerous assumptions must be met before accurate results can be estimated. The majority of these assumptions were addressed in the previous chapter at the univariate level including: linearity, homoscedasticity, normality, and independence (Hair et al 1998). Additionally, at the multivariate level, all VIF factors were near one and all tolerance factors were above .9

exhibiting relative tolerance of variable multicolinearity (Hair et al 1998). Finally, researchers have shown that both MANOVA and GLM are relatively robust to the violation of at least one assumption, so the related assumptions are deemed admissible for hypothesis testing.

General Linear Modeling is a hierarchical method for testing relationships. Thus, higher order effects must be tested first. Table 5-5 presents the results of the omnibus test of main effects. Wilk's Lambda (λ) is reported as it is the most commonly used measure and exhibits more power that the Roy's largest root and Hotelling's T -- which are extrapolations of univariate T-tests (Hair et al 1999).

The sample was initially split into two groups, Manufacturer and Retailer, and then the relationships between the *Technological Readiness* dimensions and the *Logistic Service Quality* dimensions were tested. The omnibus test reveals six significant relationships reported in Table 5-5. As hypothesized in H_1: manufacturing firms with higher levels of technological readiness do experience improved Logistics Service Quality driven by the dimensions of *Optimism* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .673$), *Discomfort* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .412$), and *Insecurity* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .397$) in order of relative strength. The *Innovativeness* dimension was not found to have a significant effect (Wilk's $\lambda = .000$; $p > .10$) and thus H_1 is partially supported.

Additionally, as hypothesized in H_2: retail firms with higher levels of technological readiness do experience improved Logistics Service Quality across the dimensions of *Innovativeness* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .341$), *Insecurity* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .331$), and *Discomfort* (Wilk's $\lambda = .000$; $p < .01$; $\eta 2 = .312$) in order of relative strength. Retailer *Optimism was* not founds to have a significant t effect on

Logistics Service Quality (Wilk's $\lambda = .011$; $p > .10$) and thus H_2 is partially supported as well.

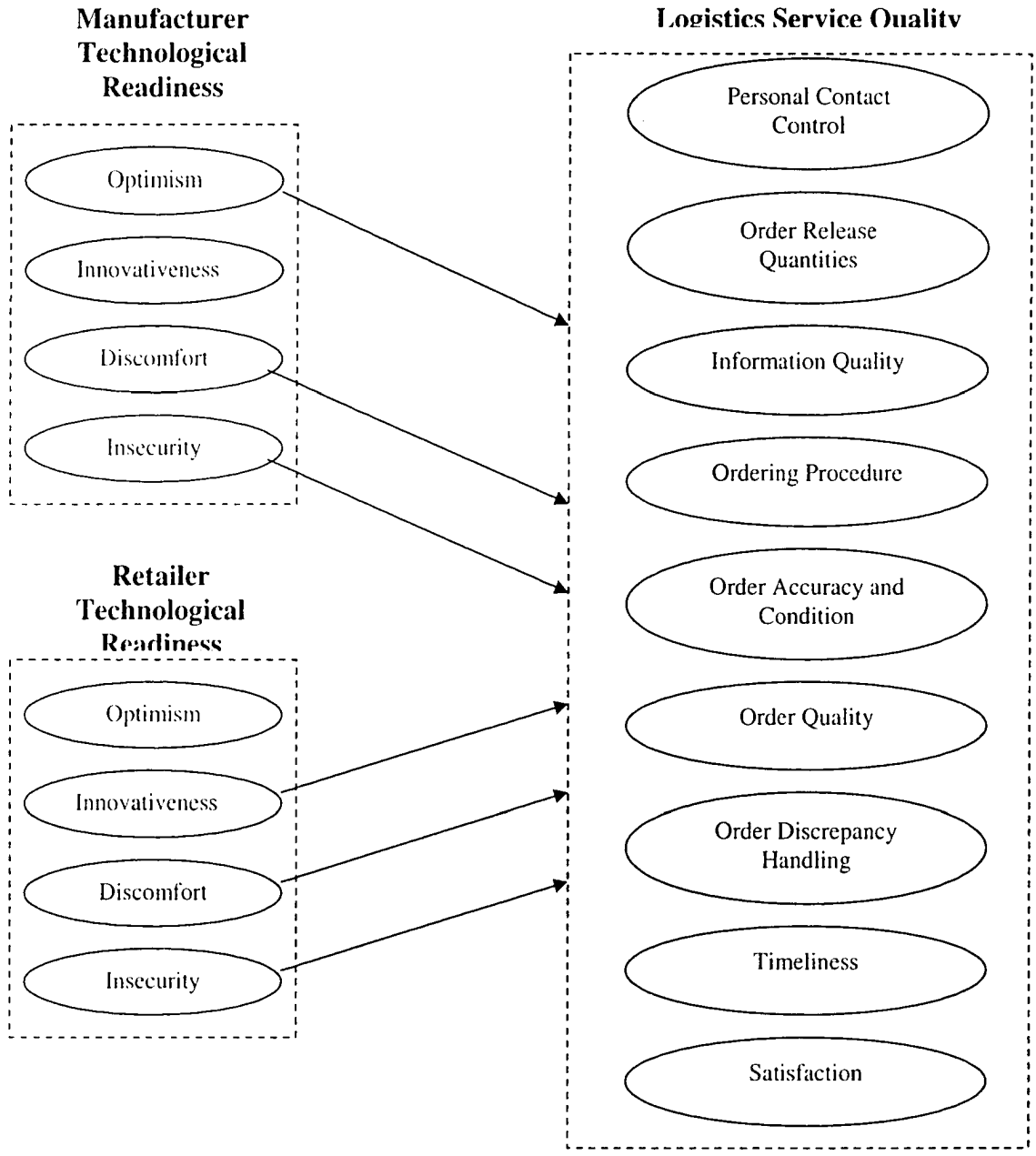
TABLE 5-5
OMNIBUS TEST OF GENERAL LINEAR RELATIONSHIP BETWEEN FIRM TECHNOLOGICAL READINESS AND LOGISTICS SERVICE QUALITY

Manufacturer Technological Readiness	**Wilk's Lambda**	**F**	**Effect Size η^2**
Optimism	.000	4.20*	.673
Discomfort	.000	3.52*	.412
Insecurity	.000	5.00*	.397
Innovativeness	.000	1.08	
Retailer Technological Readiness			
Innovativeness	.008	5.52*	.341
Insecurity	.000	4.72*	.331
Discomfort	.000	4.38*	.312
Optimism	.011	.967	

* $p < .01$

After the Omnibus MANOVA test of the General Linear Model, only those items that are significant can be tested at the between dimensions or univariate level. Thus, as manufacturer *Technological Readiness* dimension of *Optimism* and Retailer *Technological Readiness* dimension of *Innovativeness* are retained in the model but not discussed as each was found to not have a significant effect in the omnibus test (Gill 2001). Remaining six dimensions are expanded upon in the discussion that follows. Figure 5-1 displays the omnibus direct effects between the two group omnibus test.

FIGURE 5-1
SIGNIFICANT OMNIBUS LINEAR RELATIONSHIP BETWEEN TECHNOLOGICAL READINESS AND LOGISTICS SERVICE QUALITY



Moving to the univariate level, the analysis next examines the impact of the three significant dimensions of Manufacturer *Technological Readiness* and the three significant dimensions of Retailer *Technological Readiness* on the major dimensions of *Logistics*

Service Quality. As discussed in Chapter 3, manufacturers were asked to rate the quality of the logistics service they provided to their partner retailers including the dimensions of *Personal Contact Control*, *Order Release Quantities*, *Information Quality*, *Ordering Procedures*, *Order Accuracy and Condition*, *Order Quality*, *Order Discrepancy Handling*, *Timeliness*, and *Satisfaction* (Mentzer et al. 2002).

Manufacturer Technological Readiness and LSQ Dimensions

Manufacturer technological *Innovativeness* had significant effects six of the nine *Logistics Service Quality* dimensions. Manufacturers report that their technological *Innovativeness* had the largest effects on *Order Discrepancy Handling* ($p < .01$; $\eta^2 = .931$) and *Order Release Quantities* ($p < .01$; $\eta^2 = .880$). Manufacturer *Innovativeness* had similar effects on *Ordering Procedures* ($p < .05$; $\eta^2 = .849$), *Timeliness* ($p < .05$; $\eta^2 = .840$), and *Information Quality* ($p < .05$; $\eta^2 = .825$). The smallest, but still significant effect of Manufacturer *Innovativeness* was on *Personal Contact Control* ($p < .05$; $\eta^2 = .840$).

Manufacturer technological *Insecurity* also impacted six dimensions of *Logistics Service Quality*. Again, *Insecurity* had the largest significant effects on *Order Discrepancy Handling* ($p < .01$; $\eta^2 = .931$) and *Order Release Quantities* ($p < .01$; $\eta^2 = .913$). Additionally, strong effects were evident in relation to *Order Quality* ($p < .05$; $\eta^2 = .868$) and *Information Quality* ($p < .01$; $\eta^2 = .866$). Weaker significant effects occurred between manufacturer technological *Insecurity* and *Timeliness* ($p < .10$; $\eta^2 = .857$) and *Personal Contact Control* ($p < .01$; $\eta^2 = .849$).

Manufacturer technological *Discomfort* had a significant direct effect on four dimensions of Logistics service quality. *Discomfort* had a strong effect on *Logistics Service Quality* dimensions of *Timeliness* ($p < .01$; $\eta^2 = .869$), *Order Discrepancy Handling* ($p < .01$; $\eta^2 = .869$), and *Order Release Quantities* ($p < .01$; $\eta^2 = .832$). Additionally, Manufacturer *Discomfort* had a slightly weaker effect on *Ordering Procedure*. Finally, manufacturers reported that none of the four dimensions of Manufacturer *Technological Readiness* have a significant impact on *Satisfaction* ($p > .10$) or *Order Release Quantities* ($P > .10$)

Retailer Technological Readiness and LSQ Dimensions

Again, as discussed in Chapter 3, manufacturers were asked to rate their perception of the quality of the logistics service provided by their primary manufacturer along the dimensions of *Personal Contact Control*, *Order Release Quantities*, *Information Quality*, *Ordering Procedures*, *Order Accuracy and Condition*, *Order Quality*, *Order Discrepancy Handling*, *Timeliness*, and *Satisfaction* (Mentzer et al. 2002). Unlike manufacturers, the follow-up analysis discovered that retailer *Optimism* about technology had significant effects on six of the nine (retailer perceptions of) *Logistics Service Quality* dimensions. Retailer *Optimism* had the largest effect on Satisfaction ($p < .01$; $\eta^2 = .778$), Order Accuracy and Condition ($p < .01$; $\eta^2 = .645$), and Personal Contact Control ($p < .05$; $\eta^2 = .636$). Retailer *Optimism* also had significantly large effects on *Order Discrepancy Handling* ($p < .01$; $\eta^2 = .598$) and Logistics *Timeliness* ($p < .05$; $\eta^2 = .596$). Finally, Retailer *Optimism* had a smaller but significant impact on *Information Quality* ($p < .10$; $\eta^2 = .448$).

The remaining two dimensions, Retailer *Discomfort* with Technology and Retailer *Insecurity* with Technology had significant impacts on three and two dimensions of the *Logistics Service Quality* construct respectively. Retailer *Discomfort* had a significant impact on Personal *Contact Quality* ($p < .01$; $\eta^2 = .509$), *Information Quality* ($p < .10$; $\eta^2 = .418$), and *Order Accuracy and Condition* ($p < .10$; $\eta^2 = .415$). Retailer *Insecurity* had significant effects on *Order Accuracy and Condition* ($p < .10$; $\eta^2 = .680$) and Satisfaction ($p < .10$; $\eta^2 = .609$). The remaining order specific dimensions of *Logistics Service Quality; Order Release Quantities* ($p > .10$), *Ordering Procedures* ($p > .10$), and *Order Quality* ($p > .10$) are not significantly impacted by any of the four dimensions of *Manufacturer Technological Readiness.*

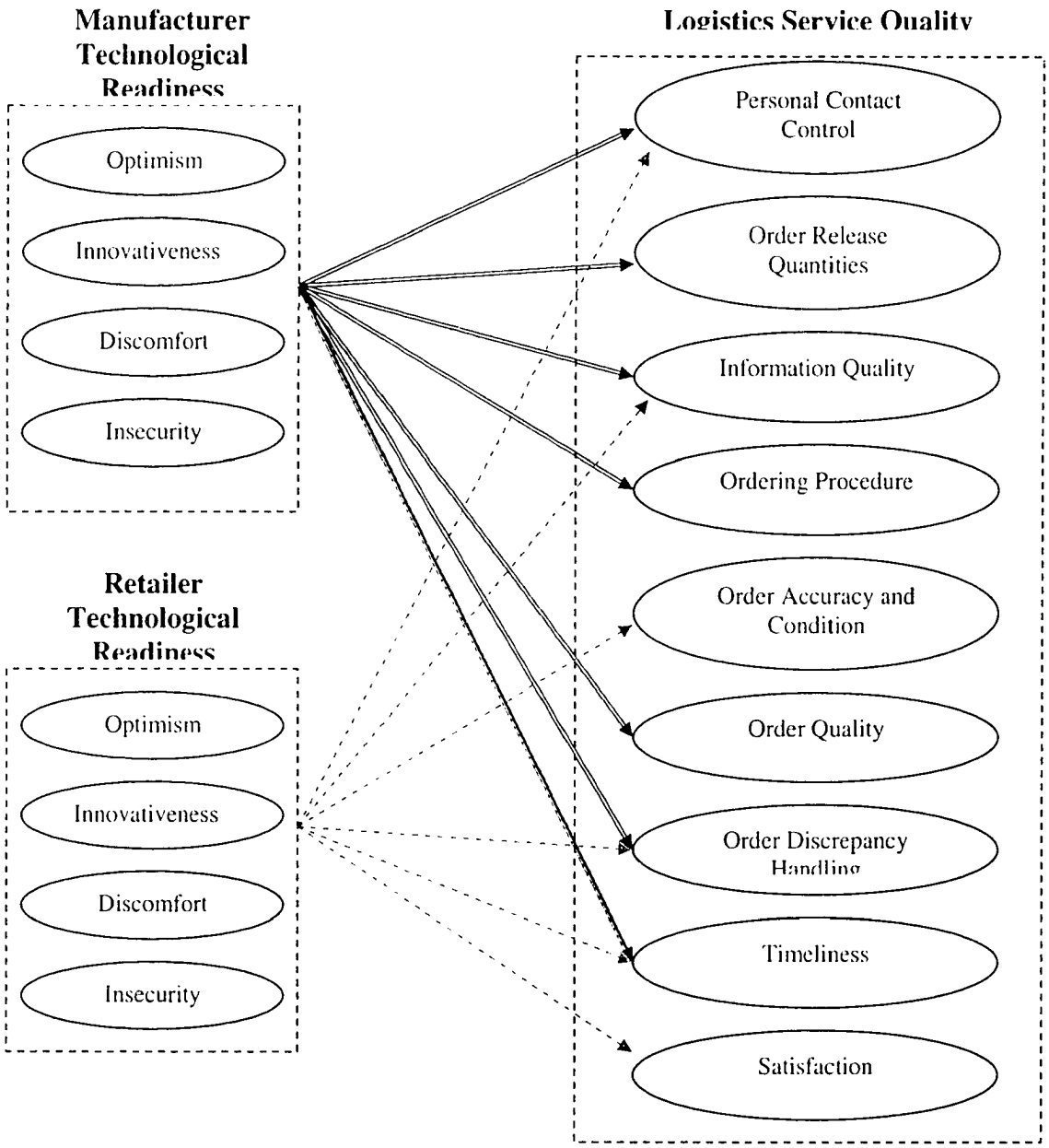
It should be noted that manufacturers report no significant impact between their *Technological Readiness* and *Satisfaction.* As discussed in Chapter 3, it is quite possible that manufacturers are the initiators of many of the technologies used in these supply chain relationships and thus are less likely to report low levels of satisfaction with partners that have implemented these technologies. A summary of the above discussion is discussed in Table 5-6. Additionally, Figure 5-2 displays the significant links between the two levels of *Technological Readiness* and *Logistics Service Quality*.

TABLE 5-6
SIGNIFICANT DIRECT EFFECTS BETWEEN TECHNOLOGICAL READINESS DIMENSIONS AND LOGISTIC SERVICE QUALITY DIMENSIONS

Manufacturer Technological Readiness	**Scale Item**	**F**	**Effect Size η^2**
Innovativeness	Order Discrepancy Handling	9.01***	.931
	Order Release Quantities	4.91***	.880
	Ordering Procedure	3.74**	.849
	Timeliness	3.49**	.840
	Information Quality	3.15**	.825
	Personal Contact Control	2.89**	.813
Insecurity	Order Discrepancy Handling	5.90***	.931
	Order Release Quantities	4.54***	.913
	Order Quality	2.85**	.868
	Information Quality	2.82**	.866
	Timeliness	2.61*	.857
	Personal Contact Control	2.45*	.849
Discomfort	Timeliness	6.61***	.869
	Order Discrepancy Handling	6.64***	.869
	Order Release Quantities	4.97***	.832
	Ordering Procedure	3.23**	.764
Retailer Technological Readiness	**Scale Item**	**F**	**Effect Size η^2**
Optimism	Satisfaction	5.01***	.778
	Order Accuracy and Condition	2.60***	.645
	Personal Contact Control	2.50**	.636
	Order Discrepancy Handling	2.11**	.598
	Timeliness	2.01**	.596
	Information Quality	1.73*	.448
Discomfort	Personal Contact Control	3.12***	.509
	Information Quality	2.16*	.418
	Order Accuracy and Condition	2.13*	.415
Insecurity	Order Accuracy and Condition	2.55**	.680
	Satisfaction	1.87*	.609

* $p < .10$; ** $p < .05$; *** $p < .01$

FIGURE 5-2
SIGNIFICANT ITEM RELATIONSHIPS BETWEEN TECHNOLOGICAL READINESS AND LOGISTICS SERVICE QUALITY



Mediation

The model implies that *Logistics Service Quality* mediates a relationship between the two supply chain levels of firm *Technological Readiness* and *Performance Outcomes.* Again a multivariate General Linear Model - with the dimensions of *Technological Readiness* as the independent variables - was run, but this time with *Performance* as the dependent variable rather than the dimensions of *Logistics Service Quality.* All mediating relationship held with the exception of manufacturer *Technological Readiness* dimension of *Innovativeness* (Wilk's $\lambda = .090$; $p < .01$; $\eta^2 = .701$) This analysis reveals that although manufacturer technological innovativeness had no significant effect on *Logistics Service Quality*, it may have a significant effect on overall performance outcomes. Table 5-7 details the outcomes of this test.

TABLE 5-7
OMNIBUS TEST OF GENERAL LINEAR RELATIONSHIP BETWEEN TECHNOLOGICAL READINESS AND PERFORMANCE

Manufacturer Technological Readiness	**Wilk's Lambda**	**F**	**Effect Size η^2**
Innovativeness	.090	3.40***	.701
Insecurity	.101		
Discomfort	.204		
Optimism	.236		
Retailer Technological Readiness			
Optimism	.497		
Innovativeness	.687		
Discomfort	.761		
Insecurity	.485		

*** $p < .001$

Logistics Service Quality Effect on Performance Outcomes

To complete this general linear model a final analysis of the link between *Logistics Service Quality and Performance Outcomes* must take place. The omnibus test of the relationships between the *Logistics Service Quality* dimensions and the *Performance Outcome* dimensions results in six significant relationships, providing partial support for H_4. The better the *Logistics Service Quality* in terms *Order Release Quantities* (Wilk's $\lambda = .020$; $p < .05$; $\eta^2 = .653$), *Satisfaction* (Wilk's $\lambda = .036$; $p < .05$; $\eta^2 = .631$), *Order Discrepancy Handling* (Wilk's $\lambda = .042$; $p < .05$; $\eta^2 = .623$), *Timeliness* (Wilk's $\lambda = .046$; $p < .05$; $\eta^2 = .618$), and *Order Accuracy and Condition* (Wilk's $\lambda = .090$; $p < .10$; $\eta^2 = .570$) the better the firm's *Performance*. Four dimensions of *Logistics Service Quality* are reported as have non-significant relationships to firm *Performance*. They are: *Information Quality* (Wilk's $\lambda = .297$; $p > .10$);, *Order QuantitiesI* (Wilk's $\lambda =$ ..376; $p > .10$), *Ordering Procedures* (Wilk's $\lambda = .357$; $p > .10$), *and Personal Contact Control* (Wilk's $\lambda = .342$; $p > .10$). Although these dimensions are often considered important supply chain performance metrics, they appear to have little impact on overall firm performance as operationalized in this study.

As before, between dimension analyses is run to evaluate which areas/dimensions of *Performance* are being impacted by each dimension of *Logistics Service Quality* Again, only dimensions that passed the omnibus test were examined at the univariate level although all dimensions were retained in the model (Gill 2001). *Market Performance* was significantly impacted by *Order Discrepancy Handling* ($p < .05$; $\eta^2 = .696$), *Order Release Quantities* ($p < .10$; $\eta^2 = .688$), *Timeliness* ($p < .10$; $\eta^2 = .666$), *and Satisfaction* ($p < .05$; $\eta^2 = .663$). Financial Performance is significantly impacted by

Order Accuracy and Condition ($p < .10$; $\eta^2 = .720$), Order Release Quantities ($p < .10$; $\eta^2 = .671$), Satisfaction ($p < .10$; $\eta^2 = .610$), and Order Discrepancy Handling ($p < .10$; $\eta^2 = .604$). It should be noted that while four of the *Logistics Service Quality* constructs impact both *Market Performance* and *Financial Performance*, two do not. First, *Timeliness* impacts *Market Performance* but not *Financial Performance*. This may be due to the fact that the cost of being timely counteracts the financial gains.

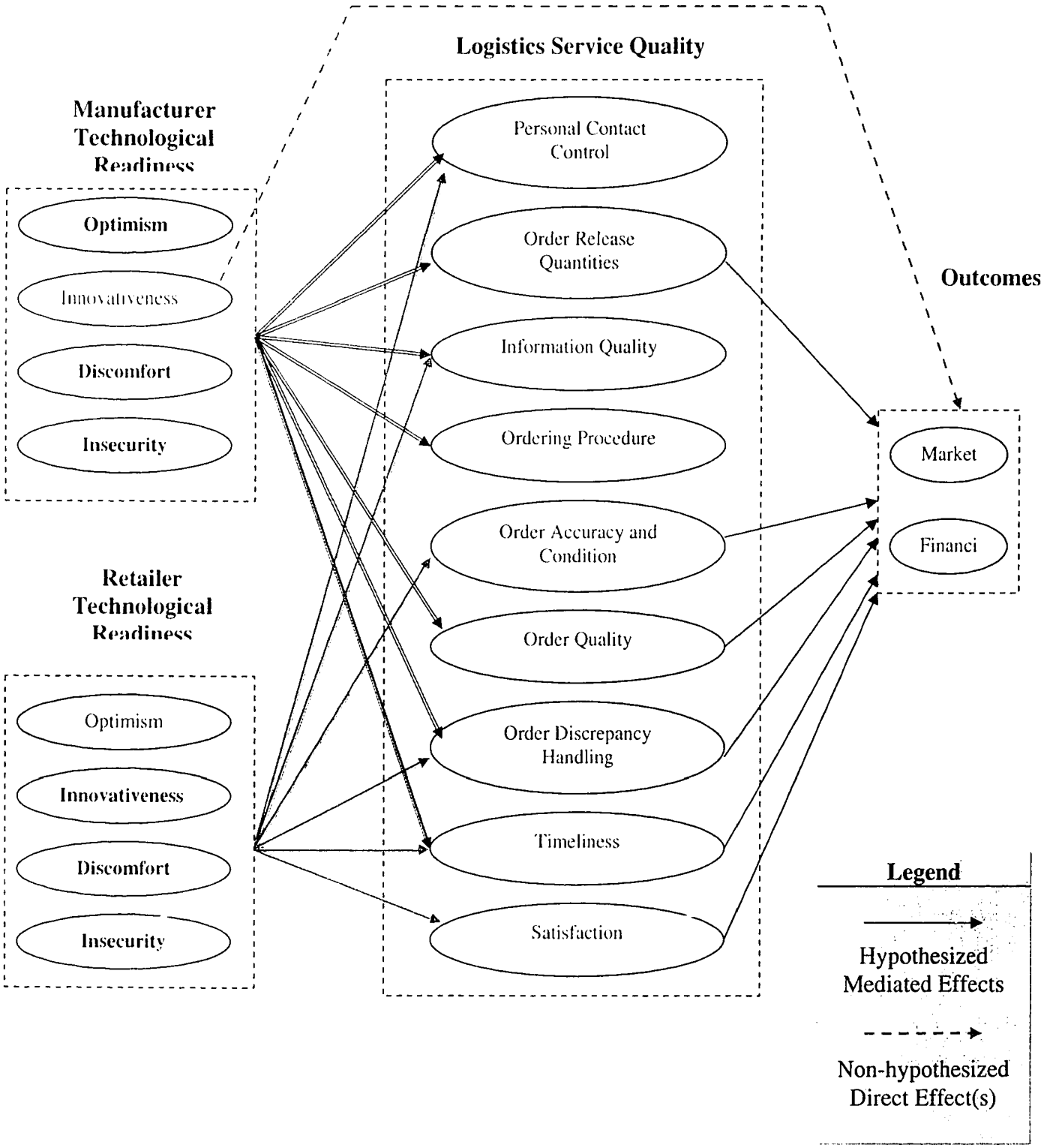
Additionally, *Order Accuracy and Condition* impacts *Financial Performance* but not *Market Performance*. This is most likely an example of meeting expectations while not exceeding them and relying on internal efficiency to drive performance. For instance, firms expect the order to be correct and undamaged, but that does not guarantee an increase in order frequency or size. Financially, if orders are correct (e. g. extra items are not shipped and/or lost) the firm is more likely to reap a financial gain. The results of this analysis are detailed in Table 5-8. Figure 5-3 displays the final results of the Multivariate General Linear Model testing.

TABLE 5-8
SIGNIFICANT DIRECT EFFECTS BETWEEN LOGISTICS SERVICE QUALITY DIMENSIONS AND PERFORMANCE DIMENSIONS

Logistics Service Quality Item	Wilk's Lambda	F	Effect Size η^2	Significance By Performance Area		
				Performance Item	F	Effect Size η^2
Order Release Quantities	.020	1.78**	.653	Market	2.20*	.688
				Financial	2.04*	.671
Satisfaction	.036	2.08**	.631	Market	2.54**	.663
				Financial	2.01*	.610
Order Discrepancy Handling	.042	2.16**	.623	Market	3.17**	.696
				Financial	2.11*	.604
Timeliness	.046	1.72*	.618	Market	2.24*	.666
				Financial	1.31	
Order Accuracy and Condition	.090	1.65*	.570	Market	1.58	
				Financial	1.93*	.720
Information Quality	.297	1.58				
Order Quantities	.376	1.53				
Ordering Procedures	.357	1.27				
Personal Contact Control	.342	.930				

* $p < .10$; ** $p < .05$

FIGURE 5-3
SIGNIFICANT MEDIATING EFFECTS BETWEEN TECHNOLOGICAL READINESS AND LOGISTICS SERVICE QUALITY AND PERFORMANCE



The final stage of the analysis was to test H_3 concerning retailer and manufacturer fit versus *Logistics Service Quality*. First the data set was trimmed down to the matched pairs only. Then the scores for the Goal Fit, Role Fit and Technological Readiness constructs were standardized using z-scores to protect against a non-normal distribution of means that could become a problem at the univariate level (Hair et al 1998). Following standardization, Euclidean distance scores were taken as a measure of similarity/dissimilarity for each pair using the following formula:

$$\textbf{Euclidian Distance } (D^2) =$$

$$(\textbf{Goal}_{\text{Manufacturer}} - \textbf{Goal}_{\text{Reatiler}})^2 + (\textbf{Role}_{\text{Manufacturer}} - \textbf{Role}_{\text{Reatiler}})^2 + (\textbf{TR}_{\text{Manufacturer}} - \textbf{TR}_{\text{Reatiler}})^2$$

The distance score were then grouped together using a Hierarchical Cluster Analysis and Ward's method. Seeding thresholds were set to free to allow the generation of as many clusters as possible. The analysis agglomerated the pairs into two initial clusters of multiple pairs with two possible outliers indicated by the dendogram. The outliers were then removed and the pairs were re-grouped. Group membership remained the same and two distinct clusters were defined. Twenty three pairs were defined as weaker fit while 14 were defined as stronger fit. The results of the cluster analysis are presented in Table 5-9.[3]

[3] It should be noted that both hierarchical and quick non-hierarchical clustering methods resulted in the same classifications. This may be due to the relatively small sample size, but adds validity the use of either approach.

TABLE 5-9
CLUSTER ANALYSIS RESULTS

Cluster (Members)	Iterations	Change in Centroid	Final Euclidean Mean by Item by Cluster
Strong Fit (23)	1	3.751	
	2	.227	
	3	.000	
Goal Fit			1.280312
Role Fit			.416081
Technological Readiness Fit			3.188190
Weak Fit (14)	1	4.535	
	2	.328	
	3	.000	
Goal Fit			1.797490
Role Fit			3.612973
Technological Readiness Fit			7.460009

With the groups defined, one final General Linear Model was tested to examine the impact of group membership on the *Logistics Service Quality* dimensions. Group membership was set as the independent variable, 0 for weaker fit and 1 for stronger fit, while retailer perception of *Logistics Service Quality* was set as the dependent variable. The results reveal that firms with tighter *Technological Readiness Fit* can expect better *Logistics Service Quality* (Wilk's $\lambda = .000$; $p < .01$; $\eta^2 = .901$), along the dimensions of *Personal Contact Control* ($p < .05$; $\eta^2 = .183$), *Order Accuracy and Condition* ($p < .05$; $\eta^2 = .121$), *Information Quality* ($p < .05$; $\eta^2 = .183$), *Order Discrepancy Handling* ($p < .05$; $\eta^2 = .183$), and *Order Release Quantities* ($p < .05$; $\eta^2 = .183$),

TABLE 5-10
TEST OF IMPROVEMENT IN LOGISTICS SERVICE QUALITY OF STRONG FIT GROUP VERSUS WEAK FIT GROUP

Logistics Service Quality Item	F	Effect Size η^2
Personal Contact Control	7.39**	.183
Order Accuracy and Condition	4.55**	.121
Information Quality	4.34**	.113
Order Discrepancy Handling	3.12*	.086
Order Release Quantities	2.36*	.061
Ordering Procedures	.720	
Satisfaction	.320	
Timeliness	.048	
Order Quantities	.038	

* $p < .10$; ** $p < .05$; *** $p < .01$

OVERVIEW

This section has shown at least partial support for all four hypotheses at multivariate and univariate levels. Specifically, Manufacturer *Technological Readiness* has a direct impact on *Logistics Service Quality* in terms a manufacturer's *Optimism, Discomfort, and Insecurity* in implementing a technology. These dimensions have the potential to impact *Personal Contact Control, Order Release Quantities, information Quality, Ordering Procedures, Order Quality, Order Discrepancy Handling,* and *Timeliness* offered to the retail partner. Similarly, retailer *Technological Readiness* has a direct impact on *Logistics Service Quality* in terms a retailer's *Innovativeness, Discomfort, and Insecurity* in implementing a technology. These dimensions have the potential to impact the retail partner's perception of *Logistics Service Quality* in the areas of *Personal Contact Control, Information Quality, Ordering Accuracy and Condition, Order Discrepancy Handling,* and *Timeliness,* and *Satisfaction* offered by the manufacturer.

The analysis also indicted that several components of *Logistics Service Quality* can impact a firm's *Performance Outcomes.* Specifically, the dimensions of Order Release Quantities, Order Quality, Order Discrepancy Handling, and Satisfaction may impact both *Market Based Outcomes and Financial Outcomes.* Two dimensions impact only one *Performance* dimension. *Order Accuracy and Condition* effects *Financial Performance,* while *Timeliness* effects *Market Based Performance.* An artifact of the study design also revealed that Manufacturer *Innovativeness* may have a direct impact on *Performance.* Although this was not hypothesized in the conceptualization, it does strengthen the argument that *Technological Readiness* impacts performance.

Finally the results found that partner *Technological Readiness Fit* also has an impact on *Logistics Service Quality.* Manufacturers that have better fit along the goals for technology, role of technology, and overall technological readiness can expect retailers to experience/perceive better *Personal Contact Control*, *Order Accuracy and Condition,*, *Information Quality*, *Order Discrepancy Handling*, and *Order Release Quantities*

CHAPTER SIX

CONCLUSIONS

This study makes significant discoveries in the analysis of the 4 major hypotheses. The study finds that logistics service quality is impacted by the readiness of both manufacturers and retailers. It finds that a technological readiness fit also improves logistics service quality. Finally, it supports the proposition that superior logistics service quality drives superior performance.

As the case study implies and the dissertation supports, there is much more to enhancing performance than just adopting the most innovative technologies. Specifically, firms engaging in supply chain relationships may be very willing to adopt a technology, but not willing or even ready to implement it.[4] This study shows that technology may be an effective tool to be used by management to better performance, but emphasis on technology alone without a dynamic understanding of whether a manager or firm can implement and/or manage the tool is short sighted. These findings will have an impact on both researchers and managers.

[4] For additional information see Forrester studies at http://www.forrester.com

THEORETICAL IMPLICATIONS

Researchers sometimes make the mistake of holding the wrong variables constant or look to the wrong variable when examining business to business technology and its impact. For example, a large portion of the existing research on the use of technology has looked at adoption of a technology and not implementation and management. Additionally, researchers attempting to find the link between technology and performance had difficulty supporting a relationship.

This study supports that, regardless of technology type, firm technological readiness impacts performance. It also finds that this impact is indirect and mediated by logistics service quality in most cases. Thus, a researcher attempting to find the root of the problem might find it difficult to relate technology to performance if he/she is overlooking the impact of technological readiness and/or logistics service quality. By examining strategic implementation and the role of the process, executives may learn how to better project supply chain success. These findings may have an impact on theory and theory development. Some specific theories that may be impacted include: Resource Based Theory, Transaction Cost Economics, Relationship Marketing, Power and Dependence, Network Theory, Communications Theory, and theories of strategic fit.

Ultimately, technology is only an asset and not a resource. It is the combination of the technological asset with the managerial input (readiness, knowledge, learning, etc.) that makes it a resource and hopefully a capability. Considering the findings from this study, researchers grounding studies in Resource Base Theory of the firm should give greater consideration to the managerial inputs that convert assets to valuable resources. It

is the combination of readiness and a given technology that create resources and capabilities. Additionally, strategy researchers should consider adding a new component to the study of strategic (interactive) partner fit, as the study supports a positive relationship between technological readiness fit and performance.

It may be possible that technological readiness can be conceptualized as a transaction cost reducing function as discussed in Transaction Cost Economics. That is to say that firms possessing superior technological readiness may not incur the monitoring, training, and other contracting cost that are associated with firms possessing weaker readiness. The readiness of the dyad may make transactions more fluid across firms and thus improve performance through the reduction of transaction costs (e.g. cost of manually taking orders, cost of reverse logistics to repair mistakes, etc.). Researchers examining the impact of technology and quality on transaction costs and performance need to be aware of the role of readiness. Additionally, technological readiness that is built into the relationship may become as transaction specific investment binding two firms together. These managerial components will need to be studied, addressed, and controlled to get a true measure of how well a technological tool is performing and why a business relationship continues to exist.

A firm's technological readiness may have an impact of the study of Relationship Marketing (Marketing Concept) -- relationships and/or partnering. Researchers should take into account the possibility that business partners consider the readiness of a potential partner before making any agreement to do business. Certainly, the technological readiness of a partner needs to be considered by researchers and this study reveals that only specific dimensions of technological readiness are truly important to

partnership success. Additionally, asymmetry in technological readiness may have a negative impact on relationships. Lower levels of technological readiness may have a negative impact on trust, commitment, and long term firm orientation.

How does technological readiness impact the strategic interorganizational position of a firm? Is it possible that firms with higher levels of technological readiness have a stronger power position? Can they create countervailing power if in a weaker position? What type of power does technological readiness facilitate? These are just some of the questions that have been overlooked by researchers studying Power and Dependence in marketing channels. Technological readiness may have a powerful mediating or moderating effect on power symmetry/asymmetry. It also may be the source of higher levels of dependence for firms implementing idiosyncratic technology. A related issue of note is -- firms that are the focus of numerous dependents often become the node of a network. Network theorists may find technological readiness to be a valuable measure of potential network centrality.

Finally, Communications Theory may be augmented by a better understanding of how technological readiness impacts inter-firm and intra-firm communications. Specifically, readiness may impact or be impacted by communication richness, frequency, and modality. Since much of today's communication it technology mediated, it is quite likely that firm communications strategy and outcomes have changed since much of the marketing channels work of the early 1990's.

MANAGERIAL IMPLICATIONS

Results from studies in education find that often the downfall of technological innovation can be traced to poor planning (see http://www.wested.org/techpolicy/recapproach.html). This issue is currently being discussed in the popular press (see Anonymous 1999). Is it possible that manufactures and retailers are overlooking their supply chain partner's readiness for implementation of a technology in their strategic planning? The results of this study bring light to numerous issues of managerial concern. Manufacturing and retail managers need to pay attention to technological readiness in their management of human capital, selection of business partners, management of business to business relationships, and measurement of technological effectiveness and efficiency,

The dissertation finds that retailer technological innovativeness, discomfort, and insecurity all play a role in the logistics service quality a retailer receives/perceives from a manufacturer. It is this service quality that in turn drives retailer performance. Thus, retail managers need to scan the environment for emerging technologies and attempt to build technological innovativeness, comfort, and security into their human resources – management teams. This may be done through managerial selection, training, hands on experience, and collaborative sessions between a retailer and the manufacturer or a third party. As advanced technologies become more commonplace, i.e. EDI over the past decade, retailer managers will need a different skill set and technological competencies. These managers will have to be ready to manage change and convert raw technological assets into capabilities.

Manufacturers have become known for developing R & D departments that focus on technological innovation (see discussion of Fleming in Chapter 4). Results from the dissertation support that all four dimensions of Manufacturer Technological Readiness impact performance. Technological optimism, discomfort, and insecurity have a major impact on logistics service quality. As with the discussion of retailers, manufacturers need to be sure their managers are ready for the implementation of technology across the supply chain as many of these managers may actually have to take the lead in training their retail partners. If not, they may actually see a reduction in the service quality offered to their partners.

When scanning the supply chain for prospective partners, manufacturers and retailers must develop ways to target a fit between firm types. Technological readiness should no doubt be included in the mix of variables a manager considers to attain superior performance. Managers should make attempts to measure the dimensions of a potential partner's technological readiness. This may assist in a smoother transition through the development of the relationship and hopefully result in superior quality and performance. Considering existing partners, firms should consider developing readiness based partnering initiatives. These initiatives would help partners develop collaborative training, education, and implementation encouraging the transfer of knowledge and expertise.

Finally, Managers may need to readdress their measurement of technological effectiveness across the supply chain. This study finds that technological innovation has a direct impact on manufacturer performance. This may be the cause of some of the managerial confusion over why technology is not reaping the expected rewards. If an

executive is to look at the readiness of his/her managers to implement supply chain technology without considering the role logistics service quality plays, only technological innovation will be found to be important. So the managerial directive becomes "we need to be more innovative" and hence research and practice focus on that issue rather that the implementation process overall (see Graff, Heiman, and Zilberman 2002; Hellstrom, Hellstrom, and Berglund 2002; and King and Tucci 2002). But the resources being spent on becoming more innovative may be undermined by the fact that managers are becoming increasingly pessimistic, uncomfortable, and insecure, thus reducing logistics service quality and ultimately performance. Firms must try to make sure their managers are ready for technological innovation or innovation may have no performance impact at all.

FUTURE RESEARCH

This research opens the door for an extended research program across five dimensions: channel relationships, firm strategy and orientation, industry impacts, the extended enterprise, and theoretical development.

First, technological readiness and its impact on logistics service quality and performance may be impacted by some of the dynamic issues discussed in the marketing channels literature. Some possible research questions and a possible grounding study for each follow:

- What types of firm power have what types of effects on technological readiness and logistics service quality? (Gaski and Nevin 1985)
- Do trust and commitment mediate the relationship between firm technological readiness and logistics service quality? (Morgan and Hunt 1994)

- How does communications frequency and richness impact technological readiness and logistics service quality? (Mohr and Nevin 1990)
- How does contract form impact technological readiness and logistics service quality? (Lusch and Brown 1996)
- How does Vendor Managed Inventory impact technological readiness and logistics service quality? (Levy and Grewel 2000)

Secondly, numerous issues need to be examined concerning firm strategy in the supply chain possible research questions include:

- What are the values and/or costs of focusing specifically on innovation as a dynamic capability? (King and Tucci 2002)
- How does formalization impact technological readiness and logistics service quality? (Gunnarsson and Jonsson 2003)
- How does planning time horizon and planning time horizon fit impact technological readiness and logistics service quality? (Richards 1996)
- How does top management team succession impact technological readiness and logistics service quality? (Rousseau 1994)
- What are the appropriate selection criteria to ensure partner fit? (Harvey and Richey 2002)
- With technological readiness as a control variable, what are the most effective supply chain technologies? (John, Weiss, and Dutta 1999)
- What types and what impact do knowledge and learning have on technological readiness and logistics service quality? (Glazer 1991)
- What role do macro-environmental impacts play on technological readiness and logistics service quality? (Corbett and DeCroix 2001)

Third, Michael Porter championed the fact that industry does matter to firm performance (Porter 1985). Technological readiness should be examined in its relationship to the following major issues:

- Industry complexity (Flynn and Flynn 1999)
- Stage of the corporate life cycle/product life cycle (Daugherty, Autry, and Ellinger 2001; Tibben-Lembke 2002)

- Industry volatility (Claycomb, Dröge and Germain 1999)
- Barriers to entry (Brown 2001)
- Technological intensity (John, Weiss, and Dutta 1999)
- Hyper-competition (D Aveni 2001)

The final two areas are much more specific. Fourth, the extended enterprise needs to be examined. Analysis would be more robust and meaningful in a supply chain context if multiple channel intermediaries were surveyed across the supply chain rather than just a dyad. Additionally, this study of intermediaries could be extended to facilitators and thus examine the roles, goals, and impacts of third party service providers (Gould 2002). Finally, in light of all the research areas that present themselves in this discussion, it may become important to develop a theory of technological readiness in supply chain management.

LIMITATIONS OF THE RESEARCH

As with any empirical study, limitations do exist. The design discussed in Chapter 3 was developed in an attempt to control error and bias and was effective. Yet, due to certain aspects inherent in quantitative research and scope/level of this analysis, some limitations exist. These issues are discussed briefly below.

STUDY LIMITS

Four major study limits exist. They include cross-sectional design, the use of perceptual data, the use of key informants, and interest/response bias. Cross-sectional

design is a limitation as it could be better to study performance over a time range rather than asking for a snapshot. Thus, the manager may relate performance to this week which has been exceptionally good or bad and thus not representative of typical firm performance. This issue may be complicated by the fact that most measures were perceptual and therefore depend at some level on individual differences and environmental influences. The complications of perceptual differences could be overcome through the use of multiple informants, but it was deemed that multiple informants would restrict the sample size too much. Additionally, multiple informants have not been supported as a perfect panacea for the complications of perceptual differences (John and Reve 1982; and Kumar, Stern and Anderson 1993). Finally, interest bias is a type of response bias caused by the people who are interested being the only people to respond. This is a limitation, but the large response rate should reduce its impact. Sadish, Cook, and Campbell (2002) suggest that response bias is not a huge issue and that if researchers focus on non-response bias, response bias should take care of itself.

METHOD LIMITS

In addition to the study limits, a few method based limits exist. Two specific areas of contention are linear vs. curvilinear estimation of fit and the lack of a global measure of logistics service quality. First, some researchers suggest that linear relationships are not a true representation of fit (Edwards 1993, 1994a, 1994b, 1995). Due to the simple nature of the study design for measuring fit (and the fact that analysis of fit was required by only one hypothesis), it was assumed that a simpler measure of fit would better "fit"

the study. Thus, the test of fit used in the study was general linear modeling analysis which mirrors the analysis of the rest of the hypotheses. Future research should examine the three-dimensional components of technological readiness fit. Another important limitation is there was not global measure of performance in the study so the decision was made to use the retailer's perception of performance as the logistics service quality measure when examining fit. Ultimately, it would have been better to have a supply chain based metric(s) as this variable, but there is no globally accepted or adopted measure available.

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APPENDIX
Survey Instruments

INITIAL SURVEY COVER LETTER

(Date)
Dear (xxx),

I am a doctoral candidate in the Division of Marketing and Supply Chain Management of the Michael F. Price College of Business at The University of Oklahoma. I invite you to participate in a research study that is being conducted under the auspices of The University of Oklahoma – Norman Campus, titled *Partnering and Technological Readiness: A Study of Strategic Fit Between Firms in the Supply Chain* (IRB # 03-040). The purpose of this study is to examine and evaluate how manufacturers and retailers implement and manage supply chain technologies and relationships.

Your participation will involve answering the following questions that relate to your business and a primary business partner. The questionnaire should only take about 15 minutes to complete. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time. This questionnaire is anonymous. The results of the research may be published, but neither your name nor the name of your company will be used or linked to your responses. In fact, the published results will only be presented in summary form. All information you provide will remain strictly confidential.

The project findings will provide information on best practices that enhance your management of technology and relationships with your business partners. In addition you will receive an executive summary within one month of the completion of the study. Only aggregate information will be reported in the summary to maintain confidentially.

If you have any questions about this research project, please feel free to contact me at the number below. Questions about your rights as a research participant or concerns about the project should be directed to the Office of Research Administration at the University of Oklahoma, (405) 325-4757 or irb@ou.edu.

By returning the questionnaire described above, you will be agreeing to participate in the project described above. As a token of thanks, we are enclosing a $2 bill.

Thanks for helping me complete my dissertation and Ph.D!

Best regards,

R. Glenn Richey
Project Administrator
Doctoral Candidate in Marketing
richey@ou.edu
(405) 325-0430

Patricia J. Daugherty
Faculty Sponsor
Siegfried Chair in Marketing
pdaugher@ou.edu
(405) 325-5899

FOLLOW UP COVER LETTER

(Date)
Dear (xxx),

I am a doctoral candidate in the Division of Marketing and Supply Chain Management of the Michael F. Price College of Business at The University of Oklahoma. I am contacting you because your name was forwarded to me by one of your key suppliers/buyers. The supplier's/buyer's name can be found on page seven of the enclosed survey. I invite you to participate in a research study that is being conducted under the auspices of The University of Oklahoma – Norman Campus, titled *Partnering and Technological Readiness: A Study of Strategic Fit Between Firms in the Supply Chain* (IRB # 03-040). The purpose of this study is to examine and evaluate how manufacturers and retailers implement and manage supply chain technologies and relationships. Your participation is vital in the completion of this study.

Your participation will involve answering the following questions that relate to your business and a primary business partner. The questionnaire should only take about 15 minutes to complete. Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time. This questionnaire is anonymous. The results of the research may be published, but neither your name nor the name of your company will be used or linked to your responses. In fact, the published results will only be presented in summary form. All information you provide will remain strictly confidential.

The project findings will provide information on best practices that enhance your management of technology and relationships with your business partners. In addition you will receive an executive summary within one month of the completion of the study. Only aggregate information will be reported in the summary to maintain confidentially.

If you have any questions about this research project, please feel free to contact me at the number below. Questions about your rights as a research participant or concerns about the project should be directed to the Office of Research Administration at the University of Oklahoma, (405) 325-4757 or irb@ou.edu.

By returning the questionnaire described above, you will be agreeing to participate in the project described above. As a token of thanks, we are enclosing a $2 bill.

Thanks for helping me complete my dissertation and Ph.D!

Best regards,

R. Glenn Richey
Project Administrator
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(MANFACTURER SURVEY)
PARTNERING AND TECHNOLOGICAL READINESS
A Study of Strategic Fit Between Firms in the Supply Chain

Sponsored by:
The University of Oklahoma
Michael F. Price College of Business
Division of Marketing and Supply Chain Management

Please note:

We need your help. This questionnaire looks at a critical business issue – how firm performance can be enhanced through the matching of technological readiness with key trading partners. The insights gained should have significant managerial implications and help you develop effective collaborative strategies.

Therefore, we hope you'll take a few minutes to complete the questionnaire. Many of the questions can be answered by simply circling a number. If you can't answer a question or prefer not to answer, just leave it blank. But please complete as much as possible and return it at your earliest convenience (within two weeks if possible).

We'll be glad to share the results with you. Please attach a business card or provide contact information on the final page and we will forward the Executive Summary as soon as data collection is finished. If someone else in the organization is better qualified to answer these questions, please pass the survey on to that person.

If you have any questions regarding the project, please contact me directly.

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Supply chain technologies are important to business success. We are interested in what technologies you use, how you manage those technologies, and how technologies influence trading partnerships with key customers. Later in the survey we will ask you to identify a key customer. We will contact that customer and ask for his/her input. By looking at both you and your customer, we will be able to assess the level of fit regarding technologies used to support business operations.

SECTION ONE: TECHNOLOGY

1. Which of the following technologies do you use in conjunction with your primary customer? By primary customer we mean the customer that buys the most from you (dollar volume). (Mark all that apply).

[ ] Automated Materials Handling Equipment
[ ] Automatic Replenishment Systems (ARS)
[ ] Capacity Resource Planning (CRP)
[ ] Customer Relationship Management Systems (CRM)
[ ] Customer Replenishment Planning Systems (CRP)
[ ] Distribution Resource Planning (DRP)
[ ] Electronic Data Interchange (EDI or EFT)
[ ] Enterprise Resource Planning (ERP)
[ ] E-Commerce (EC)
[ ] Geographic Information Systems (GIS)
[ ] Intelligent Agent Purchasing Systems
[ ] Internet/Extranets
[ ] Manufacturing Resource Planning (MRP or MRP II)
[ ] Network Management Systems
[ ] Order Management Systems (OMS)
[ ] Physical Distribution Management Systems (PDM)
[ ] Point of Sale (POS)
[ ] Scanners - Bar Codes – UPC
[ ] Transportation Management Systems (TMS)
[ ] Warehouse Management Systems (WMS)
[ ] Other _____

SECTION TWO: TECHNOLOGY MANAGEMENT

2. Please indicate your level of agreement/disagreement with the following statements.

	Strongly Disagree			Neutral			Strongly Agree
Technology gives my company more control over daily operations.	1	2	3	4	5	6	7
Processes and equipment that use the newest technologies are much more convenient to use.	1	2	3	4	5	6	7
We prefer to use the most advanced technology.	1	2	3	4	5	6	7
We like to use technology that can be tailored to fit our needs.	1	2	3	4	5	6	7
Technology makes task completion more efficient.	1	2	3	4	5	6	7
Other firms come to us for advice on new technology.	1	2	3	4	5	6	7
It seems that our business partners and competitors are learning less about the newest technologies than we are.	1	2	3	4	5	6	7
In general, we are among the first in our industry to acquire new technology.	1	2	3	4	5	6	7
We can usually figure out technology without much outside help	1	2	3	4	5	6	7

	Strongly Disagree			Neutral			Strongly Agree
Sometimes, we feel that technology is not developed for use by the average person.	1	2	3	4	5	6	7
When we get technical support from a provider, we sometimes feel we are being taken advantage of.	1	2	3	4	5	6	7
We do not consider it safe to give out our company account information over the internet.	1	2	3	4	5	6	7
We do not consider it safe to do any kind of financial business online.	1	2	3	4	5	6	7
We worry that information sent over the Internet will be seen by competitors.	1	2	3	4	5	6	7
We do not feel confident in working with a business partner that can only be reached online.	1	2	3	4	5	6	7
If we transmit information electronically, we can never be sure it will get to the right place.	1	2	3	4	5	6	7
If we transmit information electronically, a terrorist may use that information against us.	1	2	3	4	5	6	7

3. Please indicate your level of agreement/disagreement with the following statements regarding your company and your primary customer.

	Strongly Disagree			Neutral			Strongly Agree
Our reward systems are compatible with that of our customer.	1	2	3	4	5	6	7
Our procedures for control and use of technologies are different from our customer.	1	2	3	4	5	6	7
Our objective for technology is always the same as our customer.	1	2	3	4	5	6	7
The differences we have in the goals for our technology cause the ordering process to become inefficient.	1	2	3	4	5	6	7
The goals of our organizations are consistent and compatible.	1	2	3	4	5	6	7
In dealing with our customer, we have a mutual understanding of the role of each party in selecting the correct technologies.	1	2	3	4	5	6	7
In dealing with our customer, we have a mutual understanding of how each party is to use the technology.	1	2	3	4	5	6	7

4. How adequate is the resource commitment made by your primary customer?

	Not at all Adequate			Adequate			More Than Adequate
Financial resources	1	2	3	4	5	6	7
Physical assets (equipment, facilities)	1	2	3	4	5	6	7
Technological resources	1	2	3	4	5	6	7
Managerial resources (assignment of personnel to account)	1	2	3	4	5	6	7

SECTION THREE: LOGISTICS SERVICE QUALITY AND OVERALL PERFORMANCE

5. What do you think *your primary customer* would say (agree/disagree) regarding the logistics service quality <u>you provide to them.</u>

	Strongly Disagree			Neutral			Strongly Agree
<u>Contact Quality</u>							
The designated contact person makes an effort to understand my situation.	1	2	3	4	5	6	7
Problems are resolved by the designated contact person.	1	2	3	4	5	6	7
The product knowledge/experience of contact personnel is adequate.	1	2	3	4	5	6	7
<u>Order Release Quantities</u>							
Requisition quantities are not challenged.	1	2	3	4	5	6	7
Difficulties never occur due to *minimum* case quantities.	1	2	3	4	5	6	7
Difficulties never occur due to *maximum* promotional quantities.	1	2	3	4	5	6	7
<u>Information Quality</u>							
Product-specific information is *available.*	1	2	3	4	5	6	7
Product-specific information is *adequate.*	1	2	3	4	5	6	7
<u>Ordering Procedures</u>							
Requisitioning procedures are *effective.*	1	2	3	4	5	6	7
Requisitioning procedures are *easy to use.*	1	2	3	4	5	6	7
<u>Order Accuracy</u>							
Shipments rarely contain the *wrong items.*	1	2	3	4	5	6	7
Shipments rarely contain an *incorrect quantity.*	1	2	3	4	5	6	7
Shipments rarely contain *substituted items.*	1	2	3	4	5	6	7
<u>Order Condition</u>							
Material received is undamaged.	1	2	3	4	5	6	7
Damage rarely occurs as a result of transportation mode or carrier.	1	2	3	4	5	6	7
<u>Order Quality</u>							
Substituted items worked fine.	1	2	3	4	5	6	7
Products ordered meet technical requirements.	1	2	3	4	5	6	7
Equipment and/or parts are rarely non-conforming.	1	2	3	4	5	6	7
<u>Order Discrepancy Handling</u>							
Correction of delivered quantity discrepancies is satisfactory.	1	2	3	4	5	6	7
The report of discrepancy process is adequate.	1	2	3	4	5	6	7
Response to quantity discrepancy reports is satisfactory.	1	2	3	4	5	6	7
<u>Timeliness</u>							
Time between placing orders and receiving delivery is short.	1	2	3	4	5	6	7
Deliveries arrive on the date promised.	1	2	3	4	5	6	7
The amount of time a requisition is on back-order is short.	1	2	3	4	5	6	7

6. Please estimate your firm's overall performance	Much Worse			Same As			Much Better
Market Based Performance							
Our *Market Share* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Customer Retention* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Sales Growth* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Financial Performance							
Our *Current ROI is much worse/better* than our main competitor.	1	2	3	4	5	6	7
Our *Anticipated Average Profits per Customer* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Anticipated ROI* is much worse/better than our main competitor.	1	2	3	4	5	6	7

SECTION FOUR: RELATIONSHIP WITH YOUR PRIMARY CUSTOMER

7. Please indicate your level of agreement/disagreement with the following statements regarding your relationship with your *primary customer.*

	Strongly Disagree			Neutral			Strongly Agree
Flexibility							
Whenever unexpected situations arise, we hold each other to the terms of our original contract.	1	2	3	4	5	6	7
Both partners are able to make adjustments in the relationship to cope with the changing market environment.	1	2	3	4	5	6	7
Working with our customer, we have developed processes to increase flexibility to respond to customer requests.	1	2	3	4	5	6	7
Collaboration							
Both companies work together toward common goals.	1	2	3	4	5	6	7
Our company and customer work together to take advantage of unique opportunities in the market.	1	2	3	4	5	6	7
Our companies work together to develop new ideas.	1	2	3	4	5	6	7
We continually share proprietary information with each other.	1	2	3	4	5	6	7
Trust							
We have a high level of trust in our business relationship.	1	2	3	4	5	6	7
When the customer offers us advice, we believe they are sharing their best judgment.	1	2	3	4	5	6	7
We have developed a strong sense of loyalty to the customer.	1	2	3	4	5	6	7
Commitment							
My firm intends to maintain the relationship we have with this customer indefinitely.	1	2	3	4	5	6	7
The relationship my firm has with the customer deserves our maximum effort to maintain.	1	2	3	4	5	6	7
We expect to be supplying this customer for some time.	1	2	3	4	5	6	7

	Strongly Disagree			Neutral			Strongly Agree
Innovation							
Innovation is readily accepted in program/project management.	1	2	3	4	5	6	7
Our firm's management actively seeks innovative ideas.	1	2	3	4	5	6	7
Technical innovation is readily accepted in our firm.	1	2	3	4	5	6	7
Investments							
We have made significant financial investments dedicated to our relationship with this customer.	1	2	3	4	5	6	7
If we switched to our customer's competitor, we would lose a lot of the investment we have made in this customer.	1	2	3	4	5	6	7
If we decide to stop working with this customer, we would be wasting a lot of knowledge regarding their method of operation.	1	2	3	4	5	6	7

8. Please indicate your level of agreement/disagreement with the following statements regarding *your level of satisfaction in the relationship with your primary customer.*

	Strongly Disagree			Neutral			Strongly Agree
Our relationship with this customer has been a successful one.	1	2	3	4	5	6	7
Our relationship with this customer has more than fulfilled our expectations.	1	2	3	4	5	6	7
We are satisfied with the outcomes from this relationship.	1	2	3	4	5	6	7
We regret the decision to work with this customer.	1	2	3	4	5	6	7
If we had to do it all over again, we would still choose to work with this customer.	1	2	3	4	5	6	7

9. Please indicate your level of agreement/disagreement with the following statements regarding your industry environment.

	Strongly Disagree			Neutral			Strongly Agree
There is not much competitive intensity in our market.	1	2	3	4	5	6	7
The growth rate of total industry sales is very high.	1	2	3	4	5	6	7
Competitors enter and exit our market at a very high rate.	1	2	3	4	5	6	7

SECTION FIVE: ABOUT YOUR COMPANY

10. Please provide the following basic information concerning your company

What is your primary industry? _____

Primary Business Area (Circle one) Manufacturer Wholesaler Retailer Other _____

Approximate Number of Full Time Employees _____

Approximate Number of Employees Devoted to Supply Chain Management _____

Sales Volume for Most Recent year _____

11. Please provide a contact name at your primary customer for us to send a follow-up survey. Your responses will remain confidential.

Contact Name and Title

Company

Address | City, State, Zip

Phone | Email

This Customer is a (Circle One) Retailer Wholesaler Other _____

12. For the customer above, how much of the overall success/failure of the listed technologies do you attribute to?

Your firm's management of technology	_____ %
Your partner's management of technology	_____ %
The technology itself (anyone can manage it)	_____ %
Total	100 %

(Please fill in or attach business card if you would like to receive a copy of the executive summary)

Respondent Name: Title:

Company:

Mailing Address:

City: State: Zip: Country:

Thank you for your time and effort in helping us. It is greatly appreciated.

(RETAILER SURVEY)
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[ ] Intelligent Agent Purchasing Systems
[ ] Internet/Extranets
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[ ] Order Management Systems (OMS)
[ ] Physical Distribution Management Systems (PDM)
[ ] Point of Sale (POS)
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[ ] Transportation Management Systems (TMS)
[ ] Warehouse Management Systems (WMS)
[ ] Other _____

SECTION TWO: TECHNOLOGY MANAGEMENT

2. Please indicate your level of agreement/disagreement with the following statements.

	Strongly Disagree			**Neutral**			**Strongly Agree**
Technology gives my company more control over daily operations.	1	2	3	4	5	6	7
Processes and equipment that use the newest technologies are much more convenient to use.	1	2	3	4	5	6	7
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We like to use technology that can be tailored to fit our needs.	1	2	3	4	5	6	7
Technology makes task completion more efficient.	1	2	3	4	5	6	7
Other firms come to us for advice on new technology.	1	2	3	4	5	6	7
It seems that our business partners and competitors are learning less about the newest technologies than we are.	1	2	3	4	5	6	7
In general, we are among the first in our industry to acquire new technology.	1	2	3	4	5	6	7
We can usually figure out how to use technology without much outside help.	1	2	3	4	5	6	7

	Strongly Disagree			Neutral			Strongly Agree
Sometimes, we feel that technology is not developed for use by the average person.	1	2	3	4	5	6	7
When we get technical support from a provider, we sometimes feel we are being taken advantage of.	1	2	3	4	5	6	7
We do not consider it safe to give out our company account information over the internet.	1	2	3	4	5	6	7
We do not consider it safe to do any kind of financial business online.	1	2	3	4	5	6	7
We worry that information sent over the Internet will be seen by competitors.	1	2	3	4	5	6	7
We do not feel confident in working with a business partner that can only be reached online.	1	2	3	4	5	6	7
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If we transmit information electronically, a terrorist may use that information against us.	1	2	3	4	5	6	7

3. Please indicate your level of agreement/disagreement with the following statements regarding your company and your primary supplier.

	Strongly Disagree			Neutral			Strongly Agree
Our reward systems are compatible with that of our supplier.	1	2	3	4	5	6	7
Our procedures for control and use of technologies are different from our supplier.	1	2	3	4	5	6	7
Our objective for technology is the same as our supplier.	1	2	3	4	5	6	7
The differences we have in the goals for our technology cause the ordering process to become inefficient.	1	2	3	4	5	6	7
The goals of our organizations are consistent and compatible.	1	2	3	4	5	6	7
In dealing with our supplier, we have a mutual understanding of the responsibilities of each party in maintaining the technology.	1	2	3	4	5	6	7
In dealing with our supplier, we have a mutual understanding of how each party is to use the technology.	1	2	3	4	5	6	7

4. How adequate is the level of resource commitment made by your primary supplier?

	Not at all Adequate			Adequate			More Than Adequate
Financial resources	1	2	3	4	5	6	7
Physical assets (equipment, facilities)	1	2	3	4	5	6	7
Technological resources	1	2	3	4	5	6	7
Managerial resources (assignment of personnel to account)	1	2	3	4	5	6	7

SECTION THREE: LOGISTICS SERVICE QUALITY AND OVERALL PERFORMANCE

5. Please indicate your level of agreement/disagreement with the following statements regarding the logistics service quality <u>provided by</u> your *primary supplier.*

	Strongly Disagree			Neutral			Strongly Agree
<u>Contact Quality</u>							
The designated contact person makes an effort to understand my situation.	1	2	3	4	5	6	7
Problems are resolved by the designated contact person	1	2	3	4	5	6	7
The product knowledge/experience of contact personnel is adequate.	1	2	3	4	5	6	7
<u>Order Release Quantities</u>							
Requisition quantities are not challenged.	1	2	3	4	5	6	7
Difficulties never occur due to *minimum* case quantities.	1	2	3	4	5	6	7
Difficulties never occur due to *maximum* promotional quantities.	1	2	3	4	5	6	7
<u>Information Quality</u>							
Product specific information is *available.*	1	2	3	4	5	6	7
Product specific information is *adequate.*	1	2	3	4	5	6	7
<u>Ordering Procedures</u>							
Requisitioning procedures are *effective.*	1	2	3	4	5	6	7
Requisitioning procedures are *easy to use.*	1	2	3	4	5	6	7
<u>Order Accuracy</u>							
Shipments rarely contain the *wrong items.*	1	2	3	4	5	6	7
Shipments rarely contain an *incorrect quantity.*	1	2	3	4	5	6	7
Shipments rarely contain *substituted items.*	1	2	3	4	5	6	7
<u>Order Condition</u>							
Material received is undamaged.	1	2	3	4	5	6	7
Damage rarely occurs as a result of transportation mode or carrier.	1	2	3	4	5	6	7
<u>Order Quality</u>							
Substituted items worked fine.	1	2	3	4	5	6	7
Products ordered meet technical requirements.	1	2	3	4	5	6	7
Equipment and/or parts are rarely non-conforming.	1	2	3	4	5	6	7
<u>Order Discrepancy Handling</u>							
Correction of delivered quantity discrepancies is satisfactory.	1	2	3	4	5	6	7
The report of discrepancy process is adequate.	1	2	3	4	5	6	7
Response to quantity discrepancy reports is satisfactory.	1	2	3	4	5	6	7
<u>Timeliness</u>							
Time between placing orders and receiving delivery is short.	1	2	3	4	5	6	7
Deliveries arrive on the date promised.	1	2	3	4	5	6	7
The amount of time a requisition is on back-order is short.	1	2	3	4	5	6	7

6. Please rate your firm's overall performance	**Much Worse**			**Same As**			**Much Better**
Market Based Performance							
Our *Market Share* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Customer Retention* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Sales Growth* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Financial Performance							
Our *Current ROI is much worse/better* than our main competitor.	1	2	3	4	5	6	7
Our *Anticipated Average Profits per Customer* is much worse/better than our main competitor.	1	2	3	4	5	6	7
Our *Anticipated ROI* is much worse/better than our main competitor.	1	2	3	4	5	6	7

SECTION FOUR: RELATIONSHIP WITH YOUR PRIMARY SUPPLIER

7. Please indicate your level of agreement/disagreement with the following statements regarding your relationship with your primary supplier.

Flexibility	**Strongly Disagree**			**Neutral**			**Strongly Agree**
Whenever unexpected situations arise, we hold each other to the terms of our original contract.	1	2	3	4	5	6	7
Both partners are able to make adjustments in the relationship to cope with the changing market environment.	1	2	3	4	5	6	7
Working with our supplier, we have developed processes to increase flexibility to respond to customer requests.	1	2	3	4	5	6	7
Collaboration							
Both companies work together toward common goals	1	2	3	4	5	6	7
Our company and supplier work together to take advantage of unique opportunities in the market.	1	2	3	4	5	6	7
Our companies work together to develop new ideas.	1	2	3	4	5	6	7
We continually share proprietary information with each other.	1	2	3	4	5	6	7
Trust							
We have a high level of trust in our business relationship.	1	2	3	4	5	6	7
When the supplier offers us advice, we believe they are sharing their best judgment.	1	2	3	4	5	6	7
We have developed a strong sense of loyalty to the supplier.	1	2	3	4	5	6	7
Commitment							
My firm intends to maintain the relationship we have with this supplier indefinitely.	1	2	3	4	5	6	7
The relationship my firm has with the supplier deserves our maximum effort to maintain.	1	2	3	4	5	6	7
We expect to be buying from this supplier for some time.	1	2	3	4	5	6	7

	Strongly Disagree			Neutral			Strongly Agree
Innovation							
Innovation is readily accepted in program/project management.	1	2	3	4	5	6	7
Our firm's management actively seeks innovative ideas.	1	2	3	4	5	6	7
Technical innovation is readily accepted in our firm.	1	2	3	4	5	6	7
Investments							
We have made significant investments in displays, trained salespeople, etc., dedicated to our relationship with this supplier.	1	2	3	4	5	6	7
If we switched to our supplier's competitor, we would lose a lot of the investment we have made in this supplier.	1	2	3	4	5	6	7
If we decide to stop working with this supplier, we would be wasting a lot of knowledge regarding their method of operation.	1	2	3	4	5	6	7

8. Please indicate your level of agreement/disagreement with the following statements regarding your level of satisfaction in the relationship with your primary supplier.

	Strongly Disagree			Neutral			Strongly Agree
Our relationship with this supplier has been a successful one.	1	2	3	4	5	6	7
Our relationship with this supplier has more than fulfilled our expectations.	1	2	3	4	5	6	7
We are satisfied with the outcomes from this relationship.	1	2	3	4	5	6	7
We regret the decision to work with this supplier.	1	2	3	4	5	6	7
If we had to do it all over again, we would still choose to work with this supplier.	1	2	3	4	5	6	7

9. Please indicate your level of agreement/disagreement with the following statements regarding your industry environment.

	Strongly Disagree			Neutral			Strongly Agree
There is not much competitive intensity in our market.	1	2	3	4	5	6	7
The growth rate of total industry sales is very high.	1	2	3	4	5	6	7
Competitors enter and exit our market at a very high rate.	1	2	3	4	5	6	7

SECTION FIVE: ABOUT YOUR COMPANY

10. Please provide the following basic information concerning your company

What is your primary industry?

_____

Primary Business Area (Circle one) Manufacturer Wholesaler Retailer Other _____

Approximate Number of Full Time Employees _____

Approximate Number of Employees Devoted to Supply Chain Management _____

Sales Volume for Most Recent year _____

11. Please provide a contact name at your primary supplier for us to send a follow-up survey. Your responses will remain confidential.

_____

Contact Name and Title

_____

Company

_____ _____

Address City, State, Zip

_____ _____

Phone Email

This Supplier is a (Circle One) Manufacturer Wholesaler Other_____

12. For the supplier above, how much of the overall success/failure of the listed technologies do you attribute to?

Your firm's management of technology	_____ %
Your partner's management of technology	_____ %
The technology itself (anyone can manage it)	_____ %
Total	100 %

(Please fill in or attach business card if you would like to receive a copy of the executive summary)

Respondent Name: Title:

Company:

Mailing Address:

City: State: Zip: Country:

Thank you for your time and effort in helping us. It is greatly appreciated.